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ICFAEAM 2018
International Conference on Factors Affecting the Efficacy of Ayurvedic Medicines 05th - 06th January, 2018

Prof. K. Ramachandra Reddy
Organizing Chairman

Organized By
Department of Rasa Shastra
Banaras Hindu University
Varanasi - 221005

Conference Proceedings
Special Online Issue

Official publication of TIFAC CORE in Green Pharmacy

Online full text at www.greenpharmacy.info
Prime Minister

MESSAGE

It is a pleasure to know that an International Conference on Factors Affecting the Efficacy of Ayurvedic Medicines (ICFAEAM 2018) is being organized by the Banaras Hindu University on 5th and 6th January, 2018.

India’s gift to the world, Ayurveda has captured the imagination of the whole humanity. It is a wonderful means to remain healthy. It is appreciable that the University is undertaking this initiative to bring together the researchers working on the pharmacological effects of the Ayurvedic drugs to understand the factors influencing their efficacy.

Best wishes for the success of the Conference.

New Delhi
01 January, 2018

Dr. K. Ramachandra Reddy
Organizing Chairman, (ICFAEAM-2018)
Head, Deptt. Of Rasa Shartra
Superintendent, Ayurvedic Pharmacy
Faculty of Ayurveda, IMS, BHU
Varanasi, Uttar Pradesh- 221005
MESSAGE

The Hon'ble Vice President of India is happy to learn that Department of Rasa Shastra is organizing an International Conference on ‘Factors Affecting the Efficacy of Ayurvedic Medicines’ on January 5 – 6, 2018 at BHU, Varanasi.

The Vice President extends his greetings and congratulation to the organizers and the participants and wishes the event all success

New Delhi
04th December, 2017.

(N. YUVARAJ)
MESSAGE

I am pleased to learn that Rasa Shastra Department of institute of Medical Sciences, Banaras Hindu University, Varanasi is organizing international conference on Factors affecting the efficacy of Ayurvedic Medicines from 5th - 6th January, 2018.

Although the Ayurveda formulations are known for their long history of safe and effective use, yet validation of safety and efficacy using scientific and evidence-based methodologies is needed for the purpose of universal acceptability, gaining confidence of practitioners and satisfaction of end users in the products. The arguments of having long standing in the medical practice or market are often unconvincing and there has been persistent and increasing demand of documented proof of clinical safety and efficacy of Ayurvedic medicines. Availability of raw material, biodiversity and geographical distribution of medicinal plants and seasonal collection and cultivation, chemical profile variation due to eco-climatic conditions are the big challenges in addressing the standard quality and efficacy of Ayurvedic medicines.

Furthermore, the increase in the utilisation of Ayurveda and traditional medicines across the globe and within the country has called for various concerns of quality, safety, efficacy and rational use backed by scientific evidence. Also, in the emerging scenario of the integrative medicine the role of Ayurveda has been expanded as add-on/adjuvant to conventional therapies besides its standalone interventional approach. This situation also poses the issues of drug interactions and bio-availability issues that may interfere efficacy of medicines.

CCRAS under this Ministry has taken a flagship programme “Validation of Classical Ayurveda formulations for its safety and efficacy” since 2011 and so far the evidence on the clinical safety and efficacy of about 80 formulations have been completed while studies are about 100 formulations are under investigational phase. Further, CCRAS has generated evidence on experimental.

Contd...2/-
safety of 14 commonly Ayurvedic herbo-mineral and metal based formulations in collaboration with reputed institutions. About 8 common herbo-mineral formulations for which CCRAS has generated evidence of quality and safety. The above evidences certainly endorse the safety and efficacy of Ayurvedic formulations realising that the formulation prepared as per guidelines of classical Ayurvedic texts are always safe.

CCRAS is shortly introducing Pharmaco-epidemiology programme to study the factors influencing the safety and efficacy of the Ayurveda interventions which would be certainly a guiding principle and evidence to document such issues for Academic and Research purpose.

The Government of India, Ministry of AYUSH has formulised the process of quality control and quality assurance through the provisions of drug and cosmetic act, 1940. The Ministry has set up Pharmacopeial commission for Indian Medicine and Homeopathy, Pharmacopeial laboratory for Indian Medicine and Ayurvedic Pharmacopeia Committee (APC) to address the issues related with standardization and laying down of the Pharmacopeial standards of the formulations/single drugs.

Further the Ministry has also issued guidelines on ‘Good Clinical Practice’ for ASU medicines to facilitate researchers, sponsors and drug manufacturers, therefore, have to be well versed with the standard scientific procedures that are required to be followed while conducting clinical trials with ASU interventions to achieve objective and reproducible results. This Ministry has also provided inputs related AYUSH medicines that are reflected in the National Ethical Guidelines for Bio-Medical Research published by ICMR in 2017 which could be well utilised by Academic and Research Fraternity.

I congratulate the organizers for conducting this international conference with the relevant theme and hope that deliberations made in this event would certainly widen the horizons of practitioners, researchers, academicians, public health fraternity & other stakeholders and sensitize them to translate this potential area into practice and generate evidences on efficacy of Ayurveda medicines.

I wish this event a great success.

New Delhi,
Dated: 11th December, 2017

(Rajesh Kotecha)
We are delighted to know that the 25th International Conference “Factors Affecting Efficacy of Ayurvedic Medicines” is organized by the Department of Rasa Shastra, Banaras Hindu University, UP, India 5th & 6th January 2018 in alliance with the Association of Ayurvedic Professionals of North America (AAPNA), Global Ayurveda Conferences (GAC), USA.

Ayurvedic system of healing is well established and recognized in ancient time. It is high time to organize an international conference on factors affecting effectiveness and efficacy of ayurvedic medicines. The key areas of establishing the efficacy of ayurvedic basic principles such as dinacharya (daily routine and lifestyle management) and seasonal routine (circadian or bio rhythms and seasonal influence). As I am practicing and teaching Ayurveda in USA over three decades majority of diseases are related to lifestyle disorders, anxiety and stress disorders are responsible for majority of metabolic disorders, immunological disorders, cancer etc.,

Psychological, neurological, immunological and substance abuse disorders are becoming hazardous in all regions of the world. Ayurveda, which is the ancient science of life, promotes and preserves mental health and well-being which are both integral parts of a healthy life. With Shamana (internal medication) and Shodhana (Panchakarma) therapies forming the mainstay treatment in Ayurveda, managing the disorders of the above areas demands in depth understanding and analysis and this conference will help you to gain that knowledge.

I hope everyone will enjoy this groundbreaking conference. I extend my warm wishes for continued success in your teaching, practice and research.

Dr. Shekhar Annambhotla

December 25, 2017
MESSAGE

I am happy to learn that the Department of Rasa Shastra, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University is organizing an International Conference on “Factors affecting the Efficacy of Ayurvedic Medicines” from January 5-6, 2018 at Institute of Medical Sciences, Banaras Hindu University, Varanasi and also glad to note that the proceedings containing scientific papers of the conference will be published as a special issue in the “International Journal of Green Pharmacy”

I am sure that the participants will be highly benefitted with the brainstorming sessions and the conference will become a platform to share the vast knowledge of the prominent speakers.

I wish the conference all success and welcome all the delegates to the great seat of learning.

(V.K.SHUKLA)
MESSAGE

It is a matter of immense pleasure and joy to learn that Department of Rasa Shastra, Faculty of Ayurveda, IMS, BHU is hosting an International conference in a subject, which is very much relevant to the present time and challenges in practicing Ayurveda. Both the physician and the medicine are important to treat a patient, but because of several environmental changes, many plants are extinct, and the minerals are also contaminated. The procedures of manufacturing of medicines are also gradually shifting from ancient descriptions to modern technology. Although it is a good move, but it needs a comparative study, while adopting different techniques and tools.

The organizers of the International conference “Factors affecting the efficacy of Ayurvedic Medicines” on 5-6th January, 2018 have done a great job. I personally congratulate Prof KRC Reddy, the Head of the Department and his entire team for conceptualizing this topic. I am sure the resource persons and the participants would give enough thoughts to different field of this seminar. Further, I am happy to note that the proceedings of this seminar will be published as special issue of the “International journal of green chemistry”, which will serve as a valuable reference in the future to come.

Further, I would like to share my feelings with the participants, to focus on the mechanism of action behind changes in efficacy of any drug. It starts from intestine, to liver, to cell membrane and finally to the nucleus. As transcription and translation of a given protein, I would also emphasize to develop collaborations with basic scientists, because now it is difficult for one scientist or one laboratory to meet the set goals of drug research and publications in indexed journals of High impact factor. This is the high time to also debate whether mixing of metallic preparations with herbal preparations is essential or they can be prescribed separately? This current practice is seriously hampering the export of herbal preparations in International market.

Once again, I welcome all the participants to this holy city of Kashi, a place, where Devadas Lord Dhwantariji established the science of Ayurveda to rescue the suffering humanity. I am sure they will get some time to feel the culture and tradition of Kashi the oldest living city on the earth.

(Yamini Bhusan Tripathi)

Dean,
Faculty of Ayurveda
IMS, BHU
Banaras Hindu University established in 1916 by Bharat Ratna Mahamana Pt. Madan Mohan Malviyaji. One of the most prestigious Central Universities of the Country. Largest residential University of the Asia and with the humble message Sarvavidhya ki Rajdhani is the only University in India.

Ayurveda is the science of life practiced by ancient Aryans, and it is based on Atharva Veda, one of the oldest scriptures of the Hindus. Mahamana Pt. Madan Mohan Malviyaji was of the firm view that, Ayurveda is the only science which can serve the entire nation for improving its health and life as a hole. In this University full fledged studies of Ayurveda commenced since 1927 and with due progresses, Faculty of Ayurveda is propagating globally due to its uniqueness in relation of its management of diseases. Rasa Shastra department was established in 1978, in the Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University. Department of Rasa Shastra is responsible in teaching, training and research in Rasa Shastra and Bhaishajya Kalpana. Rasa Shastra deals with conversion of mineral/ metal/animal origin, herbs of poisonous nature, some aquatic substances and plant material in to efficacious medicines as an outcome of its specialized manufacturing process i.e. Shodhana, Bhavna and Marana etc. Rasaushadhies are known for their uniqueness to provide quick therapeutic action, lesser dose regimen, better palatability, long shelf life and wider range of therapeutics to treat acute and chronic diseases. Bhaishajya Kalpana deals with the preparation of different dosage forms i.e. Churna, vati, Gutika, Avaleha, Asava, Arishta and Pathya kalpana etc. These dosage forms are still prescribed by Ayurvedic Physicians very efficiently. Ayurvedic Pharmaceutics i.e. Rasa Shastra and Bhaishajya Kalpana, enriched with number of Formulations. Present day demand of Ayurvedic formulations has been raised globally.
Hence commercialisation of Ayurvedic drug manufacturing took place. Therefore certain things i.e. Standardization, Quality control, Safety became essential requirements for Ayurvedic formulations.

In view of evidences, practices and belief about Ayurvedic formulations, therefore the Department has been decided to conduct this International conference on Factors Affecting the Efficacy of Ayurvedic Medicines on 05-06 January, 2018. During this conference the following issues will be focused viz:
1. Factors influencing during Collection, Procurement and storage of Raw Material.
2. Factors influencing at different levels of Manufacturing of Ayurvedic Medicines.
3. Factors influencing the Quality and Safety of Ayurvedic Formulations.
4. Factors influencing the Dose, mode of Administration, Vehicle and Absorption etc.
5. Factors influencing by the storage conditions and stability of Ayurvedic Medicines.
6. Pathya Ahara (Dietetics)-Vihara (things to do and not to do) and their influence on the Efficacy of Ayurvedic Medicines.

The Conference proceedings will be published as a special issue in International Journal of Green Pharmacy.

I am sure the present Conference will address all the problems and will come with fruitful solutions for the welfare of mankind.

Prof. K.R.C. Reddy
Organizing Chairman ICFAEAM 2018
Head, Dept. of Rasa Shastra
Superintendent, Ayurvedic Pharmacy

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It gives me immense pleasure to present this souvenir on the occasion of “International Conference on Factors Affecting the Efficacy of Ayurvedic Medicines” to be held on 5–6 January 2018, at Department of Rasa-Shastra, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi. Health is the level of functional or metabolic efficiency of a living being. In humans, it is the general condition of a person’s mind, body, and spirit, usually meaning to be free from illness, injury or pain (as in “good health” or “healthy” and one of most traditional system of medicine which has been in practice of ensuring health in our country is Ayurveda, good manufacturing practices are one of the prerequisite conditions to ensure the quality as well as efficacy of Ayurvedic drugs to maintain a healthy society.

The various factors such as the collection, procurement, storage of raw drug, quality, and safety of Ayurvedic formulations, dose, mode of administration, and stability of Ayurvedic medicines are may enhance the medicinal value of Ayurvedic medicine and popularize among the people.

All these aspects are essential for a virtuous and benevolent society and this conference deals with these crucial aspects of the society. This conference will serve as a canopy for a get together of researchers of all these fields to discuss their latest research in these important themes.

I also take this chance to extend my sincere gratitude to speakers, delegates, and other distinguished guests for their support in making this conference a great success. I would also like to express my gratitude to the members of organizing the committee for their hard work and support for the success of this International conference. Finally, I am very thankful for the financial support from various agencies without; whose support this conference would not have been possible.

Dr. DevNath Singh Gautam
Organizing Secretary
Conceptual study of factors influencing the dose and mode of administration of Rasayan W.S.R. to Triphala rasayan

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Abstract

Introduction: According to our ancient texts Rasayan drug are used against a multiplicity of seemingly various disorders. Rasayan is not only a drug therapy but it is a rejuvenation recipes, dietary regimen and especially in health enhancing and correcting the conduct. Now a day Rasayan is having much wider application. Material and Method: This is the conceptual review article which was collected from different peer review journals, authentic classical texts and modern references books and websites. Result: Rasayan may be of three types Kamya, Ajasrik, Naimittik Rasayana and on the basis of Mode of administration classified into Kutipravesik and Vatatapik. It act upon the cell and body tissue. Conclusion: In present study mainly focus upon the factors which influence the Dose and mode of administration of Triphala Rasayan. Triphala is a marvelous drug by using it in a proper way and in proper quantity the people can live more than hundred years without any disease and geriatrics. Charaka samhita states that there is no curable disease in the universe which is not effectively cured Rasayan when it is administered at the appropriate dose and time in combination with suitable drug and by adopting the prescribed method.

Key words: Rasayan, Vatatapik, Kuti pravesika, Triphala

INTRODUCTION

Rasayan is the wonder drug that aid in increasing the natural immunity enhancing our general well-being improving the functioning of all fundamental organs of the body and keep the sign of early ageing at bay when it is taken in proper way.[1] Rasayan is one of the specialties of Astang Ayurveda. Nowadays, Rasayan is having much wider application. However, due to wrong uses of inappropriate terminologies to equate Rasayan with immunomodulation, geriatrics, medicine, and free radical scavenging activity the role and scope seems minimized. Rasayan has been broad scope starting from lifestyle management including preventive, rejuvenative aspects, and geriatrics. As per Ayurveda in the Indian system of medicine, Triphala is the combination of (equal proportion 1:1:1) dried fruit of Amalaki (Emblica officinalis), Bibhitaki (Terminalia bellerrica), and Haritaki (Terminalia chebula). It is commonly used to balance the three doshas Vata, Pitta, and Kapha in the body.[2] Early Ayurvedic writing from the Charak Samhita describes Triphala as Rasayan, i.e., rejuvenative which is able to increase longevity from 100 years of age.[2] In the present study, there are conceptual study on factor influencing the dose and how Rasayan therapy is administered specially Triphala Rasayan.

MATERIALS

This is the conceptual review article which was collected from different peer review journals, authentic classical texts, and modern references books and websites.

METHODS

Type of Rasayan[4]

In Charaka Samhita, Rasayan are of three types Naimittik Rasayan is given to combat or balance a specific cause, which is causing disease in the body. Example - Dhatri rasayan,
Mandukaparni rasayan, Brahmi rasayan, and Triphala rasayan. Ajasrik Rasayan is used to maintain good health and improve the quality of life through a healthy lifestyle, diet, or exercise. It includes use of milk, ghrita, honey, and adopting the principle of proper sleep and celibacy. Karprachitiya Rasayan is used to fulfill the wish or desire or to serve a special purpose such as Prunkamaya, Medhakamya, Ayushkamya, and Chakehouka. On the basis of mode of administration, Rasayan are of two types Kuti pravesika and Vatatapika. Kuti pravesika is a therapy in which the person lives in a special type of cottage for a long period while tacking various Rasayan. This Rasayan was practiced by the royal and wealthy family of ancient India. Vatatapika literally, Vata means air and tapika means heat or sun. Vatatapika on the other hand does not bear stringent rule and can be practiced in our daily life. Hence, this method of taking Rasayan in a person remain exposed to air and heat. The Rasayan used generally Chywanprash, Brahmi Rasayan, Shilajit Rasayan, Triphala Rasayan, etc.[5]

**Triphala Rasayan**

Acharya Charaka has described the Triphala Rasayan in Karprachitiya Rasayan, i.e. 3rd chapter of the 1st Paad of Charaka Chikitsa Sthan. They describe mainly four types of Triphala Rasayan.

1st Triphala Rasayan[6]

It is the first rejuvenation recipe of Triphala Rasayan which is used along with honey and ghrita after the previous meal is digested, i.e. in early morning, as one Haritaki and before food they take two Bibhitaki and after food they should take four Amalaki. After using this, Rasayan a person lives 100 years of life without any disease and geriatrics.

2nd Triphala Rasayan[7]

First of all, prepare the paste of Triphala then take new vessels and vessels are pasted by the Triphala paste for 24 h. After this, one Tola of the paste is mixed with two Tola of honey and four Tola of water and prepares a sharbat like solution. This is taken in morning and after its digestion one should take a lot of fat. Using this recipe continuously for 1 year, the person should live for 100 years free from ageing and disease.

3rd Triphala Rasayan[6]

Triphala is mixed with Madhuka - licorice-glycyrrhiza glabra, Banslochan, pippali-piper longum, Honey, Ghrita, and sugars. Here, it is noted that all the ingredients should take in amount of one Tola with respect to the honey and sugar. This Rasayan is an effective anti-ageing recipe after using morning and evening till 1 year.

4th Triphala Rasayan[9]

First of all, we take Sarva lauha Bhasma, Gold (swarna) bhasma, Vacha (Acorus calamus) churna, Honey, Ghrita, Vidanga (Embelia ribes), pippali, and Saindhava lavana and mixed with Triphala. Here, it is noted that all the ingredient should take in equal quantity, i.e. one Tola each, Sapta lauha wholly one Tola, Amalki, Bibhitaki, and Haritaki each one Tola and except it all the substances in one Tola quantity should take and mixed with Honey and Ghrita and continuously used for 1 year; then, this Rasayan increases the intellect, memory, strength, longevity (Ayu) wealth and also prevent the ageing and disease.

**Contents and Uses of Triphala**

The individual plant of Triphala has been reported to be a reach source of Vitamin C, ellagic acid, gallic acid, chebulinic acid, bellericin, beta-sitosterol, and flavonoids.[10] Conventionally, the Triphala formulation has been used as a laxative in chronic constipation as a detoxifying agent of the colon and as a rejuvenator of the body.[11]

**Factor Influencing the Amount of Rasayan**

The factor which affects the amount of Triphala Rasayan required for the proper uses are body mass index, general health, metabolism, food, and other lifestyle also.

**Factor Influencing the Dose of Drugs**

The dose has to be finalized after considering the relevant factor that affects the dosage. Nowadays, the people have too low sattva so the classical therapeutic dose may be influence. According to Sharangdhar Samhita following factor influences the therapeutic doses.[12] Agni dose of any drug depend on the digestive fire, the person who have Dipanagni will be given to maximum therapeutic dose while the one which has mandagni will be given to minimum dose. Bala - sarangdhar says that the dose of any drug will depend on the strength of both the person and the disease. The person who is strong and the strength of disease is also strong will be given to the maximum therapeutic dosages. Vaya - on our texts, the dose of any drug is given for the middle age person. However, sarangdhar[13] given a law for the lower and higher age person which is known as Aanshik dose are as for 1 month child the dose is 125 mg, this dose gradually increases 125 mg in each month till 1 year so the dose of 1 year child become 1.5 g, later increase the dose 1 g for every year so the dose of a 16 years child become equal to 16 g, this dosages also for the middle age person, i.e. 16-70 years, after 70 years, this dose will be reduce according to child dose, i.e. 1 g in every year, this is for kalka and churna. Prakriti - the dose of any drug is decided by the prakriti of the rogi. Dosha - the dose is also decided according to the Dosh, i.e. vata, pitta, and kapha, the person which has maximum Dosh strength will give maximum amount of drugs. Kala - season play an important role in deciding the dose of a drug. Desha (climate) - Desha...
Drugs, and dose of the drug such as – Acharya Charaka also explains the factor which decides the dose of the drug such as – Dosh, Agni, Bala, Vaya, Disease, Drugs, and Kosth.[14]

Except these, there are some other factors which influence the dose of drugs such as idiosyncrasy (nature), habit, absorption, excretion, mental condition, time, and preparation.

Factor Influencing the Mode of Administration

The mode of administration of a drug will decide by the place of dosh, which is present in our body and the nature of the drugs. Our classical texts describe nine opening of channels known as mouth, nose, eye, ear, anus, and urinary opening. These are the channels through which the drug is administered.[15] Oral route - through this route, the drugs are given for local action as well as for systemic action. The drugs locally act in oral cavity, throat, and systemically acts on the respiratory system like dhumrapan and digestive system through digestion, absorption, assimilation, excretion, and works on the whole body. Nasal route - locally acts on the nasal cavity and systemically for respiratory and also for shirovirechana. Anus - through this route, Basti is given for local and systemic action.

Factor Influencing the Kuti pravesika Rasayan Sevari[16]

Time and duration - during the sun is northern course, in the light half of the month (suklapaksha), on an auspicious day with an auspicious constellation (naksatra) and favorable muhurta (moment) and karana.

A person desirous of undergoing rejuvenation therapy should enter into the cottage after shaving, endowed with the perseverance and memory, full of faith, single-minded, having removed all mental affliction, cherishing good will for all living, and performs the pradakshina (going round) of the Gods, cows, and the Brahmans.

That individual should then be cleansed by Panchkarma, elimination therapy. Thereafter, when he is happy and has regained his strength, the rejuvenation therapy should be administered.

RESULTS

Rasayan is preventing the effect of ageing and to improve memory, intelligence, and complexion, sensory and motor function. According to our ancient seers taking the actual benefits of Rasayan is very difficult because its mode of administration and dose play an important role in its uses. In general, the Triphala Rasayan is of four types and its uses according to their types are very important. Thus, the above conceptual study suggests that the Rasayan therapy is very much difficult because whenever the use of Rasayan is not in a proper way its benefits are not obtained.

CONCLUSION

Literary study shows that Rasayan therapy is such a therapy that can be practiced properly we can maintain our health for a long time and can stop ageing. Our ancient seer used the Rasayan therapy for various different purposes such as for removing the disease, to maintain the health and also for the various purpose of the life. The Rasayan is generally used by two ways, i.e. Kuti pravesika and Vatatapik. When the Kuti pravesika method is used properly with the patient it provides tremendous advantages, but there is a lot of difficulties to use it. While the Vatatapik method can be used comfortably in our busy life but according to conceptual study there are many factors which effect the proper use of Rasayan as the form of dose and mode of administration and those individual factors such as idiosyncrasy (nature), habit, absorption, excretion, mental condition, time, and preparation which effect the properly use. Acharya Charaka has described four types or Triphala Rasayan and they clearly indicated the quantity of Amalki, Bibhitaki, and Haritaki. In its other types, it is clearly indicated that how it make and when and how much duration it is used so that we can find its real advantages because by proper using we can live a healthy life of 100 of years without any kind of disease. Conventionally, the Triphala formulation has been used as a laxative in chronic constipation as a detoxifying agent of the colon and as a rejuvenator of the body such a wide and varied effect on the human body. Thus, from the above conceptual study, it is concluded that there are lot of factors which affect the proper use of Rasayan.

REFERENCES


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Fourier-transform infrared spectroscopy based corroboration of the ingredients of Triphaladi Yoga: A polyherbal formulation

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Abstract

Aim: The aim of this study is to assess the possible functional groups and active phytoconstituents present in all the six ingredients of Triphaladi Yoga using Fourier-transform infrared (FTIR) spectroscopy.

Material and Methods: Well-dried, fine-powdered samples of all the ingredients were prepared by pressed pellet technique and scanned in moisture-free condition through double-beam FTIR Spectroscopy (Varian 640 IR Spectrophotometer).

Result and Discussion: Various absorption peaks reflect different functional groups such as hydroxyl (-OH), carbonyl (C=O), alkenes (C=C), alkanes (C-H), alcohol (C-O), acids (O-C), and alkyl halides (C-Br, C-I) groups and possible phytoc omstituents such as polyphenols, tannins, carbohydrates, and sugar.

Conclusion: The presence of specific functional groups and phytoconstituents at particular absorption peaks not only makes known about the drug but also validates and signifies the quality of the herbs.

Key words: Fourier-transform infrared, Diabetes mellitus, Phytoconstituents, Triphaladi Yoga.

INTRODUCTION

On reassessing the Ayurvedic literatures, it is found that different types of Prameha (diabetes) are explained based on specific clinical characteristics of urine. They are categorized according to the quantity (excess urination-polyuria) and quality (color, odor, taste, consistency, heaviness, etc.) of the urine.[1] The decoction of Triphaladi Yoga is described in Vaidya Chintamani under “Prameha prakaranam” for the treatment of Bahumutrata (Polyuria).[2] It contains a total of six herbs [Table 1]. The action of a medicine/ formulation depends on the sum total of the effect of the ingredients in it rather than the action of individual drugs. Drug combinations are envisaged to serve synergistic action and combined action. Since Fourier-transform infrared (FTIR) spectroscopy is a unique analytical assessing means which make possible to directly monitor the vibrations of the functional groups which characterize molecular structure of a compound or formulations. Consequently, in the present paper, FTIR spectroscopy study of all the six ingredients of Triphaladi Yoga was assessed and possible interpretations was done to reveal the functional groups and phytoconstituents present in the herbs. This study analytical validation has been conducted in the Ayurvedic Pharmacy Laboratory, Rajiv Gandhi South Campus, Banaras Hindu University.

MATERIAL AND METHODS

At the present time, FTIR spectroscopy is one of the most competent analytical methods available for the investigation of various ayurvedic dosage forms such as liquids (Asava and Arishta), solutions (Rasakriya and Avaleha), powders (single drug and multidrug Ayurvedic Churnas), and films (Shilajatu coated tablets). The progress has been made possible by developments in the design of both FTIR instruments and equipment to interface these instruments to chemical processes. The IR region of the electromagnetic spectrum has a dimension of wave numbers extending from 13000/cm...
For infrared analysis, fine powders of all the six ingredients [Table 1] of Triphaladi Yoga were made and all the samples were mixed with potassium bromide (KBr) in proportion to 1:100, i.e., in a ratio of one part fine powder of the drug with 100 times of KBr crystals, and this was made into pellet form by press pellet technique using hydraulic pressure.\[4\]

### RESULT

The samples of the six ingredients were prepared separately by pressed pellet technique and scanned in moisture-free condition through double-beam FTIR spectroscopy (Varian 640 IR Spectrophotometer). The spectrums of the ingredients of Triphaladi Yoga [Figures 1-6] were analyzed and the absorbance peak was recorded for Haritaki [Table 2], Vibhitaki [Table 3], Amalaki [Table 4], Venu Patra [Table 5], Musta [Table 6], and Patha [Table 7]. These spectrums and its absorbance peaks were studied for possible group of phytoconstituents present in the samples and the functional group prominent in these ingredients for the validation and identification of the formulation.

### DISCUSSION

The fine powder of all the ingredients is evaluated for FTIR scanning and spectrums of the respective samples are exposed in Figures 1-6 (Haritaki, Vibhitaki, Amalaki, Venupatra, Musta, and Patha, respectively). These spectrum absorption peaks of all the six ingredients of Triphaladi Yoga are compared against their chemical interactions and bonding pattern/strength in the molecules. The possible interpretations with respect to their functional groups are specified in Tables 2-7 of Haritaki, Vibhitaki, Amalaki, Venupatra, Musta, and Patha.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Botanical name</th>
<th>Family</th>
<th>Part used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haritaki (H)</td>
<td><em>Terminalia chebula</em></td>
<td>Combritaceae</td>
<td>Fruit pulp</td>
</tr>
<tr>
<td>Vibhitaki (V)</td>
<td><em>Terminalia bellirica</em></td>
<td>Combritaceae</td>
<td>Fruit pulp</td>
</tr>
<tr>
<td>Amalaki (A)</td>
<td><em>Emblica officinalis</em></td>
<td>Euphorbiaceous</td>
<td>Fruit pulp</td>
</tr>
<tr>
<td>Venu patra (VP)</td>
<td><em>Bambusa arundinaceae</em></td>
<td>Poaceae</td>
<td>Leave</td>
</tr>
<tr>
<td>Musta (M)</td>
<td><em>Cyperus rotundus</em></td>
<td>Cyperaceae</td>
<td>Rhizome</td>
</tr>
<tr>
<td>Patha (P)</td>
<td><em>Cissamperol pareira</em></td>
<td>Menispermaceae</td>
<td>Root</td>
</tr>
</tbody>
</table>

**Table 1: The ingredients of Triphaladi Yoga**

**Figure 1:** Different absorbance peaks of *Haritaki (Terminalia chebula)* fruit pulp powder

**Figure 2:** Different absorbance peaks of *Vibhitaki (Terminalia bellirica)* fruit pulp powder
and Patha. Absorption peaks in the range 3000–4000/cm was 3455 (H), 3452 (V), 3417 (A), 3433 (VP), 3417 (M), and 3426 (P) cm\(^{-1}\) which denotes the presence of hydroxyl group (OH\(^{-}\)) either in H-binding or free state.\(^{[5]}\) These peaks reflect the possibility of the presence of phytoconstituents tannins, polyphenols, and phenols. Peak in the range 2000–3000 was
2931/2859 (H), 2927/2867 (V), 2929 (A), 2924 (VP), 2925 (M), and 2925/cm designating the presence of alkane (C-H) asymmetric stretching vibration because of the presence of carbohydrate in the samples.[6] Peak in the range of 1500–2000 was 1705/1621 (H), 1703 (V), 1715/1621 (A), 1653 (VP), 1643 (M), and 1651 (P) cm⁻¹ reflecting the presence of carbonyl group (C=O) stretching of saturated aliphatic ester and alkenes (C=C) isolated stretch illustrate the chances of tannins in the sample.[7] Absorption peaks found in the range 1000–1500 were 1344/1200/1045 (H), 1064 (V), 1453/1213/1070 (A), 1422/1067 (VP), 1431/2054/1042 (M), and 1456/1043 (P) cm⁻¹ reflecting the presence of functional groups, symmetrical bending at aliphatic CH₂, triterpene compounds (CH₃=CH-CH₃) or alkane (C-H) in plane-bend, C-O bonding vibration stretching, and OH-CH stretching in sugar and polysaccharide. The presence of alkane in plan bending peak signifies the stability of the formulation.[3,8] Peak at 1453 and 1456/cm indicates CH₂ and CH₃ deformation or alpha-CH₂ bending vibration which are due to the presence of larger carbohydrate/sugar molecule and glycosides.[9] Peak at 1344/cm denotes the presence of triterpene compounds (CH₃=CH-CH₃) in the sample, and peak at 1045/1043/1042/cm indicates OH-CH stretching in sugar and polysaccharide. Absorption peaks found in the range ≤500–1000 were 867/663/462 (H), 773/659/566/458 (V), 663 (A), 786/659/542 (VP), 771/524/458 (M), and 657/540/462 (P) cm⁻¹ indicate the presence of O-C (acid)

### Table 2: FTIR absorption peaks and functional groups of *Terminalia chebula*

<table>
<thead>
<tr>
<th>Absorption peaks (Wave numbers) cm⁻¹</th>
<th>Possible interpretations of the respective peaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3455</td>
<td>Hydroxyl group either in H-binding</td>
</tr>
<tr>
<td>2931</td>
<td>CH₂ asymmetric stretching</td>
</tr>
<tr>
<td>2859</td>
<td>Alkane (C-H) stretching vibration</td>
</tr>
<tr>
<td>1705</td>
<td>C=O stretching of saturated aliphatic ester</td>
</tr>
<tr>
<td>1621</td>
<td>Carboxyl group (C=O)</td>
</tr>
<tr>
<td>1344</td>
<td>Symmetric bending at aliphatic CH₃, triterpene compounds (CH₃=CH-CH₃)</td>
</tr>
<tr>
<td>1200</td>
<td>C-O bonding vibration stretching</td>
</tr>
<tr>
<td>1045</td>
<td>OH-CH stretching in sugar and polysaccharide</td>
</tr>
<tr>
<td>867</td>
<td>O-C (acid) bond overlapping</td>
</tr>
<tr>
<td>663</td>
<td>Characteristic peak of CH2</td>
</tr>
<tr>
<td>462</td>
<td>Alkyl halides (C-I) stretch</td>
</tr>
</tbody>
</table>

FTIR: Fourier-transform infrared

### Table 3: FTIR absorption peaks and functional groups of *Terminalia bellirica*

<table>
<thead>
<tr>
<th>Absorption peaks (wave numbers) cm⁻¹</th>
<th>Possible interpretations of the respective peaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3452</td>
<td>Hydroxyl group either in H-binding</td>
</tr>
<tr>
<td>2927</td>
<td>CH₂ asymmetric stretching</td>
</tr>
<tr>
<td>2867</td>
<td>Alkane (C-H) stretching vibration</td>
</tr>
<tr>
<td>1703</td>
<td>C=O stretching of saturated aliphatic ester</td>
</tr>
<tr>
<td>1064</td>
<td>OH-CH stretching in sugar and polysaccharide</td>
</tr>
<tr>
<td>773</td>
<td>O-C (acid) bond overlapping</td>
</tr>
<tr>
<td>659</td>
<td>Characteristic peak of CH₂</td>
</tr>
<tr>
<td>566</td>
<td>Alkyl halides (C-Br) stretch</td>
</tr>
<tr>
<td>458</td>
<td>Alkyl halides (C-I) stretch</td>
</tr>
</tbody>
</table>

FTIR: Fourier-transform infrared

### Table 4: FTIR absorption peaks and functional groups of *Emblica officinalis*

<table>
<thead>
<tr>
<th>Absorption peaks (wave numbers) cm⁻¹</th>
<th>Possible interpretations of the respective peaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3417</td>
<td>Hydroxyl group either in H-binding</td>
</tr>
<tr>
<td>2929</td>
<td>Alkanes (C-H) stretch</td>
</tr>
<tr>
<td>1715</td>
<td>C=O stretching of saturated aliphatic ester</td>
</tr>
<tr>
<td>1621</td>
<td>Carboxyl group</td>
</tr>
<tr>
<td>1453</td>
<td>Alkane (C-H) in plane-bend</td>
</tr>
<tr>
<td>1213</td>
<td>C-O bonding vibration stretching</td>
</tr>
<tr>
<td>1070</td>
<td>OH-CH stretching in sugar and polysaccharide</td>
</tr>
<tr>
<td>663</td>
<td>Acetylenic (C-H) bend</td>
</tr>
</tbody>
</table>

FTIR: Fourier-transform infrared

### Table 5: FTIR absorption peaks and functional groups of *Bambusa arundinaceae*

<table>
<thead>
<tr>
<th>Absorption peaks (wave numbers) cm⁻¹</th>
<th>Possible interpretations of the respective peaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3433</td>
<td>Hydroxyl group (OH⁻) either in H-binding</td>
</tr>
<tr>
<td>2924</td>
<td>Alkane (C-H) stretching vibration</td>
</tr>
<tr>
<td>1653</td>
<td>Carbonyl group (C=O)</td>
</tr>
<tr>
<td>1422</td>
<td>Alkane (C-H) in plane-bend</td>
</tr>
<tr>
<td>1067</td>
<td>OH-CH stretching in sugar and polysaccharide</td>
</tr>
<tr>
<td>786</td>
<td>O-C (acid) bond overlapping</td>
</tr>
<tr>
<td>659</td>
<td>Acid chloride (C-Cl) stretch</td>
</tr>
<tr>
<td>542</td>
<td>Alkyl halides (C-Br) stretch</td>
</tr>
</tbody>
</table>

FTIR: Fourier-transform infrared
Table 6: FTIR absorption peaks and functional groups of *Cyperus rotundus*

<table>
<thead>
<tr>
<th>Absorption peaks (wave numbers) cm⁻¹</th>
<th>Possible interpretations of the respective peaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3417</td>
<td>Hydroxyl group (OH⁻) either in H-binding</td>
</tr>
<tr>
<td>2925</td>
<td>Alkane (C-H) stretching vibration</td>
</tr>
<tr>
<td>1643</td>
<td>Alkenes (C=C) isolated stretch</td>
</tr>
<tr>
<td>1431</td>
<td>Alkane (C-H) in plane-bend</td>
</tr>
<tr>
<td>1254</td>
<td>Alcohol (C-O) stretching vibration</td>
</tr>
<tr>
<td>1042</td>
<td>OH-CH stretching in sugar and polysaccharide</td>
</tr>
<tr>
<td>771</td>
<td>Meta aromatic (C-H) bend</td>
</tr>
<tr>
<td>524</td>
<td>Alkyl halides (C-Br) stretch</td>
</tr>
<tr>
<td>458</td>
<td>Alkyl halides (C-I) stretch</td>
</tr>
</tbody>
</table>

FTIR: Fourier-transform infrared

Table 7: FTIR absorption peaks and functional groups of *Cissampelos pareira*

<table>
<thead>
<tr>
<th>Absorption peaks (wave numbers) cm⁻¹</th>
<th>Possible interpretations of the respective peaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3426</td>
<td>Hydroxyl group (OH⁻) either in H-binding</td>
</tr>
<tr>
<td>2925</td>
<td>Alkane stretching vibration</td>
</tr>
<tr>
<td>1651</td>
<td>Carbonyl group (C=O)</td>
</tr>
<tr>
<td>1456</td>
<td>Alkane (C-H) in plane-bend</td>
</tr>
<tr>
<td>1043</td>
<td>Aldehyde (OH-CH) stretching in sugar and polysaccharide</td>
</tr>
<tr>
<td>657</td>
<td>Characteristic peak of CH₂</td>
</tr>
<tr>
<td>540</td>
<td>Alkyl halides (C-Br) stretch</td>
</tr>
<tr>
<td>462</td>
<td>Alkyl halides (C-I) stretch</td>
</tr>
</tbody>
</table>

FTIR: Fourier-transform infrared

In conventional method of spectroscopic recording, generally, the IR spectrum of a compound reflects only few peaks but spent much time in recording the background noise. At present, the available technique FTIR is capable enough in the recording of the whole spectrum in the magnetic resonance; microwave and infrared region are possible. In this study, FTIR absorption peaks indicate the presence of many phytoconstituents such as polyphenols, tannins, glycosides, and carbohydrates which validates the identity and quality of the herbs.

**REFERENCES**


**Source of Support:** Nil. **Conflict of Interest:** None declared.

**CONCLUSION**

FTIR spectroscopy together with the knowledge of size, composition, and morphology is very much needed for the identification and interpretation of absorption pattern of the compound with particular functional group and finally for the understanding of the mechanisms and interaction among them.
A classical vehicle for drug administration –

Anupana

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Abstract

Ayurveda is an ancient science which not only cures the disease but also a science of well-being. Bhashajavacharana (Drug administration) is a unique and broadly described science in Ayurveda and Anupana is essential part of this. Anupana is a fluid vehicle which is taken along with or after medicine. According to Ayurveda, “The liquid media which opposite to food and similar to body tissue is known as Anupana.” Anupana has an important role to increase Aushada Bala (strength of Medicine) as well as Rogibala (strength of patient). By changing the Anupana, one medicine can be used in different diseases. According to Acharya Charaka, Anupana refreshes body and help in easily digestion of medicine. It reduces adverse effect of drug, increases action of drug and also acts as an Agni deepana (Appetizer). In the present paper, many factors which affect the Anupana is described. Furthermore, reveals the actions and importance of Anupana in Ayurvedic practice.

Key words: Ayurveda, anupana, vehicle, aushadha, drug

INTRODUCTION

In Ayurveda, Anupana is described by all Brihattrayi. In Charak Samhita, it is described in Annapanavidiadhhyay. Acharya Sushruta has mentioned in classification of Aaha Dravya and is mentioned under Anupana Varga. Concept of Anupana is a peculiar concept along with Ahara and Aushadha. Different types of Anupana can be used in different Ahara, Roga, Dosha, and Prakriti of patient. Hence, specific Anupana in specific conditions should be adopted in clinical practice. Any liquid media which is taken along with or after the food and Aushadhi is called Anupana. It helps not only in ingestion but also facilitate transporting and absorption.[1]

Definitions

Many Acharya’s has described the different definitions in their own view:

• During administration of meal and drug, Anupana refers as “vehicle which means liquid mixed with medicine or food.”[3]
• In Sushruta Samhita – “Anupana is any liquid taken immediately after or along with food.”[4]
• According to Vagbhata – “Anupana is media which is taken before or after or along with drug and food.”[5]
• Which facilitates distribution to all Dhatus is Sahapana.[6]
• Anupana is a liquid part which is taken after some gap medicine.[7]
• If Anupana is given by a physician, it will cure the specific disease.[8]

Nirukti

The word “Anupana” is derived from two words:

• Anu + Pana
• Anu = Paschat (later)
• Pana = Drinking
• Pana is made from “Paa” dhatu and “lyut” pratyaya Sri varada prasada.[2]

Any media or liquid which is taken after meal or drug.

Mode of Actions of Anupana

Anupana which is rightly administered satisfies the man immediately and digests the food happily and gives life and
Archana, et al.

Anupana gives Tarpan (nourishment), Preena (pleasure), Oorja (energy), Brihan (roboration), Bhuktavasadan (settle down the eaten food), Annasamghathhinntati (breaks the mass of food), Mardavkarak (imparts softness), Kledayati (liquifies), and Jarayati (digests), brings about quick assimilation and diffusion in the body. Food which cause aggravation of the doshas, which are hard for digestion and foods consumed in more quantity get digested easily by the after drinks mentioned so for. It helps Rochan (taste), Brihan (stoutens the body), Vrishya (aphrodisiac), Dosham ghaat bhedanam (splits the lumps of the doshas), Tarpan (nourishing), Mandavkar (softens), Shramhara (relieves fatigue) and Klamhara (exhaustion), Sukham (confers happiness), Deepana (kindles digestion), Dosh shaman (mitigates the dosh), Pipa sanashan (best for relieving thirst), Balya (best to strength), and Varnkara (color); these are the effect/benefits of suitable after drinks, used appropriately.

Contraindications of Anupana

Swasa (breathing difficulty), Kasa (coughing), UdhrwajatrugatRoga (diseases of ENT), Lalaprasek (excess salivation), Svarbheda (Hoarseness of voice), Ledaadhikya (excess humidity), Medhraroga (Anorectal diseases), Netraroga (eye diseases), Galroga (diseases of throat), and Vrani (wounded person). In whom, vata is provoked in the upper parts of the body, and who suffer from hiccup, dyspnea, those who are engaged in singing, lecturing, or studying.

Factors Affecting the Anupana

Anupana according to Dosha

- Vata – Snigdha and Ushna
- Pitta – Madhur and Sheeta
- Kapha – Ruksa and Ushna

Anupana according to different conditions

1. Milk - for those fatigued by fasting, travel, lecturing, after intercourse and exertion due to wind, sun.
2. Sura - for emaciated person
3. Madhudaka - for reducing the corpulent
4. Madya - for those suffering from Alpaagni (weak gastric fire), Shoka (grief), fear, and fatigue.

Diseases

Ex: Narayana Churnam

- Udara - Takra
- Gulma - Badarakashaya
- Vibandha - Suramand
- Vataroga - Prasanna
- Vitsanga - Dadhimantha
- Arshas - Dadhimantha
- Ajirna - Ushnambu
- Sula (pain) - hingu mixed with ghrita
- Puranajvara - pippli mixed with madhu
- Vataroga - rasona mixed with ghrita
- Svasanakjvarya - trikatu mixed with madhu
- Sitaroga - citraka leaves and maricha
- Jvara - musta and parpataka
- Grahani - takra
- Visa - svarnabhasma
- Chardi - laja
- Atisara - kutaja
- Raka pitta - vasa
- Arsas - citramula
- Krimi - vidanga.

According to Sneha preparations

- Ghrita - Ushnajala
- Taila - Yoosha
- Vasa, majja - Manda.

Anupana Kala

After drinks, if consumed at the beginning of the meal it produces emaciation of the body. If consumed after in the middle, it maintains the body and if consumed after meals it produces stoutness. Hence, it can be used considering the desirability.

Best Anupana

Rainwater is the best among all Anupana.

Exploring the Actions of Anupana

It has adjuvant action, Vehicle, Digestanat (appetizer and synergestic) action. For example, honey contains fructose, digestive enzymes; which facilitate quick absorption of medicine as Yogwahai. Curd contains high fractions of lactic acid, which causes, heartburn. While taking it with cold water, it decreases heartburn. In Prameha Asana Kwatah is used as vehicle, help in easily ingestion Anupana mentioned with Ahara is having appetizing and digestant action.

CONCLUSION

Anupana is very essential part on medicine as well Ahara. One drug can be used in different diseases by altering suitable Anupana. Anupana helps in absorption, assimilation, reduces adverse effect of drug, increases action of drug, and also acts as a Agni deepana (Appetizer). Various Anupana should be applied carefully in practice. All the affecting factors of Anupana should be considered.

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The classical methods and the benefits of modified techniques of bahyasneha

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INTRODUCTION OF SNEHA

Sneha - Indicates or includes oiliness, unctuousness, viscidity, and lubricity.

Sneha is the essences of “human life” itself is dependent on Sneha. The entire strength of an individual is dependent on Sneha.

Classification of Sneha according to usage: It is mainly of two types:

1. Baahya sneha
2. Abhyantara

The external use of unctuous substances on the body can be done in the following methods, Abhyanga, Lepa, Mardana, Udvartana, Samvahana, Moordhataila, Gandusha, Akshi Tarpana, Pariseka, and Nasatarpaana

BENEFITS OF MODIFIED TECHNIQUES OF BAHYA SNEHA

Both types of Snehas are important because we needed to cleanses of all the tissue layers, the internal Snehana works from the inside, while the external Snehana works from outside in making sure all of the saturated with medicated oil.

The pressure of massage varies depends on the part of the body and its relation to the Marma point. It facilitates the Medicated oil penetrating the dhatus through the skin pores.

As the anatomical structure of different parts of the body is different oil may have applied differently according to the structure. Second depending on the degree of Snehana effect one may have to adopt different forms of oil application to get maximum effect.

ABHYANGA

It can be defined as the procedure of application of Sneha dravya over the body with mild pressure. Is derived from Abhi upasarga and Anga dhatu

Actions

- It improves smoothness and skin lustre, take care of body exhaustion
- It controls Vata and improves vision, it induces sound sleep, delays the aging process.

According to Sushruta: “Abhyanga makes the body soft and controls Vata, mitigates Kapha, provide nourishment to tissue, good complexion, and strength to body.”

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As a pitcher, a dry skin and an axis become a strong and resistance by application of oil. Hence, by the massage of oil human body become strong and smooth skinned. It is not susctable to the diseases due to vaata; it is resistant to exertions and exhaustion. Regular application of bahya snehas such as Abhyangam, Lepam, Udvaratana, Saam havana, and Mardana, comes under Transdermal purification.

Indications
- Neuromuscular disorders: Pakshavatha (hemiplegia), Shaishaveeya vaata (polio myelitis), pangu (paraplegia) and gridhrasi, etc.
- Rhueomotological problems: Arthritis, lumbago, etc., Vridhavastha (old age)
- Shirashula (headache), Angamardana, and Rejuvenation of the body.

Contraindications
- It should be avoided in persons of kapha aggravated condition, navajwara (acute fevers) who have undergone purificatory therapies, atisara-diarrhea, ajeerna-people with indigestion.

Materials and Equipment
- Abhyanga table (dhroni) - 1
- Medicated oil - 100 to 150 ml
- Vessel – 200 ml capacity
- Tissue paper/soft towel
- Green gram powder or sanachoorna/medicated soap.

Medicated Oils Commonly Used
- Masha tailam, Mahanarayana taila, and Dhanvantara tailam
- Karpasasthyadi tailam, Ksheera bala tailam, Kottamchukkadi tailam, etc.

Man Power
- Ayurvedic physician: 1 and Masseur: 2.

Procedure
- Patient sit in dhroni with legs extended, then the medicated oil heated optimum comfortable temperature and applied over the head, ears, and soles of feet, M. oil should be applied uniformly with mild pressure over the body by two masseurs standing on both sides of the dhroni
- Massage is to be started from scalp, head and move down to neck, upper back, shoulders, upper arms, forearms, hands and chest, abdomen, low back, and lower limbs
- Abhyanga should be done in 7 positions sitting, supine, right lateral and left lateral positions, and prone
- At the end, the M. oil on the body is wiped off with tissue paper or towels.

Duration and Mode of Action
- Usually 30–40 min
- Upper back should be massaged in upward down direction,
- Limbs should be done in circular manner, muscles in linear manner, umbilical region in circular manner
- At least 5 min in each position if one wants to get its effect in deeper tissues like majja
- Acharya Dalhana (Su. Chi 24/30) has cited a reference which specifies the duration of abhyanga. Medi. Oil enters into various levels:
  - Root of romakupa about 300 matra, full thickness of skin 400 matra,
  - Rakta dhatu 500 matra, mamsa dhatu 600 matra, medhodhatu 700 matra,
  - Majja dhatu 900 matra. Dalhana explains that when sneha drug reaches to particular dhatu then it subsides the particular disease.
- Charaka mentioned that vayu dominates in the Sparshanendriya and its adhistana is tvacha, i.e., skin the abhyanga is beneficial to the skin so one should follow regularly.

Post-operative Procedure
- Take rest for half to 1 h
- Bath with hot water with snana choorna, light semi solid digestible diet after bath.

MODERN MODE OF ACTION

Physiological Effects of Massage
- Imparts pressure and stimulation mechanically
- Massage reduces stagnation of blood and lymph in tissue spaces
- Contraction of skeletal muscles compresses blood vessels and exert.
Pressure on fluid present inside. This increase in intravascular pressure stimulates contraction of smooth muscles in valves of vessels.

**Effect of Massage on Arterial Flow**

- Blood supply and vasodilation along with an increase in peripheral blood flow is observed, and activation of axon reflex and then decrease of venous congestion.

**Effects of Massage on Nervous System**

- Sensory system - massage has sedative effect on central nervous system (CNS).
- Motor system - can elicit facilitating and inhibiting responses in neuromuscular excitability, and it has been facilitatory effects to increase muscle tone and it has inhibitory effect - can also reduce muscle tone.

**Effects on Circulation**

- Mechanical compression and relaxation of massage creates pumping effect and improve lymphatic, venous drainage.
- Hypothetically Amino acids like tryptophan increase in blood after massage. An increase in plasma tryptophan subsequently causes a parallel increase in the neurotransmitter serotonin

**Classification of Massage**

Characteristics of techniques:

- Stroking
- Pressure
- Percussion
- Vibration.

- Depth of tissue approached: Light massage and deep massage
- Means of application of pressure: Manual and mechanical massage
- Joint movements: Both assisted and resisted movements are given.

**CLASSIFICATION OF MASSAGE**

**Types of Massage (Swedish) According to Movements**

- Touch: Sensation which is carried through brain
- Stroke: Touch with movement with one/both palms slowly
- Friction: Grasp the part and move with little amount of pressure.

- Kneading: Alternative compressions of the tissues by grasping them against the underlined body surfaces.
- Vibration: Fine vibratory movements communicate to the body through the hands.
- Percussion: The movement/blows administered in various ways with varying degree of force.

**Techniques of Massage**

There are five fundamental procedures in massage:

1. Effleurage: This consists of long centripetal strokes.
2. Kneading: In this tissue is lifted from the bone and rolled, squeezed. It has a marked stimulant effect on muscles and on the circulation in the deeper blood vessels and lymphatic vessels.
3. Friction: This is a circular rolling movement deep in character used especially for the treatment of joints around the bony prominences. It is useful in breaking down adhesions and promoting absorption and over small areas, for the relief of stasis. It should be generally followed by effleurage.
4. Tapotment: This is performed in one of four ways; hacking, clapping, tapping, and beating. This is stimulating to the circulation and muscles and may have either a sedative or stimulating effect on superficial nerve supply.
5. Vibration: This is performed with several fingers or the whole palm or surface of the hand. Vibration stimulates glandular and vascular activity, organs of digestion. It has stimulating effect on nervous system.

**MARDANA**

- Performing the massage with the application of more pressure after anointing the body with oil is referred by the name mardana.
- In mardana comparatively more pressure is applied in the form of massage.
- Mardana indicated in both disease and healthy person.
- Regular practice of mardana improves body musculature.
• Enhances physical activity and strength.
• When vata is affecting the skin, muscles, blood and veins, arteries (these are the seats of rasa, rakta, and mamsa dhatu).
• Advocated therapies such as sneha, abhyanga, upanaha, mardana, alepa, and asrikmoskhana.

After doing exercises, all the body parts of the body should be massaged comfortably.

**DHATU GATA VATA CHIKITSA**

• According to Sushruta.
• In dhatu gata vata chikitsa mardana is mentioned.

When vata is found affecting ligaments, joints, and bones
Then, therapies such as sneha, upanaha, agnikarma, bandhana, and unmardana should be done without any laxity.

**PAADAAABHYANGA**

Provides quick relief of roughness, stiffness Dryness, fatigue, and numbness of the legs
It promote eyesight. It controls Vata and is good for Gridhrai
It prevents cracks over the legs, Sankocha of Sira and Snayu
Benefits
Increase foot strength improves eyesight and aids sleep
Acts as aphrodisiac prevents hardening, stiffness, roughness, tiredness, insensitive touch

Mode of action
In the center of feet, there are two siras situated which are directly connected to eyes. These transmit the effect of medicine applied over the feet in the form of massage
As nadies which nourish the netras are present in feet. According to Bhela samhita, Alochaka pitta is located in Pada, but as per other references, it is present in eyes
By doing Padaabhyanga it stimulated the Alochaka pitta and enhances the visual activity
Sushruta sarira explains that, out of four tiryak dhamanies, each divided hundreds and thousand times its innumerable. These cover the body like network, and their openings are attached to roma kupa

**According to acupuncture theory**

Vision-related Acupoint is located in the lateral aspect of foot, and when acupuncture is stimulation is performed there, activation of occipital lobe is seen in MRI
Probably paadaabhyanga normalize the two important nuerotransmitters serotonin and norepinephrine which regulates a wide variety of nueropsychological process along with sleep
Thus, it induces natural sleep, relaxation, and positive effects on eyes
SNEHA AVAGHANAM

Immersing the body parts in a bathtub filled with medicated oil up to the level of umbilicus

The procedure is similar to avagaha sweda

With water similarly, the tissues grow when the body is supplied with fats. Oil is used for anointing satisfies the orifices of the veins follicles of hair and orifices of the arteries and bestows strength thereby

Materials and equipment
Bathtub 6 ft 2.6 ft 1.4 ft - 1, Vessels 2 Sneham M.oils - 10-20 Lts Towels, etc.
Medicines: According to disease Mahamasha thailam ksheerabala thailam, Dhanvantaram, etc.

Procedure
The patient should be massaged properly and advised to sit in the tub containing warm sneha for 20–30 min. It should be ensured that lower part of the body is submerged in the sneham to maintain continuous uniform temperature

Post-operative care
Advised to take hot water bath followed by light food. Treatment is maybe given for 3–7 days or as per physicians directives based on patient/disease condition

Indications
lumbosacral pain and degenerative conditions neurological problems of hip and lower limbs lower gastrointestinal problems urogenital problems bhagandhara and arsas

Contraindications
Navajwara, atisara, prasutha, and madhumeha

Dietary regimen
Light easily digestible diet preferably liquids and semi solids

Scientific explanation: This process stimulates nerves and relaxes the muscles is provided through heat and fomentation to the back, perineum, thighs, and lower abdomen. It also local treatment for arshas and fistula

• Procedure of kati vasti

Materials required
1. Black gram flour
2. Maha vishagarbha tailam 150–200 ml
3. Vessels - 3
4. Spoon - 1
5. Cotton - Q.S
6. Hot water bath
7. Therapist - 1

Procedure
Make thick dough with black gram powder by mixing with adequate quantity of water Using the dough make a rim and fix it on the lumbosacral region Take the oil, warm it and pour on the inner wall of the rim taking care not to spill out When oil becomes cool, remove it with cotton and refill the warm oil Uniform temperature should be maintained throughout the procedure Duration of procedure should be for 30–45 min for 14 days

Scientific explanation: This process stimulates nerves and relaxes the muscles is provided through heat and fomentation to the back, perineum, thighs, and lower abdomen. It also local treatment for arshas and fistula
• **Procedure of janu vasti**

<table>
<thead>
<tr>
<th>Materials required</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Black gram flour – Q.S</td>
<td>Make thick dough with black gram powder by mixing with adequate quantity of water</td>
</tr>
<tr>
<td>2. Maha vishagarbha taïlam 150 – 200 ml</td>
<td>Using the dough make a rim and fix it on both knee joint surfaces</td>
</tr>
<tr>
<td>3. Vessels – 3</td>
<td>Take the oil, warm it and pour on the inner wall of the rim taking care not to spill out When oil becomes cool, remove it with cotton and refill the warm oil</td>
</tr>
<tr>
<td>4. Spoon – 1</td>
<td>Uniform temperature should be maintained throughout the procedure</td>
</tr>
<tr>
<td>5. Cotton – Q.S</td>
<td>Duration of procedure should be for 30–45 min for 14 days</td>
</tr>
<tr>
<td>6. Hot water bath</td>
<td></td>
</tr>
<tr>
<td>7. Therapist – 1</td>
<td></td>
</tr>
</tbody>
</table>

**UDVARTANA, UDGRARSHANA, UTSADANA**

- Udvarnta mitigates Kapha, liquefies the fat, produces stability of the body parts and excellence of the skin.
- Depending on the variations in the therapeutic effect there are two types udvartana, namely: (1) Snigdha Udvarntana (2) Ruksha Udvarntana.
- Different oils are mentioned that can be used in
  1. Vata prakriti - hima sagara oil, Pitta prakriti - chandana bala lakshadi taïla
  2. Kapha prakriti - triphaladi taïla, Sama prakriti - asana bilvadi thailam.
- For Ruksha Udvarntana Kulattadi churna, Kolakuthadi churna, Mrittika churna is used, depending on the nature of the drugs used during massage two varieties of Udvarntana practiced listed below:

**1. Udgarshana**

1. “Udgharshanam asneha aushada churnadibhi gharshanam”
   
   It is rubbing the body with powdered medicine without mixing oils or sneha, or other liquids is called udgharshana. (Dalhana on su ci 24/53)
   
   Benefits: Vata shamaka, kandu, sopha, pidaka nashaka, twak gata agni vardhaka. Stimulates bharajaka pitta

**2. Utsadhana**

“Sasneha kalkena udgharshanam utsadanam”

Friction of the body with drugs containing Sneha or medicine mixed with oil or other liquids in the form of kalka is called as utsadana (Dalhana on su ci 24/53)

Benefits: Improves complexion, Cleanliness and beautification

Udgharshana and utsadanam causes dilatations of siramukha and increase of Bhrajaka pitta, the benefits of this improves complexion of females gives a good appearance, clarity, and beauty
MODE OF ACTION OF UDVARTANA

1. Rubbing helps in absorption effusions, relief of blood stasis, carry way the toxin or morbid products away from tissues.
2. Deep pressure massage helps in interchange of the tissue fluids by increasing the circulation in superficial veins and lymphatic’s.
3. The pressure helps the content of the vessel move toward the heart, and it is having stimulating effect.
4. It improves the complexion by increasing the circulation eliminating the waste products and the nervous system by stimulating the cutaneous nerves.
5. It is influence the general metabolism and helps in the reabsorption of the excess lipids from the tissues.
6. But it may not be helpful in circulating serum cholesterol. In this condition, the dosas are already in Prasara avastha and are ready to remove from the body by Sodhana therapy only.

KARNA PURANA

• Filling of ear by lukewarm sneha for a stipulated period of time is called karnapurana.
• It subsides the pain of jaw, neck, head, and ear.

Benefits:
- Prevent ear problems such as earache, tinnitus, and deafness:
- Balances vata prevents headache.
- Prevents neck stiffness.
- Ears and eyes are very closely related to the soles of the feet. Pouring the oil into the ear produces coldness and remove burning sensation in the feet.

Mode of action:
- In purvakarma for karna purana gentle massage is done with lukewarm oil around the ear and pinna. After the heat is applied around the ear with a towel soaked in boiling water cause vasodilatation and thus increased of capillary permeability.
- Instilled medicine in ear canal gets absorbed by skin lining external auditory meatus and Tympanic membrane and reaches systemic blood flow.
- Acc to Ayurveda drugs get absorbed by Bhrajaka pitta present in skin and shows its effects on the body and local tissue.

GANDUSHA

• Holding of oil in oral cavity without any movement is called Gandушa

Benefits:
- Improves the strength of mandible
- Voice become more effective and melodious
- Prevents dryness of throat and dental carries and teeth become strong

Mode of action:
- It is explained in both oral and systemic action
- The action of Gandusha exerts mechanical pressure inside the oral cavity.
- The chemical constituents of the drug which is present in the liquid stimulate.
- Pressoreceptors send signals to salivary nuclei; as a result, parasympathetic nervous system and motor fibers in facial and Glossopharyngeal nerves help to increase the output of salivary secretion which predominantly contains water and metabolic waste present in the oral cavity.
- Gandusha helps in increase the salivary amylase present in saliva lingual lipase helps in digestion of carbohydrate and fat substances. The warm medicated oil with its chemical constituents and active ingredients irritates the oral mucosa and increase the vascular permeability.
- Therefore, the lipid soluble drugs get rapid absorption into systemic circulation, as the mucosal layer inferior to the sublingual layer is thin and highly vascular.
- It gives passive exercise to muscle and strengthen them.
KAVALA

- Kaval is a procedure of holding sneha in the ally done with drava. Mouth up to half of its capacity with movement inside.
  It is usually done with Drava.

<table>
<thead>
<tr>
<th>Indications of gandoosham</th>
<th>Indications of Kabala</th>
</tr>
</thead>
<tbody>
<tr>
<td>In dantarogas</td>
<td>Manya sira: Karna Mukhakshi Roga: Praseka</td>
</tr>
<tr>
<td>Danta Harsha, Mukharoga,</td>
<td>Kanta amaya Vaktra Sosha: Hrillasa Tandra Aruchi</td>
</tr>
<tr>
<td>Danta Chalana, vataroga</td>
<td>Peena acha Sadyha Vishesht kabala Graheha!</td>
</tr>
<tr>
<td>Tilakalkodaka best</td>
<td></td>
</tr>
<tr>
<td>Tapa Visha Ksharagni Dagdha Conditions Sarpi And Ksheera Is Good</td>
<td></td>
</tr>
<tr>
<td>Mukha Vrana, Daha, Trishna Etc-makshika Gandoosham Best</td>
<td></td>
</tr>
<tr>
<td>In Aruchi, mala, Aasyavyrasya, Dhourgandhya - Dhanyamla Is Best</td>
<td></td>
</tr>
</tbody>
</table>

Dharana Time: Up to Watery Discharge Coming From Nose and Eyes or Kapha Lodged with Oral Cavity

Procedure: First Sweda, and do kandara, skanda Mardhana (Neck, shoulders) Kinchit Unnatasyo.

We Can Take Gandoosha with Sukoshna (just lift the oral cavity up).

NETRA TARPANA

Akshi tarpana is useful for both healthy and diseased persons

Indications
Netrastabdata, Arjuna, Siraharsha, Abhishyanda, Vataparyaya Anyatovata, Shukra, Netrasula, Netra sushka, Kricchaunmilana, Vata pitta diseases of eye, etc., (Ah Su 24/1-4)

Benefits
Enhance vision, relieves strain from the eyes
Strengthens eye muscles, ensures good sleep, provides relaxation
Helps prevent early formation of cataract
Xerophthalmia, optic nerve atrophy

Duration
Diseases of eyelids Akshi Tarpana-100 matra
For sandhigata rogas - 300 matras
For sita (sclera) gata rogas - 500 matras
For krishana gata rogas -700 matras
Drusti gata rogas - 800 matras
Kept for 15–20 min usually, a little below body temperature and done 7–14 days.
Is continued 1000 matras in diseases involving all five
NASATARPANA

- Dropping of the medicated oil into the nostrils is known as Nasatarpana and is a type of Nasya therapy.

MURDHA TAILAS: FOUR TYPES

<table>
<thead>
<tr>
<th>MURDHA TAILAS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Shiro Abhyangam</td>
<td>Pichu kesasata sputana dhupane (ah su 22/24)</td>
</tr>
<tr>
<td>Should be used in case of dirtiness and itching, dryness of head</td>
<td>Mode of action:</td>
</tr>
<tr>
<td>Benefits:</td>
<td>Relieves stress to a great extent when we get distressed state, the psychosomatic balance is established</td>
</tr>
<tr>
<td>Useful in Hairfall prevents graying of hair and cures headache, it makes the hair long, soft, and glossy</td>
<td>Balancing Pitta and Rakta after siropichu circulation throughout the body and relieves stress over the heart</td>
</tr>
<tr>
<td>It promotes complexion of the face</td>
<td>Diseases like HTN are dealt with support</td>
</tr>
<tr>
<td>Revitalizing the nervous system</td>
<td>Enhances blood supply to brain</td>
</tr>
</tbody>
</table>

SIRO PICHU

- Applying oil to the vertex using a cotton pad and impregnated with oil.
HEALING MARMAS

- Moordhataila procedure communicates with the deepest recesses of the brain by soothes the marmas located in head such as apanga, shanka, utksehpa, seemanta, and shapani.
- By activating the marmas, mrdhataila treatment procedure might make a strong impact on the functioning of CNS and important glands with the brain.

SHIRO DHARA

- Shirodhara is a type of Murdha taila. In which medicated oil/liquid is continuously poured over the forehead and then allowed to flow over the scalp from a specific height for a certain period of time.

Indications

अर्द्धिका शिरः तोद दाह पाक ब्रूणेदुः।
परिषेकः पिचु केशशाल स्फुटन घुपने ।

A. In cases of ulcerations of the head, headache, burning sensation, wounds, and suppurations.
B. (1) Cerebrovascular disorders such as hemiplegia, (2) cerebral palsy (3) mental stress and headache, and (4) insomnia and anxiety neurosis.

Containdications

1. Space-occupying lesions, glaucoma, fever, conjunctivitis, and inflammatory conditions.

Materials and Equipment

- Droni table, sirodhara device, and suitable sneha dravya 3–5 L
- Medicated oils any of following:
  - Karpasastyadi thailam, Ksheerabala thailam, Chandanadi taila
  - Dhanvantaram thailam, Narayana thailam, etc.
- Manpower: Physician 1 and attendant 2.

Procedure

- Patient lies in spine position on the drone with a pillow under the neck and shirodhara device is placed over the head.
- Height is fixed, oil should fall from a height of 8–10 cm in a continuous stream of the thickness of little finger over the forehead.
• The oil and liquid poured is recollected and reheated just above the body temperature and again poured in dhara patra.
• Attendant should move the vessel both sides of the forehead, so that flow of liquid reaches both sides properly.
• After the process, the oil is to be wiped off, and the patient is advised to take a bath with medi. warm water after half an hour.
• Duration: It may be done for 7, 14, or 21 days as per the severity of the disease.

Precautions

The eyes are well protected and covered so that medicinal liquid does not leak into the eyes and produce irritation of the eyes.

Scientific Explanation

• Constant flow of liquid in a specified manner relaxes the mind, calm, and tranquilizer the patients.

Mode of Action

• Hypothesize the action of shiro dhara might be stimulation of sthapani marma and motivation of agna chakra, organizing different phases of manomayakosa and added benefit of posture, i.e., shavasanam with auto body suggestion therapy facilitates to counterbalance the manasika and sharirakados as and simultaneously potentiated by psycho neuro immunology mechanism (PNI).
• PNI mechanism: Relationship between CNS and ANS, endocrine system, immune system is called PNI.
• It says that the states of anything which influence any one system among nervous or immune or endocrine system the effect would seen in all three systems. Since they are mutually interlinked with each other. This shows the relationship between stress and the emotional state of individual.
• This relation exists by the connection between mind and body by the interaction of endocrine, nervous, and immune system. The code dictum of this core of action is encouraging relaxation mentally followed by physically. Due to synchronization of metabolism deepest level of healing is achieved.

SHIRO VASTI

• It is a type of Murdha Taila, in which the medicated oil is kept over the head with the help of a cap fixed for a prescribed period of time.
### Indications
- Neurological disorders
- Sleeplessness
- Dryness of mouth
- Eye diseases
- Severe or chronic diseases of the head

### Procedure

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Mode of action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The person who has been purified should be anointed with oil and given mild fomentation, then at the closing of the day he should be made to sit on a stool of the height of the knee, a strap of leather made from the leather of either cow or buffalo, 12 angular in width and equal to that of the head, just above the ears, covered by a piece of both over the forehead, and fast ended tight with a thread, the joints and intervening spaces should be packed with paste of masha. Then medicated oil prescribed for the diseases should be poured over the head in lukewarm condition. To a height of one angular over the skin. It should be held till secretion appears in the mouth and nose or for a period of 10000, 8000, and 6000 matra for vata, etc. It should be 1000 matra for healthy person. After this period the shoulders, etc., should be massaged after removing the healthy person. 7 days shall be maximum period for this therapy.</td>
<td>Shiro vasti gives strength to CNS; it calm down both mind and senses and allows the bodies natural healing mechanism. To release the stress from the nervous system by pacifying the vata dosa particularly prana vayu. Peripheral circulation which nourishes the tissues and hastens the phagocytosis and brings the rejuvenative changes. The neuro transmitters released during these periods improve the efferent and afferent pathways, and eventually, the tonicity of muscles get improved. As the nervous system is mainly composed of lipid tissue, the taila being lipid in nature is quickly absorbed due to the rich vasculature of the scalp and get distributed to different parts of the brain through the communicating veins.</td>
</tr>
</tbody>
</table>

### PARISEKA

- Pariseka dispels fatigue, mitigates aggravation of Vata unites fractures and dislocations, relieves pain of wounds burns and lacerated wounds

1. Pariseka - Milk added with dashamula cures pains instantaneously in vatarakta. Similarly, affusion done with ghee cures vata rakta predominance of vayu and beneficial in peripheral vascular disease, and it relieves pain.
2. Pariseka with Triphaladi Kwatha used in ulcerations, burns, trauma, etc.
3. Pariseka with plain water relieves exhaustion and rectifies imbalance of Vata.
Kayaseka is snigdha sweda in which warm oil is poured all over the body or specific part for a stipulated period in a specific manner. Pizchichilli is a modified form of kayaseka developed by a keraliya vaidyas and extensively practiced.

Dhathunam drudatam karothi vrushatam dehagini varno oojasa dharakalpa 2
Hemiplegia, paraplegia, peripheral neuropathy and other degenerative disorders, muscular and ligament injuries, RA, OA, stiffness of joints, dislocation and contusions of joints, etc.

Indications

- Painful inflammatory conditions, acute fever
- Gastrointestinal-diarrhea, digestive disorders, etc.
- Respiratory disorders—cough, infections, etc.

Contraindications

- Painful inflammatory conditions, acute fever
- Gastrointestinal-diarrhea, digestive disorders, etc.
- Respiratory disorders—cough, infections, etc.

Materials required

- Suitable oil-3 L
- Cotton cloth (40 cm×40 cm) - 4
- Vessels (5 L) - 3
- Soft towels - 2
- Oil for talam - 10 ml
- Rasnadi choorna - 5 g
- Gauze (60 cm) - 1
- Earplugs - 2
- Hot water bath - 1
- Coconut leaves/tongue cleaners - 2
- Gandharvahastadi kṣ - 90 ml
- Medicated water - Q.S.
- Masseurs - 2
- Attendant - 1

Pre-operative procedure

- Patient should sit on the droni with legs extended, Talam is applied with suitable oil/choorna, along with karnapoornana
- Gauze should be tied around the head above the eyebrows
- Ears should be plugged with cotton and oil smeared all over the body (mildabhyanga)
- The oil for seka should be heated in a vessel kept in a hot water bath. The temperature of the oil must be 42°C–45°C.
- The oil should flow, in a uniform stream from the thumb facing downwards, from a height of 6–9 inches as per the condition. The process should be carried out in seven positions as follows: Sitting, supine right lateral, supine, left lateral, supine, and sitting. Prone position can be adopted if necessary oil flowing out should be collected and used after reheating.
- A gentle massage should be given along the stream. It is desirable to use fresh oil daily. As the medicated oil is very costly the same oil may be used for 3 days after removing sediments. This should be preserved after removing moisture. Small quantity of fresh oil should be added to this to maintain the quantity. On the 4th day, fresh oil should be taken and used for next 2 days. On the 7th day, both these batches of oil can be used.

Operative-procedure

- The oil is wiped off with the help of coconut leaves/tongue cleaners
- Body should be cleaned with soft towel
- Talam should be removed, and appropriate choorna like Rasnadi is applied on the head. Gandharvahastadi Kashaya should be given for drinking
- Take rest for ½ an hour and take a bath
- Head bath can be done with amalaki kwatha and body with erandakwatha.
- Duration: 45 min - 1 h for 7, 14 or 21 days

Post-operative procedure

- Precaution: Temperature should be maintained at the same level throughout the procedure; stream should be uniform and continuous. Frequently wiping of head should be done so that we will prevent the Rhinitis.
- Silence should be maintained
- Scientific explanation: This process stimulates neuromuscular system increase the peripheral circulation, improves the function of skin, sense organs and provide nourishment.
SHASTIKA SHALI PINDA SWEDA

This procedure belongs to the category of agni sweda as well as snigdha sweda. This is popularly known as Navarakizhi.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Materials required</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The word “PINDA” means bolus</td>
<td>Shashtika shali - 500 g</td>
<td>2 warm potalis should be gently applied in a synchronized manner by the two therapists on two sides of droni. It is followed by a gentle massage with other hand. They should ensure that the heat of the boluses is bearable to the patient by touching them over the dorsum of their hand</td>
</tr>
<tr>
<td>Pinda sweda refers to the sudation performed by bolus of drugs</td>
<td>Balamoola - 750 g</td>
<td>The temperature of the boluses should be maintained by continuous relay of the four boluses after reheating by dipping in milk kwatha mixture. The process should be continued till the patient gets samyak swinna lakshana or until the contents of the boluses exhausted.</td>
</tr>
<tr>
<td>Shashtika pinda sweda is performed in ekanga or sarvanga with the bolus of boiled Shashtika shali with Balamoola kwatha and ksheera</td>
<td>Water - Q. S. Cow’s milk-3 L</td>
<td>Is done in the seven positions or as advised by the physician</td>
</tr>
<tr>
<td>Shashtika rice cooking - In 1.5 L of Balamoola moola kashaya and 1.5 L of milk, 500 g of Shashtika rice should be added and boiled till it becomes thick and semisolid</td>
<td>Cotton cloth (45 cm x 45 cm) - 4 pieces</td>
<td>Duration 45 min - 1 h, preferable time is in between 7–11 am and 4–6 pm</td>
</tr>
<tr>
<td>Preparation of medicine: Shashtika rice cooking - In 1.5 L of Balamoola moola kashaya and 1.5 L of milk, 500 g of Shashtika rice should be added and boiled till it becomes thick and semisolid</td>
<td>Threads (75 cm) - 8</td>
<td>The procedure can be stopped if the medicine in the boluses or the milk mixture is exhausted</td>
</tr>
<tr>
<td>Sufficient quantity of hot water can be used for proper cooking of the rice</td>
<td>Vessels-</td>
<td></td>
</tr>
<tr>
<td>Another method is that the Shashtika rice can be semi-cooked in pure water; gradually added milk and kwatha; cooked again</td>
<td>For preparing kwatha</td>
<td></td>
</tr>
<tr>
<td>Preparation of boluses</td>
<td>For cooking rice</td>
<td></td>
</tr>
<tr>
<td>The cooked rice should be divided into four equal parts and put into four pieces of cotton cloths</td>
<td>To heat the boluses in mixture of kwatha and milk during the procedure (5 L capacity with wide mouth made of bronze)</td>
<td></td>
</tr>
<tr>
<td>The three corners should be folded neatly together so as to come under the fourth corner and the fourth-fold is used to cover the other three corner folds underneath</td>
<td>A plate for carrying heated pottali</td>
<td></td>
</tr>
<tr>
<td>Though a sweda karma, it has brimhana guna</td>
<td>Stove - 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil for talam - 10 ml</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rasnadi choorna - 5 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suitable oil for abhyanga - 100 ml</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coconut leaves/tongue cleaner - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tissue paper/towel - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Masseurs - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attendant - 1</td>
<td></td>
</tr>
</tbody>
</table>
One end of the thread is held tight with left hand and the other end is wound around the folds. In short, the boluses should be tied in such a way that the mouth of the sac leaves a tuft at the top of the bundle, for holding it with ease. Conventionally, the size of a bundle is half kernel of a moderate coconut.

Pre-operative procedure
The patient should be seated with leg extended over the droni talam should be applied with suitable oil. Abhyanga should be then performed with prescribed oil for about 10 min. Out of four pottalis, two are kept in the mixture of Balamoola kwatha and milk (1.5 L of each was already kept for this purpose), which should be put on a stove with moderate heat.

Post-operative Procedure

- At the end of the procedure, the medicine remained over the body should be scrapped off with the coconut leaves or with any similar device and the body is wiped with dry with tissue paper or soft towels.
- After that medicated oil should be applied.
- Talam should be removed, and Rasnadi choorna applied over the head.
- Gandharvahastadi kashaya can be given for drinking.
- The patient should take complete rest for at least half an hour, and then the patient is allowed to take warm water bath.

Mode of Action

Due to massage therapy and heat application over the area sensory stimuli passes through the cutaneous receptors. The autonomic nervous system is regulated by hypothalamus, endocrine system through pituitary gland; sympathetic nervous system may have, effect on endocrine tissue gland. Nutrients may get absorbed and give strength to the muscles, the maintenance of the balance of hormones is one of the expected results of the therapy. Due to the application of heat the sweat pores open up and various metabolites are thrown out of the body such as salt and biological wastes.

Benefits

Increased blood flow, promote healing in injured area, relaxation and pain relief enhances passive stretch for increased the range of motion. Metabolic reactions: Chemical reactions in cells of the body are influenced by temperature, oxygen uptake by the tissues will increase so more nutrients will be available to promote tissue healing. Vascular effects: Increasing tissue temperature with vasodilatations and thus with an increase in blood flow to the area and produce vasodilatation. Therapeutic effect of heat: Increase in extensibility of collagen tissues. Reduction of joint stiffness relieves muscle spasm and increase in blood flow. Assists in resolution of inflammation and edema, produces pain relief. Bradykinin released by the sweat gland.

Mode of Action of Bhrajaka Pitta

General sthanas of pitta are sweda, lasika, rakta, amasaya, nabhi, chakshu, twak.

Types of pitta 5: Pachaka pitta, Ranjaka pitta,
Sadhaka pitta, Alochaka pitta, Bhrajaka pitta

Yattu twachi, pittam tasmin bhraajakagnirithi sangnaasash abhayanga parisheka avagahaa alepanaadnam kriya dravyanam paktah chayanarmcha cha prakaasakash

(su su 21)
Pitta located in skin known as bhrajakagni various applications on skin are digested because of this pitta and it shines the skin.

Twaktastam twacho bhrajanat bhrajakam!

Tad abhyanga pariseka alepanadin pachati chayasha prakasayati! (ass su su 20)

Pitta located in the skin is known as bhrajakagni various applications on the skin are digested because of this B. pitta, and it shines the skin.

Twaktastam bhrajakam bhrajanat twacha (ah su 12)

Pitta which is responsible for the production of “Bha” complexion of skin is called bhrajaka. It means production of normal and abnormal skin color and temperature of the body.

Functions

- It is responsible for complexion of skin.
- It causes the digestion and utilization of substances which are applied as abhyanga, pariseka, alepa, etc., over the skin.
- Enhances the glow of the skin.

Modern View

- The various shades of skin color depend on the intensity of the various pigments present on the skin. Pigments that impart a wide variety of skin color are melanin, hemoglobin, and keratin. The color skin mainly depends on the pigment melanin and MSH hormones secreted by pituitary gland.
- Melanin is also have a role in regulating temperature.
- MSH regulates the melanin production from the melanocytes located in epidermis of the skin, which is said as-bhrajaka pitta plays a major role in the regulation of body temperature with the help of sweat glands, pigment melanin.
- Thermoregulation is done by 2 methods, liberating sweat at surface and adjusting the flow of blood in dermis.

Physiological Benefits and Mode of Action after Abhyanga and Sweda-1

- It permits transfer of heat and vital energy it accelerates blood circulation affording adequate blood and oxygen supply to entire body, and it mobilizes unwant incompatible products of body and release them to be excreted. This also relieves local pain and inflammation
- It promotes elasticity and functional ability of nerves, tendons and muscles affording softness of the body, it prevents stiffness and sclerosis of blood vessels

Physiological Benefits and Mode of Action after Abhyanga and Sweda-2

- Epidermis keratocytes skin protection softens, anti-allergy and melanocytes and complexion phytostabilization.
- Dermis veins, arteries biosupport vascular effect mast cells histamine lymphatic drain lymphatics collagen fibers neurostability fibroblasts skin glow subdermis subcutaneous cushion functions in fat elasticity adipose balance.
A review on factors affecting the Avaleha Kalpana during its preparation

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Abstract

The use of Ayurvedic medicines is popular in India and in recent times has become accepted in other countries. These days, herbal medicines are being used by various communities throughout the world. Avaleha Kalpana is one of the most specified Kalpanas of Bhaishajya Kalpana. Most of the Avaleha products act as a Rasayana. There are many factors which affects the Avaleha during its preparation and some factors affect its quality after the preparation of Avaleha. Hence, at the time of preparation of Avaleha, we have to keep a lot of caution. While preparing the Avaleha, the amount of fire, the vessels taken, and the time of the interpolation are many factors which affect its creation. Therefore, the quality of all things is taken care of at the time of creation. This article described the same reasons that affect the preparation of Avaleha.

Keywords: Avaleha, Factors, Kalpana, quality etc.

INTRODUCTION

Bhaishajya Kalpana is the unique branch of Ayurveda science. The science which deals in detail about the preparation of different Ayurvedic medicines is called as the Bhaishajya Kalpana. Kalpana is the process or the method employed for the preparation of pharmaceutical products. Avaleha Kalpana is an important secondary preparation of Ayurveda Pharmaceuticals. Avaleha are semisolid to solid forms of medicaments, predominately used for internal administration. Leha or Avaleha is one among the varieties of food categorization as bhakshya, bhojya, peya, and lehya or leha. Among these, leha is an important secondary preparations of Ayurvedic Pharmaceuticals. Avaleha is a semisolid preparation prepared by solidifying any of the liquid preparations along with a desired quantity of “sweetening agents,” fine powder of medicinal drugs, as praksepa dravyas and “ghruul” and “madhu” as mentioned. Avaleha Kalpana was modified form of Panchavidha Kashaya Kalpana to make the availability of the drug material throughout the year, long shelf life, good taste, elegant look, and pleasant smell, produce quick action with low doses. In this article, the elements are being described which affect the different processes of making Avaleha. There are many Ayurvedic herbal products explained for natural rejuvenation. Among them, Brahma Rasayana stands as a choicest natural remedy for stress and tiredness chronic.

Brahma Rasayana

In the Charak samhita, in the Rasayana Adhyaya, the first Rasayana described is Brahma Rasayana (pratham). It is in Avaleha form and also acts as a Rasayana. This herbal Avaleha has been prescribed by Lord Brahma. It rejuvenates the body and fights against tiredness, fatigue, early gray hairs, and wrinkling (skin rejuvenation and hair rejuvenation). It is the best antiaging formula. It also improves intelligence, memory, and immune power. Brahma Rasayana described in Charak samhita, Astanga hrudaya, and Ayurveda sara samgrah.

MATERIALS AND METHODS

While preparing Brahma Rasayan (Avaleha), there are many factors which have to be cautions and which affects its preparation. There are some process and factors which affect the different levels of its preparation.

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**Important Facts are Being Described for the Preparation of Brahma Rasayana**

**Vessels used for Brahma Rasayana Avaleha**

Chemically inactive vessels should be used for the Avaleha preparation. For the preparation of Brahma Rasayana, it is mentioned to use Odumber patra (copper vessels).[6]

It is interesting to note a similarity of copper deficiency to Vitamin C deficiency. Many changes as a result of copper deficiency can be described as “scurvy-like.” Indeed, many symptoms of copper status are evaluated, since Vitamin C is known to affect copper antagonistically and/or enzymes that required copper. Copper deficiency scurvy can be produced by excessive Vitamin C intake. Synergistic vitamins, those whose requirements are increased by copper deficiency, include Vitamin D, B₁, B₁₂, and C and follic acid (B₁₀).[8]

Hence, in *Brahma Rasayana*, *Amalaki* is the main ingredient, in which high amount of Vitamin C is found. By making *Brahma Rasayana* in the copper vessels, it makes it more effective. The properties of the copper are similar to the properties of Vitamin C. Therefore, *Tamra patra* (copper vessels) further enhances its nutrients.

**Quantity of the ingredients**

Quantity of the ingredients for the preparation of *kwatha*, syrup, *Avaleha* etc., the quantity of the ingredients must be essential. In the *Charak samhita* and *Astanga Hrudaya*, the quantity of *Amalaki* and *Haritaki* is described in numbers not in weight. In the *Bhav prakash*, weight of acceptable *Haritaki* is mentioned as 2 *karsha* (24 g) and *Vibhitaki* is *karsaphala* (12 g), and hence, as per the principle of *Triphala Amalaki* must be 6 g.[9]

Hence, the above-considered weight is significant for the acceptable *Amalaki* and *Haritaki*. For the preparation of *Brahma Rasayana*, it is essential to take standardized ingredients for the preparation of formulations. In *Charak samhita* and *Astanga hrudaya*, for the preparation of *Brahma Rasayana*, *Amalaki* is given 3000 in no. and *Haritaki* is given 1000 in no.[6]

Thus, the weight of *Amalaki* in *Brahma Rasayana* will be \(\sim 3000 \times 6 \text{ g. } =18 \text{ kg (with seeds)}\) and the weight of *Haritaki* will be \(\sim 1000 \times 24 \text{ g } = 24 \text{ kg (with seeds)}\).

**Heat during preparation**

Heat is the form of energy which is used in processes such as fusion, ignition, boiling, desiccation, evascication, evaporation, distillation, sublimation, and freeze drying.[10]

During the time of decoction, making syrup, hot infusion, and *Avaleha* preparation, it is also an effective factor. In *Samhita*, it is said that, for the making *Avaleha*, *mandaagni* (mild) heat should be used. Only on mild-to-moderate heat throughout the process is carried out. If the heat is more during *bharjana* of pulp, during preparation of *kwatha*, it will affect the quality and taste of *Avaleha*. Due to mild or moderate heat, all the ingredients get sufficient time to be mixed well, and the resultant *Avaleha* has a uniform consistency, i.e., equal distribution of active constituents in final product.[6]

**Preparation of Yavkut churna**

Surface property of a powder material has a major influence on their intermolecular action.[11] For the preparation of *Avaleha*, firstly prepared the *yavkut churna* (coarse powder) for the *Kwatha*. Powder of raw drugs must be *Yavkut*, not the fine powder. The *Yavkut* powder is indicated for the preparation of *Kwatha*. Having fine powder will obstruct the preparation of the kwatha and will be sticking to the bottom of the pot. In the Scriptures, *yavkut churna* has been indicated for the preparation of *Kwatha*.[6]

**Preparation of Kwatha (decoction)**

Ethnobotanical studies have shown the use of decoction of local plants to be a preferred mode. In Ayurveda, the term “*Kwatha*” is used for the decoction. After making the dry or wet flavored powder, boil with water, the product that is prepared is called *Kwatha*. There are three types of matter which are used for the preparation of *kwatha*.

i. Soft drugs - 4 times of water
ii. Medium and hard drugs - 8 times water
iii. Very hard drugs - 16 times water.

In the *Brahma Rasayana Avaleha* for the decoction, herbal drugs asked to cook 10 times of water and to keep the 1/10 remaining. For the decoction drug, constituents should be non-volatile.[6]

**Pharmacokinetics and Bioavailability of Decoction**

Although several phytochemicals are water soluble, it is often considered by modern herbalists that decoction is inferior preparation for extraction and delivery of herbal actives except where the actives are largely water soluble.

Water is the common carrier of constituents in decoctions, and although preparation is very primitive, it has a wide range of solvent action - alkaloids, glycosides, tannins, proteins, sugars, mucilage, enzymes, minerals, and coloring matter. Decoction is one of the traditional ways of increasing the solubility of particular compounds that are not as water soluble, by the adding of saponin-containing herbs, resulting in overall better bioavailability of the herbal constituents.[13]

**Uses of oil or fat**

Fats and oils play important functional and sensory roles in food products. They are responsible for carrying, enhancing, and releasing the flavor of other ingredients, as well as for...
interacting with other ingredients to develop the texture and taste. Fat is the natural palatable agent *par excellence*. When frying food, the hot frying fat that has penetrated into it replaces part of the water it contains, making the food considerably more palatable. This absorbed fat exerts a tenderizing effect on the crust, as well as a wetting effect on the food, and thus contributes for the popularity of deep-fried foods, namely, their flavor, crispness, and pleasant eating characteristics.

For the preparation of *Brahma Rasayana*, *Tila taila* and *Ghruta* both are used.

**Bharjana (frying) of Kalka (paste)**

Foods fried at the optimum temperature and time has golden brown color, is properly cooked and crispy, and has optimal oil absorption. Under fried foods at lower temperature or shorter frying time than the optimum have white or slightly brown color at the edge and have ungelatinized or partially cooked starch at the center.

For the preparation of *Avaleha, bharjana* (frying of pulp) is an important factor. In the process of *bharjana*, heat should be mild. Due to mild fire, the pulp is cooked well and all particle of the pulp should be fried properly and similar. Hence, *bharjana* in mild heat is the important factor, which affects the *Avaleha* preparation. Should be careful while *bharjana*, the paste should not stick in the bottom of the vessel, so the spoon should be constantly running.

In *Brahma Rasayana*, the process *bharjana* is not described in *Charak Samhita* and *Astanga Hrudaya*, but in the *Ayurveda sara samgraha*, the process *bharjana* is described for the formation of *Brahma Rasayana*. The process of *bharjana* (frying) affects the many factors of ingredients quality. It changes the quality of vitamin, protein, and carbohydrates of the foods.

**Vitamin Changes During Frying**

Several vitamins are sensitive to higher temperatures and oxidation, but high temperatures are reached only in surface layers of fried food, where their loss is certainly very high. Total losses depend mostly on internal temperature, which usually varies between 70 and 90°C. In this range, vitamin retention depends much more on the internal temperature than on the temperature of the frying oil.

**Protein Changes During Frying**

If the food is fried without any additional ingredients, as is normally the case, frying does not change the digestibility of the protein. When reducing substances are added to the food that is fried, for instance, carbohydrates protein digestibility is lowered slightly, albeit significantly.

**Carbohydrate Changes During Frying**

The change in carbohydrate content during frying has been investigated in potatoes, potato products, and breaded meat and fish. The results showed that the retention of carbohydrates varied from 95% to 100%, depending on the kind of food, indicating that the frying method has no influence.

**Preparation of prakshep dravyas**

*Prakshpay dravyas* should always be mixed after being *Avaleha* preparation. The *prakshep* should always be the fine powder. Fine powder mixed well in the preparation. The fine powder of *prakshep dravyas* is added little by little and stirred well to a homogeneous mixture.

*Prakshpay dravyas* can be broadly categorized under various subheadings such as counteraction, enhancer/yogawahi, *vishesh, srotogami/vyadhipratyanik*, and specific action. Some *dravyas* when used as *Prakshpay* helps in enhancing the property of main ingredients with its *Yogawahi* property as well as other *dravyas* processing *Tikshnaguna* helps in enhancing the penetration of the formulations and drugs processing, these properties can be categorized under enhancer/Yogawahi heading.

In *Brahma Rasayana*, nearly 12 *dravyas* are used as Prakshepa *dravyas*, which enhance its properties which all are essential for the flavoring and *yogawahi* properties.

**Preparation of syrup**

Syrup is a concentrated or nearly saturated solution of sucrose in purified water. The syrups are sweet viscous preparations. The syrups containing medicinal substances are called “medicated syrup” and those containing aromatic or flavored substances are known as “flavored syrups.” Syrups prevent decomposition of many vegetable substances. It has high osmotic pressure which prevents the growth of bacteria, fungi, and molds which are the chief causes of decomposition in solutions of vegetable matter.

In the formation of syrup, crystallization is most important factor. It is a separation process, widely applied in the chemical and pharmaceutical industry. Hence, for the preparation of *Avaleha Kalpana*, it is essential to prevent the crystallization of sucrose at the time of making syrup.

**The Following Adjuncts are Generally Added to Improve the Formulation of Syrup**

a. Chemical stabilizers - glycerin, sorbitol, and propylene glycol are added in small quantity to the syrup to prevent the crystallization of sucrose. Certain surfactants like tweens can be combined with syrup to dissolve certain ingredients in the syrup to make clear syrup.
b. Coloring and flavoring agents - many syrups are attractively colored with coal tar dyes such as amaranth, compound tartazine and green S, and tartazine. To prepare the flavored syrups, some flavoring agents are added such as: Tincture lemon, tincture ginger, and essences such as vanilla and orange.

c. Preservations - the syrup containing 66.7% w/w of sucrose have high osmotic pressure which prevents the growth of bacteria, fungi, and molds. Hence, no preservative is needed. In general, benzoic acid, sodium benzoate, and methylparaben are commonly used in appropriate concentration. The use of sterilized containers and closures is also an effective way of preserving syrups.[23]

Avaleha paka pariksha[29]

i. Tantumattva (Thready consistency) - this test is carried out during the preparation of syrup. As the liquid starts thickening, a part of paka material taken between thumb and index finger is pressed and released to find the number of threads appearing. This indicated the stage of syrup paka. To get Avaleha paka, 1–2 thread consistencies is essential, and for Khanda paka, we require 3–4 thread consistency.

ii. Apsumajjati - this test is also carried out during the preparation of Avaleha. A part of thickened paka material is put into a small bowl containing little quality of stable water. This is done to check whether the material sinks and settles at the bottom of water or not, which indicates the completion of preparation of syrup (Avaleha).

iii. Anguli mudra - final product when pressed between fingers, the prints of finger are imparted over it. This is also a sign of perfect preparation of Avaleha.

iv. Kharatva/Sthiratva - this test is done after the completion of preparation. A part of finished material is rubbed in between thumb and index finger to feel the roughness (kharatva) in it because of the fine powder of medicinal drugs added to it. The sthiratva or the stableness is made out by looking at the preparation.

v. Gandha, Varna, and Rasodhbha – gandha, varna, and rasa indicate about the paka of the preparation. Appreciable color, odor, and taste of the medicinal drugs used are essential in the end product which indicates the use of genuine ingredients.

**DISCUSSION**

Thus, we see that the Avaleha Kalpana is one of the most important preparations of Avaleha Kalpana. During the preparation of Brahma Rasayana, there are many factors affecting the preparation of Avaleha paka. Heat should be mild or moderate during the preparation of Brahma Rasayana Aalehya. More heat is not good for the preparation; it should be decreased the quality of Avaleha and burn the preparation. Vessels used for the preparation of Aalehya or kwatha should be chemically inactive. Vessels are also kept open throughout the process. The lid should not be placed on boiling kwatha for it turns guru in nature. Only coarse powder is considered for the Kwatha preparation for Avaleha. The sweetening agents such as guda, sarkara, or khanda sarkara are dissolved in liquid preparation over mild fire. Bharjana process is also affecting the preparation of Avaleha. For the paka of Avaleha, bharjana of paste should be done properly. However, for the preparation of Brahma Rasayana, bharjana should not be mentioned. Hence, it kept the nutrients (such as Vitamin C and proteins) in Avaleha. Avaleha paka pariksha should be essential for the preparation of Avaleha. It is the significance of Avaleha paka. For the preparation of Brahma Rasayana, many factors such as vessels, heat, bharjana process, decoction preparation, prakshep dravya, paka pariksha, preparation of syrup, and use of oil/fat are the important factors. These all factors affect the manufacturing of Brahma Rasayana (Avaleha) in different levels.

**CONCLUSION**

Avaleha Kalpana is the essential Kalpana of the Bhaishajya Kalpana. During the preparation of Avaleha, these all factors define above, affecting the preparation of Avaleha kalpana. Brahma Rasayana is the most important Avaleha of the pharmaceutical science. During the preparation of Brahma Rasayana, there are many factors which affect its preparation. Hence, in this article, it is showed that Brahma Rasayana is one of the important Avaleha preparation. Factors, which affect its preparation, are also very essential for the formation of Brahma Rasayana.

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Factors affecting efficacy of during raw material collection

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Abstract

Ayurveda is the mainstay for healthy lifestyle. Rasa Shastra and Bhaishajya Kalpana are intimate parts of Ayurveda. All types of raw material for preparing up of Panchmahabhuta. To prepare standard quality of medicines, it is necessary to collect raw materials very carefully. In ancient period, seers used to collect raw materials duly and carefully from different Desha such as Vindhya Desha - usha virya Aushadha, from Himalaya Desha - sheet virya, Ritu (in sharad - panchang), Bhoomi (apya, agneya, etc.), Nakshatra (pushya and ashwina), and Kala. They prepared very effective medicines to cure any types of diseases successfully. Nowadays, collecting of raw materials is not properly done, as well as manufacturing people do not care about desha, kala, ritu, bhoomi, awastha, etc. In this presentation, it is tried to elaborate the methods to collect raw materials that could improve its quality to produce effective medicines.

Key words: Aushadhi, ayurveda, collection, raw material

INTRODUCTION

The collection of raw material plays a very important role for the formation of ayurvedic medicines. Collection of raw material mainly depends on the part we have collected. Acharyas had explained the form of raw materials. The drug which is obtained from the area, where best types of soil is available, is only useful for internal administration. It should be free from pests (Krimi), poison (Visha), weapon (Sastra), severe sunlight (Aatapa), high breeze (Pawana), fire (Dahana), excessive moisture (Toya), diseases (Sambadha), and roadsides (Marga). It must have single predominant taste well-developed, strong, deeply rooted in the soil, such herb grown in the Eastern side should be collected for all medicinal purpose.

MATERIALS AND METHODS

The person who wants to collect the raw material should follow the ritual procedures, must be clean and neat, should wear white cloths, and should perform prayer earlier to collection, and he must be fasting overnight. Then, the useful part shall be collected either from the East side or North side. According to Acharyas, the property of raw material is affected through specific desa, bhumi, nakshtra, kala, and ritu.

1. Desha - Three types of desa which are mentioned by Acharyas are as follows:
   - Jangala desa (dry areas) - predominant of vata.
   - Aanupa desa (wet areas) - predominant of kapha.
   - Sadharana desa (balanced area of climate) - predominant of pitta.

Jangala desa - area with clear sky, possessing tree like Khadira, Aamalaka etc., full of mirages, small ponds here and there with little water, more rocky area. Charaka considered jangala desa as the best among the areas. This climate does not allow diseases to spread and good for health.

Aanupa desa - this area consists of trees like Narikela, Kadali etc., lakes and seas, cool breeze, full of trees Charaka considered Anupa desa is not good for health.

Sadharana desa - Jangala and aanupa both of above-described flora and fauna be seen in this area.

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2. Bhumi - Seers was subdivided bhumi into five groups:
   - Parthiva bhumi - Full of heavy rocks, grayish or blackish color soil, and huge trees are present.
   - Apya bhumi - Smooth soil, full of water and grass, delicate trees, and whitish soil are present.
   - Agneya bhumi - Different colors of soil, lighter, mixed with plenty of stones, and smaller trees are present.
   - Vayaviya bhumi - Rough and ash-colored stones, lean and small trees, and xerophytes are more seen in this type of soil.
   - Akasiya bhumi - Sandy, taste-less water, dry trees, trees which grow near rocky-mountains are seen, and soil is grayish-black in color.

3. Disha - According to Aacharyas, raw material should be collected either from the East side or North side, and it is said that potency and efficacy found in this direction because moon is swami of north side and sun of east side gives power to drugs.

4. Nakshatra - Collection of raw material should be done in Pushya and ashwina nakshatra because moon is the God of drugs and also it is the God of Pushya and Mrigshira. That is why in this time period moon is predominant over them and transmits more rasa in drug. Therefore, in this time period, medicinal drugs are more effectual.

5. Ritu - The raw materials used in ayurveda should be collected according to part used and season.

According to Charaka

<table>
<thead>
<tr>
<th>Part used</th>
<th>Season</th>
</tr>
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<tbody>
<tr>
<td>Tender leaves and branches</td>
<td>Varsha and Vasant ritu</td>
</tr>
<tr>
<td>Root of tree which have shed</td>
<td>Which are Ushna veerya Sisira for plant which are off leaves and regenerating fresh leaves - Seet veerya</td>
</tr>
<tr>
<td>Bark, tubers, and latex</td>
<td>Sarad ritu (late autumn)</td>
</tr>
<tr>
<td>Heart wood or sap wood</td>
<td>Hemanta (early winter)</td>
</tr>
<tr>
<td>Flowers and fruits</td>
<td>According to their season</td>
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</table>

According to Sushruta

<table>
<thead>
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<th>Part used</th>
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<tbody>
<tr>
<td>Root</td>
<td>Pravitta ritu (between summer and rainy seasons)</td>
</tr>
<tr>
<td>Leaves</td>
<td>Varsha ritu (during rainy season)</td>
</tr>
<tr>
<td>Bark</td>
<td>Sarat ritu (late autumn)</td>
</tr>
<tr>
<td>Letex</td>
<td>Hemanta ritu (early winter)</td>
</tr>
<tr>
<td>Heart wood</td>
<td>Vasanta ritu (spring)</td>
</tr>
<tr>
<td>Fruit</td>
<td>Greeshma ritu (summer)</td>
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According to Raj Nighantu

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<td>Tubers and rhizomes</td>
<td>Hemanta ritu</td>
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<tr>
<td>Root and leaves</td>
<td>Sisira ritu</td>
</tr>
<tr>
<td>Flower and fruit</td>
<td>Vasanta ritu</td>
</tr>
<tr>
<td>Tender leaves</td>
<td>Greeshma ritu</td>
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<tr>
<td>Panchang</td>
<td>Sarad ritu</td>
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</table>

Collection of Raw Materials According to Season

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<th>Charaka 1. chapter</th>
<th>Susruta 36. chapter</th>
<th>Raj Nighantu 2. Chapter</th>
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<tr>
<td>Mula (Root)</td>
<td>Greeshma, Sisira</td>
<td>Pravitta</td>
<td>Sisira</td>
</tr>
<tr>
<td>Palasa (Tender leaves)</td>
<td>Varsha, Vasanta</td>
<td>-</td>
<td>Greeshma</td>
</tr>
<tr>
<td>Sakha (branches)</td>
<td>Varsha, Vasanta</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Pushpa (Flower)</td>
<td>As per season</td>
<td>-</td>
<td>Vasanta</td>
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<tr>
<td>Twak (Bark)</td>
<td>Sarad</td>
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<td>-</td>
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<tr>
<td>Ksheera (Latex)</td>
<td>Sarad</td>
<td>Hemanta</td>
<td>-</td>
</tr>
<tr>
<td>Sara (Sapwood)</td>
<td>Hemanta</td>
<td>Vasanta</td>
<td>-</td>
</tr>
<tr>
<td>Phala (Fruits)</td>
<td>As per season</td>
<td>Greeshma</td>
<td>Vasanta</td>
</tr>
<tr>
<td>Kanda (tuber or rhizomes)</td>
<td>Sarad</td>
<td>-</td>
<td>Hemanta</td>
</tr>
<tr>
<td>Patra (leaves)</td>
<td>-</td>
<td>Varsha</td>
<td>Sisira</td>
</tr>
<tr>
<td>Panchang</td>
<td>-</td>
<td>Sarad</td>
<td></td>
</tr>
</tbody>
</table>

Collection of Food Materials

According to Susruta and Bhawprakash mishra Specification for collection of food materials.

Fruits

It is not to collect unripe or over ripen fruit. Fruits which are well ripen will only be collected, but Bilwa phala may be collected in unripe stage only.

Leafy vegetables

Leafy vegetables which are hard, dry infected by pests, produced in unnatural habitats, and which are grown unseasonaly are to be avoided.

Tubers

Immature, unseasonaly harvested, dried, and infected tubers should not be used as food.
Rice grains

The rice grains exposed to cold, hot, air, bugs, animals, water, polluted soil, unsprouting, mixed with other food grains, less potent, and very old should not be used.

Collection of animal products

Vayastha (young adults) - for collecting blood, hair, hoofs, etc.
Jeerahara (after the food is digested) - for milk, urine, and feces.

DISCUSSION

In the collection of raw material, acharyas have presented different opinions. According to Susruta, the collection of raw material should be done as per the season and potency (Veerya).
1. Soumya aushadha (Seeta Veerya Dravya) - In Soumya ritu (cold season), i.e., in Varsha, Hemanta, and Sisira.
2. Agneya aushadhi (Ushna veerya dravya) - in Agneya ritu (Hot season), i.e., in Sarata Varsha and Greeshma ritu.

According to Chakrapani, the roots of ushana veerya drayas will be collected in summer and those of seta veerya drayas in winter (Shishir).

According to Sarangdhar collections of Agneya dravyas (Ushna veerya dravyas) from Vindhya desa and Soumya dravyas (Seeta virya dravyas) from the Himalaya desa.

In ancient times, our seers used to collect the raw herb from natural forest and hills on their natural habitat. Nowadays, due to deforestation, artificial cultivation of medicinal plants has become a trend and trend. It is yet to need to observe the efficacy of artificially propagated herbal drugs with respect to their efficacy and potency.

CONCLUSION

The main aim of a collection of medicinal plants or parts of plants is to ensure the need of raw ingredients necessary for formulating different ayurvedic medicines. By adopting good measures of drug collection, we can get medicines having better efficacy and ultimately we may be compatible to cure the ailments by their roots. The study of the proper collection methods of medicinal plants and their parts is a need of time. Properly identified, collected drugs can be considered “pure,” and by such pure medicine having greater efficacy and potency, we will be able to fight the ailments in a better way.

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Factors affecting the absorption of ayurvedic drugs

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Abstract
Absorption is the process of drug transport from the site of administration to systemic circulation by crossing biological membrane. In order for a drug to exert its pharmacological effects, it must first gain entry into body, be absorbed into bloodstream and transported to its site of action. Absorption describes the rate and extent to which a drug leaves its site of administration and enters the circulation. Many factors may affect the absorption and bioavailability of Ayurvedic drugs. Main factors are physiological factors, physicochemical factors, and formulation factors.

Key words: Absorption, bioavailability, pharmacological, physiological

INTRODUCTION
The field of pharmacokinetics is concerned with drug absorption, distribution, biotransformation, and excretion or elimination. The overall effect of particular drugs depends on the amount of drug administered, extent and rate of absorption, rate of distribution, metabolism, and excretion. A drug administered in a dosage form by any route of administration must liberate from the dosage form and must get dissolved for absorption. Irrespective of the route of administration, to get absorbed, the drugs must pass through biological membranes which act as lipid barriers. They need to be fine to pass through the barriers or they must be attracted toward the membrane higher the rate and extent of absorption, quicker will be the therapeutic action and so the efficacy of Ayurvedic drugs. Thus, absorption is one of the important factors for the efficacy of the drugs. Absorption is defined as the amount of unchanged drug that reaches the general circulation. In systematic circulation, the drugs exist in either free form or bound to plasma proteins. The free form of drug fraction is bioavailable and elicits the therapeutic response.

PHYSIOLOGICAL FACTORS

Membrane Physiology
Biological membrane is a bilayer of phospholipids and cholesterol molecules with hydrocarbon chain oriented inwards and polar head groups oriented outward. Proteins are interspersed between the lipid bilayer and between the cell membranes are the pores which may permit the transportation of drug molecules. Any alteration in their physiology may disturb the absorption of Ayurvedic drugs.

Gastrointestinal (GI) Physiology
Drug absorption is highly dependent on the ionization of drug which in turn is dependent on the pH medium and this pH varies in different part of the GI tract that causes difference in rate of absorption in different parts. Another factor affecting the availability of the drug in the biological fluid is gastric emptying, faster the gastric emptying accelerates the drug absorption and because of the greater surface area due to the

FACTORS AFFECTING ABSORPTION OF AYURVEDIC DRUGS INCLUDES
Physicochemical properties which determine the transfer across the cell, formulation or physical state of the drug: Site of absorption; concentration of the drug; circulation at absorption site; and area absorbing surface. Main factors affecting the absorption are physiological factors, physicochemical factors, and formulation factors.

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presence of the villi and microvilli, the small intestine is the main site of the absorption of maximum drugs.

**Passage of Drugs Across Membrane**

Active transport, facilitated diffusion, passive diffusion, pinocytosis, and pore transport. Any disturbance in their physiology may affect the absorption of the Ayurvedic drugs.

**PHYSICOCHEMICAL FACTORS**

a. Solubility - Drugs given in solid form must dissolve in the aqueous biophase before they are absorbed as solution easily gets transported across the biological membrane, so this is obvious that drug given as watery solution is absorbed faster than the same is given in solid form or as oily solution. Solubility of the solute is dependent on important parameters are temperature: With the rise in temperature, the stability decreases and maximum degradation occurs leads to increase in solubility, dissolution rate increases which in turn increases the absorption; particle size: Surface area of the drug is inversely proportional to the drug particle size, therefore, smaller particles dissolve faster than the larger ones hence affecting the rate of absorption; pH: Drug molecules are weak acidic or weak basic in nature, which in turn depends on the degree of ionization that gives the ratio of the extent of ionized and unionized form of the drug therefore ultimately determines the solubility and dissolution of the drugs; and type of solvent: Some of the drugs dissolve at the low pH that means gastric acid needs for the absorption, some drugs are lipid soluble, alcohol soluble, and water soluble.

b. Concentration - Passive diffusion depends on concentration gradient; drug given as concentrated solution is absorbed faster than from dilute solution.

c. Area of absorbing surface - Larger is the surface area, faster is the absorption.

d. Vascularity of the absorbing surface - Blood circulation removes the drug from the site if absorption and maintain the concentration gradient across the absorbing surface. Increased blood flow hastens drug absorption.

e. Particle size - Solid drug delivery systems are crucial formulation through oral route. In such drug systems, particle size has a strong impact on the drug dissolution and on drug absorption. Smaller the particles larger the surface area, and thus the solubility increase with decreasing particle size. Given the larger surface area of smaller particles, the attention is directed to nanosystems and on their relevance to the bioavailability of poorly soluble drugs.

f. pH- Most drugs are weak electrolytes means their ionization is pH dependent (contrast strong electrolytes that are nearly completely ionized at acidic as well as alkaline pH). Membranes are formed of bilipid layer; ions being lipid insoluble do not diffuse through the membranes. Weakly acidic drugs ionize more at alkaline pH, whereas weakly basic drugs ionize more at acidic pH. Hence, acidic drugs are largely ionized and better absorbed from stomach and basic drugs are absorbed in intestine.

g. Prodrugs - These are pharmacologically inactive chemical entity responsible for chemical modification of drug that increases the lipid solubility, thus enhances the absorption.

h. Influence of temperature, hydrolysis, or oxidation - Affects the stability of the drug, so the maximum degradation of the drug occurs solubility increases. Drug in the solution passes easily through the cell membrane.

**FORMULATION FACTORS**

Disintegration Time

Rapid disintegration is important to have rapid absorption so lower disintegration time is required.

Nature and Types of Dosage form and Route of Drug Administration

Drug must be in solution to be absorbed efficiently. As a general, the bioavailability of a drug from various dosage forms decrease in following - Solution dosage form>Suspension dosage form> Capsule dosage form>Tablet dosage form>Sustained release dosage form. Route of administration – bioavailability of intravenously administered drugs is 100%, but most of the ayurvedic drugs administered through oral route are expecting systemic action, hence, their bioavailability is definitely <100%.

**FACTORS AFFECTING THE ABSORPTION IN AYURVEDA**

Based on Properties

**Sukshmatva (fineness)**

Suksha dravya means fine particles of drugs. To get absorbed, drugs must need to pass through membranes and for that drugs need to be very fine in nature. Fine particles have high surface area which influences the drug dissolution, in turn, drug absorption. Smaller particles with greater surface area dissolve more rapidly than larger particles even though they have the same intrinsic solubility example Bhasma – it is considered as the ancient nanoparticle responsible for higher efficacy than other because of its nano-size particle, it can transport across membrane purely by filtration, rapid the absorption, rapid will be the therapeutic action.


Laghutva (lightness)

In this universe, each and every dravya is panchbhoutik in nature. Chakrapani the commentator of Caraka samhita opines that light foods are Vayu - Agni mahabhuta predominant. Similarly, drugs having the property of laghuta are vayu and agni mahabhuta predominant where vayu is the responsible for quick movement and agni for quick digestion which, in turn, has the fastest absorption than heavy drugs. For instance, panchvidha kashaya kalpana – phant have highest absorption than hima.

Ushnatva (hotness)

Ushna guna have agni mahabhuta responsible for digestion, faster the digestion, and faster will be the absorption. Ushna guna causes the pacification of the kapha; open up the blocked strotas (channels) and permit to enter in strotas (channels), i.e. ushna guna dravya or ushna virya dravya allows the permeability of the drugs in cell membrane by opening the gap between the cells or by losing the tight junctions. Example – swedan - responsible for opening of the strotas, also increases the blood circulation and absorption, thus the absorption of ushna dravya is faster than shita dravya as shita virya dravya has stambhan property.

Amaliya-kshariya (pH)

Acidic drugs are quickly absorbed from stomach and alkaline drugs absorb in small intestine with the alkaline environment. Anupana administered with drugs helps in rapid absorption may be by maintaining the pH of the medium as anupana can be either slightly acidic (amla varga) or basic (kshara varga) in nature or by mixing of lipid soluble with drugs may form covalent bonds with them and remain them in unionized form.

Vyavayi: (Quickly absorbed)

It first spreads all over the body and then gets digested, examples, such as visha and Madhya.

Based on Dosage Forms

i. Churna-vati - churna is the simplest and basic forms of the Ayurvedic medicines. It is fine powder of the herbs or the drugs. Absorption depends on the fineness of powder or particle size. More smaller the particle size, more will be the absorption, so the therapeutic action whereas in case of vati due to the presence of binding agent, the disintegration time is more so the rate of absorption is less and in case of vati including guggulu, it does not dissolve easily.

ii. Asava-Arishta - Asavaristas preparations have a unique place in all the Madhya kalpanas and other kalpanas mentioned in Ayurveda due to their quick action and high preservative quality. Alcohol and CO, are produced during the fermentation process due to chemical changes. Sugar which is present is converted to alcohol and the produced alcohol facilitates dissolution of the active principle into the liquid media which further influences the absorption. Undesirable sugars are removed from the plant materials by fermentation process and make the product more bioavailability by eliminating side effects such as gas and bloating. Fermentation process creates an active transport system which carries the constituents from the herbal material to the menstruum.

iii. Bhasma - Bhasma used in Ayurveda is ancient nanomedicine prepared from metal. Particle size (1–2 μ) reduced significantly, which may facilitate absorption and assimilation of the drug into the body system therefore responsible for higher efficacy than other because of its nano-size particle and rapid absorption.

Based on Aushadh marga

Ayurvedic drugs are obtained from the natural source that is from plants, animals, and minerals. Different drug will act at different sites of action. Administration of drug inappropriate route is very much important to obtain maximum therapeutic effect. Path by which a drug/fluid/poison or other substances is brought into contact with the body can be defined as route of drug administration drug. These routes are considered to be the pathways from which the drug is quickly absorbed and carried to different target organs, to show its specific action. Examples basti – Basti administered in the Pakwashaya affects the whole body by its Virya (active principles of the basti), and in modern, the active principle acts on ENS that controls the mechanisms of the absorption. Similarly, Nasya - active principle gets passed through barriers and stimulates the brain for the therapeutic action.

Based on aushadh sevan kaal

The effectiveness of drugs depends on the time of administration. Aushadh kaal also plays important role in absorption, for instance, abhakta, i.e., drugs given on empty stomach, will have maximum effect on the body as on an empty stomach as the full of stomach and intestines are available means more surface area for effective drug absorption. The rate of absorption of drug depends on Agni and presence and absence of food and also on surface area, hence affect the pharmacokinetic and pharmacodynamics of Ayurvedic medicines

Anupana

In Ayurveda, according to Adhamalla (commentator of Sarangdhara Samhita), any liquid medium which is used after administrating the drug or along with the drug is known as Anupana. The Anupana is claimed to distribute the drug throughout the body within no time. It spreads like oil drops on water, i.e. spreads in all directions fastly (Ad.-sha.s. m. 6/4-5). According to Ras Tarangini Sahapan which is the liquid form taken along with main drug and which can facilitate
easy disintegration, absorption, and uniform distribution of medicines all over the body, hence that liquid form is called Anupana.

For example: Honey - It aids easy absorption by active transport, it augments the action of medicine by yogavahita. It acts as a carrier – a molecule that combined with another substance facilitates it to pass through cell membrane. It may help in pH maintenance as acidic or alkaline pH is responsible for ionization which in turn being lipid insoluble or some active constituents are water soluble, lipid soluble (ghrit or tail), or alcohol soluble (asava arishta) accordingly anupana is used to facilitate the better absorption of drugs and protecting them by coating them with layer of lipids example-ghrit, some of the anupana helps in rapid digestion for rapid absorption.

DISCUSSION

As we know Ayurveda is still facing the problem in treatment is the curing period. Although Ayurvedic treatment with proper knowledge of dosha dashya, samprapti ghatak, desha, kaal, vaya satva, etc., is very effective because of the prolonged curing period, patients generally skip the treatment in between. Focus is required on the factors responsible for quick therapeutic action of Ayurvedic medicines. Therefore, in pharmacokinetics along with many factors rapid absorption is also required to increase the rate of pharmacological action. Rapid digestion (some of the drugs are absorbed before they get digested are called as vyavayi), pH factors, ushna, laghu guna dravya, aushadh sevan kaal, aushadh marga, etc., are factors that may affect the absorption, and also pathya aahar-vihar must be followed to maintain the physiological functions of the body. This is very clear that ancient physician was also very much concerned for the absorption of medicines. Thus, they described the “Anupana” concept for the enhancement of therapeutic action.

CONCLUSION

The effect of particular drug also depends on the rate of absorption. Absorption describes the rate and extent to which a drug leaves its site of administration and enters the circulation. Factors must be focused to increase the rate of absorption so as to increase rate of pharmacological action. Anupana is a unique concept that is gifted by Ayurveda. Anupana also plays an important role in faster absorption due to its yogavahi and vyavayi action, so it must be used along with Ayurvedic medicines accordingly.

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Factors influencing during storage of raw materials

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Abstract

Ayurvedic or traditional medicine is the oldest form of medicine and it has been used all over the world. That is why this is a major issue regarding storage of raw drugs. Raw materials are collected from different places. In the India, there is so much climate difference, some drugs are collected from north-east, some are from south, so it is important to maintain efficacy and purity of raw material. The storage and handling of raw drugs can be improved by good storage place, packaging of raw herbs, authenticated, and be free from microorganism, insects, pests, or other foreign materials. Active principle of raw drug should be maintained until formulation. Storage, exposure of light, air, moisture, and microbes directly affect the efficacy of drug. Contaminated can be prevented by proper storage.

INTRODUCTION

Ayurveda is an ancient science. In Ayurveda pharmacology, pharmacy is a well-advanced branch. Crude drugs are rarely administered. Ayurveda is highly evolved and codified system of life and health science based on its own unique concepts and fundamental principles. Rasashastra and Bhaishajya Kalpana are one of the special branches of Ayurveda which deals with various herbals and minerals along with their identification, collection, storage, standardization, purification, and formulation. Any drug material, which is collected, should be stored in suitable conditions to retain the inherent properties until the drug goes into preparation. The raw material storage techniques are followed with utmost care and intelligence as the potency of raw drug goes into preparation. The quality of products is much depended on the quality of raw drugs, and quality processing of raw drug can be of mineral, herbal, and animal origin. For this, our classics also have emphasized the fact of proper storage of crude drug materials and the storehouse.

MATERIALS AND METHODS

Storage means receiving and custody of right qualities and quantities of material for operational needs. Minerals, herbals, or animal origin are the main source of raw materials. The increased use of traditional medicines and concern over safety and efficacy have certainly augmented the need of storage and standardization. As per Acharya Sushrut, the raw drugs required for the preparation of medicines are to be stored in cloths, mud pots, drugs hanged in cloths/ gunny bags, or specially designed hangers to the roof of the storehouse or to the nails fixed in the walls. East or north direction of the storehouse is preferred for storing the drugs. The raw materials are to be stored in a place which will be unaffected by external atmospheric conditions such as smoke, rain, wind, and moisture. The place should be convenient during all seasons. Furthermore, Acharya Charak mentioned in kalpa sthana that the raw materials collected are to be stored in suitable containers, arranged in storehouse facing East or North with proper air entry. The house should be fumigated (puspa, upahara, and balikarma) frequently. The drugs inside should remain unaffected by fire, water, upasweda (temperature from earth), smoke, dust, rats, rodents, and other animals. In such a place, the drugs are to be neatly tied and hanged to the walls and roof.

The substance and the preparation of pharmacopoeia are to be stored under the conditions that prevent contamination, and as far as possible deterioration, precautions that should be taken in relation to the effects of atmosphere, moisture,
heat and light are indicated. The conditions are defined by following terms.

**Collection**

Collection of raw drugs is the first step. India is a tropical country and so much climate difference that is why various range of herbal, minerals, or animal origin materials. Hence, the properties of raw herb depend on from where it came. For example, the medicinal plants which occur on the Himalayas are best in quality. Irrespective of the type of crude drug and the area of collection that the raw materials should be collected when they contain maximum concentration of active constituents. Proper identifications of crude materials are important.

**Physical Impurities/Foreign Material**

Raw materials collected from different sources contain many impurities. Hence, it is important to remove the impurities. Raw material may be contaminated from soil, dust, or animals. Cleaning and washing by fresh water help to remove these impurities. After cleaning, the raw materials should be proper dry.

**Temperature**

Some of the raw drugs need cold storage to maintain their efficacy and potency. In olden days, such materials were kept in earthen pot, coconut kernels, covering of hard fruits, and brass vessels. Efficacy of *sheeta veerya* drugs increases if kept in cold storage or refrigerator. At least, it will not decrease. In cold storage, the temperature is in control medium. Very low temperature not only maintains efficacy and potency of drugs but also protects from microbial growth.

**Duration of Storage of Raw Materials**

The main aim of storage and preservation of raw material is to maintain its potency by conserving its properties and action. Even the best selected and protected drugs lose its effectiveness after a certain period. The usual period to consider a drug used when it is dry or old is one year. Henec, it is important that drug should be used under limited or given time. For this labeling, collection date, location, and expiry date should be mentioned on packaging.

**Light**

Some raw materials which contain essential oils and photosensitve properties should stored dark places, away from sunlight. As we all know the sunlight contains UV rays that are not only harmful for our skin but also can change the component of different products as well. Pharmaceutical companies and pure plant ingredients for good reason should be stored in “Amber Bottle Glass.”

This bottle made up of glass. It protects the product contained inside from photodamage.

**Containers**

The container and its closure must not interact physically and chemically with the material with in any way that would alter its quality. The following descriptive terms are used to indicate general requirements for the permeability of containers.

**Well-closed containers**

It protects the content under normal conditions, storage, handling, and shipment.

**Tightly closed containers**

It protects the contents from efflorescence, deliquescence, or evaporation. If the containers are intended to open, it must be airtight after reclose.

**Temper evident containers**

One that is fitted with a device that reveals clearly whether it has ever opened.

**Humidity**

Drug is maintained in a sound condition by adopting a proper method of storage. If humidity and moisture present in any drugs, it gives a proper media to germinate bacteria fungi. Hence, dryness of raw drugs is very important. No living organism can develop or exist without a minimum of moisture, for example, the mites are unable to grow in flour if moisture content is maintained below 11% and that a moisture content below 9% prevents the growth of bacteria and fungi. The proliferation of microorganism may result from failure to control the level of moisture level during storage and transportation, for example, aflatoxin produced by certain fungi, which can increase risk of liver cancer. Aflatoxin can contaminate herbs during harvest or storage.
Pesticide Residue

Herbal or mineral materials may contain pesticide residue, which accumulate as a result of agricultural practices and administration of fumigants during storage. It is therefore recommended that every country producing medicinal plant materials should have at least one control laboratory capable of performing the determination of pesticide using a suitable method.

Protection from Microbial Contamination

Herbs and minerals normally carry a large number of bacteria and fungi. Current practices of harvesting and storage may cause additional contamination and microbial growth. Microbial contamination should be controlled by implementing best practices guidelines such as GACP and GMP.

Protection from Parasitic Contamination

Parasite such as protozoa and nematode and their ova may be introduced during cultivation and may cause zoonosis, especially if uncomposed animal excreta are used. Contamination with parasite may also arise during processing and storage.

Other Factors

Some small factors are also responsible to maintain the quality of raw drugs, for example, personal hygiene of workers and storekeepers. Storehouse is free from insects, rats, and rodents. The herbs or minerals which are poisonous should be placed in specific area so that it cannot contaminate the properties of other materials.

PARAMETERS OF STANDARDIZATION OF RAW DRUG

- Authentication
- Foreign material
- Organoleptic evaluation
- Macroscopic and microscopic
- Volatile matter
- Ash value
- Heavy metal contamination
- Microbial count
- Pesticide residue
- Marker component
- Chromatograph profile.

DISCUSSION

The main aim of proper storage of raw drug is to maintain their active principle. Every material has their own little deteriorative property with respect to duration. There are some other factors also e.g. rain, temperature, humidity, light, air etc. Quality of a formulation depends on quality of its content.

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Pathya Ahara and Vihara and their influence on efficacy of Ayurvedic medicine

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Abstract

The basic principles in Ayurveda give prime importance to Agni, Prakriti, Ahara, and Vihara in maintaining health. Ayurveda has holistic and scientific approach in health management. It emphasizes much more on diet and regimen along with medicines. Most of the health problems develop due to the faulty eating habits and regimen. Ayurveda deals with the planning of diet and dietetics in a very scientific way. In Ayurveda for maintaining the health of a person, various dos and do nots have described such as Dincharya (diurnal regimen) and Ritucharya (seasonal regimen). The concept of Pathya and Apathya is one such concept. Apart from being a part of regimen of healthy living, Acharyas had also extended the concept of Pathya and Apathya as a part of the treatment of the diseases. This indicates the importance of Pathya and Apathya in Ayurvedic medicine.

Key words: Apathya, Ayurveda, healthy living, Pathya

INTRODUCTION

Ayurveda specifically expresses the importance of Ahara and Vihara in maintaining and promoting good health as well as in curing diseases. For maintenance of health, Ayurveda laid many basic principles such as Ritucharya (seasonal regimen) and Dinacharya (diurnal regimen). The concept of Pathya and Apathya is the unique strategy of Ayurveda to fulfil its aims and objectives.

- iF, ka iFk*usira, kJ a p*Dra eu% fÂ, ke~A
- kPPk vfÂ, ka viF, ka p fu, kra rUu y{ksr~AA ¼p-lw- 25%45½.

The Ahara-Vihara which is beneficial and nutritional to the body and also gives the happiness to the mind is known as Pathya and opposite to that is known as Apathya.[9] The target of Pathya is to solve the cause of diseases through the practice of good dietary regimens which are favorable for subsiding the disease. It helps to avoid unfavorable routine, which is contrary to the medicine and to add favorable routines which increases the potency of the medicine.

Concept of Pathya Ahara and Vihara

Various literature about Pathya and Apathya are present in Vedas right from Rigveda. Pathya acts as a medicine and it should be strictly followed.[5] Charak had stated that Pathya Ahara is one of the causes for the growth and well-being of humans.[10] The importance of Pathya and Apathya in Ayurveda can be deduced from the fact that Charak had stated Pathya (wholesome) as a synonym for treatment.[4] Acharya Sushrut had specifically written a chapter named Hita-Ahitiya Adhaya in Sutra sthana. Kashyap explored the medicinal potential of Aahar (food) along with its prophylactic value for maintaining health. Kashyap stated that food is the best medicine.[5] Hence, person should use Pathya (wholesome) according to his/her physical and pathological condition regularly. Even in the absence of medicine, if patient takes only Pathya (whole some) according to disease, he will become healthy, but even if patient takes more and regular medicine and avoids Pathya Ahara prescribed by physician, he will never become healthy.[6]
In Yogaratnakara, it is said that, for the treatment of diseases, etiology, drug treatment, and Pathya (wholesome) are three important factors which should be studied thoroughly before starting the treatment.[7] Judicious planning of treatment by proper understanding of these three factors always yields a successful eradication of disease. Charak had also given equal importance to Pathya Vihar (wholesome routine) along with Pathya Aahar (wholesome food) for maintenance of health. As Charak has stated that, in conditions of Chinta (anxiety), Shoka (sorrow), Krodha (anger), DukhaShaiya (uncomfortable bed), and Ratrijagarana (insomnia), even small amounts of Pathya Ahara (wholesome food) are not digested, thus have given equal importance to both Pathya Ahara and Vihara.[8]

**DISCUSSION**

According to Yogratanakar, if one has taken Pathya as food, he may not need medications to treat the ailments, whereas taking hundreds of medicine without Pathya sevan will lead to failure.[7]

Hippocrates has also advocated that “Let food be they medicine and medicine be they food.”

However, ancient seers of Ayurved had not confined themselves to the role of diet in diseases, but their widened vision can be seen from the fact that they have authorized different Anupana and Pathya for each and every medicine described in reference to their respective diseases so as to facilitate the restoration of bio-humoral balance and health status.

Discovery of a case of inhibition of cytochrome P450 3A4 (CYP3A4, which is the most important enzyme in drug metabolism in liver) by taking medicine such as aspirin with grapefruit juice leading to purpura in 2007 paved the pathway for studies by modern researches on drug-food interaction. The scope of this study mainly focuses on citations along with their medicaments.[19]

While treating any disease along with medicine, the basic concern goes to what we can eat during illness that can influence the efficacy of the recommended drug in any particular disease. The main motive of prescribing Pathya Ahara and Vihara with medicine in Ayurved is nothing but to keep srotas intact, bring the vitiated doshas to normal state and to bring healthy state of mind and body.

**Probable Mode of Action of Pathya**

1. Most of the drugs used get absorbed without the interference of other food which destroys active ingredients of medicine.
2. Keep patient away from the other desires which otherwise destroy the benefits of treatment started.
3. Get needed active principles of other food materials which with its presence accelerate the action of medicine in human, i.e., *samanyam vridhi karanaam*.
4. Supplying nutritional supports to the previously malnourished patient due to sickness and harsh treatment.

### Table 1

<table>
<thead>
<tr>
<th>Medicine</th>
<th>Pathya</th>
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<tr>
<td>Pratham Brahm Rasayan</td>
<td>Shashtik audana and milk</td>
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<tr>
<td>Dwitiya Brahm Rasayan</td>
<td>Shashtik audana, milk, and ghrita</td>
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<td>Nilinyadya Ghrita in Gulma</td>
<td>Mansarasa</td>
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<tr>
<td>Dantiharitaki in Gulma</td>
<td>Mansarasa audana</td>
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<td>Amritaprasha in kshtakshina</td>
<td>Manaras and milk</td>
</tr>
<tr>
<td>Mandoor vataka in Pandu</td>
<td>Food made up of Yava with Takra</td>
</tr>
<tr>
<td>Medicines used in Atisara</td>
<td>Takra sevan</td>
</tr>
<tr>
<td>Jalkumbhi bhasma in galganda</td>
<td>Kodorava with Takra</td>
</tr>
<tr>
<td>Parada sevan</td>
<td>Dughda, Shankara</td>
</tr>
<tr>
<td>Parpati Kalpana</td>
<td></td>
</tr>
</tbody>
</table>
CONCLUSION

Ayurvedic Pathya Ahara and Vihara, if experienced in daily, can produce excellent results in prevention or cure of diseases. As it is essential to take into account the psychological aspect of the treatment, the determination of Pathya also includes personal liking of the patients. The planning of diet mentioned in our classical literature is very rational and based on certain principles. Need of time is proper mobilization in immaculate practice and correct interpretation of its principles. Today’s researchers are paying immense interest in fields such as drug-drug interaction, drug-food interaction, and nutrigenomics for the betterment of efficacy of drugs in treating ailments. Ayurvedic researchers should also widen their horizons in these fields.

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Ahara and vihara: Imperative implements for effectiveness of ayurvedic drugs

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Conventional medical system has witnessed a transition in patient approach from physical medicine to mind-body medicine in the 21st century. The patient in mind-body medicine is understood as a totality of body, mind, and spirit, and interventions are directed at each of these aspects of the person. The mind-body medicine approach to health care includes a wide range of behavioral and lifestyle interventions, on an equal basis with traditional medical interventions. Such a holistic approach to the patient including modification of diet, lifestyle, and addressing of psychological factors along with drugs and panchakarma procedures has always been a part in the Ayurvedic system of health care. With the advancements in modern medicine, questions about the interaction of diet and lifestyle on effectiveness of Ayurvedic medicines also started commencing. This paper seeks to find scientific answers to the issue of the effect of ahara (diet) and vihara (lifestyle) on the efficacy of Ayurvedic medicines.

SUMMARY

Objective of the Study

The objective of this study was to explore the effect of diet and lifestyle modifications in the efficacy of Ayurvedic drugs.

MATERIALS AND METHODS

Classical and contemporary review from all the available literature was made on the topic using the keywords diet, ahara, vihara, lifestyle, efficacy, interaction, ayurvedic medicines, and their different combinations and permutations. The matter was critically analyzed and presented in a systematic manner.

OBSERVATION AND DISCUSSION

A holistic approach to the patient including modification of diet, lifestyle, and addressing of psychological factors along with drugs and panchakarma procedures has always been a part in the Ayurvedic system of health care. In every procedure or treatment modality, there is a recommendation of diet and behavior which are to be followed and some which are to be avoided. Not only this, the classics also detail about a number of mediums through which medicine has to be taken for different benefits in the form of Anupana. Even conventional medical system has witnessed a transition in patient approach from physical medicine to mind-body medicine in the 21st century wherein interventions are directed at each of these aspects of the person, namely, body, mind, and spirit. The mind-body medicine approach to health care includes a wide range of behavioral and lifestyle interventions, on an equal basis with traditional medical interventions. Such a holistic approach to the patient including modification of diet, lifestyle, and addressing of psychological factors along with drugs and panchakarma procedures has always been a part in the Ayurvedic system of health care. Issues about interaction of diet and lifestyle affecting the efficacy of Ayurvedic medicines have been raised recently. Few scientific researches and studies are now available on the topic which provides evidence about the synergistic effect of diet and lifestyle on the efficacy of Ayurvedic drugs. The details and the scientific researchers will be presented in the seminar.

CONCLUSION

Different diet and lifestyle modifications made in the patient as per the recommendations of the classics have shown a positive role on the efficacy of Ayurvedic medicine. Though, more studies are still needed to supplement the data better.

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Quality control and standardization of bhasma

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Abstract

According to Ayurveda, bhasma means conversion of a metal into a form which is irreversible. Standardization of bhasma is very necessary to confirm its identity and to determine its quality and purity. It will also make sure the safety effectiveness and the acceptability of the formulation. However, the most important challenge faced by these formulations are lack of complete standardization. An attempt has been made to summarize the ancient and the advanced methods available for standardization of bhasma such as verna, varitara, rekhapurnatvatam, niruttha, atomic absorption spectroscopy, Fourier-transform infrared, scanning electron microscope, and NPST.

Key words: Bhasma, herbomineral, standardization

INTRODUCTION

Ayurveda is the science made up of ayush (life) and veda (knowledge). Rasa-Shastra (vedic-chemistry) is one of the parts of Ayurveda; it deals with metals/non-metals/herbomineral preparations called as bhasmas. Bhasmas literally means “ash” which is obtained after incineration. Bhasmas are unique Ayurvedic metallic preparations with herbal juices/fruits or decoction, widely recommended for the treatment of a variety of chronic ailments. Bhasmas are biologically produced metallic nanoparticles obtained by calcination into ash and are taken along with milk, butter, honey, ghee, etc. This group of medicines can work even in smaller doses and may even control incurable diseases effectively. In Ayurvedic system of medicine, the variation in collection process, timing, and procedure may yield same bhasma with different quality aspects.[1] In many cases, wrong manufacturing and marketing process may lead to the production of inferior-quality products, which reduce the efficacy of products as well as safety parameters. To minimize variability and to strengthen the quality of Ayurvedic products, standardization of a bhasma is essential. Standard is the numerical value which quantifies the parameters, and thus denotes the quality and purity of material. In the present paper, standardization study is undertaken for herbomineral preparation on the basis of ancient Ayurvedic methods of analysis and modern view of standardization.

CLASSIFICATION OF BHASMA

1. Metal-based Bhasma
2. Mineral-based Bhasma
3. Herbal Bhasma as a nanomedicine

IMPORTANCE OF BHASMA

1. Bhasma is potent in small dose
2. Provides easily absorbed and usable calcium
3. Maintains optimum alkalinity for optimum health
4. Cleanse the kidneys, intestines, and liver
5. Maintains healthier teeth and stronger bones
6. Alleviate depression and insomnia.

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PREPARATION OF BHASMA

Bhasmikaran is a process by which a substance which is bioincompatible is made biocompatible by certain samskaras or processes. The objectives of samskara are:
1. Elimination of harmful matters from the drug
2. Modification of undesirable physical properties of the drug
3. Conversion of some of the characteristics of the drug
4. Enhancement of the therapeutic action.

STEPS OF BHASMIKARAN

Shodhan (Purification)
The principle objective of shodhan is to remove unwanted part from the raw material and separate out impurities. Metals obtained from ores may contain several impurities, which are removed by subjecting them to shodhan process. In context of bhasma, shodhan means purifying and making the product suitable for the next step, i.e. Maran. Ayurveda classifies shodhan into: (a) General process for shodhan, the sheets of metals are heated till red hot and are successively dipped into liquids such as oil, buttermilk, and cow’s urine. The procedure is repeated 7 times. (b) Specific process for shodhan for some metals, a specific process is described for shodhan, for example, for purification of Jasad, the molten mass is poured in cow’s milk 21 times.

Maran (Powdering)
Maran literally means killing. As the name suggests in maran process, a change is brought about in the chemical form or state of the metal. This makes it to lose its metallic characteristics and physical nature. In short, after maran, metal can be converted into powder or other form suitable for administration. There are three methods given for maran. It is carried out by heating the metal in the presence of (a) mercury, (b) plants, and (c) sulfur.

Chalan (Stirring)
Process of stirring during heating the metal is chalan. Stirring is carried out either with iron rod or stick made from a specific plant. As we know today, iron serves as catalyst in many chemical reactions. The phytoconstituents of plant stick may be enhancing the therapeutic effect. For example, stick of Neem is used for chalan process of Jasad bhasma, which is used topically for ophthalmic diseases. We can interpret the significance of this process now. Neem is an antiseptic. Zinc is antiseptic, astringent, and has ulcer healing property. These effects of both the constituents may impart the final product better therapeutic activity.

Dhavan (Washing)
In this process, several water washes are given to the product obtained in the previous stage. Perhaps, this is to remove the excess amounts of agents used in shodhan or maran stage. Such agents may adversely affect the quality of final product. Hence, intermediates are washed with water; thereby water-soluble constituents are removed.

Galan (Filtering)
The product is then sifted either through a fine cloth or through sieves of suitable mesh so as to separate residual material larger in size.

Puttan (Heating)
The term puttan means ignition. The general term used for heating in the process of Bhasmikaran is Puta. A special earthen pot, Sharav is generally used for the process. It has two parts, each having a shape of soccer. Sharav is used for direct heating of the material. Its shallowness is useful in heating the material faster and uniformly. After keeping the material on the shallow surface, other part is used as a lid, by placing it in an inverted position. This puttan process can be looked on as the key step in manufacturing of bhasma.[2]

CHARACTERISTICS OF BHASMA

Physical Characteristics
1. Verna - A specific color is mentioned for each bhasma. Bhasmas are generally white, pale, or red. Color of preparation depends on parent material. Alteration in specific color suggests that bhasma is not prepared properly.
2. Nisvadutam - A pinch of bhasma is placed on the tongue and its taste should perceive to be tasteless. Bhasmas prepared from metal may be exception for this test. Properly incinerated bhasmas should be of particular taste. It indicates transformation of particular metallic taste to compounds of specific taste.
3. Nishchandratvam bhasma must be lusterless (Nishchandra) before therapeutic application. Luster is the character of metal which should not remain after proper incineration. For this test, bhasma is taken in petri dish and is observed under bright sunlight, whether luster is present or not; if luster is present, it indicates further incineration.
4. Varitara bhasma should have lightness and fineness. This test is based on the law of surface tension. Small amount of prepared bhasma is sprinkled over the cold and stagnant water in a beaker. Properly incinerated bhasma will float on water surface which states that prepared bhasma is light and fine.
5. Unama test - It is further assessment of varitara test. A grain of rice is carefully placed on the floated layer of bhasma. Observe whether the grain floats or sinks. If the grain remains as it is on the layer than bhasma can be considered as excellent.

6. Rekhapurnatvam - Bhasma particles should be of minimum size for easy absorption and assimilation in the body. When bhasma is spread between the thumb and index finger and rubbed, it should be so fine as to get easily into the lines and crevices of the fingers and should not be washed out from the lines of the fingers.

7. Slakshnatvam - It is tactile sensation produced by bhasma by simple touch with fingertips. Tactile sensation can be properly absorbed and assimilated into the body without producing any irritation to mucous membrane of gastrointestinal tract.

8. Sukshmatva - It indicates fineness of bhasma preparation. Bhasma must be fine so that it will be adsorbed properly in the body. This character can be perceived by varitara and Rekhapurnatvam.

9. Anjana Sannibha Anjana (collyrium) is smooth in character and it does not create irritation when applied. Bhasma which is properly incinerated should be smooth and should not produce any irritation to mucous membrane of the gastrointestinal tract.

10. Avami Bhasma should not produce nausea/vomiting on administration.

11. Particle size prepared bhasma should be in churna (powder) form. Size of particles of bhasma will be like pollen grains of Pandanus odoratissimus flower (ketaki rajah).

**CHEMICAL CHARACTERISTICS**

1. Apurnabhavta - Apurnabhavata means incapability to retain its original metallic form. For this test, bhasma is mixed with equal quantity of mitrapanchaka (seeds of abrus precatorius, ghee, jaggery, borax, and honey) and it is sealed in sarvasamputa and is heated with similar grade of heat and after self-cooling particular product is observed. Lustrous particles in it show the presence of free metal which is inactive after incineration.

2. Niruttha - Niruttha is to test inability to regain metallic form of metallic bhasma. In this test, bhasma is mixed with fixed weight of silver leaf and kept in sarvasamputa and is heated with similar grade of heat and after self-cooling, the weight of silver is taken. Increase in weight of silver leaf indicates improperly prepared bhasma.

3. Amla pariksha - A pinch of prepared bhasma was mixed with a little amount of dahi (curd) in a clean and dry petri dish and is observed for any color change. No color change of dahi should be observed. The same color of lemon juice taken in a test tube and the same result should be observed.

**STANDARDIZATION OF BHASMA**

1. Ancient Ayurvedic methods of analysis.

**ANCIENT AYURVEDIC METHODS OF ANALYSIS**

1. Raw material standardization - Raw materials are standardized by panchabhautik parikshan, i.e. physical characters, appearance, color, size, shape, consistency, smell, weight, shining, etc.
2. Process standardization - All the processes such as shodhan, maran, chalan, dhavan, galan, and puttan are standardized as per textual references such as RasTarangini and Yogratnakar netrarogadhikar.
3. Finished product standardization - Finished product is standardized as per the Bhasma Pariksha given in Ayurved Sangrah as follows:

**ADVANCED METHODS FOR ANALYSIS OF BHASMA**

**Analytical Methods for Analysis of Bhasma[4]**

*Atomic absorption spectrophotometry*

In this technique, the sample is introduced into flame using a nebulizer when the inorganic atoms get excited and emit light of specific wavelength; it is proportional to their concentration. It is used in quantitative analysis of elements especially metals.

*X-ray diffraction (XRD)*

XRD is a technique through which the special arrangement of structural units of a substance in the crystalline state is known. The distance between each set of atomic planes is determined with the help of wavelength of X-ray beam and angle of diffraction by applying Bragg’s Law. Results show the characterization of the crystallographic structure and heterogeneous solid mixture.

*Scanning electron microscopy (SEM)*

SEM is essentially a high magnification microscope, which uses a focused scanned electron microbeam to produce images of the sample, both top and down and with the necessary sample preparation, cross sections. Primary electrons generate low-energy secondary electrons, which tend to emphasize the topographic nature of the specimen. SEM is used to examine the surface morphology.
Transmission electron microscopy

It is a microscopy technique in which a beam of electrons is transmitted through an ultra-thin specimen, interacting with the specimen which passes through. An image is formed from the interaction of the electrons transmitted through the specimen; the image is magnified and focused on to an imaging device, such as fluorescent screen, on a layer of photographic film.[6]

Fourier-transform infrared (IR)

The technique is based on the simple fact that the substance shows marked selective absorption in the infrared region. After absorption of IR radiations, the molecules of the chemical substance vibrate at many rates of vibration, giving rise to close-packed absorption bands, called as IR absorption spectrum which may extend over a wide wavelength range. Various bands will be present in IR spectrum which will correspond to the characteristic functional groups and bonds present in the chemical substance. It is used to establish the structure of unknown compound and analysis of functional group.[7]

Thermogravimetric analysis

It is the technique whereby the weight of a substance, in an environment heated or cooled at a controlled rate, is recorded as a function of time or temperature. Results are represented by a plot of weight change versus temperature of time. This plot is referred as thermogravimetric curve or TG curve. It is used in testing purity of samples.[8]

Namburi phased spot test

When a drop of clear solution of a substance that is under examination is put on one of the chemical reacting papers such as potassium ferrocyanide paper, a spot with a series of changes in color and pattern will appear. It is the study of this spot and color at three successive phases spreading over three different time intervals is known as the phased spot test. This technique is helpful for the quality assessment of bhasmas as per the standards.[10]

Physicochemical Methods for Analysis of Bhasma

Ash value[9]

I. Ash value is used to determine quality and purity of a crude drug and to establish the identity of it.

II. Ash contains inorganic radicals such as phosphates, carbonates, and silicates of sodium, potassium, magnesium, and calcium. These are present indefinite amount in a particular crude drug; hence, quantitative determination in terms of various ash values helps in their standardization.

III. Used to determine foreign inorganic matter present as an impurity.

Loss on drying

Weigh accurately about 2 g of drug in a nickel or silica crucible or dry it in a hot air oven at 110°C till the constant weight is obtained. The difference in the two weighing gives the loss on drying calculate the percent loss on drying. This method is used to measure the amount of water content and other volatile material in the sample on drying or heat treatment.[11]

Microbial Evaluation

The various microbial evaluations include total viable aerobic count, total Enterobacteriaceae and total fungal aerobic count, total Enterobacteriaceae and total fungal count, test for specific pathogen: Escherichia coli, Salmonella app., Staphylococcus aureus, and Pseudomonas aeruginosa.[12]

CONCLUSION

Herbomineral formulations of Ayurveda constituting bhasma as an ingredients are as superior as it is today, in view of this high demand for the use of bhasma, there is a need to bring about standardization of their raw material, preparation process, and the end product. Although bhasmas are complex materials, the ancient and advanced methods for standardization of bhasmas will definitely help in building confidence in use of such products for medication by ensuring safety, efficacy, and batch to batch uniformity of the product. In this review, the attempt has been made to bring forth the importance of standardization of bhasmas.

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Determination of Prakriti in infants by differentiating Prakriti features with Vaikrit features?

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Abstract

Prakriti (physical constitution) of a person is used to assess the forthcoming illness, preparing guidelines for Prakriti nourishing diet and regimen to keep the person healthy, as well as the person’s strength, used in assessing disease tolerance capacity. Rational planning for therapy and accurate prognosis of any disease is also based on it. Considering its importance in different aspect of life of persons and presently unavailability of Prakriti assessment pro forma for the infants; the aim of this conceptual study was to develop the specific Prakriti pro forma for the infants that can determine the rational and accurate Prakriti by differentiating Prakriti features with almost similar characteristic presenting Vaikrit (pathological) features. The prepared pro forma is easy to use, and different data of infant can be input (selected/tick) under different headings/subheadings of subjective and objective parameters after assessing well by Prakriti features, proposed questions, laboratory investigations, and physical examination given in pro forma.

INTRODUCTION

“Prakriti” is a consequence of the relative proportion of Tridoshas, Vata, Pitta, and Kapha, which are not only genetically determined but also influenced by maternal diet, environment, lifestyle, and age of the transmitting parents. According to Ayurveda, Prakriti is classified into seven varieties, namely, Vata, Pitta, Kapha, Vata-Kapha, Vata-Pitta, Kapha-Pitta, and Sama Prakriti, among which, the first three are considered as extremes, exhibiting readily recognizable phenotypes, and are more predisposed to specific diseases it is also related to certain physical and mental tendencies.

Conventionally, the Prakriti assessment is carried out by the Ayurvedic physician on the basis of his knowledge and experience and is, therefore, subject to interobserver variations. The quantitative approach to the qualitative assessment of Prakriti for the practice of personalized medicine both by ayurvedic physician and contemporary science is essential.

To define traditional Prakriti features and clinical phenotypes on the basis of current knowledge related to the objective parameters adopted in adults population for getting Dosha specific Prakriti; may be utilized well in infants to develop a uniformly acceptable tool which can provide a quantitative element to the qualitative determination of Prakriti in infants.

However, before adopting these parameters/pro forma needs to get user-friendly questionnaire for the parents/caregiver to classify different Prakriti specific features into different compatible and valid questions which can reflect Prakriti of an infant more rationale and accurately.

Aims and Objective

1. To suggest the guidelines for the assessment of Prakriti in infants.
2. To provide guidelines in regard to differentiating Prakriti features (physiological) with almost similar Vaikrita

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features (pathological) while deciding particular Prakriti
in infants.

**MATERIALS AND METHODS**

**Materials**

Main Ayurvedic texts, used in this study, are Charak Samhita, Sushruta Samhita, Ashtanga Sangrah, Ashtanga Hridya, etc., and search was undertaken in MEDLINE (www.pubmed.com) or the PubMed database, using keywords such as Prakriti, Dosha, Prakriti chronic disease, subjective parameters for Prakriti assessment in infant and beyond the infantile period, and personalized medicine, Ayurveda Prakriti with their corresponding mesh terms in combination such as OR and AND. The search was limited to only English literature including those studies which were published from 1980 to 2012.

**Methods**

Individual Prakriti can be determined as per the characteristics specified in various textbooks of Ayurveda, which include some anatomical features such as body frame build, examination of skin, hair, nails, eyes, teeth, hand, and foot and some physiological features such as food and bowl habitat, cry, movement, and activities.

All important anatomical and physiological criteria as per their Prakriti given in Table 1 and all important and essential subjective and objective parameters with their description as per Prakriti tabulated in Table 2.

**DISCUSSION**

Features of different Prakriti types and their evaluation in infant, i.e., up to the age of one year of age is a very difficult task, and most of the authors have not touched this period for the assessment of Prakriti. The present paper is designed to describe the development of pro forma for Prakriti assessment in infant through the description of some anatomical criteria, physiological criteria as well as pathological criteria with their tools for assessment of Prakriti in the infant.

The main reason behind to designed pro forma, the poor reliability of Ayurveda based diagnosis is lack of evidence-based subjective and objective criteria which leads to an erratic assessment of Prakriti feature said for the specific Prakriti, because in most of the instances presenting organ-specific features, which may be pathological, are not differentiated through relative diagnostic criteria.

Therefore, first time, an attempt is made to explore the hypothetical, logical and scientific guidelines by considering different subjective and objective parameters simultaneously in determining the Prakriti corroborating characteristics in infants. However, most of the selected laboratory parameters, used in adults, are based on different published studies on Prakriti assessment, because the principle used in these studies for the selection of laboratory parameters is same.

This pro forma has also been enriched with different laboratory and clinical parameters under the heading of objective parameters which are based on different studies published in various journals and various ayurvedic and modern textbooks.

Guidelines, regarding to differentiating Prakrita feature (physiological) with almost similar Vaikrita feature (pathological) while deciding particular Prakriti in infant, are discussed as follows:

1. Thin, dry, brittle, and lusterless characteristics of hairs are described for Vata Prakriti person,[9] but a child of different Prakriti, suffering with protein-energy malnutrition specially kwashiorkor,[16] may show the similar features in hairs.[22]

2. Body hairs are scanty in Vata Prakriti,[9] but it also occurred in Pitta Prakriti and preterm child at birth. To differentiate normal variation according to gestational age and Prakriti, must consider others characteristics, and gestational age of infant, if you are assessing the Prakriti during early neonatal period as the neonatal hairs at scalp, is scanty while the body hair which is known as Lanugo is thin and abundant in preterm infant.[23]

3. Kinky hairs, a normal feature for the Vata Prakriti is also found in a pathological condition, i.e., Menkes Kinky Hair Syndrome (Trichothiodystrophy).[24]

4. In Pitta Prakriti, sweating is profuse and foul smelling which we have to differentiate from bacterial decomposition of apocrine sweat gland which accounts for the unpleasant odor associated with perspiration.[25] Hyperhidrosis may be associated with numerous disorders may be neural mechanisms or non-neurally mediated, e.g., emotional (volar hyperhidrosis), dysautonomia, antipyretics, exercise, infection, hyperpituitarism, hyperthyroidism, hypoglycemia, and cardiovascular. Scanty sweating in Vata Prakriti should also been clarified from anhidrosis/hypohidrosis in children may be due to a disturbance in neural pathway from the control center in the brain to the peripheral efferent nerve fibers that activate sweating. Peripheral segmental neuropathies may be associated with anhidrosis of innervated skin. Eccrine glands are largely absent throughout the skin or are present in a localized area among patients with Anhidrotic ectodermal aplasia, or localized congenital absence of sweat glands, dehydration or anticholinergic drugs may suppress sweating.[26]

5. In Pitta Prakriti, early graying of scalp hairs and early baldness are seen. However, due to hereditary factors, vitamin B12 deficiency, anemia, vitiligo, leukemia or excessive intake of carbohydrates, and sugary foods such...
<table>
<thead>
<tr>
<th><strong>Anatomical (body parts)/physiological criteria</strong></th>
<th><strong>Vata</strong></th>
<th><strong>Pitta</strong></th>
<th><strong>Kapha</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Body frame and body build</td>
<td>Thin, weakly developed, disproportionately developed body parts⁸</td>
<td>Medium, moderate muscular body¹⁰</td>
<td>Broad, well developed and large forehead¹²,¹⁴</td>
</tr>
<tr>
<td>Eyes</td>
<td>Small dry, dull, and muddy sclera⁹</td>
<td>Reddish tinges to sclera, medium size, and piercing eyes¹⁰</td>
<td>Large eyes with thick eyes lashes, white sclera, and attractive eyes¹²</td>
</tr>
<tr>
<td>Teeth (after 6 months)</td>
<td>Brittle, cracked, and uneven⁹</td>
<td>Yellow loose and medium¹¹</td>
<td>Milky white, large and regular</td>
</tr>
<tr>
<td>Skin color and texture</td>
<td>Rough and dark complexion, dry, and rough with prominent veins/tendons⁹</td>
<td>Fair and copper color soft, thin, with tendency for moles-black/pink spots (naevi) eruptions (birthmarks)¹¹</td>
<td>Fair, white, pale complexion, smooth, and firm¹³</td>
</tr>
<tr>
<td>Scalp hairs</td>
<td>Dry, rough, smoky/dusty, scanty, kinky, gray⁹</td>
<td>Thin, soft, oily, early graying, pinkish brown, baldness¹¹</td>
<td>Soft, dark black, thick, shiny, silky, abundant, dense, and oily¹³</td>
</tr>
<tr>
<td>Body hairs</td>
<td>Dry, scanty, horny (hard consistency) Grayish black⁸</td>
<td>Soft, pinkish, scanty, grayish, yellowish¹¹</td>
<td>Thick, soft, oily, blackish, wavy¹⁴</td>
</tr>
<tr>
<td>Food and bowel habits</td>
<td>Frequent, variable, and irregular⁹</td>
<td>Higher capacity for food and water consumption¹¹</td>
<td>Low digestive capacity and stable food habit¹²</td>
</tr>
<tr>
<td>Thirst</td>
<td>Variable⁹</td>
<td>Excessive¹¹</td>
<td>Scanty¹³</td>
</tr>
<tr>
<td>Urine/</td>
<td>Small quantity frequent⁸</td>
<td>Excessive¹¹</td>
<td>Reduced¹³</td>
</tr>
<tr>
<td>Stool</td>
<td>Dry, hard small quantity, constipated⁹</td>
<td>Large quantity, oily, foul smell¹¹</td>
<td>Thick, oily, heavy whitish yellow¹²</td>
</tr>
<tr>
<td>Sweating</td>
<td>Sometime and variable⁹</td>
<td>More and foul smell/smell of agru¹¹</td>
<td>No smell¹³</td>
</tr>
<tr>
<td>Voice/cry</td>
<td>Over-talkative, continuous, rough, week, unpleasant and horse, voice⁹</td>
<td>Hot talkative and shouting voice¹¹</td>
<td>Less talkative, soft and pleasant¹³</td>
</tr>
<tr>
<td>Movements of joints, eye, lips, head, tongue, palm, sole, and activity level?</td>
<td>Light, fast, unsteady, and early onset, and active⁹</td>
<td>Slow and oriented¹¹</td>
<td>Slow and steady sometime active and sometimes dull¹²</td>
</tr>
<tr>
<td>Sleep</td>
<td>Disturbed (interrupted) scanty, a wakefulness⁹</td>
<td>Moderate sleep, little, and sound²</td>
<td>Deep sleep, heavy, prolonged daytime too¹²</td>
</tr>
<tr>
<td>Tolerance for Heat</td>
<td>Cold intolerant⁸</td>
<td>Heat intolerant¹¹</td>
<td>Endurance for both¹³</td>
</tr>
<tr>
<td>Disease resistance and healing capacity</td>
<td>Poor⁹</td>
<td>Good¹⁰</td>
<td>Excellent¹³</td>
</tr>
<tr>
<td>Disease predisposition/poor prognosis</td>
<td>Developmental, movement and speech disorders⁹</td>
<td>Ulcer, skin diseases¹¹</td>
<td>Obesity¹³</td>
</tr>
</tbody>
</table>

as cakes, candies, and chocolates may lead to early graying of hairs in children. Moreover, acquired localized hair loss seen in childhood, may be due to three conditions traumatic alopecia, alopecia areata, and inflammatory conditions such as pyoderma or tinea capitis.

6. In Vata and Pitta Prakriti, there is discoloration of teeth. This Lakshana must be confirmed that these are not a result of incorporation of foreign substances into developing enamel. Neonatal hyperbilirubinemia may produce blue to black discoloration of the primary teeth. Porphyria produces a red-brown discoloration. Tetracycline is extensively incorporated into bones and teeth and, if administered during the period of formation of enamel, may result in brown-yellow discoloration and hypoplasia of the enamel. Iron therapy temporarily causes blackish discoloration of teeth.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Subjective parameters: Questionnaire</th>
<th>Objective parameters</th>
<th>Laboratory-oriented</th>
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<tr>
<td></td>
<td>Proposed derived questions</td>
<td>Expected answer</td>
<td>Clinical oriented</td>
</tr>
<tr>
<td>Eyes</td>
<td>-</td>
<td>-</td>
<td>Inspection method</td>
</tr>
<tr>
<td>Teeth (after 6 month)</td>
<td>-</td>
<td>-</td>
<td>Inspection method</td>
</tr>
<tr>
<td>Skin color and texture</td>
<td>-</td>
<td>-</td>
<td>Inspection, palpation method and oleation method[^17]</td>
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<tr>
<td>Scalp hairs</td>
<td>-</td>
<td>-</td>
<td>Inspection through magnifying glass and palpation method</td>
</tr>
<tr>
<td>Body hairs</td>
<td>-</td>
<td>-</td>
<td>Inspection through magnifying glass and palpation method</td>
</tr>
<tr>
<td>Food and bowel habits</td>
<td>Baby like</td>
<td>1. V - Warm milk/food</td>
<td>Manual, but need experienced pediatrician/mother (screening purpose)</td>
</tr>
<tr>
<td></td>
<td>Condition of baby before feed?</td>
<td>P - Cold milk/food</td>
<td>Assess the cry: Duration, intensity and pitch in relation with feeding</td>
</tr>
<tr>
<td></td>
<td>Frequency of feeding per day?</td>
<td>K - Warm milk/food</td>
<td>Home based, by asking the mother to maintain feeding time chart (breastfeeding/ formula feeding and/or any other type of food complemented)</td>
</tr>
<tr>
<td></td>
<td>Quantity of intake?</td>
<td>S - Lukewarm milk/food</td>
<td>By asking the mother, how much quantity of milk is given to the formula milk or animal milk feeder infant only. In breast milk feeder, not possible to take by all mother</td>
</tr>
<tr>
<td></td>
<td>Digestion of feed (intervals</td>
<td>2. V - Some time cry some time does not cry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>between two feed)</td>
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(Contd...)
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<tbody>
<tr>
<td></td>
<td>Proposed derived questions</td>
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</tr>
<tr>
<td></td>
<td>Expected answer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>By assessing the prefeeding symptoms by the neonatologist or by asking mother, e.g., hunger cry</td>
</tr>
<tr>
<td>Thirst (after 6-month, may be assessed)</td>
<td>1. Frequency of thirst?</td>
<td>1. V - Variable P - More K - Less S - Optimum</td>
</tr>
<tr>
<td></td>
<td>2. Intensity of thirst?</td>
<td>2. V - More or less satisfied with variable quantity of water P - More and satisfied with water K - Less and satisfied with less quantity of water S - Normal and satisfied with less quantity of water</td>
</tr>
<tr>
<td>Urine</td>
<td>1. Frequency of urine?</td>
<td>1. V - Variable P - &gt;8 K - &lt;6 S - 6-8</td>
</tr>
<tr>
<td></td>
<td>2. Volume of urine?</td>
<td>2. V - Variable P - Normal K - Reduced</td>
</tr>
<tr>
<td>Stool</td>
<td>1. Color, frequency, odor, and consistency of stool?</td>
<td>1. V - Different color at different time if associated with irregular frequency with normal smell and consistency P - Dark yellow color if associated with normal frequency with normal smell and consistency</td>
</tr>
<tr>
<td>Criteria</td>
<td>Subjective parameters: Questionnaire</td>
<td>Expected answer</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td>Proposed derived questions</td>
<td></td>
</tr>
<tr>
<td>Sweating</td>
<td>Smell of sweating</td>
<td></td>
</tr>
<tr>
<td>Voice/cry</td>
<td>1. Tendency (as per inform by mother)</td>
<td></td>
</tr>
<tr>
<td>Movements and activity</td>
<td>1. Movement of joints, eye, lips, head, tongue, hand and foot?</td>
<td></td>
</tr>
<tr>
<td>Criteria</td>
<td>Subjective parameters: Questionnaire</td>
<td>Objective parameters</td>
</tr>
<tr>
<td>----------------------------------------------</td>
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<td>-------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Proposed derived questions</td>
<td>Clinical oriented</td>
</tr>
<tr>
<td></td>
<td>Expected answer</td>
<td>Laboratory-oriented</td>
</tr>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Sleep[11] 0–3 months: 13–20 h 4–12 months:</td>
<td>1. Duration of Sleep? 2. Depth of sleep?</td>
<td>By inspection method and by getting</td>
</tr>
<tr>
<td>12–13 h</td>
<td></td>
<td>information from the mother for total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>period of sleep per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tolerance for heat</td>
<td>1. Intolerance ability?</td>
<td>By assessing the baby response/reaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>against the variation in temperature in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>different seasons, i.e., in rainy season,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>summer, winter season</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease resistance and healing capacity</td>
<td>1. Incidence disease in month?</td>
<td>By calculating the type and incidence of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>diseases noted time to time in his/her</td>
</tr>
<tr>
<td></td>
<td></td>
<td>healthy diary during the given period</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease predisposition/poor prognosis</td>
<td>1. Name of disease?</td>
<td>-</td>
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</tbody>
</table>

TWEL: trans-epidermal, water loss

Table 2: (Continued)
7. Increase frequency of urine, a feature of Vata Prakriti, also an important feature of Urinary tract infection, while decrease in urine frequency is described in Kapha Prakriti but in case of dehydration, decreased output and frequency of urine are also found.[16]

8. Dry and hard stool, described as Vata Prakriti feature, is also occurred in case of constipation.[16]

**CONCLUSION**

The valuable conclusion has automatically picked up after the discussion that anatomical, physiological as well as pathological criteria through various tools and techniques, guided in above-mentioned table, can be adopted for rational and accurate Prakriti assessment in infants, but the Prakriti determining feature should be differentiated with their counterpart Vikriti feature because some pathological features may mislead the pediatrician while deciding the Prakriti of an infant.

**REFERENCES**

4. Dey S, Pahwa P. Prakriti and its associations with metabolism, chronic diseases, and genotypes: Possibilities of new born screening and a lifetime guided in above-mentioned table, can be adopted for pathological criteria through various tools and techniques, the discussion that anatomical, physiological as well as pathological features may mislead the pediatrician while deciding the Prakriti of an infant.

Pharmaceutical and analytical studies of Kanadi Čūrna and standardization of its tooth gel

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Abstract

Background: Recently, the therapeutic regimen prefers to recommend the polyherbal formulation for the management and treatment of various diseases due to their lesser side effect and more compatible to a living organism. This leads to exponential growth in the development of various polyherbal formulations. For the acceptance of a polyherbal formulation, standardization of the formulation is highly essential, but most of the formulation lacks standardized data. Čūrna is an Ayurvedic formulation consists of mixture of powdered drugs. Kanadi Čūrna is an important Ayurvedic formulation that mentioned in Vaidya Cintāmani and recommended for dental problem (mukh rog and sheethada). Objective: The present study is designed to prepare and standardize Kanadi Čūrna and its tooth gel. Materials and Methods: Kanadi Čūrna was prepared as per classical text and it is pharmaceutical, physicochemical, and phytochemical parameters were evaluated as per the WHO guidelines. Physical parameters of its tooth gel were also studied as per the WHO guideline. Results: The results of all set parameters of Kanadi Čūrna and its tooth gel showed within the limit as per Ayurvedic Pharmacopoeia of India standards. Conclusion: The prepared Kanadi Čūrna and its tooth gel formulation possessed all parameters within the limit. These data can be used for the manufacturing of standard Kanadi Čūrna and its tooth gel for dental problems.

Key words: Kanadi Čūrna, micromeritics, phytochemical, physicochemical, tooth gel

OBJECTIVE

Ayurveda is holistic approach of treatment in which medications are recommended for the social, mental, and physical fitness. In Suśruta Samhita the description about dental disease and the treatment procedure has been mentioned. Diseases which affect the cavity of the mouth are known as dental disease and also in Vaidya Cintāmani description of mukh rog and sheethada are described.[1] Dental disease is admitted as a major public health problem in developed and developing countries. As we know dental disease may be chronic or acute, for that their long-term treatment is seldom necessary. It is not the disease of a particular age. Children, youngsters and old people also suffer from the dental disorder.[2,3] A disease on the tissue which surrounds or supports the teeth (periodontium) is called as a periodontal disease. Dental plaque (microbial biofilm) has been found to be responsible for periodontal disorders.[4,5] One of the major dental problem is gingivitis, which is mainly initiated by dental plaque or bacterial biofilm that is deposited on the teeth nearby gingiva (gums), which effects 50–90% of world’s population.[4] Several modern types of mouthwash and rinses containing antibacterial agents that are effective in dental plaque have been investigated. In several studies, Chlorhexidine mouthwash has been evaluated clinically in dental plaque, gingival inflammation, and gum bleeding.[6-9] Despite effectiveness, the available modern antibacterial rinses have been associated with undesirable side effects such as loss of taste, burning sensation of the oral

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mucosa, subjective dryness of the oral cavity, tooth staining, allergic reactions, and alcohol intoxication.[10-13] On the other hand, the complementary and alternative system of medicines like Ayurveda, which is based on Indian tradition is highly relied and accepted especially by the population of India due to lesser side effects. In a survey, it has been projected that about 70-80% of the population in the developing world has relied on herbal medicine for the treatment and cure of several ailments.[14] Global demand and usage of traditional and herbal medicine continues to expand and gaining popularity throughout the world with an incredible rush in acceptance of natural therapies.[15] Findings related with the association of side effects and availability of a safe alternative system of medicine like Ayurveda has gained considerable attention of the scientist community to explore the possibilities and potential of Ayurvedic formulations in dental problems and management of oral health. Dabur red tooth paste and Meswak and Dantkanti are some Ayurvedic medicated formulations highly recognized by people for dental problem. In Ayurveda, Cūrna is a dosage form of fine powder of a single drug or group of drugs. The term Cūrna is prepared by powdering all drugs separately before being mixed to homogeneity. The potency of Cūrna is related to its particles size and stored condition. As we know that smaller the particle size greater is the rate of absorption of any drug in gastric fluid and hence greater is the bioavailability of that drug. Some of the Ayurvedic formulations that available commercially are such as Trikatu Cūrna, Triphala Cūrna, Madhu shoonya Cūrna, and Sudharsana Cūrna.[16] Kanadi Cūrna is a medicated formulation mentioned in Vaidya Cintāmani and in Muka roga Prakaranāṃ for the management of Dante calana (loose tooth), Dante sula (tooth ache), Dante mula soth, Rakta srava (hemorrhage), etc.

In the light of above-mentioned investigations on herbs, formulations, and procedures based on a traditional Ayurvedic system of medicine, an attempt has been made to formulate and standardize Kanadi Cūrna and a tooth gel based on the WHO guidelines.

**MATERIALS AND METHODS**

**Collection of Plant and Authentication**

The essential components of Kanadi Cūrna, i.e., fruits of *Piper longum* (Pippali) and *Cuminum cyminum* (Jeera) and Rock salt (*Saindhava lavana*) were purchased from the local market of Varanasi and identified by Prof. Dr. Anil Kumar Singh, Department of Dravyaguna, Faculty of Ayurveda, IMS, BHU, Varanasi.

**Preparation of Kanadi Cūrna**

Kanadi Cūrna was prepared as per classical text using authenticated raw drugs. Kanadi Cūrna was prepared by method prescribed in text book of Vaidya Cintāmani, Volume II.[17]

**Method of Preparation**

All ingredients were grounded separately, and each grounded drug of the equal volume was mixed uniformly, and the powder was filtered through sieve to get final Cūrna formulation and Cūrna was packed in airtight container for further study.

**Pharmaceutical Study of Kanadi Cūrna**

To determine the flow property and uniformity of the Kanadi Cūrna, pharmaceutical parameters such as bulk density, tapped density, Hausner ratio, compressibility index, and angle of repose were studied.[18,19]

**Analytical Study of Kanadi Cūrna**

To standardize the Kanadi Cūrna physicochemical and phytochemical studies were made. Physicochemical parameters such as total ash value, extractive value (water and alcohol soluble), loss on drying, acid insoluble ash, and pH were studied as per the WHO guideline.[19] Phytochemical assessment was performed for phytochemicals such as alkaloid, tannin, saponin, glycoside, carbohydrates, and phenolic compound.[20]

**Preparation of Tooth Gel**

**Chemicals used**

Carbopol-940 (Loba chemicals), Sodium Carboxyl methylcellulose (S.D. Fine-Chem. Ltd.), Polyethylene glycol-4000 (Central Drug House), Sodium laurel sulfate (Central Drug House), Sodium benzoate (Loba chemicals), Triethanolamine (Loba chemicals), and Sodium saccharine (Loba chemicals) were collected from the market. All other solvents, chemicals, and reagents used were of analytical grade, and extract of crude drug was collected in the lab.

**Extraction of Crude Drug**

The dried fruits of *P. longum* and *C. cyminum* were washed and coarsely powdered separately. The powder drugs of 100 g of Jeera and 300 g of Pippali were soaked separately in hydroalcoholic solution of 1 l in a beaker for 24 h with occasional shaking. The quantity of drug used for extraction was decided on the basis of their extractive value. Extracts of both drugs were collected by filtration and dried in a rotary vacuum evaporator, and concentrated extracts were kept in a desiccator for 24 h for further drying. The dried extracts were weighed and used to prepare Kanadi Cūrna tooth gel.
Preparation of the Formulation

Four batches of Kanadi Cūrna tooth gel were prepared as per the procedure of Haque et al. with modification.[21] Required quantity of Carbopol-940 was slowly dissolved into the previously prepared solution of distilled water, polyethylene glycol-4000, and sodium benzoate with continuous stirring to get uniform dispersion and kept overnight to achieve the consistency. After that specified quantity of extracts and other additives were added to the hydrated carbopol gel and final preparation was neutralized with triethanolamine at pH 6.4 by constant stirrers.

Evaluation of the Tooth Gel

**Evaluation of the tooth gel was studied as per the procedure described by Haque et al.[21]**

**Physical appearance of the gel**
1. Color: The color was checked out against white background of the formulation.
2. Consistency: It was checked by applying the formulation on the skin.
3. Greasiness: It was also checked by application on to the skin.
4. Odor: It was checked by mixing the formulation in water and taking the smell of it.

**Transparency and Smoothness**

To 2 ml of formulation was taken in a test tube, and its transparency was seen visually against white background. The smoothness was checked by rubbing the gel between two fingers and was observed that the formulation is smooth or rough and homogeneous or clumped.

**Homogeneity**

Formulated gels were checked for their homogeneity by visual inspection after the gel kept in the container. In this, appearance and presence of any aggregates were analyzed.

**Viscosity and pH**

Viscosity was determined using Brookfield digital viscometer to check the flow behavior of formulated gel. Viscosity was measured at controlled temperature of 30±2°C. pH of the formulation was done using pH meter (Eutech). The electrode of the pH meter was washed with distilled water and dried with the help of tissue paper then dipped in 20 ml gel formulation.

**Tube Extrudability**

Collapsible aluminum tubes were filled with formulated tooth gel with a nasal tip of 5 mm opening and sealed by crimping to the end. Tube extrudability was calculated by recording the amount of gels extruded through the narrow tip when a high pressure was applied on to the collapsible tube. Percentage of extruded formulated gel was calculated to determine tube extrudability as like ->90% extrudability: Excellent, >80% extrudability: Good and >70% extrudability: Fair.[22]

**Spreadability**

Weighed about 1 g of formulated gel was kept in the center of glass slide and another glass plate was placed at the top of the plate (dimension 10 × 10 cm), heavyweight placed at the top of both sides and care was taken to avoid sliding of plate and excess of gel was scrapped off from the edges. After completion of 30 min diameter of the formulated gel was measured in cm.[23]

Spreadability was calculated by this formula: $S = \frac{M \times L}{T}$

Where, $S =$ Spreadability, $M =$ weight in the pan (tied to the upper slide), $L =$ Length moved by the glass slide, and $T =$ Time (in sec.) taken to separate the upper and lower slide completely.

**DISCUSSION**

Recently, there has been extensive use of herbal medicine due to lesser side effects of Ayurvedic formulation over synthetic medicine but most of the Ayurvedic medicine are not reliable due to lack of standardize data. Hence, standardization of a polyherbal formulation is highly essential, which benefits us to access exact quantity of dosage form. It is also said that accurate identification and appropriate quality of the crude drug is an essential requirement to get reproducibility of the formulation.[24,25] The organoleptic characteristics of Kanadi Cūrna was studied and observed as color - yellowish brown, odor - characteristic, taste - salty and astringent, appearance - homogeneous, and touch - smooth and soft. The organoleptic studies are helpful in preliminary identification of Ayurvedic formulation. The pharmacological effect of an Ayurvedic formulation is related to the presence of various phytomolecules present in the formulation. Preliminary phytochemical study of the Kanadi Cūrna was made for the identification of phytomolecules such as alkaloid, carbohyrate, saponin, flavonoids, tannin and phenolic compounds, proteins, and glycoside which are extracted from the Kanadi Cūrna using solvents as methanol, chloroform and aqueous, respectively. It was observed that Kanadi Cūrna rich with most of the secondary metabolites as mentioned in Table 4 both physicochemical and phytochemical studies helpful in identification of adulteration in Ayurvedic formulation. The physicochemical evaluation of Kanadi Cūrna was made as per the WHO guideline to compare with the official standards (API). The various physicochemical parameters such as
total ash value, acid insoluble ash value, loss on drying, water soluble extractive value, alcohol soluble extractive value, and pH of 1% aqueous solution were studied and mentioned in Table 5. The physicochemical parameters data obtained for Kanadi Cūrna shows within the limit as per the Ayurvedic Pharmacopoeia of India standards (API-2, Vol-1). The flow property of Kanadi Cūrna was determined by studying Bulk density, Tapped density, Compressibility index, Hausner ratio, and angle of repose. It was observed that Kanadi Cūrna prepared by classical method has fair flow property and passes all parameters successfully as per the reference.[26,27] Further, ingredients of Kanadi Cūrna formulation extracts were used to design Kanadi Cūrna tooth gel. Four batches of tooth gel were prepared using four different concentration of extract. Organoleptic studies of the above formulation showed that batch F1 (10%) and F3 (20%) have good consistency and further evaluated for various parameters. It was observed that F1 showed brownish red in color, homogeneous in appearance, soft in touch, and translucent whereas F3 possessed same property as the above but difference in only its homogeneity. Further pH, spreadability, viscosity, and tube extrude ability were measured for both concentrations of tooth gel and result was given in Table 6. It wC as concluded that the F3 concentration of gel was better as compare to F1 concentration. Above discussions conclude that formulation designed for F3 batch (20% extract concentration) Kanadi Cūrna tooth gel is good for further study.

| Table 1: Formulation of Kanadi Cūrna tooth gel |
| Ingredients | F1 | F2 | F3 | F4 |
| Extract concentration with respect to final formulation (%) | 10 | 15 | 20 | 25 |
| Carbopol-940 (g) | 2.5 | 3.0 | 1.5 | 0.5 |
| Sodium CMC (g) | 1.0 | - | 1.0 | 2.5 |
| Sodium saccharine (g) | 2.0 | 2.0 | 2.0 | 2.0 |
| Sodium benzoate (g) | 1.5 | 1.5 | 1.5 | 1.5 |
| Sodium lauryl sulfate (g) | 2.5 | 3.0 | 1.5 | 1.0 |
| Polyethylene glycol-400 (g) | 1.0 | 1.0 | 1.0 | 1.0 |
| Triethanolamine (ml) | q.s | q.s | q.s | q.s |
| Distilled water (ml) | q.s | q.s | q.s | q.s |
| Jeera (Cuminum cuminum) (g) | 2.5 | 5.0 | 2.5 | 5.0 |
| Pippali (Piper longum) (g) | 1.25 | 2.5 | 1.25 | 2.5 |
| Saindhava lavana (Rock Salt) (g) | 1.25 | 2.5 | 1.25 | 2.5 |

| Table 2: Organoleptic character of Kanadi Cūrna |
| Organoleptic characters | Kanadi Cūrna |
| Color | Yellow-brown |
| Odor | Characteristics |
| Taste | Salty and astringent |
| Appearance | Homogeneous |
| Touch | Smooth and soft |

| Table 3: Pharmaceutical evaluation of Kanadi Cūrna |
| Sample | Compressibility index (%) | Hausner ratio | Angle of repose (degree) |
| Kanadi Cūrna | 23 | 1.22 | 39 |

| Table 4: Qualitative evaluation of Kanadi Cūrna |
| Plant constituents | Test/reagents |
| Alkaloids | Dragendorff’s reagent | + | + | + |
| Carbohydrates | Molisch’s reagent | + | + | + |
| | Fehling solution | + | - | + |
| | Reducing sugar test | + | - | + |
| Saponins | Foam test | + | + | + |
| Flavonoids | Shinoda/pew test | - | - | + |
| Phenolic compounds and tannin | + | + | + |
| Ferric chloride solution | + | - | + |
| Nitric acid test | |
| Proteins | Millon’s reagent | + | + | + |
| Glycoside | Keller-Killani test | - | - | + |
| Borntrager’s test | - | - | + |

| Table 5: Physiochemical evaluation of Kanadi Cūrna |
| Parameters | API standard | Sample |
| Total ash value (% w/w) | <4.7 | 3.033 |
| Acid insoluble ash (% w/w) | <1 | 0.209 |
| Loss on drying 110°C (% w/w) | Not more than 36 | 23.75 |
| Water soluble extractive (% w/w) | More than 67 | 62.21 |
| Alcohol (95%) soluble extractive (% w/w) | More than 21 | 45.23 |
| pH value of 1% aqueous solution | 6.4–6.6 | 4.64 |
Table 6a: Physical characteristics of Kanadi Cūrna tooth gel formulation

<table>
<thead>
<tr>
<th>S. No</th>
<th>Color</th>
<th>Appearance</th>
<th>Smoothness</th>
<th>Homogeneity</th>
<th>Transparency</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Brownish red</td>
<td>Homogenous</td>
<td>Smooth</td>
<td>Good</td>
<td>Translucent</td>
</tr>
<tr>
<td>F3</td>
<td>Brownish red</td>
<td>Homogenous</td>
<td>Smooth</td>
<td>Very good</td>
<td>Translucent</td>
</tr>
</tbody>
</table>

Table 6b: Physical characteristics of Kanadi Cūrna tooth gel formulation

<table>
<thead>
<tr>
<th>S. No</th>
<th>pH</th>
<th>Spreadability (g-cm/sec)</th>
<th>Viscosity (cps)</th>
<th>Tube extrude ability (%)</th>
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</thead>
<tbody>
<tr>
<td>F1</td>
<td>6.7</td>
<td>15.23</td>
<td>41650</td>
<td>88.82</td>
</tr>
<tr>
<td>F3</td>
<td>6.5</td>
<td>16.45</td>
<td>41180</td>
<td>90.23</td>
</tr>
</tbody>
</table>

F1-10% concentration of tooth gel, F3-20% concentration of tooth gel

CONCLUSION

Within the limits of the current work, it was concluded that Kanadi Cūrna an Ayurvedic formulation recommended for dental problem (mukh rog and sheethada) satisfied the characters of an ideal Cūrna. The phytochemical investigation resolved that Kanadi Cūrna rich with phytochemical constituents such as alkaloid, glycoside, carbohydrate, amino acids, and phenolic compound which are responsible for its therapeutic value. The physicochemical parameters were studied as per the WHO guideline and this information can be used as standard data for quality of Kanadi Cūrna formulation. The micrometrics study of the Kanadi Cūrna reveals the acceptable flow properties and handling attributes of the powder, which will help in formulation development. Further, both batches of the gel-based formulation of Kanadi Cūrna formulation exhibits considerable physical parameters, which could be recommended for further quality control of tooth gel. Last but not least, it was concluded that both Kanadi Cūrna and its tooth gel formulation may be used as adjunct to mechanical periodontal therapy.

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Factors affecting the quality of ayurvedic formulations

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Abstract

Quality of a product is a very crucial topic nowadays, and especially in the pharmaceutical industry. Herbal plants contain a variety of chemical compounds that act on the body and are used to prevent or treat disease or promote health and well-being. The segment of herbal medicinal products is no exception. Indeed, the regulatory authorities have paid special attention to quality in this particular industry, due to the high risk of damage to life and health of patients possible, and developed many guidelines to insure a sufficient level of quality. The Government of India began a series of measures to introduce a quality control system, from 1964 onward similar to that existing already under the Drug and Cosmetics Act, 1940. The Government of India introduced an amendment in 1964 to the Drug and Cosmetics Act, 1940, to control to a limited measure the ayurvedic, Siddha, and Unani drugs. A present overview covers various factors for quality of ayurvedic formulations in ayurvedic and modern aspects.

Key words: Drug and cosmetic act, pharmaceutical, quality

INTRODUCTION

Quality derives from Latin word “Qualis” means “of what kind.” Quality is fitness for use (Juran). Quality is the totality of features and characteristics of product of service that bear on its ability to satisfy a given need (The European Organization for quality control). Quality is the sum of all factors which contribute directly or indirectly to the safety, effectiveness, and acceptability of the product. Quality is the denominator of a product for its acceptability to consumers and regulatory authorities. Standardization is essentially a measure for ensuring the quality control of the herbal drugs.[1]

Aim and Objective

- Promote community involvement in management of medicinal plant resource including its quality and sustainability.

MATERIALS AND METHODS

Quality raw herbs should be stored under controlled temperature, pressure, air and light, etc., to retain the active constituents of the herbs in different stores with proper labeling as per the provision of Drug and Cosmetic Act, 1940, after packaging with specific packing material for different parts of the medicinal herbs.[2] To control the quality of the crude drugs, the following aspects need to be considered.[3]

Authentification and Reproducibility of Herbal Ingredients

Herbal ingredients must be accurately identified by macroscopically and microscopical characteristics, comparison with authentic material.

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Inter-Intraspecies Variation in Plants

There are considerable inter- and intra-species variations in different plants, for which the primary and secondary metabolite also varies considerably.

Environmental Factors

Hence, many factors relating to climate, altitude, rainfall, and other conditions responsible for the growth of plants affect the quality of herbal ingredients present in a particular species, even if it is in the same country.

Plants Parts Used

Usually, the active constituents vary between different parts of a plant. It is not uncommon for an herbal ingredient to be adulterated with the parts of the plant not normally utilized. The same situation arises when an exhausted plant part of the same physical appearances are mixed to increase the weight of the supplied herbal ingredient causing adulteration.

Time of Harvesting

While collecting a particular herbal ingredient, the optimum time of harvesting should be specified.

Postharvesting Factors

The treatment of the collected herbal raw materials such as storage and transport can greatly affect the quality of an herbal ingredient. Improper storage after collection may result in microbial contamination so also the processes such as drying may result in a loss of thermolabile active constituents.

Contaminants of Herbal Ingredients

Herbal materials should be free from insect, other animal matter and excrete. As it is not possible to make the herbal materials completely free from all these contaminants, specifications have been set up to limit then. This includes the determination of ash value, which constitutes the inorganic matter after incineration of that particular herbal ingredient. Determination of acid-insoluble ash value is used to measure of soil present within the sample. Sometimes, aerobic bacteria and fungi may be present in plant material due to faulty growing, harvesting, and storage or processing. Herbal drugs with high starch content are prone to increase microbial growth, so limit should be set to control all these contaminations.

Pesticides, Fumigants, and Other Toxic Metals

Herbal materials growing as cultivated crops may be contaminated by DDT or other chlorinated hydrocarbons, organophosphates, carbonates methyl bromide, and other fumigants are sometime used to control pests the contaminate herbal ingredients. Lead, cadmium, mercury, thallium, and arsenic have been shown to be contaminants of some herbal ingredients. Limit tests for acceptable levels of all these pesticides, fumigants as well as the toxic metals are utmost necessary to control the quality of plant materials.


The drug must possess four qualities, i.e., bahuta (should be in plenty [availability]), yogatvam (can be used as combination), anekavidha kalpana (usable with various types of formulation), and sampad (must have potency to combat the disease). Sidhhistahanam of Charaka samhita refers to the standard norms of drugs and also reveals the skill of ancient sages who had the vision to look beyond the physical world and attain wisdom without any modern equipment or procedures.

Alpamatram - The amount of drug which is effective without any adverse or side effects, which the modern scientist consider as therapeutic index (Therapeutic effect=maximum non-toxic dose/minimum effective dose=lethal dose/effective dose=LD₅₀/ED₅₀). The wider the gap between the two values the better is the drug. Matra (dose) with a prefix of alpa shows that it should be used in a small quantity. The ancient sages were aware of toxicity in high doses and advised small quantity of drug. Mahavegam - The drug should respond with great intensity, which is dependent on its pharmacokinetic properties. Bahudosaharam - The drug should cover a wide range of diseases. In Ayurveda, the drugs are classified into three groups, some rectify the discordance of body elements, some vitiate body elements, and some are conductive to the maintenance of good health. Sukham - Anukula vedneeyam, the drug should give a feeling of well-being after administration, which is an indicative of betterment of the health. Laghupakam - The drug should be easily digestible (metabolize quickly) to get better results and quick relief. Sukhasvadanam - It should be palatable in quality and quantity. Preeranam - Drug must give pleasure or it should elevate mood as depression itself is mother of many diseases. Vyadhinasanam - The drug must have potency to cure diseases. Avikari - It must not have any side effect or any adverse effect. Natiglanikara - Drug should not produce any depression or guilty. Gandhavararasopetam - Should have pleasant smell, color, and taste. Matravad aushadham - Given in proper dose acts like medicine. If overdose occurs, then, it is toxic or if it is not sufficient, then it does not have significant effect on disease.

The Need for Quality Evaluation on Herbal Drugs

Oral knowledge eroded/distorted because of – persistent invasion – cultural adaptation.
Lack of systematic documentation of standard procedure for maintaining the inventory of the knowledge of the medicinal plants.

**Factors Affecting Quality and Safety**

Quality of crude materials, complexity of nomenclature of herbal ingredients, chemical contamination by heavy metals, choice of chemical markers, and adulteration with synthetic chemical drugs.

**Major Problems Faced in the Quality Control of Herbal Drugs and their Solutions**

**Problems in establishing taxonomical identity**

Wild source, collection by illiterate tribal, intentional and unintentional adulteration, multiple vernacular names, and controversial botanical identity.

**Problem due to variation**

Seasonal, geographical, and edaphic.

**Problems due to incomplete research**

Lack of in-depth of knowledge on active chemical constituents, non-availability of reference standards/markers compounds, non-availability of limits and testing standards of pesticide, heavy metals, organic solvents, and mycotoxin residues.

**DISCUSSION**

Quality of herb depends on many factors such as cultivation, collection, drying, storage, and processing for market. The increasing demand for herbal medicines (which represent a substantial proportion of the global drug market) both in the developing and developed countries, inevitably led to maintaining the quality and purity of the herbal raw materials and finished products. To ensure reproducible quality of an herbal formulation, proper control of the raw material is utmost essential.

**RESULT**

Quality is assured through a detailed manual protociling and controlling the physical processes, manufacturing according to SOP and performing in-process controls at every critical step of production. The technique for this is laid down in the international valid good manufacturing practices guidelines.

**CONCLUSION**

In general, quality control is based on three important pharmacopoeias definitions: Identity (Is the herb the one it should be?), purity (are there contaminants, e.g., in the form of other herbs which should not be there?), and content or assay (is the content of active constituents within the defined limits).

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Anupana the vehicle

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Abstract

Ayurveda, a traditional system of medicine has been employed since many years. The concept of Anupana is a unique one which is very well established in Ayurveda. The Anupana plays a very significant role in treating the disease and also helps to increase the efficacy (effectiveness) of drugs. It helps not only palatability but also mainly for carrying the drug to the target site by which it increases its absorption in target place. Present paper deals with the detailed description of Anupana (vehicle) and its effect on the efficacy of the drug.

Key words: Anupana, efficacy, palatability, vehicle

INTRODUCTION

Anupana is made up of two words Anu and pana. Anu means paschat, pana means paa dhadu and lyut pratyaya.[1]

Panchavidha kashaya kalpana (basic formulation) and their derived formulation are used as different dosage form in Ayurveda. All these are mentioned according to time, route of administration, duration and with relevant anupana. Most of the Ayurvedic drugs administration through oral route which have bioavailability <100%. Expect bhasma and liquid in most preparations particle size are not so fine which effects absorption. Anupana plays a major role regarding potentiating the efficacy of drug through pharmacodynamics and pharmacokinetics, so the action of drugs depends largely on the Anupana, i.e. the vehicle for the drug. The Anupana may be taken as adjuvant, vehicle or carrier through which the action and drug interaction are performed.

DEFINITION

According to Susruta Samhita (Dalhana Commentary)[2]

Anupana is taken along with or after the meal (Su.su.46/419).

According to Charak Samhita[3]

Anupana stands for the vehicle means liquids are mixed with medicine or food.

According to Vagbhatacharya[4]

Anupana is the media which can be given either before or after or along with drug and diet.

According to Dravyaguna Vignya Part 1

Consumption of the medicine and food are Anu Saha Paschat (along and after) taken liquids known as Anupana.

According to Yogratnakar[5]

If medicine is given for curing particular disease along with Anupana, it will cures that specific disease definitely by the strength of Anupana.

According to Ras Tarangani

Sathapana is the liquid taken along with main drug and which can facilitate easy disintegration, adsorption and uniform distribution of medicine all over the body hence that liquid form is called as Anupana.

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According to Vacaspatyam

The liquid media which is opposite to Ahara and similar to body tissue is known as Anupana, and it is the part of main medicine. It may be either taken along with or soon after the main medicine.

According to Adhamalla Commentary on Sharangadhara

It is defined as the vehicle used after administration of the main drug.

The term vehicle is derived from Latin word “vehiculum” meaning which carries. It is a substance used for administration of medicine. They form the reservoir of the ingredient. They allow the local release of suitable amount of the active drug. Mere change in the Anupana of a drug changes the rogadikara (target disease) of a drug. Anupana has important role in the improvement of efficacy of Ayurvedic drugs.

According to Adhamalla (Commentator of Sharangadhara Samhita), any liquid medium which is used after administrating the drug or along with the drug is known as Anupana. Acharya Sharangadhara has given the simile that, the anupana along with the base spreads all over the body rapidly as the oil drop added to water spreads in a fraction of the time. It indicates that when we administer the medicines with the base, it spreads quickly, due to the presence of the yogavahi and vyavahi properties in it.

According to Yogratnakar, Anupana has enhanced the activity of the main drug. Anupana of any medicine is responsible factor for minimizing the drug dose and it plays a major role to increase therapeutic effectiveness of formulation. Some toxic or adverse effects can be subsided by vehicle.

Probable Mode of Action

Anupana kala and Oushadha sevana kala influences the body both in physiological and pathological level. Anupana should be used as per doshic involvement of the diseased condition. The time of administration depends on the variations of Doshas at a different time in a day. As mentioned in the definition of Anupana, it is clear that Anupana is to be taken after or along with bhojana or Oushadha. Some other reference says it can be taken before food also. The Anupana can be administered in delay, i.e. by surpassing the actual time of administration. It can be given in the night. As the oil spreads in the water, the medicine also gets spread by the effect of Anupana.

When the medicine is administered with appropriate Anupana, the effect of the drug gets enhanced. If water is not consumed after food, then the food becomes dry and produces different ailments in the body. At the same time, consumption of proper Anupana after food does proper digestion even if the quantity of food consumed is excess in quantity and quality (Guru, Adhika matra yukta anna). By the help of Anupana the properties of the Oushadha (medicine) will increase and helps to cure the disease. Particle size also affects the rate of absorption. Absorption of coarse powder is less than absorption of fine powder. Hence, Anupana plays a major role to increase the absorption accordingly. Ushnajala, Madhu, Gharit, takra, etc., fasten the absorption of drugs and its bioavailability. Acidic drugs are quickly absorbed through the stomach, and alkaline drugs absorb in the small intestine with the help of alkaline environment. Anupana of some drug is acidic as well as some are alkaline (Amla varga and kshara varga) which are helpful for absorption.

If drug is administered along with proper Anupana, absorption may promote with most of the active ingredients. The time between the administration of drug and the development of response is known as the biological lag. Mercurial preparations have shown less biological lag than herbal drugs. If both of the mercurial and herbal drugs are administered along with proper Anupana biological lag of these medicine can be done less.

According to Ayurvedic physiology after administration of food and drugs, it digested and metabolize to produce nutritive and active principles along with kitta. To enhance these biological process, Anupana which is containing particular properties can be administered with the main drug.

When two substances are administered simultaneously, one may alter the response of the other which may be beneficial or harmful, e.g. Vatsanabha with Tanaka. Here Tanaka minimizes the vishakta (toxic) effect and prevents from undesired effect.

When the two dravyas with the similar property are administered they may alter the sensitivity effect, the dravya may act on same or different receptors or processes to produce the response, e.g. Yashtimadhu with dugda.

Some dravyas when combined with certain substances they slow down the absorption rates so:

- The duration of drug action is prolonged, e.g. Talia Anupana in Vatvyadhi
- Sustained Dravya action.
- Reduced frequency of administration for dravya required in small doses, e.g. Jayapal with sheeta jala.

Anupana are of two types-based on the utility

1. Aharopoyogi - Anupana advocated with food
2. Aushadhopayogi - Anupana taken after or along with Bheshaja (medicine). In this condition liquid substance taken after the medicine serves important functions.
such as
- Easy swallowing of drug.
- Increases drug palatability by improving taste, consistency and by masking the odor of drug.
- Anupana may acts as an adjuvant to the drug in treating the disease.
- By proper use of Anupana drugs quickly distributes in the body.
- It helps the drugs to reach the target site.

The Anupana has to be selected based on different factors such as Vyadi, Kala, Dravya, and Ahara.

According to Acharya Vagbhata jala (water) is considered as best anupana to both healthy and diseased person.[4]

Anupana is having more functions in rasaushadhi. It may consider that anupana removes the toxicity if present. Almost all rasushadhi are having different system wise action with different Anupana, e.g., Swarna Bhasma

Swarna Bhasma is prepared from gold. Its Anupana is - for burning sensation, if taken along with bile fish. It gives aphrodisiac effect if taken along with Bhringraj (Eclipta alba). It improves strength and immunity if taken along with milk. It is good for eyes if taken along with punarnava. It improves memory if taken along with sweet flag. It improves strength and immunity if taken along with milk. In poisoning, it is given along with an herb called Nirvisha. In psychiatric conditions, it is given along with ginger, clove, and pepper.[11]

**DISEASE SPECIFIC ANUPANA**

In case of disease, Anupana helps in:

Easy absorption of medicine from the gut, significantly helps in the treatment of the disease.

Example-A dilute water decoction of giloy is very useful in gout and diabeties. A dilute neem decoction may be helpful anupana during fever and infection disorder. Because neem helps to fight microbes.

**Anupana for Specific Drugs**

Garlic-If processed and taken along with milk helps to reduce its pungency.

Maha Sudarshan Churna with Honey-Opposite ras, Tikta and Madura.

Kaphaketu Rasa with Ginger juice-Main drug and Anupana has same kaphahara property.

Punarnavashtaka Kashaya with Gomutra; both are Diuretics.

Mukta Pishiti is administered along with honey, butter, or milk.

Anupana should possess the properties opposite to those of meal but at the same time should not in contradict the qualities of Dhatus.[9]

The terms which can be taken to understand the concepts of Anupana from modern system of medicine are Vehicle, Adjuvant or Synergist and Carrier through which the actions such as drug absorption, drug companion, drug interaction, drug delivery, and bioavailability of the drug will take place.

**RESULT**

Term Anupana was first used in the context to the drug by Sharangdhar and explained by its commentator Adhamalla followed by Vaidya Jeeven and other texts.

In Aushadhopayogi Anupana, the condition of the patient, Doshas predominance, nature of Disease, properties of medicine being used, etc., are to be kept in mind for the best result of treatment.

By the use of proper Anupana drug quickly distributes in the body.

It helps the drug to reach the target site.

**DISCUSSION**

The word Anupana is that a drink that is taken with or after medicine intake and also it is considered as a fluid vehicle for medicine.

Anupana is an after drink for both the ahara and oushada (food as well as medicine) Acharya charaka opines that an ideal Anupana is that which has the properties opposite to that of the food but not incompatible with them.
Anupana is a very important factor which helps in absorption, assimilation as well as inefficacy of the drug. Anupana is a vehicle that carries the medicines to its target. This should be decided according to the constitution of the patient as well as the condition of doshas.

The main vehicle is cold water, warm water, honey, buttermilk, sugar, jaggery, milk, whey water, Dhanyamla, etc. The pharmaceutical preparation such as swaras, kwath, hima, and phanta is also given as anupana.\[9\]

Action of medicine depends on the anupana to treat various diseases. For instance one drug, Makaradwaja may be useful in jwara when given with Ardraka swarasa (ginger juice) and in Raktapitta (internal hemorrhage) with vasa swarasa. According to Sharangdhara Anupana is usually selected on the basis of drug, patient, disease, etc. The dosage and mode of action of Anupana is explained by Sharangdhara depending on the predominance of doshas in the body.

**CONCLUSION**

Concept of Anupana is a unique contribution and essential part in the administration of Ahara and Aushada. The potency of medicine gets enhanced and brings about the desired effect when administered with suitable Anupana. Bhashaja avacharana vidhi (drug administration) in Ayurveda is science itself and concept of Anupana forms an integral part of Chikitsa (treatment). It brings certain changes in substances along with which is administered.

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Prudent herb *Pashanbheda* (*Bergenia ligulata* Wall.) in urinary tract dysfunctions - A review

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**Abstract**

Millions of people nationally and internationally are suffering from urinary tract disorders such as renal calculi, calculi of urinary bladder, urinary tract infections, dysuria, urinary incontinence, and diabetes mellitus. It is a prime concern of medical professionals to manage these ever increasing disorders by application of appropriate medicament. A traditional wealth of a number of herbs and herbomineral drugs posses a huge potential to combat these disorders. *Pashanbheda* (*Bergenia ligulata* Wall.), a valuable herbal drug mentioned in different classical texts, carries a wide therapeutic potential such as *Ashmarihara* (helpful in calculi treatment), *Mutrakrichrahara* (helpful in dysuria), and *Pramehahara* (helpful in diabetes mellitus). In addition to the multidimensional properties of *Pashanbheda* given in various treatises, many research works published on this herb also support the above-mentioned therapeutic potential. This paper is a sincere effort to enumerate current researches done on *Pashanbheda* to scientifically validate its medicinal properties.

**Key words:** *Bergenia ligulata*, *Pashanbheda*, urinary effective agent

**INTRODUCTION**

*Pashanbheda* (meaning “stone breaker”) is a well-known Ayurvedic herbal drug, used mainly as diuretic and lithotptic. Many plants such as *Bergenia ligulata* Wall., *Aerva lanata* Juss., *Coleus aromaticus* Benth., *Kalanchoe pinnata* Linn., *Homonoia riparia* Lour., and *Rotula aquatica* Lour. are being used under the name *Pashanbheda*.\(^1\) However, the most common species of *pashanbheda* used in different classical and proprietary formulations is *B. ligulata* Wall. (Family: Saxifragaceae). Conventionally, *B. ligulata* Wall. rhizomes (BLRs) are mainly used for constipation, kidney stones, and urinary problems and have been tested for antiurolithic and diuretic properties\(^2,3\).\(^2,3\)

*B. ligulata* is a perennial herb with thick rootstock, short and fleshy stem, and white, purple, or pink color flowers, mainly occurs in temperate regions from Kashmir region to Bhutan. It is found in the Himalayas between the altitudes of 2000 and 2500 m.\(^4,5\) Pharmacological profile of the plant shows its antilithic, antidiabetic, anti-inflammatory, antioxidant, diuretic, and anti-bradykinin activities which are known to be due to the presence of different phytoconstituents in the plant. Although rhizome, root, leaves, and flower of the plant *pashanbheda* are known to be used therapeutically, rhizome is the most commonly used plant part as it carries a bundle of phytoconstituents. The presence of a number of phytoconstituents shows the holistic approach of Ayurveda, i.e. every plant has an enormous therapeutic potential by having not only a single chemical entity but also a multiple of chemical entities. Rhizome contains coumarins namely bergenin, flavanoids namely afzelechin, catechin and benzenoids namely arbutin. Bergenin is the major phenolic compound present in *Pashanbheda* and other phenolic compounds are present in very less quantity. β-sitosterol, tannins, glucose, mucilage, and waxes are also present in the rhizome.\(^6-10^\)

The occurrence of different kinds of urinary tract disorders is related to each other or one may further acts as a causative

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factor for the another one. Moreover, they may also take place separately. Less intake of water and electrolyte imbalance are the most common causative factors for the pathogenesis of renal stone, renal stones further increase the chances of development of urinary tract infections, and once infections in urinary tract occurs, there are more chances of occurrence of dysuria, urinary incontinence, etc.\footnote{Pashanbheda} can act as an effective remedy in these diseased conditions as it has the ability to break the pathogenesis of these diseases.

\section*{MATERIALS AND METHODS}

\subsection*{Traditional and Regional Uses}

\textit{Pashanbheda} is the most commonly used plant material in traditionally used Ayurvedic medicines for urinary dysfunctions. The roots of \textit{B. ligulata} possess cooling, laxative, analgesic, abortifacient, and aphrodisiac properties and used in the treatment of vesicular calculi, urinary discharges, excessive ureter hemorrhage, diseases of the bladder, dysentery, menorrhagia, splenic enlargement, and heart diseases.\footnote{In Nepal, about 10 g of rhizome paste or juice of \textit{B. ligulata} along with the molasses has been taken by adults, twice a day for 3–4 days as an anthelmintic for the expulsion of roundworms.\footnote{Fresh root decoction of \textit{Pashanbheda} on oral administration is found to be effective in all kinds of urogenital and urinary complaints.}}\footnote{In India, rootstock of \textit{pashanbheda} is used as a masticator by adults.\footnote{In Sind (Pakistan), root after complete rubbing administered with honey to the children at the time of their teething as it is believed to combat the irritating symptoms occurs during teething and leaf juice is used in earaches in China.\footnote{Tea prepared from Pashanbheda is given daily to dissolve the kidney stones.\footnote{Oral intake of leaf juice dissolves kidney stones as believed by the peoples of Mizoram regions.}}}}\footnote{Various research works have been done on \textit{B. lingulata} Wall. to support its consideration as urinary effective agent. Many of the preclinical and clinical researches conducted previously are validating the facts regarding the \textit{Pashanbheda} given in various classical treatises or ayurvedic literature. These scientific researches show that \textit{Pashanbheda} apart from urinary disorders is also found to be effective in systemic dysfunctions such as an analgesic, antiviral, hepatoprotective, cardioprotective, and antimotor. Here, in this review, only the researches related to urinary effective agent are being compiled to show its \textit{Ashmarihar} (stone dissolving), \textit{Mutrakrichara} (helpful in dysuria), and \textit{Pramehahara} (helpful in diabetes mellitus) action as has been given in various treatises.} Less intake of water and electrolyte concentration of Na$^+$, K$^+$, and Cl$^-$which indicates its significant diuretic activity. It was concluded that the active principles such as flavonoids and saponins present in alcoholic extract of roots of \textit{B. ligulata} might be responsible for diuretic activity.\footnote{Some other studies conducted on methanolic extract of the plant also exhibit diuretic activities, for diuretic activity.} By the diuretic property of \textit{B. lingulata}, it is found to be useful in dysuria like conditions.

\subsection*{Antilithic Activity}

\textit{Methanolic extract of \textit{B. ligulata} Wall. dissolved stones in both kidney and urine constituents of urolithic rats.\footnote{In vitro and in vivo studies have been conducted on crude aqueous methanolic extract of BLR, and it showed that its rhizome was inhibiting the calcium oxalate (CaC2O4) crystal aggregation as well as crystal formation in the metastable solutions and exhibited antioxidant effect against 1,1-diphenyl-2-picrylhydrazyl free radical and lipid peroxidation \textit{in vitro}. In an animal model of urolithiasis, developed in male Wistar rats by adding 0.75% ethylene glycol (EG) in drinking water, BLR (5–10 mg/kg) prevented CaC2O4 crystal deposition in the renal tubules. The symptoms caused due to lithogenic treatment such as polyurea, weight loss, impairment of renal function, and oxidative stress, manifested as increased malondialdehyde and protein carbonyl contents, and depleted reduced glutathione and decreased antioxidant enzyme activities of the kidneys were also prevented by BLR. Unlike the untreated animals, EG intake did not cause excessive hyperoxaluria and hypercalciuria in BLR-treated groups, and there was a significant increase in the urinary Mg$^{2+}$, instead of a slight decrease. These data indicate the antirolithic activity in \textit{B. ligulata} mediated possibly through CaC$_2$O$_4$ crystal inhibition, diuretic, hypermagnesuric, and antioxidant effects, and this study rationalizes its medicinal use in urolithiasis.}}\footnote{A comparative study was conducted on the aqueous extracts of \textit{B. ligulata} and \textit{Tribulus terrestris} and it was concluded that the aqueous extracts of \textit{B. ligulata} produced maximum inhibition of the growth of calcium oxalate monohydrate crystals than \textit{Tribulus terrestris}. From these studies, it can be said that presence of different phytoconstituents in various extracts of the plant is responsible for its antilithic activities.} Methanolic extract of \textit{B. ligulata} Wall. dissolved stones in both kidney and urine constituents of urolithic rats.\footnote{Alcoholic extract of \textit{B. ligulata} was found to be effective in increasing urinary electrolyte concentration of Na$^+$, K$^+$, and Cl$^-$which indicates its significant diuretic activity. It was concluded that the active principles such as flavonoids and saponins present in alcoholic extract of roots of \textit{B. ligulata} might be responsible for diuretic activity. Some other studies conducted on methanolic extract of the plant also exhibit diuretic activities, but these are said to be due to the presence of tannins, phenols, and flavonoids present in the plant. By the diuretic property of \textit{B. lingulata}, it is found to be useful in dysuria like conditions.}\footnote{Alcoholic extract (500 mg/kg body weight) of roots of \textit{B. ligulata} Wall. was found to be effective in increasing urinary electrolyte concentration of Na$^+$, K$^+$, and Cl$^-$which indicates its significant diuretic activity. It was concluded that the active principles such as flavonoids and saponins present in alcoholic extract of roots of \textit{B. ligulata} might be responsible for diuretic activity. Some other studies conducted on methanolic extract of the plant also exhibit diuretic activities, but these are said to be due to the presence of tannins, phenols, and flavonoids present in the plant. By the diuretic property of \textit{B. lingulata}, it is found to be useful in dysuria like conditions.} In vitro and in vivo studies have been conducted on crude aqueous methanolic extract of BLR, and it showed that its rhizome was inhibiting the calcium oxalate (CaC2O4) crystal aggregation as well as crystal formation in the metastable solutions and exhibited antioxidant effect against 1,1-diphenyl-2-picrylhydrazyl free radical and lipid peroxidation \textit{in vitro}. In an animal model of urolithiasis, developed in male Wistar rats by adding 0.75% ethylene glycol (EG) in drinking water, BLR (5–10 mg/kg) prevented CaC2O4 crystal deposition in the renal tubules. The symptoms caused due to lithogenic treatment such as polyurea, weight loss, impairment of renal function, and oxidative stress, manifested as increased malondialdehyde and protein carbonyl contents, and depleted reduced glutathione and decreased antioxidant enzyme activities of the kidneys were also prevented by BLR. 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\subsection*{Antidiabetic Activity}

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\subsection*{Antidiabetic Activity}

\textit{Alcoholic extract of \textit{B. ligulata} reduced the blood glucose levels in diabetic rats, and it was assumed that the antidiabetic effect may be due to the stimulation of cells of pancreatic islets or mediated through stimulation of insulin release
resembling the oral hypoglycemic sulfonylureas.[26,27] The (+)-afzelechin isolated from rhizomes of B. ligulata was found to be an inhibitory compound of alpha-glucosidase activity with ID$_{50}$ value 0.13 mm.[28]

**Anti-inflammatory Activity**

Evaluation of the anti-inflammatory activity of aqueous and 50% ethanolic extracts of the rhizomes of B. ligulata is reported to attenuate the inflammatory response as determined by pharmacological and biochemical measurements. The treatment significantly decreased the inflammation. It has been reported that the increased activity level of succinate dehydrogenase got decreased in inflammatory rats receiving the extract treatment.[29] The study suggests that, case of urinary tract infections and inflammatory conditions such as cystitis and nephritis, B. lingulata administration can be useful to get rid of these pathological conditions.

**Patents**

Mitra has filed a patent of a novel herbal composition for maintaining or caring the skin around the eyes comprising extracts of B. ligulata, Cipadessa baccifera, Emblica officinalis, and cosmaceutically acceptable excipients. Lee and Martin have also filed patents of cosmetic composition comprising B. ligulata as an active ingredient for artificial tanning of human skin and remedying skin wrinkles. Agarwal and Kumar have patented an improved process for isolation of bergenin from Bergenia species.[30-33]

**DISCUSSION**

The urinary system is mainly comprised of kidneys, ureters, urinary bladder, and urethra. Normal physiology of all these organs is responsible for the urinary system to perform its action properly. Due to various causative factors such as less intake of water, electrolyte imbalance, some bacterial (Escherichia coli, streptococci), viral (ICH), and parasitic (Dirofilaria immitus) infections, autoimmune diseases lead to the development of pathology in urinary tract which further leads to generation of renal calculi, urinary calculi, cystitis, nephritis, dysuria, urinary incontinence, etc. Moreover, the incidence of urinary tract disorders is more in females as compared to males.[11] Due to disturbances in dietary and water intake habits and imbalanced physical activities, huge numbers of peoples are suffering from urinary tract disturbances. On account of more safety and efficacy of herbal drugs, if administered in prescribed doses and with appropriate adjuvant at an appropriate time, a demand of herbal drugs for the treatment of above-mentioned diseases is increasing. Many of the classical and proprietary drugs are available nowadays to get rid of all these ailments. Pashanbheda (B. ligulata Wall.) is considered among the high-valued temperate medicinal herbs.[34] Pashanbheda carries a huge therapeutic potential in the above-mentioned disorders either administered singly or in combination of various classical and proprietary formulations. Proprietary formulations available in the market such as calcury, cystone, crush tablet, urotone tablet, and cystone syrup all are prescribed in urinary malfunctioning which consists of Pashanbheda as an ingredient. Aqueous extract of B. lingulata Wall. was tested by homogenous precipitation method and compared with aqueous extract of cystone (Formulation of Himalaya Company, India), and it was found that it was showing less activity as compared to cystone, but it was inhibiting the calcium and phosphate accumulation with the help of non-protein and non-tannin molecules as active constituents.[35] B. ligulata alcoholic extract at low doses (0.5 mg/kg of alcoholic extract) promotes diuresis in rats, but higher doses of 100 mg/kg reduce the urine output and the diuresis produced by urea.[35] Apart from these activities, alcoholic extract of B. ligulata has exhibited significant anti-inflammatory, analgesic, antibacterial, and diuretic properties.[36,37] Paashanolactone and other constituents of the rhizomes possess anti-inflammatory properties.[38] From all these compilations, a view toward Pashanbheda suggests it as a prudent herb in the curing of a wide range of urinary disturbances.

**CONCLUSION**

In the present scenario, a demand of herbal remedies is increasing day-by-day as peoples are more aware about the safe and efficacious medicaments. Pashanbheda carries a potential to maintain the health of urinary system if it is administered in an appropriate way. Not much work on the pharmacological activities of pashanbheda is available; hence, more exploratory efforts are in necessity regarding the herb so that it can play a role in curing the diseases related to urinary tract.

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Simple practical tools for the ayurvedic physician used during the procurement of raw herbs

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Abstract

There is a vast document available with regard to morphology of green drugs. However, for physicians who are totally dependent on market for the procurement of medicinal plant raw materials, it is not of much relevance even if he has sound knowledge of identification of green drug. Moreover, excessive deforestation, indiscriminate use, and exponential increase in demand of herbal medicine all over the world have led to building up of pressure on demand side, thereby leading to unethical and dangerous practice of adulteration that has compromised the reliability of ayurvedic treatment to serious proportions. Therefore, there is an urgent need to evolve exclusive identifying features of raw drugs by simple practical tools so as to serve as a ready reference for all physicians in the identification of genuine medicinal plant raw materials. Thus, present article will help to solve the problem regarding the identification of some of the crude drugs.

INTRODUCTION

The creditability of the ayurvedic system of medicine depends on the availability of the authentic raw material in sufficient quantities. The basic source of raw materials for Vaidyas, Hakims, and industries is from various forest zone, fallow land, and plains. The bulk of raw materials (stem, root, leave, bark, flower, fruit, exude, and seeds) is procured annually from these wild source, and a small amount comes from cultivation. The collection of the plant material is done by unskilled person, and there always remain a doubt for genuineness and possible adulteration. Moreover, excessive deforestation, disappearance of many medicinal plant species from the flora, indiscriminate use, and exponential increase in demand of herbal medicine all over the world have led to building up of pressure on demand side, thereby leading to unethical and dangerous practice of adulteration that has compromised the reliability of ayurvedic treatment to serious proportions. Further, the discontinuity in the healing traditions of Ayurveda has led to confusion and controversies over the identity of many medicinal plants whereby different plant species are employed against one classical drug in different species. In the absence of documentation of clear-cut identifying features, it has become almost impossible to recognize the genuine drugs. Therefore, there is an urgent need to evolve exclusive identifying features of raw drugs by simple practical tools so as to serve as a ready reference for all physicians in the identification of genuine medicinal plant raw materials. Thus, the present article will help to solve the problem regarding the identification of some of the crude drugs.

Aim of Study

In spite of having wealth of medicinal flora in India, the chief difficulty experienced by the ayurvedic physician in the manufacture of ayurvedic formulations is that they find it extremely difficult to obtain genuine crude drug. There is a vast document available with regard to morphology of green drugs. However, for physicians who are totally dependent on the market for the procurement of medicinal plant raw materials, it is not of much relevance even if he has sound

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knowledge of identification of green drug. Different parts of medicinal plant raw materials, in dry form, show different features, most of which are being common to many drugs, thus creating a lot of confusion and controversy in the identification of the crude drug. The same is the case with Pushkarmool (Inula racemosa) and Kustha (Saussurea lappa), both of these herbs are difficult to differentiate from each other. Another important herb Trivrit (Operculina turpethum) which is used in many formulations is being adulterated with Murva. Drug like Kesar due to its high price is being adulterated to gain more profit. Thus, there is an urgent need to develop practical methods to assess their genuineness in the dry form.

**Objective**

Several studies have been done for a correct identification and to distinguish the genuine herbs from adulterant and also from their substitute. However, more often than not these researches are oriented toward sophisticated laboratory methods creating a practical barrier in easy use for authentication of plant materials from its substitute and adulterants. Due to the macroscopic morphological similarities, it is not easy to differentiate Pushkarmool (*I. racemosa*), Kustha (*S. lappa*), Trivrit (*O. turpethum*), Murva (*Marsdenia tenacissima*), and Keshar (*Crocus sativus*) from its adulterants by organoleptic tools, also known as the practical tool or on the spot tool for identification. However, with the help of a simple chemical test, we can easily differentiate these herbs from their substitutes and adulterants.

**Market Study**

Exclusive dependence on traders has created serious malpractice of adulteration and selling of substandard medicinal plant raw materials in the market. Hence, it is mandatory to study the market samples to check the adulteration. During the market surveys, following points were kept in mind. Markets samples were collected as such and not verified on spot. All the available grades were collected with the simple order method. Sample purchased or received from contacts was properly labeled, stored, and subjected to investigation. Summary of market survey of Pushkarmool (*I. racemosa*), Kustha (*S. lappa*), Trivrit (*O. turpethum*), and Keshar (*Crocus sativus*) done by Pg scholars of the Department of Dravyaguna, NIA, Jaipur, was given in Tables 1-3.

### MATERIALS AND METHODS

#### Sample Drug Material

The genuine root samples of Pushkarmool, i.e., roots of *I. racemosa* Hook. F. were collected from Bhadarwah in the district of Doda, state - Jammu and Kashmir, and of

<table>
<thead>
<tr>
<th>Market</th>
<th>Pushkarmool</th>
<th>Kustha</th>
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<tbody>
<tr>
<td>Kullu</td>
<td>Pushkarmool</td>
<td>Kustha</td>
</tr>
<tr>
<td>Amritsar</td>
<td>Pushkarmool</td>
<td>Nagori Ashwagandha</td>
</tr>
<tr>
<td>Jaipur</td>
<td>Pushkarmool</td>
<td>Nagori Ashwagandha</td>
</tr>
<tr>
<td>Mumbai</td>
<td>Pushkarmool</td>
<td>Pushkarmool</td>
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<tr>
<td>Kolkata</td>
<td>Unidentified</td>
<td>Kustha</td>
</tr>
<tr>
<td>Cochin</td>
<td>Pushkarmool</td>
<td>Kustha</td>
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<tr>
<th>Delhi</th>
<th>Murva (<em>Marsdenia tenacissima</em>)</th>
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<tr>
<td>Jaipur</td>
<td>Murva (<em>Marsdenia tenacissima</em>)</td>
</tr>
<tr>
<td>Kolhapur</td>
<td>Murva (<em>Marsdenia tenacissima</em>)</td>
</tr>
<tr>
<td>Cochin</td>
<td>Shyama Trivrit (<em>Ipomoea petaloidea</em>)</td>
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<tr>
<th>Doda</th>
<th>Keshar</th>
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<tr>
<td>Bengaluru</td>
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<td>Jaipur</td>
<td>Adulterated sample</td>
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<td>Delhi</td>
<td>Keshar</td>
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<td>Mumbai</td>
<td>Keshar</td>
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<td>Kolkata</td>
<td>Keshar</td>
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<tr>
<td>Chennai</td>
<td>Adulterated sample</td>
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<tr>
<td>Amritsar</td>
<td>Adulterated sample</td>
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</table>

Kustha, i.e., *S. lappa* C.B. Clarke roots were collected from the hills of Shatargala Tehsil – Bhaderwah in the district of Doda, state - Jammu and Kashmir. From these sources as mentioned above, samples were collected, herbarium was made and authenticated at IIIM Jammu with herbarium sheet no 13697 (*I. racemosa* Hook. f.) and 17279 (*S. lappa* C.B Clarke). The genuine samples of *Trivrit*, i.e., roots of *O. turpethum* were collected from Chitrakoot forest in district of Satna, state - Madhya Pradesh. Herbarium was made and authenticated by the Botanical Survey of India at Allahabad, state - Uttar Pradesh, with certificate number B.S.I./C.R.C./2013-14/TEC./185. Genuine sample of Keshar (*C. sativus*) was collected from district Doda, state - Jammu and Kashmir.

#### Methods

500 mg of powdered sample drug material was taken in separate test tubes and then 3 ml of 50% H2SO4 was added in the test tubes containing samples of Pushkarmool (*I. racemosa*) and Kustha (*S. lappa*).[10] 10% NaOH was added
in test tubes containing sample of Trivrit (O. turpethum) and Murva (M. tenacissima) after 5 min, all the samples were seen under daylight, and difference in color was observed. The same test is then repeated with the market samples, results were reproducible with the genuine samples. For Keshar (C. sativus), 5–10 filaments were taken in a test tube, and to it, 3 ml of $\text{H}_2\text{SO}_4$ acid was added. After few seconds, color of the test solution changed into blue color, and after few minutes, the solution changed into bluish-red in color. And finally, the solution turns into violet color with a reddish-tint.

**RESULTS**

Kustha (S. lappa) is being adulterated in the market with Pushkarmool (I. racemosa) as well as Nagori Ashwagandha (Withania ashwagandha), whereas Murva (M. tenacissima) is being sold under the name of Trivrit and Keshar (C. sativus) was also found adulterated in major markets of India. During the chemical tests, when test tube having a sample of Pushkarmool (I. racemosa) treated with 50% $\text{H}_2\text{SO}_4$ gave golden rod color whereas test tube having sample of Kustha gave red color [Figure 1]. Test tube having a sample of Trivrit (O. turpethum) treated with 10% $\text{NaOH}$ gave coral red, whereas test tube having sample of Murva (M. tenacissima) gave dark ivory [Figure 2]. Test tube having a sample of Keshar (C. sativus) treated with $\text{H}_2\text{SO}_4$ changes color from bluish-red to violet [Figure 3].

**DISCUSSION**

All the above tests are very simple and can be used as a tool to differentiate Pushkarmool (I. racemosa) from Kustha (S. lappa), Trivrit (O. turpethum) from Murva (M. tenacissima), and Keshar (C. sativus) from its adulterants. Moreover, this tool can be used as an on the spot tool during the procurement of samples from the market. This tool can be used by physicians, researchers, pharmacies, etc., partly or fully as per the resources available to reasonably identify authentic samples. During the study, sample size is very small and all the findings were based on seven to eight samples of each drug. Hence, it is suggested that the users should use this tools to further validate and require modifications can be appended.

**Limitations**

1. 50% $\text{H}_2\text{SO}_4$ can only be used to differentiate Pushkarmool (I. racemosa) and Kustha (S. lappa) from each other.

2. $\text{H}_2\text{SO}_4$ can be used to differentiate Trivrit (O. turpethum) from Murva (M. tenacissima). However, this test is incompetent to differentiate between Ipomoea turpethum syn., O. turpethum (genuine sample), and Ipomoea petaloidea, i.e., Shyama trivrit (Kochi sample).

**REFERENCE**


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Factors influencing the stability of Ayurvedic medicine

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Abstract

Ayurvedic medicine may consist of single or many active constituents of the drug. Most of the ayurvedic medicine used a group of constituents. Suitability of consumption depends on all these active constituents. Ayurvedic medicine is often prone to deterioration, especially during storage, leading to loss of active component, production of metabolites with no activity, and in extreme cases, production of toxic metabolites. This area needs to be addressed to determine the efficacy of the formulation. Understanding the problems related to natural product stability can give the idea of dealing with the stability issues. Stability studies are carried out to demonstrate that the medicine will remain suitable for consumption during shelf period when stored under the condition mentioned on the packaging. The aim of this article is to provide some tool to increase the stability of ayurvedic medicine.

Key words: Ayurvedic medicine, shelf life, stability

INTRODUCTION

Plants, as a whole or their parts or exudates, are subjected to certain treatments such as extraction, distillation, purification, concentration, or fermentation to obtain herbal preparations. Stability is defined as the capacity of a drug substance or drug product to remain within established specifications to maintain its identity, strength, quality, and purity throughout the retest or expiration dating periods. Currently, the usage of standardized extract in natural medicines has become common and popular. However, during manufacturing and the extraction process for natural products, the drug molecules or active components are exposed to oxidation, hydrolysis, microbial attack, and other environmental degradation which poses a problem of stability to the products.[1] Stability of drug can also be defined as the time from the date of manufacture and packaging of formulation until its chemical or predetermined level of labeled potency and its physical characteristics have not changed appreciably.[2]

Objective

The objective of this study is to monitor the stability of the developed herbal formulations using the limited and specific methods.

The stability of pharmaceutical product is investigated throughout the various stages of development process.

Ayurvedic Concept of Saviryata avadhi (Shelf Life)

Ayurvedic texts reveal that aspect of shelf life has been recognized already and some of the granthas have actually given guidance regarding factors that make formulations degrade or become unfit for use, and in specific cases, in certain dosage forms, have actually prescribed the period, and from the date, it was compounded within which such dosage form should be used. The Ayurvedic Formulary of India also has given the time period from the date of manufacture within which the formulations should be consumed for best results.[3]

In Ayurveda, Veerya Shakti or potency of drug is most active principle among rasa, guna, vipaka, and prabhava. Acharya Charaka has explained that Veerya of any drug is responsible for its pharmacological actions. Therefore, Saviryata avadhi is defined as the maximum period during which the drug contains its Veerya (potency).

In Ayurvedic literatures, “Saviryata avadhi” term is mentioned in the context of the time period during which the Virya (potency) of any drug remains unaffected[3] due to environmental/microbial deterioration. India has well-documented and traditionally well-practiced knowledge of ayurvedic medicines.
MATERIALS AND METHODS

In accordance with the guideline on the quality of the herbal medicinal product, if a herbal medicinal product contains combinations of several herbal preparations, and if it is not possible to determine the stability of each active substance, the stability of combination has to be demonstrated by appropriate overall methods of assay and physical or other appropriate tests.[5]

Ingredient Selection

In addition to ingredients included strictly for the purpose of extending shelf life (preservative), ingredients included for other purpose can make important contributions.

Temperature

It is usually an effective method of increasing shelf life. Refrigeration can extend shelf life. Low temperatures impede chemical reaction and slow the growth of some bacteria.

Protection from Light

It is also often, effective, that is why many cosmeceuticals, vitamins, and food products are packaged in opaque rather than clear containers.

Protection from Air

It is the primary oxidizer, and also carriers such as bacteria, mold, dust, and water are also essential. Keeping a container tightly closed.[2]

There are Five Types of Stability that must be Consider for Each Drug Chemical

Each active ingredients retain its chemical integrity and labeled potency, within the specified limits.

Physical

Physical properties including appearance, palatability, uniformity, dissolution, and suspend ability are retained.

Microbiological

Antimicrobial agents that are present retain effectiveness within the specified limits.

Therapeutic

The therapeutic effect remains unchanged.

Toxicological

No significant increase in toxicity occurs.

Changes in Ayurvedic Formulation

Physical changes

- Appearance
- Melting point
- Clarity and color of solution
- Moisture
- Crystal modification
- Particle size.

Chemical Changes

Solid state reactions are generally slow, and it is customary to use stress conditions in investigation of stability.

High temperature can drive moisture out of a sample and render the material apparently stable otherwise prone to hydrolysis.

Photolysis

Compound such as ascorbic acid, riboflavin, cyanocobalamin, and folic acid undergoes degradation on exposure to light, sometimes coupled with thermal reactions.

Isomerization

Compounds get converted into a less effective form, for example, adrenaline solutions at low pH lose activity since its levo form is more stable than dextro form.[6]

Effect of pH

Most of the drug is stable at pH 4–8. Weakly acidic and basic drugs are most soluble in ionized form and instability is likely as they are charged. This quandary that potent drugs being poorly soluble, pH ionization being best solution. Inclusion of a water miscible solvent increases stability, thus suppressing ionization.

Density

It is useful for the idea about the size of final dosage form and critical for low potency drugs and also affects flow properties.

Hygroscopicity

Equilibrium moisture content has to be calculated which influences the flow and compression characteristics and
hardness of final tablet.

**Flowability**

Flow properties are critical for tableting operation.

Angle of response has to be calculated which should be within 25–45°.

Example - acicular crystal materials with low density and with static charge exhibit poor flow. Grinding of acicular crystals results in improvement of flow properties.

Example - above 65% relative humidity, the beta form of chloretetracycline hydrochloride transforms into alpha form.[2]

Stability can be determined from this type of study, simply because stability-indicating methods were used in the analysis. The typical analytical characteristics used in method validation include accuracy, precision, specificity, detection limit, quantitation limit, linearity, range, and ruggedness, as outlined in. The stability study includes storing the preparation in stability chambers.

Stability data can also be generated under accelerated atmospheric conditions of temperature humidity, and light, which are referred to as short-term stability, and the data obtained are used for predicting shelf life of the product.[6]

**Stability Testing**

Pharmaceutical compounds and preparation often exhibit chemical or physical instabilities. The deteriorations that result from such instabilities may lead to:

a. A reduced activity of the compound and preparation.
b. The formation of toxic reaction products.
c. The formation of an inelegant or unusable product.

In addition, microbial contamination may be unacceptable or lead to deterioration.

Stability testing is therefore carried out to ensure that deterioration does not exceed an acceptable level to:

a. Ensure the safety of the patient
b. Maintain the activity of the product
c. Maintain sales because a deteriorated product is either unusable or a poor advertisement.

**Chemical Degradation**

**Hydrolysis**

This is particularly important in systems containing water, for example, solutions, suspensions, and emulsions. It is also important in the deterioration of ingredients contained in solid dosage forms, since water may enter as vapors from the atmosphere or as water of crystallization in other ingredients. Solanaceous alkaloid that contains ester linkage is susceptible to hydrolysis. It is usually assumed that if hydrolysis of the alkaloids occurs in the crude drug if the moisture content increases.

**Oxidation–reduction**

Oxidation–reduction involve the loss of electrons and gain of electrons, respectively. Many oxidation reactions result from the atmospheric oxygen, but the required loss of electrons may sometime occur even when oxygen is absent, for example, in reactions between oxidizing and reducing agents. However, the decomposition of medicinal compound usually involves molecular oxygen, and such oxidations are termed as autoxidations because they occur spontaneously under normal conditions and often involve free radicals. Autoxidation also is responsible for tetracycline, Vitamin A, Vitamin D, and morphine.[7]

**Problems Related to the Herbal Product Stability**

**Physical Instability**

Physical instability

Natural medicines often suffer the problem of the physical instability due to the presence of impurities and reaction with the container. Conditions such as growth of the microorganisms and insect feeding affect the secondary metabolites and chemical composition of plants. Volatile active components of natural medicine have the problem of volatility and decreasing activity during storage for a long time.

**Environmental Conditions**

Environmental conditions such as rainfall, altitude, temperature, soil, storage conditions as well as different harvesting procedures, time and method of collection, and manufacturing processes such as selecting, drying, purifying, extracting, and genetic variability can create substantial variability in the product quality, stability, and concentration of plant chemicals within different products. Light is also a prominent factor affecting phytoformulations by the generation of free radicals.

**Chemical Instability**

Phytoformulations often suffer degradation during storage by oxidation, hydrolysis, crystallization, emulsion breakdown, enzymatic deterioration, and chemical reactions with the additives and excipients. Temperature and moisture are the two major factors that affect quality and stability of a herbal product. A chemical reaction increases by a factor between two- and three-fold for every 10°C rise in temperature. Moisture absorbed on to the surface of solid drug often increases the rate of decomposition if it is susceptible to hydrolysis. The presence of enzymes in the product also increases the rate of chemical degradation.
Complex Mixtures, Variability, and Inconsistency

Herbal formulations are complex mixtures of different components obtained during extraction process. Each component has variable shelf life, activity, concentration, and consistency. It creates a problem during storage condition determination as it is not easy to determine the stability of final herbal preparation based on the activity and stability profile of a single component. [8]

Drug Interactions, Deterioration, Decomposition, and Storage

Moisture content above the critical value and mold growth in natural products can cause the interaction of the active components with the packaging material. Furthermore, interactions of active component with the other ingredients of formulations used such as additives cause alteration in the novel drug activity. Herbal formulations have many active constituents as alkaloids, glycosides, tannins, and flavonoids, and each component is having different stability conditions. Hence, actual stability condition for the herbal formulation is different than its individual component. [9]

CONCLUSION

Ayurvedic medicines are continuously gaining attention as the remedy treatment for many ailments in the present era. Hence, it becomes the prime responsibility of ayurvedic drug manufacturer to provide adequate stability for long-term storage and safety for consumption of drug by the patient. As the ayurvedic medicine is a mixture of one or more active ingredients, care should be taken to the determination of stability profile for ayurvedic medicine.

REFERENCES


Source of Support: Nil. Conflict of Interest: None declared.
Chemical evaluation of Hamsa Mandura and Vidangadi Loha

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Abstract

Rasashastra is science of metals, minerals, as well as herbo-mineral preparations. Standardization of herbo-mineral drug is today’s burning issue due to its complexity. Hence, a multidimensional approach is essential for standardizing compound drugs. In the present time apart from insufficient knowledge of Ayurveda, the standards of ayurvedic formulations are into worst predicament than ever before because of highly evolved technology and scanning of human system coupled with health awareness. Hence, the study of Standardization of Hamsa Mandura/Hamsa Mandoora and Vidangadi Loha is undertaken to understand the basic idea about the present drug standardization, Bhasma Kalpana and Khariya Kalpana, as per modern analytical methods as well as ayurvedic textual parameters. Establishing qualitative and quantitative parameters of medicines is the major step in developing safe and effective medicines. Analytical standardization is helpful in assuring quality standards of medicines. Such standardization for ayurvedic classical dosage forms is needed to be evaluated. Incinerated metallic-mineral preparations have a significant role in ayurvedic therapeutics. Different organic functional groups are noted in Fourier-transform infrared spectroscopy. Even shapes are observed in various cubic forms from X-ray diffraction analysis.

Key words: Hamsa Mandoora, Vidangadi Loha, Herbo-mineral, metal, Fourier-transform infrared, X-ray diffraction

INTRODUCTION

Apart from the Ashtanga’s of Ayurveda, there is the backbone of Chikitsa, namely, Rasashastra, which has contributed much in the field of pharmaceutical science. In the present era, ayurvedic physicians are using medicines made up of minerals, metals, gems, and products derived from animal as well as vegetable source. Among these, preparations from minerals-metals are supposed to be harmful to our body as per the Western medical system. However, it is very surprising to know that in Rasashastra text the side effect IS already mentioned if we use this medicine not made properly. Moreover, to avoid such side effects, different ayurvedic pharmaceutical processing techniques such as shodhana, marana, murchana, and jarana to convert metallic preparation into non-toxic form of medicines are mentioned and also standardization of that processes according to Ayurveda as well as modern analytical methods of standardization is also given in Ayurvedic texts. Standard is a numerical value which quantifies the parameters and thus denotes quality and purity of material. The World Health Assembly in May 2003 under a resolution on traditional medicine (WHA56.31) urged member states to set national standards for traditional formula to ensure safety, efficacy, and quality of medicines.[11] Many of the formulations are standardized for quality; still a good number of formulations are yet to be investigated. Further, similar formulations by means of ingredients or uses are needed for analytical, chemical, and other analysis. Hamsa Mandura and Vidangadi Loha are two different formulations with almost similar ingredients in similar proportion but with iron in two different forms (mandoora and loha) which are not screened for chemical analysis to cross the forms of iron or other organic compounds included in the course of processing. Hence, such study becomes a need of time.

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Dr. D. Narapa Reddy, Medical Officer, Sri Srinivasa Ayurveda Pharmacy, TTD, Tirupati, Andhra Pradesh, India. Phone: 9848054131. E-mail: dnreddyayu@gmail.com
The present study of the Standardization of Hamsa Mandura and Vidangadi Loha was undertaken for standardization of metallic, i.e. herbo-mineral preparations on the basis of modern analytical methods and simultaneous ayurvedic textual standards. Characterization of ayurvedic drugs ensures the chemical configuration and physicochemical changes due to various ayurvedic processing methods. It also helps to know the probable role of a media during the pharmaceutical processing. Analytical study provides standards to judge the quality of raw material as well as finished product. Analytical study also interprets the probable pharmacokinetics and pharmacodynamics of the drug. Ayurveda has also mentioned various analytical techniques to access the quality of selected material and final product. Although ayurvedic analytical techniques are time-tested, these are not adequate to answer the queries of modern science. Hence, for better utilization of Ayurvedic pharmaceutics, it is need of the hour to analyze the drug through both classical as well as modern qualitative and quantitative parameters.

**MATERIALS AND METHODS**

Drugs were processed in pharmacy attached to Gopabandhu Ayurveda Mahavidyalaya, Puri, Odissa. Hamsa Mandura was prepared as per the procedure mentioned in *Yogaratnakara*,[^12] while Vidangadi Loha was prepared following the method is given in *Chakradatta*.[^13] Hamsa Mandura and Vidangadi Loha were packed in an airtight container and were brought to QC Laboratories, ALNRMAMC, Koppa, for chemical analysis. Organoleptic characters, total ash, and acid-insoluble ash were determined with PID-controlled muffle furnace of *Exacta*.[^14] Loss on drying was measured using hot air oven of *Thermotech* and analytical balance of *Contech*.[^14] The pH was determined in 10% aqueous solution using

### Table 1: Characteristic absorption and respective functional groups

<table>
<thead>
<tr>
<th>Characteristic absorption (cm⁻¹)</th>
<th>Functional group</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM</td>
<td></td>
</tr>
<tr>
<td>469.84</td>
<td>Polysulfide or Aryl disulfide</td>
</tr>
<tr>
<td>538.76</td>
<td>Disulfide (weak vibration)</td>
</tr>
<tr>
<td>1033.38</td>
<td>C-N or O-C (2 bonds)</td>
</tr>
<tr>
<td>1380.69</td>
<td>N-O (strong vibration 2 bonds)</td>
</tr>
<tr>
<td>1450.00</td>
<td>-C=C (medium or weak, multiple bonds)</td>
</tr>
<tr>
<td>1627.94</td>
<td>N-H (bending)</td>
</tr>
<tr>
<td>2925.32</td>
<td>C-H (stretch)</td>
</tr>
<tr>
<td>3421.84</td>
<td>N-H (1°-amine)</td>
</tr>
<tr>
<td>3693.93</td>
<td>N-H (stretch, Amide)</td>
</tr>
<tr>
<td>VL</td>
<td></td>
</tr>
<tr>
<td>458.33</td>
<td>Aryl disulfide</td>
</tr>
<tr>
<td>547.36</td>
<td>C-Br (stretch strong)</td>
</tr>
<tr>
<td>1028.83</td>
<td>C-O (Ether group, stretch strong)</td>
</tr>
<tr>
<td>1371.48</td>
<td>N-O (strong vibration 2 bonds)</td>
</tr>
<tr>
<td>1628.71</td>
<td>C=C (stretch variable)</td>
</tr>
<tr>
<td>2927.03</td>
<td>C-H (stretch strong)</td>
</tr>
<tr>
<td>3413.37</td>
<td>N-H (primary amine 2-bonds and secondary amine)</td>
</tr>
</tbody>
</table>

*Figure 1: Fourier-transform infrared spectroscopy peaks of Hamsa Mandura*

*Figure 2: Fourier-transform infrared spectroscopy peaks of Vidangadi Loha*

*Figure 3: X-ray diffraction peaks of Hamsa Mandura*
pH meter of Labtronics and double calibrated buffers of pH 4 and pH 9.2 from Nice Chemicals. Ferrous and ferric type of irons was determined by methods mentioned in pharmacopoeial standards for ayurvedic formulations using reagents and chemicals manufactured by Nice Chemicals. For fluorescence study, both drugs were observed under visible light and under long UV after treating with deionized water, methanol, 10% each of sodium hydroxide, hydrochloric acid, sulfuric acid, nitric acid, and ammonia in aqueous media.

Fourier-transform infrared (FTIR) and X-ray diffraction (XRD) studies were done in the Indian Institute of Chemical Technology, Tarnaka, Hyderabad.

**RESULT/OBSERVATION**

### Organoleptic Characters

<table>
<thead>
<tr>
<th></th>
<th>Hamsa Mandura</th>
<th>Vidangadi Loha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Brick red</td>
<td>Brownish red</td>
</tr>
<tr>
<td>Taste</td>
<td>Astringent</td>
<td>Astringent, slightly bitter</td>
</tr>
<tr>
<td>Odor</td>
<td>Characteristic</td>
<td>Characteristic</td>
</tr>
<tr>
<td>Texture</td>
<td>Semi-amorphous</td>
<td>Semi-amorphous</td>
</tr>
</tbody>
</table>

### Physicochemical Parameters

<table>
<thead>
<tr>
<th></th>
<th>Hamsa Mandura</th>
<th>Vidangadi Loha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss on drying at 105°C</td>
<td>2.78%</td>
<td>3.25%</td>
</tr>
<tr>
<td>Total ash</td>
<td>58.40%</td>
<td>58.25%</td>
</tr>
<tr>
<td>Acid-insoluble ash</td>
<td>5.55%</td>
<td>5.24%</td>
</tr>
<tr>
<td>pH</td>
<td>5.46±0.10</td>
<td>4.13±0.10</td>
</tr>
</tbody>
</table>

### Preliminary Phytochemical Tests

<table>
<thead>
<tr>
<th></th>
<th>Hamsa Mandura</th>
<th>Vidangadi Loha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Protein</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Alkaloid</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Anthraquinone glycosides</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Tannin</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Terpenoids</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Phytosteroids</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>Saponins</td>
<td>Present</td>
<td>Present</td>
</tr>
</tbody>
</table>

### Fluorescent Tests

<table>
<thead>
<tr>
<th></th>
<th>Under visible light</th>
<th>Under long UV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamsa Mandura</td>
<td>Brick red</td>
<td>Brown</td>
</tr>
<tr>
<td>Sample</td>
<td>Tortilla</td>
<td>Light green</td>
</tr>
<tr>
<td>Sample+Water</td>
<td>Yellowish-brown</td>
<td>Fluorescent yellow</td>
</tr>
<tr>
<td>Sample+10% NaOH</td>
<td>Reddish-brown</td>
<td>Reddish-yellow</td>
</tr>
<tr>
<td>Sample+10% HCl</td>
<td>Light brown</td>
<td>Light green</td>
</tr>
<tr>
<td>Sample+10% H2SO4</td>
<td>Light yellow</td>
<td>Light green</td>
</tr>
<tr>
<td>Sample+10% HNO3</td>
<td>Light yellow</td>
<td>Light yellow</td>
</tr>
<tr>
<td>Sample+10% NH3</td>
<td>Yellowish-brown</td>
<td>Yellow</td>
</tr>
<tr>
<td>Vidangadi Loha</td>
<td>Brownish-red</td>
<td>Caramel</td>
</tr>
<tr>
<td>Sample + water</td>
<td>Creamish-brown</td>
<td>Creamish-green</td>
</tr>
<tr>
<td>Sample + methanol</td>
<td>Pale yellow</td>
<td>Fluorescent white</td>
</tr>
<tr>
<td>Sample + 10% NaOH</td>
<td>Garnet</td>
<td>Yellowish-green</td>
</tr>
<tr>
<td>Sample + 10% HCl</td>
<td>Caramel</td>
<td>Yellowish-brown</td>
</tr>
<tr>
<td>Sample + 10% H2SO4</td>
<td>Creamish-brown</td>
<td>Lemon yellow</td>
</tr>
<tr>
<td>Sample + 10% HNO3</td>
<td>Yellowish-brown</td>
<td>Light yellow</td>
</tr>
<tr>
<td>Sample + 10% NH3</td>
<td>Brown</td>
<td>Green</td>
</tr>
</tbody>
</table>

### Quantitative Estimation

<table>
<thead>
<tr>
<th></th>
<th>Hamsa Mandura</th>
<th>Vidangadi Loha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total iron</td>
<td>26.34%</td>
<td>28.36%</td>
</tr>
<tr>
<td>Ferric</td>
<td>5.36%</td>
<td>22.11%</td>
</tr>
<tr>
<td>Ferrous</td>
<td>20.98%</td>
<td>6.25%</td>
</tr>
</tbody>
</table>

### FTIR

Fourier-transform infrared spectroscopy (FTIR) is a technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas.

**DISCUSSION**

Organoleptic characters of Hamsa Mandura and Vidangadi Loha show a slight variation in color and taste only, as Hamsa Mandura is brick red in color and astringent in test, while Vidangadi Loha is brownish-red with astringent taste having slight bitterness.
Loss on drying is a loss of weight expressed as percentage w/w resulting from water (moisture) and volatile matter of any kind.[18] Total ash determination is done to determine the amount of inorganic constituents left after biological materials are burnt.[19] Both Hamsa Mandura and Vidangadi Loha read nearby values, respectively, being 58.40% and 58.25%. Of obtained ash, 5.55% and 5.24% were, respectively, insoluble in diluted HCl.

pH is numeric scale to specify acidity or basicity of aqueous solution. Every single difference in pH measurement is equivalent to a ten-fold difference in hydrogen ion concentration.[20] The difference of 1.33 was noted in both as Hamsa Mandura being 5.46 while Vidangadi Loha being 4.13. Potassium is also marked more in Hamsa Mandura than Vidangadi Loha being 3.64% and 1.79% in sequence.

Preliminary phytochemical tests for both Hamsa Mandura and Vidangadi Loha exhibited similar pattern of constituents. Protein was observed as absent while carbohydrate, alkaloid, anthraquinone glycosides, flavonoids, tannin, terpenoids, and phytosteroids were noted presently. Differences in fluorescence testings are quite obvious as color of Hamsa Mandura was brick red while Vidangadi Loha was brownish-red. The ingredients of Hamsa Mandura and Vidangadi Loha differ in forms of iron as ferric and ferrous. Accordingly, they react differently with bases and acids displaying color differences in fluorescence tests.

Quantitative estimation shows absolved difference in the quantity of iron as well as form of iron present with Hamsa Mandura and Vidangadi Loha. Total iron is a difference of 2.02% being 26.34% in Hamsa Mandura while 28.36% in Vidangadi Loha. However, greater differences lie with the form of iron as ferric form was noted more in case of Vidangadi Loha with 22.11% in comparison to 5.36% of Hamsa Mandura, while ferrous form was recorded 20.98% in Hamsa Mandura in comparison to 6.25% of Vidangadi Loha.

Elemental qualitative tests using energy dispersive X-ray show elements, namely, Si, S, S, Rh, K, Ca, Ti, Cr, Mn, Fe, Cu, Zn, and Ar which are present in both cases, while Sr, V, Zr, Al, and P are only present with Hamsa Mandura. Even the quantitative estimation out of total inorganic constituents shows differentiation in common elemental percentage. Iron is 73.52% of total inorganics in Hamsa Mandura, while it is reported 95.12% of total inorganics in Vidangadi Loha. Another greater difference among the inorganics is calcium and silicon being 6.53% and 9.32% in Hamsa Mandura. Only they are, respectively, 0.70% and 1.00% in Vidangadi Loha.

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XRD shows differences in peaks with 2-theta values, interplanar space, and therefore, in Miller indices with respective peaks except nearly similarities, interplanar distances of 2.68, 2.50–2.51, and 1.69 at 2-theta of 33.30–33.39, 35.73–35.77, and 54.23. Only peak of 33.30–33.39 2-theta values exhibited miller indices of face-centered cubic. All other peaks in both cases are either of primitive cubic or body-centered cubic.[21,22]

FTIR analysis reveals peaks of transmittance versus characteristic absorption with chances of different functional
groups. Both show aryl disulfide, C-O stretch, N-O stretch, C=C stretch, and N-H stretch. A slight variation is seen in Vidangadi Loha with C-Br stretch as it is not marked in Hamsa Mandura.[23-26]

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Source of Support: Nil. Conflict of Interest: None declared.
Factors influencing the dose

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Abstract

Ayurved strongly emphasis on preventive and promotive aspect of health rather than curative. Posology is the branch of dose. All pharmacopoeias prescribe the doses of drug for internal use. The dose is usually its own range. The minimum dose range is essential for eliciting an intended therapeutic response, whereas the maximum dose range is amount of the drug substance that can be tolerated by an average individual. In the administration of medicines, there are many factors that affect the dose such as age, sex, severity of disease, pathological state, tolerance, route of administration, and idiosyncracy. According to Ayurved, there are some factor related to doses describe by Acharya Charak in Viman isthan known as Ashtavidhivsheha ayatana as prakriti, karana, samyoga, raasi, desh, kaala, upayoga - samastha and upayukta.

Key words: Idiosyncracy, Pharmacopeias, Posology, Therapeutic

SUMMARY

Dose is the quantity amount administered or taken by a patient for the intended medicinal effect. In the administration of medicines, there are many factors that affect the dose: (1) Age is the most common factor that influences the amount of drug to be given. (2) Sex - female require smaller dose than the male due to presence of more body fat, (3) race - black usually require larger dose, (4) occupation persons who are working hard require larger dose than comparative other normal working persons, (5) time of administration - therapeutic effect depend on the time of administration. (6) Route of administration - in general intravenous dose of a drug is smaller than intramuscular, subcutaneous, and oral dose, (7) allergy some drug may produce an anaphylactic shock in allergic patient but not in normal patient, (8) tolerance - it can be required as a result of repeated administration of some drug. Psychological factors, habitual use and frequency, are also other factors, etc. According to Ayurved there are some factors related to dose describe by Acharya Charak known as Ashtavidhivsheha ayatana such as Prakriti, karana, samyoga, raashi, desha, kaala, upayoga-samstha, and upayukta. Anna is responsible for the production and growth of all living being. Matra of diet is that which does not harm. The root “Ash” here includes all types of diet. The quantity depends on the strength of digestive fire. The quantity cannot be the same for all persons because the strength of digestive fire varies in each individual. Acharya Charak said in Rasavimana that the quantity is considered in two ways: (1) Sarvagraha (total food) and other is (2) Parigraha (individual items). Lightness and heaviness of dietary items may also considered in respect of processing apart from their natural character. Light substances are predominant in akasa, vayu and agni mahabhutas, Acharya Charak omits akasa here because it is not so favorable for stimulation of fire. Heavy substances are predominant in prithvi and jal Mahabhutas, so heavy substance do not stimulate to fire.
Synthesis, spectral, structural characterization, thermal, luminescent, and antimicrobials studies of Co(II) complex of thiophene-2-carboxylic acid hydrazide

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E-mail: manoj_vns2005@yahoo.co.in

A new complex [Co(tcah)3].Cl2.2H2O (where tcah = thiophene-2-carboxylic acid hydrazide) has been synthesized and characterized by elemental analyses, infrared, ultraviolet-visible, and single crystal X-ray data. The octahedral geometry of the complex is stabilized by various types of intermolecular extended hydrogen bonding providing a supramolecular framework. Thermal behavior, luminescent and antimicrobials properties of the complex have also been studied.

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Figure 1: ORTEP diagram of [Co(tcah)3].Cl2.2H2O

Source of Support: Nil. Conflict of Interest: None declared.
Factors influencing by the storage condition and stability of ayurvedic medicine

Sonam Tiwari, Shankar Dayal Upadhyay, Ritendra Dohary

Department of Rasashastra and Bhaishajya Kalpana, Pt. Khushilal Sharma Government Ayurveda College & Institute, Bhopal, Madhya Pradesh, India

Abstract

Ayurveda is a well-documented traditional system of Indian medicine. It is one of the most ancient systems of life. Acharya Sharangdhar first mentioned about Saviryata Avadhi of various formulation that is known as Shelf life or expiry date, i.e., stability in the modern system of medicine. The stability is aimed, assuring that the drug or drug product remains within the specification established to ensure its identity, strength, quality, and purity. Environmental factors such as temperature, light, air, and humidity can affect stability. Many factors are influencing the storage condition including heat, air, light, and moisture. The temperature of storage is one of the most important factors that can affect the stability of medicine. The shelf life period of each drug will depend on the various factors such as environmental factor, storage condition, container humidity, and packing. All these factors can be prevented by proper and carefully preparation and packing.

Key words: Saviryata Avadhi, stability, storage condition

INTRODUCTION

Ayurveda is a well-documented traditional system of Indian medicine. It is one of the most ancient systems of life.

Sairyata Avadhi - Acharya Sharangdhar, first mentioned about Saviryata Avadhi of various formulation that is known as Shelf life or expiry date, i.e., stability in the modern system of medicine.

Acharya Sharangdhar explained Saviryata Avadhi as the period during which the drugs contain its Veerya or potency. He has also specified the use of raw drugs for the preparation of various formulations in the context of its stability.

Acharya Charaka also explained that Veerya of any drug is responsible for its pharmacological actions.

According to Sharangdhar Shelf life:

<table>
<thead>
<tr>
<th>Aushadha</th>
<th>Shelf life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Churn, Malhara</td>
<td>2 months</td>
</tr>
<tr>
<td>Vati</td>
<td>1 year</td>
</tr>
<tr>
<td>Avaleha, arka</td>
<td>1 year</td>
</tr>
<tr>
<td>Ghrit, Taila</td>
<td>4 months</td>
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<tr>
<td>Rasaushadhi, Bhasma</td>
<td>Better as old as</td>
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</tbody>
</table>

Stability

The stability is aimed, assuring that the drug or drug product remains within the specification established to ensure its identity, strength, quality, and purity.

The stability depends on various factors such as nature of the product, ingredients of the product, and packaging material.

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Aims and Objective

To obtain the best quality of medicines without influencing these factors such as:
- Environmental factor - Temperature
- Light
- Moisture content
- Storage condition
- Microorganism
- Packaging interaction
- pH
- Hydrolysis
- Oxidation and reduction

Environmental factors such as temperature, light, air (specifically oxygen, carbon dioxide, and water vapor), and humidity can affect stability.

Similarly, factors such as particle size, pH, properties of water, and other solvents employed, nature of container and the presence of other chemical resulting from contamination or from the intentional mixing of the different product can influence stability.

METHODS

- Temperature: High temperature accelerates oxidation, reduction, and hydrolysis reaction which lead to drug degradation.
- Light: Affects drug stability through its energy or thermal effect which leads to oxidation.
- Moisture: Water catalyzes chemical reaction as oxidation, hydrolysis, and reduction reaction. Water promotes microbial growth.
- pH: Acidic and Alkaline pH influence the rate of decomposition of most drugs. Many drugs are stable between pH 4-8.
- Hydrolysis: This is particularly important in systems containing water, e.g. solutions, suspension, and emulsion. It is also important in the deterioration of ingredients contained in solid dosage forms, since water may enter as vapors from the atmosphere or as water of crystallization in other ingredients.
- Oxidation: Oxidation and reduction involve the loss and gain of electrons, respectively. Many drugs will react with atmospheric oxygen, so oxidation is a prime cause of degradation.
- Storage condition: Proper storage of medicine is always an important consideration during periods of extreme heat or cold. Drugs can undergo physical, chemical, and microbial changes on storage.

Many factors are influencing the storage condition including heat, air, light, and moisture.

The temperature of storage is one of the most important factors that can affect the stability of medicine.

Different storage condition is required in pharmacies:
- Room temperature: Most of the pharmaceutical activity are done at room temperature 20–25°C.
- Cool storage condition: 8–15°C temperature is known as cool storage condition.
- Cold storage condition: Cold condition is from 2°C to 8°C temperature. This temperature decreases the rate of chemical reaction as well as the microbial growth.
- Fridge storage condition: 4 to 2°C temperature.

CONCLUSION

The Saviryata Avadhi is said to be an important part in pharmacognosy. The shelf life period of each drug will depend on the many factors such as environmental factor, storage condition, container humidity, and packing. After the shelf life period, the drug will lose its potency. It can be prevented by proper and care full preparation and packing.

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Mode of drug administration

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Abstract

The route of administration is the way through which different drug preparations are administrated to the body according to patient’s Sharirk and Manasik bala and Rogas. Various routes of administrations play a role in the bioavailability of the active drug in the body. There are various ways of administration of medications as oral, parenteral, intramuscular, and intravenous. Route of administration differs from patient to patient based on the state or condition of the patient so that can be convenient for giving the drug. As such few disadvantages and loopholes are with the administration of drugs, if they are consumed in larger quantities, or if any misuse is done. Proper guidelines and ethics should be followed before administering the medicine or drug into the body. This is an attempt for the initials of field to familiarize with the routes of administrations with their significances.

Key words: Bioavailability, drug, route

INTRODUCTION

Ayurvedic medicine is the ancient system of medicine from India which is called as the science of life. In Ayurveda, the medicine that is employed in management of various diseases and for rejuvenation purpose includes vegetables, animal, and mineral origin products. Currently, more than 600 herbal formulae and 250 single plant drugs are used in ayurvedic practise. Ayurvedic formulations are in the form of liquids, tablets, powders, ghee, etc. The dosage, route of administration, and time of administration depend on the nature and type of Doshic imbalance. The Ayurveda drugs are of three categories, some alleviate doshas, some vitiate dhatus, and some are good for maintenance of positive health.

The principles of drug actions are understood using the certain principles such as rasa, guna, virya, vipaka, and karma.[1]

METHODS

The Oral Route

The drugs are administered through the oral route either for their local action happening through the rasā or for the means of absorption by the alimentary tract through the vīrya, vipāka, and prabhāva of the drugs. Sometimes, certain drugs produce a systematic effect, by getting absorbed through the mucous membrane of the oral cavity such as śūtaśekara, hemagarbha, and nāgavalli. Some yogas are used as lozenges and held locally in the mouth to be chewed until they get completely dissolved to produce viable clinical result as in - khadirādi and yaśī.[2]

Abhyanga

Acharya dalhana has explained in detail about the absorption of Śneha (Oleation) used in Abhyanga procedure, accordingly the oil used in Abhyanga can reach up to the different Dhatus if it is applied for the sufficient time. Hence, it is clear that the drug used in the Abhyanga gets absorbed by the skin. Dalhana also mentions that, when Śneha drug reaches to the particular Dhatu, it subsites or cures the diseases of that particular Dhatu Caraka has also described that Vayu dominates in the Sparshanendriya, i.e., tactile sensory organ, and this sensory organ is lodged in the skin. The Abhyanga is exceedingly beneficial to the skin, so one should practice it regularly.[3]

Basti

Basti being the most widely used and highly effective treatment modality in the Ayurveda, and Anuvasana Basti after reaching in the rectum and colon causes secretion.
of bile from gallbladder which leads to the formation of conjugate micelles which is absorbed through passive diffusion. Especially, short-chain fatty acid present in Sneha of Anuvasaana Basti may absorb from colon and large intestine part of gastrointestinal tract and break the pathology of disease. In Ayurveda classics, various Basti Dravya is mentioned in diverse proportion in different diseases, and it again confirms pharmacodynamics of Basti through absorption mechanism. The latest concept of system biology makes this clearer how Basti can act on the various systems. This theory believes that all the organs are interconnected at molecular level. Any molecular incident is transformed at cellular level, then tissue level, and ultimately, at organ level. Each molecule of the body is in contact with another molecule of body directly or indirectly, if we alter the pathophysiology at one level results into changes in pathophysiology at another level. Thus, whatever the effects of Basti are on gastrointestinal system, it will definitely affect another systems and help to achieve the bodily internal homeostasis. Ulcerative colitis is a good example to understand the functioning of system biology. Colon has a large number of bacterial floras which bestow the body by producing certain factor of the: “B” group of vitamins and “K.” It has shown that this flora flourishes abundantly on administration of Sneha Basti. Maybe the fact in it, provide a favorable environment for their growth and help in healing up of intestinal ulcer by providing a coat on the one hand, while it normalizes appetite, digestion, and absorption function of gastrointestinal tract on the other hand and also relives psychological features along with it.

Nasyakarma

It is a process wherein the drug herbalized oils and liquid medicines are administered through the nostrils. Since the nose is the gateway of the head, it is highly effective in curing a number of diseases pertaining to the head, if it is performed systematically. It cleanses and opens the channels of the head, thereby improving the process of oxygenation prana, which has a direct influence on the functioning of the brain. It is beneficial if done on a regular basis, because it keeps the eyes, nose, and ear healthy. It also prevents the early graying of hair and bear. Head is the ruler of Indriyas senses and Kapha dosha. It works on Kapha dosha. The medicine given through Nasya reaches up to the brain, and thus, it pulls out all the disease-causing doshas impurities. Karnapoorna is the best for vata imbalances including Insomnia, ringing in the ears, headaches, and anxiety which improves hearing, loosens ear wax, strengthens the bones in the ear, and prevents neck stiffness.

Hence, in this way, mode of administrations plays a marked role in the bioavailability of the active drug in the body.

Karma Purna

It includes a range of effective oil treatments for reducing the Vata content in the ears which helps fight jaw tension, ringing in the ears, sore throats, colds, sinus infections, and congestions of the head. The treatment includes using warm sesame oil and massage in a defined way to soothe the central nervous system. The procedure starts with pouring warm herbal oils or medicated liquids into the ears.

This bathing of the ears with medicated substances is beneficial for both the aggravated nervous system as well as the over worked and over stressed mind. The coating of the oils in the ears creates a cooling and calming effect that helps in eliminating the burning sensation of the feet. Even body pains and aches can be cured by ear purification by the means of Karna Purna.

CONCLUSION

There are different modes of drug administration which enhances the effect of drug action. If a drug is given in Abhyanga form, it pacifies Vata and Pitta dosha, calms the nerves, and moves the lymph, aiding in detoxification.

Vasti establishes lifespan (Vaya) and age; it is called Asthapana Vasti. Basti establishes unparalleled health and immunity in all the cells in the body. All the functions of the body will be carried out in a smooth way. A new life element is created in each and every cell enabling them to live more and live healthy. This Vasti enhances longevity and establishes youthfulness.

The medicine given through Nasya reaches up to the brain, and thus, it pulls out all the disease-causing doshas impurities.

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Factors influencing safety of Ayurvedic formulation

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Abstract

The use of herbal medicine continues to expand rapidly across the world. Many people now take herbal medicines or herbal for their health care in different national healthcare settings. However, mass media reports of adverse events tend to be sensational and give a negative impression regarding the use of herbal medicines in general rather than identifying causes of these events, which may relate to a variety of issues. The safety of herbal authorities and the general public. The World Health Organization (WHO) received an urgent request from its member states, through the national pharmacovigilance centers participating in the WHO international drug monitoring program and drug regulatory authorities to assist member states to strengthen national capacity in monitoring the safety of herbal medicine and in analyzing the causes of adverse events, and to share safety information at national, regional, and global level.

Key words: Pharmacovigilance, safety study, World Health Organization

INTRODUCTION

Objective

Reported and documented side effects (according to established principles of pharmacovigilance) of a herb or herb mixture, its closely related species constituents of the herb and its preparation/finished product should be taken into account when decision is made about the need for new pharmacological or toxicological studies. The absence of any reported or documented side effects is not an absolute assurance of safety for herbal medicines. However, a full range of toxicological tests may not be necessary. Suggested tests include immunotoxicity, genotoxicity, carcinogenicity, and reproductive toxicity. World Health Organization (WHO) research guidelines for evaluating the safety of herbal medicines can also be consulted for these as well as for other appropriate toxicity tests.

MATERIALS AND METHODS

In general, traditional procedure-based therapies are relatively safe, if they are performed properly by well-trained practitioners. But accidents do occasionally occur most probably when practitioners are not fully trained. One problem in ensuring the safety of therapy is variable quality control in the manufacture of therapy equipment.

Assessment of Safety

This should cover all relevant aspects of the safety assessment of a medicinal product. A guiding principle should be that if the product has been traditionally used without demonstrated harm.

(a). Toxicological studies - Toxicological studies if available, should be part of the assessment. Two types of tests acute toxicity test, long-term toxicity test.

(b). Documentation of safety based on experience - As a basic rule, documentation of a long period of use should be taken into consideration when assessing safety. This means that when there are no detailed toxicological studies, documented experience of long-term use without evidence of safety problems should form the basis of risk assessment. The period of use, the health disorders treated the number of users and the countries with experience should be specified if a toxicological risk is known, toxicity data must be submitted. The assessment of risk weather independent of dose or related to dose should be documented. In the latter case, the dosage specification must be an important part of the risk
assessment. An explanation of the risks should be given, if possible.

RESULT

Research and evaluation of herbal medicines without a long history of use or which have not been previously researched should follow WHO’s research guidelines for evaluating the safety of herbal medicine.

CONCLUSION

One problem in ensuring the safety of therapy is variable quality control in the manufacture of the therapy equipment. The most effective safety measures, therefore, are to ensure that the equipment used is of good quality and the practitioner who uses it should have good knowledge.

[Source of Support: Nil. Conflict of Interest: None declared.]
Phytochemistry and pharmacology of Sida spinosa

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Abstract

*Sida spinosa* Linn. (Malvaceae) is an erect, perennial shrub found throughout the hotter parts of India. The tribes used this for the treatment of ulcers, pain, asthma, burning sensation, skin diseases, snake bite, gonorrhea, diarrhea, and dysentery. Phytochemical investigations indicate that 26 compounds reported from the plant belong to various chemical category, namely, aliphatics, ecdysteroids, alkaloids, steroid, and other compounds. Pharmacological activities of different parts of the plant reported include antioxidant, antipyretic, antidiabetic, antihyperlipidemic, antimicrobial, antiulcer, wound healing, and diuretic activity. In the present review, the literature data on the phytochemical and biological investigations on the *S. spinosa* are summarized up to December 2017.

Keywords: *Sida spinosa*, antioxidant, antipyretic, antihyperlipidemic

INTRODUCTION

*Sida spinosa* Linn. (Malvaceae), commonly known as Kantakinibala (prickly fanpetals) is an erect, perennial shrub found throughout the hotter parts of India, ascending to an altitude of 4400 ft. The plant is stellate, 30 cm–1 m tall with filiform leaves, stipules are 2–5 mm long, petiole 2-20 mm long, 1–3 spiny tubercles present on the stem at the base of petiole, lanceolate to ovate, oblong or somewhat orbicular, round at base, acute or obtuse at apex, and serrate. Flowers axillary, solitary or 2–5 in fascicles in terminal branches, pedicel 2–5 mm in, fruit up to 0.2 cm long, joined near the middle or top. Calyx is 4-5 mm long. Fruits are depressed globose with pubescent above. The glabrous seeds of *S. spinosa* are 1.5 mm long having brown to black color.[1]

ETHNOPHARMACOLOGY

The plant *S. spinosa* has been claimed to possess various medicinal properties. The root leaves and fruits obliterate Kapha and Vata stimulant in homicide diseases, heal ulcers and biliousness further the plant is also useful in urinary and skin diseases. The fruit is also astringent and cooling.[2,3] *S. spinosa* is used in the treatment of asthma and other chest ailments and as a tonic.[4] The leaves have reportedly been used for the treatment of some skin diseases and as oral snake bite treatment.[5] The roots and leaves of *S. spinosa* are used in the treatment of diarrhea and dysentery.[6] The leaves are demulcent and refrigerant and are useful in cases of gonorrhea, gleet, and scalding urine.[7] The decoction of the root bark and root is used as a demulcent in irritability of the bladder and gonorrhea.[8,9] The root acts as a gentle tonic and diaphoretic and is complied in mild cases of debility and fever.[10] The root decoction is given as a demulcent in irritability of bladder and genitourinary tract. Leaves of *S. spinosa* are used as demulcent and refrigerant; used for scalding urine.[11] The whole plant of *S. spinosa* is used in the healing of pain, arthritis, asthma, bronchitis, burning sensation, hemorrhoids, intermittent fever, and general debility.[12]

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## PHYTOCHEMISTRY

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PHARMACOLOGY

Wound Healing Activity

The wound healing activity of herbal ointment containing aqueous extract of leaves of *S. spinosa* was estimated by excision wound model in Wistar rats for 16 days. In this model wound area and percentage of the epithelization period is used as the parameter. On the 16th day, the Wistar rats showed 90.90% and 95.94% wound healing activity at 2% w/w and 4% w/w aqueous extract of leaves of *S. spinosa*, respectively. Whereas nitrofurazone (standard drug) showed 100% wound healing activity in rats. No patches on treated rat skin were observed during skin irritant test. The epithelization time revealed that both test treated group were found to be significant and comparable with control.[16]

In another study, the ointment of ethanol leaves extract of *S. spinosa* was evaluated by excision and incision model of wound healing potential. In the excision model, the extract at 5% w/w and 10% w/w shows facilitates the healing process as evidenced by the increase in the tensile strength.[17]

Antimicrobial Activity

The ethanol whole plant extract of *S. spinosa* was evaluated for antimicrobial activity of against 4 bacterial (*Staphylococcus aureus, Bacillus subtilis, Escherichia coli*, and *Pseudomonas aeruginosa*) and 2 fungal (*Candida albicans* and *Aspergillus niger*). The ethanol whole plant extract of *S. spinosa* inhibited the growth of *S. aureus, B. subtilis, E. coli*, and *P. aeruginosa, C. albicans, and A. niger* at 500 μg/disc.[18] The ethanol leaves extract of *S. spinosa* shows antimicrobial activity against same above bacteria and fungi at same dilution of extract.[19] The methanol, ethanol, and hexane extract of *S. spinosa* was evaluated for antimicrobial activity of against *Streptococcus pyogenes, S. aureus, E. coli, P. aeruginosa*, and *Streptococcus pneumoniae* by agar well diffusion method. All three extracts showed moderate antimicrobial activity against above-mentioned microbes.[20]

The antibacterial activity of ethanol leaves extract was determined using cup-plate agar well diffusion method against *E. coli, B. subtilis, S. aureus, P. aeruginosa*, and *Proteus vulgaris*. The ethanol extract of the plant exhibited potent antibacterial activity against Gram-positive bacteria strain (*B. subtilis*) showing inhibition zone 12 ± 0.26 mm whereas the plant exhibited least susceptible zone against the Gram-negative strain (*E. coli*) with the inhibition zone 6 ± 0.68 mm.[21]

The ethanol root extract of *S. spinosa* was evaluated for antimicrobial activity against *S. aureus, B. subtilis, E. coli*, and *S. aeruginosa*, by disc diffusion and microdilution methods. The ethanol root extract of *S. spinosa* has shown the zone of inhibition of 15, 13, 9, 8, mm at 50 μl against *Pseudomonas, E. coli, Bacillus Sp., and S. Aureus*, respectively.[22]

In another study, the aqueous root extract of *S. spinosa* has shown significant antimicrobial activity against *S. aureus, B. subtilis, E. coli, and P. aeruginosa*.[23]

Antioxidant Activity

The *S. spinosa* from the Western Ghats, India, have been evaluated for in vitro antioxidant activity. The methanol root extracts (10% w/v) of *S. spinosa* possessed moderate (total phenolic content: 1.35 ± 0.07 mg caffeic acid equivalent/g and 1.56 ± 0.08 mg tannic acid equivalant/g) and also possessed highest antioxidant activities in 2,2-diphenylpicrylhydrazyl (DPPH) radical scavenging (37.32 ± 1.87 % radical scavenging activity, trolox equivalent antioxidant capacity: 408.50 ± 20.43 μM; ascorbic acid
equivalent antioxidant capacity: 351.60 ± 17.58 μM) and ferric reducing antioxidant power assays (TEAC: 396.33 ± 19.82 μM; AEAC: 406.33 ± 20.32 μM). Disparate DPPH and ferric reducing antioxidant power activity, 2,2’-azinobis ABTS+antioxidant activity were found highest in *S. spinosa* (TEAC: 877.67 ± 43.88 μM; AEAC 967.67 ± 48.38 μM).[24]

In another study, *In vitro*, the antioxidant activity of ethanol extract of the whole plant of *S. spinosa* was performed. The ethanol extract of the plant exhibited strong scavenging effects on DPPH free radicals, hydroxyl radicals, with IC\textsubscript{50} were (58.21 ± 0.9854), (25.46 ± 0.04), μg/mL, respectively, whereas nitric oxide and superoxide anion showed 67.34% and 38.14 % inhibition at 150 μg/mL. The presence of flavonoid and tannin in the ethanol extract is likely to be responsible for the *in vitro* antioxidant.[25]

### Antiulcer Activity

Protective and curative effect of ethanol extract of *S. spinosa* against pylorus ligation induced gastric ulcer in rats was examined. The ethanol leaves extract of *S. spinosa* showed the significant antiulcer effect in a dose-dependent manner. At a dose 100 and 200 mg/kg showed protection effect of 70.85% and 73.42%, respectively, whereas famotidine (standard drug) showed protection index of 72% at a dose of 20 mg/kg. The histopathological studies showed the reduction in ulcer focus and a hyperplastic gastric mucosa with regenerating mucosal epithelium that at a dose 100 mg/kg.[26]

### Diuretic activity

The diuretic activity of aqueous and alcoholic leaves extracts of *S. spinosa* was evaluated in Wistar rats. The study possesses the excellent diuretic activity of aqueous and alcoholic leaves extracts of *S. spinosa*. At the dose of 100 mg/kg, urine volume, cation, and anion excretion were increased, Na+/K+ ratio was found to be 2.04, and 2.18 for aqueous and alcoholic leaves extract, respectively. The alcoholic leaves extracts showed most effective in increasing urinary electrolyte concentration of all the ions that is Sodium, Potassium, and Chloride.[27]

### Antihyperglycemic Activity

The antihyperglycemic activity of the ethanol and aqueous extract of roots of *S. spinosa* was estimated in streptozotocin-induced Type-II diabetic rats. Type-II diabetic rats were administered ethanol and aqueous extract root extract (200 and 400 mg/kg, p.o.) of the plant drug or vehicle (gum acacia solution) or standard drug glibenclamide (10 mg/kg p.o.) for 15 days. Blood samples were collected by retro-orbital puncture. For oral glucose tolerance tests, glucose (2 g/kg, p.o.) was administered to nondiabetic rats treated with glibenclamide (10 mg/kg, p.o.) and ethanol and aqueous extract of roots of *S. spinosa*. The serum glucose levels were analyzed at 0, 30, 60, and 120 min after drug administration. For insulin tolerance test, insulin (2 U/kg, i.v.) was administered to fasted rats. Blood samples were collected before insulin load at 0 min and at 10, 20, and 30 min after drug administration. Serum glucose levels were analyzed 0, 1, 2, and 4-hour using glucose oxidase-peroxidase reactive strips and glucometer. Ethanol and aqueous extract root extract (200 and 400 mg/kg, p.o.) induced the significant reduction of fasting blood glucose levels in streptozotocin-induced type-II diabetic rats. In the oral glucose tolerance and insulin tolerance test, the extract increased the glucose and insulin tolerance.[24]

### Antihyperlipidemic Activity

Chronic administration of glibenclamide and ethanol and aqueous extract of roots of *S. spinosa* to diabetic rats showed significant restoration in lipid parameters to normal values, when compared with diabetic control rats. The ethanol extract (400 mg/kg) showed 23.27% reduction in serum triglycerides and aqueous extract (400 mg/kg) showed 27.26% reduction in serum total cholesterol compared to glibenclamide treated diabetic rats where 25.81% and 38% reduction in serum triglycerides and serum total cholesterol was found. Ethanol extract (400 mg/kg) and glibenclamide showed 32.60% and 29.82% reduction in VLDL-c level whereas 50.03% and 72.63% reduction in LDL-c level was found in the aqueous extract (400 mg/kg) and glibenclamide treated groups. The level of HDL-c was significantly increased in glibenclamide, and ethanol extract treated groups. Ethanol and aqueous extract treated groups have reduced serum triglycerides and serum total cholesterol, VLDL-cholesterol, LDL-cholesterol level, and increased HDL-cholesterol level compared to diabetic control group.[28]

### Antipyretic Activity

Aqueous extract of the roots of *S. spinosa* was evaluated for its antipyretic potential on yeast-induced pyrexia in...
albino rats. Yeast suspension (10 ml/kg) increased rectal temperature 17 h after subcutaneous injection. Aqueous extract of the root of the plant at doses of 100, 200, and 400 mg/kg, p.o. produced the significant reduction in yeast induced elevated temperature in a dose-dependent manner. The effect extended up to 5 h after the drug administration. The antipyretic effect of aqueous extract of root of S. spinosa was found comparable to that of standard drug aspirin (100 mg/kg, p.o.).[23]

Another study ethanol extract of the roots of S. spinosa has evaluated for its antipyretic potential on brewer’s yeast and 2,4-dinitrophenol induced pyrexia in rats. The ethanol extract of the roots of S. spinosa at a dose of 400 mg/kg has significantly attenuated Brewer’s yeast induced hyperthermia and 2,4-dinitrophenol induced pyrexia was found to be 74.12% and 65.73% at 3 h.[22]

### CONCLUSION

**S. spinosa** have been widely prescribed in folkloric medicine in India, China, and African peoples for an extensive range of indications including dysentery, rheumatism, diarrhea and malaria, diseases, skin diseases, gonorrhea, renal inflammation, and cardiac diseases. Utmost of these traditional applications have been supported by the pharmacological actions of the plant extracts. Furthermore, **S. spinosa** hold wound healing, anti-diarrheal, antipyretic, diuretic and antidiabetic properties. Most of these therapeutic properties are associated with the presence or absence of alkaloids such as ephedrine, vasicine, and ecdysteroids. **S. spinosa** is in the mucosa diseases such as nasal blockage, throat diseases, asthma, including bronchitis (Ghosal et al., 1975). **S. spinosa** is in the healing of malaria and other fevers. **S. spinosa** is in the external treatment of boils, skin diseases, and abscesses. It would be an excellent approach for the preparation of an ointment for relief from these skin diseases as these plants have potent antimicrobial activity against S. aureus, *B. subtilis*, *E. coli* and *P. aeruginosa*, and *C. albicans* (Iroha et al., 2009; Ouedraogo et al., 2012). **S. spinosa** is in the treatment of cardiac diseases. Moreover, some of the validation studies such as conjunctivitis, cancer, urinary diseases, and piles as well as studies on untouched **S. spinosa** are the parts of additional research.

### REFERENCES


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Influence of shodhana samskar W. S. R. to Vishopvisha

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Abstract

Many of herbs with toxicity liability have been useful in some diseased conditions. In spite of their toxic nature, Ayurveda describes that these toxic herbs should be used medicinally after proper detoxification processes. The process of detoxification without harming its medicinal properties is referred to as the process of shodhana or shodhana prakriya in Ayurveda. Charaka says “Even an acute poison can become an excellent drug if it is properly administered.” On the other hand, even a drug if not properly administered becomes an acute poison. Vishopvisha (Poisons) when used incautiously, readily spread throughout body and cause even death due to their qualities such as Vyavayi, Tiksna, and Aasu, but when used cautiously in small quantity after proper purification act as Amrta, i.e. it has very good clinical efficacy. With the help of shodhana samskara, qualitative changes are carried out in vishopvisha. Recent researches have proved the impact of shodhana on various poisonous herbs used for medicinal purpose.

Key words: Ayurveda, vishopvisha, poisons, shodhana

INTRODUCTION

In classical text, poisonous drugs are described under the term of Visha and Upvisha. “Visha” includes more poisonous drugs which produce acute toxic symptoms lead to death on consumption (like Vatsanabha). Upvisha is the group of drugs which were less toxic in nature and not as lethal as Visha but produces certain toxic symptoms on consumptions or administration. Visha dravya along with their undesirable properties is also incorporated with certain desirable assets, by which they act faster than other medicines. Hence, the medicines containing these dravyas as ingredient can be used for emergency treatments or in atyayika chikitsa after proper shodhana (detoxification). Acharya Charaka also says that “Even an acute poison can become an excellent drug if it is properly administered.”¹ The concept of shodhana was highly accepted by the pioneers of Rashshastra (8 century A.D.), especially for the purification of Visha–Upvisha and herbomineral drugs. The process of detoxification is said to bring about favorable changes that modify the therapeutic effect and also render the drug free from poisonous effect. A well-said definition for Shodhana process is given in Ayurveda Prakash that the bad qualities those are present in the un-purified will be reduced or nullified after subjecting to Shodhana process.²

Rasarnava appears to be first text to mention about Vishopvisha classification. After Rasarnava, Rasaratnakar, Rasendra Chunamani, and Rasa Ratna Sannuchya have mentioned about five visha, while other texts such as Rasendra Chintamani, Bhavaprakasha, Sharangdhar Samhita, and Ayurveda Prakash have enumerated nine dravyas as vishas including vatsnabha. The author of Rasa Taringini described only Vatsnabha in Visha group considering its medicinal importance, common availability and frequent use in therapeutics. The other drugs of poisonous nature have been included in “Upvisha” group.

IMPORTANCE OF SHODHANA

Vatsanabh

Shodhita Vatsanabha in anesthetized frog showed positive inotropic and negative chronotropic effects through a
Table 1: Different poisonous herb included in Upvisha group by various texts

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Table 2: Different media (Dravyas) for Shodhana purpose W. S. R. to Visha (Vatsanabha)

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significant increase in the height of force of contraction and increase in heart rate at a very low concentration of Shodhita Vatsanabha.[27] In other research work, aconitine enhanced the effects of adrenaline, antagonized the T wave inversion caused by calcium chloride, and antagonized the initial elevation and the subsequent depression of ST segment induced by the posterior pituitary preparations in rabbits and guinea pigs. It increased the toxic effects of strophanthin G on the heart.[28]

Kupilu

Variations in strychnine content after purification in different media of seed powder of Kupilu was analyzed. According to Mitra et al.,[29] percentage of strychnine is in decreasing order in crude Kupilu (unpurified) is 0.63% > % after purification in cow’s urine, milk, ghee is 0.62%>% after purification in cow’s ghee is 0.52% and Brucine % after purification in cow’s ghee is 0.87% > % in crude Kupilu (unpurified) is 0.77%> % after purification in cow’s urine, milk, ghee is 0.57%. Out of these three methods, maximum reduction in strychnine and brucine contents was found when the seeds were purified by keeping them in cow’s urine, milk, ghee is 0.62%>% after purification in cow’s milk is 0.52% and Brucine % after purification in cow’s ghee is 0.87% > % in crude Kupilu (unpurified) is 0.77%> % after purification in cow’s urine, milk, ghee is 0.57%. Out of these three methods, maximum reduction in strychnine and brucine contents was found when the seeds were purified by keeping them in cow’s urine for 7 days followed by boiling in cow’s milk for 3 h.[29] In other study, seeds of nux-vomica were also processed in castor oil by HPLC where strychnine and brucine content in the processed seed reduced up to 67.40% and 46.58%, respectively, as compared to unprocessed seeds.[30] Detoxified seeds are also found to be more hepatoprotective than raw seeds when examined in albino rats.[31]

Gunja

The absence of toxicity and presence of anti-inflammatory activity of detoxified Abrus seed extract confirmed that the Swedana process is effective in carrying out the detoxification without affecting its therapeutic potential.

In hemagglutination assay, non-detoxified extract showed higher agglutination of red blood cells than detoxified extract means absence of abrin band indicating riddance of toxic hemagglutinating proteins by Shodhana. Subsequently, in in vitro cytotoxicity screening, the results were obtained as percent cell growth curve which expresses the reduction in the cytotoxicity of detoxified extract in HeLa cells as compared to the nondetoxified extract. As well as in this study, detoxified extract was found to retain the cell viability on zebrafish (Danio rerio) indicating a reduction in the toxicity propensity of the detoxified extract.[32]

Dhatura

After completion of sodhana process of Dhatura, the color of gomutra which was light yellow had changed into dark brown color and color of godugdha changed into yellowish which indicates that some of the constituents of Dhatura were transferred into gomutra and godugdha.[33] In another study, % of hyoscyamine and scopolamine was decreased in both varieties of Dhatura after sodhana. In ashuddha Dhatura innoxia Mill. and ashuddha Dhatura metel Linn., % of hyoscyamine and scopolamine are 17.67% and 6.86% and 3.71% and 3.2%, respectively. In shuddha Dhatura innoxia Mill. and shuddha Dhatura metel Linn., % of hyoscyamine and scopolamine are 0.0% and 0.55% and 1.01% and 0.0%, respectively. Total alkaloid contents were decreased, whereas total protein was increased after sodhana of Dhatura.[34]

Karveera

The impact of shodhana on Peeta Karveera Mula was evaluated by physicochemical and chromatographic evaluation of three different media such as gomutra, godugdha, and distilled water which showed different Rf value and proved that godugdha media have been significantly purificatory media compared to gomutra and distilled water.[35]

Bhallataka

In Bhallataka, bilhawanols and anacardic acids are the main chemical constituents which responsible for the blisters. Bilhawanol is known as urushiol, and anacardic acids are also closely related to urushiol. Shodhana (purificatory procedure) increases the anacardol level in shodhita bhallataka due to decarboxylation of the oil and conversion of toxic urushiol into anacardol, the anacardic acid gets converted into less toxic anacardol.[36] In other study, quantitative estimation of anacardol in raw bhallataka was 47.51% and 50.62% in processed.[37]

Jaipala

In one study, when seeds of Jaipal are subjected to swedana with milk, the free crotonoleic acid may bound with fatty acid of milk, resulting in therapeutic property exhibition rather than poisonous effect and milk may also help in reducing the tikshna and ushan guna of Jaipala seeds by its mridu and sheeta property.[38,39]

Langali

The colchicine present in Langali is reported for its toxic effects. Shodhana process involves the soaking of roots and seeds in Gomutra for 24 h, then washing with water. After shodhana, the level of colchicine significantly reduces colchicine because it is polar in nature and therefore soluble in gomutra and water.[40]

CONCLUSION

It may be concluded that the traditional system of purification (Shodhana) can influence the phytochemical,
pharmacological, and toxicological profile of the poisonous plant drugs and thereby useful in increasing safety profile and efficacy of the drugs. It is worthwhile to adopt shodhana processes as per the Indian System of Medicine in the development of herbal formulations with application of modern technology to assess its safety and efficacy. Research studies have shown that the toxic constituents are transferred into media rendering the drug nontoxic. Specific Shodhana studies have shown that the toxic constituents are transferred modern technology to assess its safety and efficacy. Research processes as per the Indian System of Medicine in the pharmacological, and toxicological profile of the poisonous plant drugs and thereby useful in increasing safety profile and efficacy of the drugs.

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Clinical assessment of “Neeri KFT” in chronic kidney disease patients

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¹Department of ISM, Aggarwal Dharmarth Hospital, New Delhi, India, ²Research and Development, Aimil Pharmaceuticals (India) Ltd., New Delhi, India, ³Department of Clinical Practice, Aimil Healthcare and Research Centre, New Delhi, India

Abstract

In view of the overall health impact of chronic kidney disease, inventors understand the necessity of improving kidney function in adults with impaired kidney function. Neeri KFT provides an effective treatment option for adults with impaired kidney function who have been inadequately controlled on lifestyle with or without other antihypertensive agents such as diuretics, angiotensin-converting enzyme inhibitors, angiotensin II receptor antagonists, adrenergic receptor antagonists, and vasodilators. Neeri KFT is an appropriate option to consider for addition drug. Treatment with Neeri KFT produced clinically relevant and statistically significant reductions in serum creatinine, blood urea, and serum uric acid when compared with placebo. Neeri KFT showed the promising result with respect to decrease of 17% in serum creatinine, 18% in urea, and 13% in uric acid.

Key words: Chronic kidney disease, impaired kidney function, indian system medicine, Neeri KFT

INTRODUCTION

Among organ failure associated diseases, chronic kidney disease (CKD) is now becoming more common these days and is transformed from a subspecialty issue to global health concern.[1] Based on the WHO report, 13% of the population worldwide is affected by CKD and millions more are hailing from diabetes and hypertension background, as later two contribute nearly 40% and 28.4%, respectively.[2] CKD is characterized by gradual loss of kidney function to end-stage renal disease. Repeated dialysis and kidney transplant are widely used the treatment of CKD.[3] Both dialysis and kidney transplant put an expensive financial weight on patient, their families, and society on the one hand, while still arresting the process of kidney function deterioration, remain a big challenge. In the light of these facts, the use of traditional medicine (TM) for health aids self-healthcare and disease prevention, can actually reduce healthcare costs spent on CKD on the one hand, and plays a significant role in the treatment and prevention of the progression of renal diseases.[4] An extensive list of the single and compound medication specified in TM for treating kidney-related ailments such as Vikradoshas (kidney disorders), Mutrajana (facilitates urine formation), raktshodhak (blood purifier), mutrakrich (painful urination), mutral (diuretic), and shothahar (relieving edema) is Boerhaavia diffusa, Cichorium intybus, Solanum nigrum, Tinospora cordifolia, Nelumbo nucifera, Butea monosperma, Tribulus terrestris, Albizia lebbeck, Pterocarpus santalinus, Curcuma longa, Moringa oleifera, Vettiveria zizanioides, Hemidesmus indicus, Coriandrum sativum, and so on.[5-21] Taken together these findings, “Neeri KFT” an herbal formula has been developed by integrating clinical expertise with the best available clinical evidence from systematic research for achieving a synergistic impact in the form of safe and therapeutically effective for patient with disturbed kidney functions. The pre-clinical investigations of “Neeri KFT” on experimental rats revealed significant improvement in impaired kidney functions (such as serum creatinine, serum urea, serum albumin, and serum total protein), urine profile (proteinuria, glycosuria, and urinary creatinine), and also pronounced antioxidant-based protection.[22] The aim of the present study is to evaluate the safety and clinical efficacy of Neeri KFT with following objectives:

i. To prepare the standard drug as per pharmacopoeial procedures.

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ii. To find the safe limits of Neeri KFT dosage through acute toxicity in rats.
iii. To find the effect of Neeri KFT on kidney function parameters in a clinical trial.
iv. To develop information about drug effects (including possible adverse effect if any) associated with Neeri KFT in clinical practice based on Indian Market Survey.

**MATERIALS AND METHODS**

**Identification of Plants**

The medicinal plants [Table 1] were procured, from the local herbal market and authenticated in-house by Dr. H.B Singh, former chief scientist, Raw Materials Herbarium and Museum, NISCAIR, New Delhi. Authenticated voucher samples of raw material were preserved in research and development section of Aimil Pharmaceuticals (I) Ltd.

**Preparation of Neeri KFT**

All ingredients of Table 1 were individually weighed and coarsely powdered/chopped. For ingredients for aqueous extract, decoction was made by heating at 80°C for 8 h. Decoction was allowed to sediment, and supernatant liquid was decanted and filtered. Juices were prepared from juice ingredients. Sugar formulation/formulation sugar free was made, and decoction/juices were incorporated along with excipients.

**Standardization of Formulation**

The formulation was analyzed for various physicochemical parameters such as pH, weight per ml, total ash, and chloroform soluble extract according to the method given in API.[23]

**Phytochemical Analysis**

The phytochemical screening was carried out in the formulation using standard procedure.[24]

**Quantitative Estimation of Heavy Metals**

Analysis of heavy metals in the formulation was quantified as per the WHO guidelines.[25]

**Microbial Load Analysis**

Microbial load was tested for the polyherbal formulation which includes total bacterial count, total yeast, and molds count and the absence of *Escherichia coli*, *Salmonellae*, *Clostridia*, and *Shigella* as per the WHO guidelines.[25]

<table>
<thead>
<tr>
<th>Table 1: Composition of Neeri KFT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant</strong></td>
</tr>
<tr>
<td>Boerhaavia diffusa</td>
</tr>
<tr>
<td>Cichorium intybus</td>
</tr>
<tr>
<td>Solanum nigrum</td>
</tr>
<tr>
<td>Tinospora cordifolia</td>
</tr>
<tr>
<td>Nelumbo nucifera</td>
</tr>
<tr>
<td>Butea monosperma</td>
</tr>
<tr>
<td>Tribulus terrestris</td>
</tr>
<tr>
<td>Nelumbo nucifera</td>
</tr>
<tr>
<td>Albizia lebbeck</td>
</tr>
<tr>
<td>Pavonia odorata</td>
</tr>
<tr>
<td>Curcuma longa</td>
</tr>
<tr>
<td>Moringa oleifera</td>
</tr>
<tr>
<td>Vetiveria zizanioides</td>
</tr>
<tr>
<td>Hemidesmus indicus</td>
</tr>
<tr>
<td>Coriandrum sativum</td>
</tr>
<tr>
<td>Moringa oleifera</td>
</tr>
<tr>
<td>Crataeva nurvala</td>
</tr>
<tr>
<td>Amaranthus spinosus</td>
</tr>
<tr>
<td>Rheum emodi</td>
</tr>
<tr>
<td>Cucumis utilissimus</td>
</tr>
<tr>
<td>Carica papaya</td>
</tr>
<tr>
<td>Carica papaya</td>
</tr>
<tr>
<td>Piper cubeba</td>
</tr>
<tr>
<td>Ananas comosus</td>
</tr>
<tr>
<td>Lagenaria siceraria</td>
</tr>
<tr>
<td>Coriandrum sativum</td>
</tr>
<tr>
<td>Emblica officinalis</td>
</tr>
</tbody>
</table>

**High-performance Thin-layer Chromatography (HPTLC) Fingerprinting of the Polyherbal Formulation**

Accurately weighed 10 ml of the formulation was extracted thrice with methanol (50 ml) at room temperature (25°C ± 2°C) in a separating funnel. The methanolic extracts were filtered through Whatman No. 1 filter paper and combined. The combined extracts were concentrated under reduced pressure at a temperature of 45°C and freeze-dried. Accurately weighed 10 mg of the extracts were dissolved in 1 mL methanol and filtered through a 0.45 μm filter membrane; the filtrate was used as a sample solution, and 10 μl of the sample were applied on a pre-coated silica gel F254 on aluminum plates to a bandwidth of 8 mm using Linomat 5 TLC applicator. The plate was developed in toluene:ethyl acetate:formic acid (5.0:4.0:1.0 v/v). The developed plate was visualized under long UV. The plate was visualized and scanned at 366 nm using CAMAG Linomat 5.
The accelerated stability study of prepared formulation was carried out for 6 months. The formulation was kept at 40°C ± 2°C/75% RH ± 5% and formulation was stored in ambered-colored bet bottle. The parameters evaluated every month were pH, total solids, specific gravity, and viscosity. The quantitative estimation of phytoconstituents and microbial load was done at the beginning and at end of the 6 months period as per the ICH guidelines.[26]

Toxicity Studies

An acute oral toxicity study was conducted in accordance with the Organization for Economic Cooperation and Development 11–13 Guidelines 425 and 407, respectively.[27] The experimental protocol had been approved by the Institutional Animal Ethics Committee of Shree Dhanvantry Pharmaceutical Analysis and Research Centre Pvt. Ltd. with the Experimental Protocol Approval Number SDPARC/IAEC/2015/046 before the initiation of the study. Experiments were performed as per the instructions prescribed by the Committee for the Purpose of Conduct and Supervisions of Experiments on Rats, Ministry of Environment and Forest, Government of India.

**EXPERIMENTAL RATS**

Female albino Wistar (Mahaveer Enterprises, Hyderabad) weighing 180–200 g ± 20 were maintained under standard laboratory conditions of temperature (22°C ± 3°C) and humidity 30–70% with 12 h day:12 h night cycle. Rats had free access to water and rodent pellet diet (Hindustan Lever Ltd., Bengaluru, India).

**Acute Oral Toxicity Study**

Acute oral toxicity study of Neeri KFT carried out in 15 adult female Wistar as per the11 and 12 test guidelines 425. All rats were dosed orally once in a stepwise manner, i.e., next higher dose level was administered to next animal after observation of the previous animal for any mortality for 48 h. Dose levels were progressed in geometric progression with the factor of 2. Dosing was started by oral administration of 250 mg/kg bw of Neeri KFT to first test animal. As no mortality was observed in first animal when observed for 48 h, next animal was treated with 500 mg/kg bw dose and observed in a similar manner and so on up to 2000 mg/kg bw. A total of 5 rats were tested, at test dose 2000 mg/kg bw, and observed for any clinical sign of toxicity for a total of 14 days.

**Clinical Study**

A clinical trial of the nephroprotective potential of Neeri KFT was conducted as per the Indian Council of Medical Research guidance document, 2006, on conducting trials of ayurvedic substances.[28] The experimental protocol has been approved by the Ethical Committee on human safety trial, and the study was conducted at Aggarwal hospital, New Delhi, India, between 12/3/2015 to 30/2/2016 on OPD basis.

**Study Design**

Of 96 patients suffering from kidney disorders attending the Aggarwal Hospital, New Delhi, India, 71 were selected based on inclusion and exclusion criteria. They were served with placebo for 1 month duration (the 1 month run-in period with dietary and lifestyle schedule to be followed). The patients were randomly divided into Neeri KFT as test group and as placebo group [Figure 1]. Group 1 (test drug: 2 teaspoonful thrice a day): 35 patients were kept on a combination of routine management with antihypertensive + NEERI KFT, and Group 2 (PLACEBO: 2 teaspoonful thrice a day): 36 patients were registered in this group and observed without interfering with their routine management, i.e., with antihypertensives, etc., + placebo. Patients underwent clinical examination and biochemical investigations on day 1 and at monthly intervals. Adverse drug reactions/efffect (e.g., headache, dizziness, nausea and vomiting) if any were also recorded during the study period. The study protocol was approved by the Hospital’s Institute’s Ethics Committee with the protocol approval number being AH/IEC/NEERI-KFT 12/1/2015. Informed written consent was obtained from all

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical description</td>
<td>Yellowish-brown-colored viscous liquid, odor characteristic with and sweetish in taste</td>
</tr>
<tr>
<td>Description</td>
<td>pH</td>
</tr>
<tr>
<td></td>
<td>Between 4.0 and 6.5</td>
</tr>
<tr>
<td>Weight per ml.</td>
<td>Between 1.01 and 1.11 g/ml</td>
</tr>
<tr>
<td>Average fill volume</td>
<td>Not less than the label claim</td>
</tr>
<tr>
<td>Total ash</td>
<td>Not more than 1.0% w/w</td>
</tr>
<tr>
<td>Chloroform soluable extract</td>
<td>Not more than 0.05% w/w</td>
</tr>
</tbody>
</table>
study participants. If they so desired, patients were free to withdraw from the study.

Inclusion Criteria

The hypertensive patients between the age of 48 and 72 years, either male or female diagnosed with patients suffering from over the past 10 years with hypertension, and characterized by elevated creatinine on 2 occasions, in spite of continued treatment men: \( \geq 1.4 \) mg/dL (120 \( \mu \)mol/L), women: \( \geq 1.2 \) mg/dL (106 \( \mu \)mol/L), elevated blood urea \( \geq 20 \) mg/dL), and elevated blood uric acid \( \geq 20 \) mg/dL), were selected for the present study.

Exclusion Criteria

Patients with serum creatinine of more than 6 and patients on dialysis and with acute infections or chronic debilitating diseases, tuberculosis, malignancy, HIV infection, etc., were excluded from the clinical study. Pregnant and lactating women and the patients having the history of severe unstable angina, myocardial infarction, and renal failures were excluded from the study.

Follow-up and Assessment

All subjects underwent clinical examination and evaluation of serum creatinine, blood urea, serum uric acid, serum total proteins, globulin, albumin, and serum electrolytes - calcium (Ca), potassium (K), sodium (Na), and phosphate (P) test were done on entry and at 4 monthly intervals as per assessment method illustrated in Figure 1.

Primary and Secondary Outcome Measure

The primary endpoint was improvement in clinical parameters of chronic kidney disease with reference to improve/control of kidney functions tests a 4 months interval and symptoms – swollen feet and ankles, puffiness around eyes, nocturia, muscle cramping, general fatigue and quality of life at: 0, 30, 60, 90, 120, 150, 180, 210, 240 and 270 days.

Post-marketing Study

A total of 1000 doctors from all demographic areas, namely, north, south, east, and west were followed up. The study was based on questionnaire incorporating details pertaining to improvement in patient with any untoward effect obtained if any.

Statistical analysis

Data were arranged in MS Excel. Student’s \( t \)-test was used to compare the difference in mean values between the two groups. Paired \( t \)-test has been used for within group analysis. For every outcome variable, results are presented as mean ±
standard deviation, and \((P < 0.05)\) was considered statistically significant. Statistical analyses were performed using MedCalc for Windows, statistic for biomedical research software.

**RESULTS**

**Standardization of Formulation**

The physicochemical evaluation of the formulation was performed and the results are tabulated in Tables 2 and 3. All the tests for safety namely, microbial load, heavy metals, mycotoxin and pesticides \([\text{Tables } 4-6]\) revealed to be within permissible limits. The stability test of finished drug as presented in Table 7 showed no change in physical, chemical, and microbial properties over a specified period. Preliminary HPTLC fingerprinting photo documentation as shown in Figure 2 revealed the presence of many phytoconstituents. On photo documentation, 16 spots under 366 nm were observed.

![Figure 3: Densitometry scan of Neeri KFT at 366 nm](image)

![Figure 4: Percent change (reduction) in kidney function parameter levels between test ad placebo group](image)

**Table 3: Phytochemical analysis of Neeri KFT**

<table>
<thead>
<tr>
<th>Identification</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenols</td>
<td>Present</td>
</tr>
<tr>
<td>Tannins</td>
<td>Present</td>
</tr>
<tr>
<td>Amino acids</td>
<td>Present</td>
</tr>
<tr>
<td>Glycosides</td>
<td>Present</td>
</tr>
<tr>
<td>Chloride</td>
<td>Present</td>
</tr>
</tbody>
</table>

**Table 4: Microbial load analysis**

<table>
<thead>
<tr>
<th>Microbial load</th>
<th>Result unit</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total microbial plate count</td>
<td>&lt;1 cfu/ml</td>
<td>10⁴/g</td>
</tr>
<tr>
<td>Yeast and molds count</td>
<td>&lt;1 cfu/ml</td>
<td>10⁴/g</td>
</tr>
<tr>
<td>Coliforms</td>
<td>&lt;1 cfu/ml</td>
<td>&lt;1 cfu/ml</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>&lt;10/ml</td>
<td>&lt;10/ml</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>&lt;10/ml</td>
<td>&lt;10/ml</td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>Absent/25 ml</td>
<td>Absent</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>Absent/10 ml</td>
<td>Absent</td>
</tr>
<tr>
<td><em>Shigella</em></td>
<td>Absent/25 ml</td>
<td>Absent</td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td>Absent/25 ml</td>
<td>Absent</td>
</tr>
</tbody>
</table>

**Table 5: Heavy metal analysis**

<table>
<thead>
<tr>
<th>Heavy metals</th>
<th>Result unit</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>&lt;0.05 mg/kg</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Arsenic</td>
<td>&lt;0.05 mg/kg</td>
<td>3 ppm</td>
</tr>
<tr>
<td>Cadmium</td>
<td>&lt;0.02 mg/kg</td>
<td>0.3 ppm</td>
</tr>
<tr>
<td>Mercury</td>
<td>&lt;0.01 mg/kg</td>
<td>0.1 ppm</td>
</tr>
</tbody>
</table>

![Figure 5: Serum creatinine: A decline 0.4 and 0.1 was observed in patient assigned to Neeri KFT or placebo, respectively](image)
Densitometric scan at 366 nm [Figure 3] showed 16 peaks, peak with Rf - 0.07, 0.13, 0.26, 0.29, 0.32, 0.40, 0.42, 0.13, 0.49, 0.51, 0.67, 0.72, 0.75, 0.79, 0.84, and 0.89.

Clinical Study

Of a total of 96 patients enrolled, 71 patients with impaired kidney functions participated in the study. There were 35 patients in the test drug group and 36 patients in the placebo group. Within 1 to 39 week, a total of 21 patients withdrawn the study during treatment period and 50 completed the study [Figure 1].

Effect on Kidney Function Parameters

The decrease of 17% in serum creatinine, 18% in urea, and 13% in uric acid was observed as against placebo group [Figure 4]. Over the course of study the decline from initial month (0) to the end (9) of treatment, the average achieved serum creatinine was 0.4 in Neeri KFT group ($P = 0.3398$) and 0.1 of serum creatinine of placebo group [Figure 5], the average achieved blood urea was 13.0 in Neeri KFT group ($P = 0.1502$) and 10.5 of blood urea of placebo group [Figure 6]. Moreover, the average decline achieved serum uric acid was 0.9 in Neeri KFT group ($P = 0.1502$) and 0.3 of serum uric acid of placebo group [Figure 7].

Adverse Events

Test drug effect was well tolerated by all patients during the course of the study. Further, no adverse hematological or biochemical abnormalities were experienced by any patient.

Post-marketing Study

The geographic zones of the study were from India namely north, south, east and west. The average treatment period in the patient population was around 140 days month, irrespective of the other medication used. According to the suggested schedule, about 120 doses and no adverse event were recorded. The subjective judgment of the clinical effectiveness in terms of percent average reduction kidney function parameter was for serum creatinine, blood urea, and blood uric acid as 42.4, 31.9, and 39.1, respectively.

DISCUSSION

The quality of herbal medicines has a direct impact on their safety and efficacy. As a part of drug preparation and its standardization, the finished product of Neeri KFT was tested for all the safety and quality parameters which include physical, chemical, microbiological, mycotoxins, heavy metals as well as pesticide residues according to the WHO guidelines. The finished product appeared yellowish-brown viscous fluid and sweet in taste with pH varying between 4 and 6.5. Qualitatively, the presence of phenols, tannins, amino acids, and glycosides was confirmed. The formulation was found to comply with the specification limit for total microbial count. The heavy metal analysis of the formulation indicates that all the heavy metals were in acceptable ppm range, thus showing the purity of the raw drugs and also the finished product. The stability test of finished drug showed no change in physical, chemical, and microbial properties over specified period. Preliminary HPTLC profile of finished product developed can

<table>
<thead>
<tr>
<th>Table 6: Pesticide analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticides</td>
</tr>
<tr>
<td>IR408 IR Screened</td>
</tr>
<tr>
<td>IR409 IR Screened</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 7: Stability analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability specification</td>
</tr>
<tr>
<td>Physical properties</td>
</tr>
<tr>
<td>Chemical properties</td>
</tr>
<tr>
<td>Microbial properties</td>
</tr>
</tbody>
</table>
be considered as the reference standard for validating quality control of formulation in future. The acute oral toxicity study was performed on rats to determine the safe dose limit which came out to be 20 ml/kg body weight, i.e., equivalent to 3.22 ml/kg bw dose for human (for 60 kg adult human dose should be 193.6 ml per day). At safe dose limit, clinical sign of toxicity such as change in general behavior and change in physical activity and mortality was entirely absent. Clinical studies of test drug suggest that it is effective and safe in the management of primary kidney disease. Among 25 patients treated with test drug, a significant improvement in the feeling of well-being was observed due to better control of kidney function parameters. According to several reports achieving near normal, kidney function parameters can prevent or delay the progression of CKD, reduce or prevent the development of complications, and reduce the risk of cardiovascular disease.[29] Other signs and symptoms such as swollen feet and ankles, puffiness around eyes, nocturia and muscle cramping, and general fatigue were also absent. Improvement in appetite and digestion with no gastric discomforts were additionally reported in the test drug group. In addition, nearly all patients have shown the beneficial diagnostic effect on the biochemical parameter and experienced a reasonable improvement after treatment. The therapeutic actions of Neeri KFT may be attributed to antioxidant mechanism.[30] Pre-clinical studies show that antioxidants alleviate renal injury and improve kidney function through reducing oxidative damage and/or inflammation.[31] Based on a clinical study of Neeri KFT, it is further suggested that test drug should be further used as a mono therapy/adjunctive therapy with antihypertensive for the management of hypertension. The synergistic approach of test drug with antihypertensive drugs shall help in reducing the dosage dependence the risk from their long-term usage. It is noteworthy that life-threatening side effect was not reported in post-launch market survey, it is a testimonial of 5000-year-old Ayurveda system of medicine. Advance studies are running on a large number of patients with additional clinical biochemical parameters for the test drug Neeri KFT.

CONCLUSION

Neeri KFT is found to be highly effective against renal disorders. The drug administered patients showed improvement in health by improvement in key indicators of renal features. The serum electrolyte level of serum calcium, potassium, chloride, and sodium of drug administered patients remained normal. CKD: Early identification and management of CKD in adults in primary and secondary care; NICE Clinical Guidelines (July 2014).

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29. Chronic Kidney Disease: Early Identification and Management of Chronic Kidney Disease in Adults in Primary and Secondary Care; NICE Clinical Guidelines; 2014.


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Analytical study of Tamra Bhasma

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Abstract

Background: Rasa Shastra is a specialized branch of Ayurveda which mainly deals with the pharmaceutical preparations. Bhasma is a special dosage form mentioned in Rasa Shastra texts. Tamra Bhasma is an incinerated metal obtained after various samskaras (processing) like Shodhana, Bhavana, Marana and Amrutikarana for several times. Bhasmas are said to be properly prepared if they pass certain Bhasma pariksha enlisted in Rasa Shastra texts. But in the present era, only Bhasma pariksha are not enough to satisfy the modern scientific world.

Objective: Hence the present study was carried out to assess Tamra Bhasma through various ancient and modern analytical parameters.

Materials and Methods: Tamra Bhasma was prepared as mentioned in the classics and it was tested with both ancient parameters and modern parameters like X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDS), Particle size analysis (PSA), Zeta Potential (ZP), UV-Spectroscopy and Fourier transform Infra-Red spectroscopy (FTIR).

Results: XRD of Tamra Bhasma shows major peaks of HgS, CuS and a minor peak of Cu4O3. SEM micrographs showed distribution of particles as clusters of irregular shaped flakes at 3KX and 5KX magnifications; EDS analysis confirmed the significant presence of elements viz. O-21.74%, S-23.67%, Cu-32.93% and Hg-14.28%; Particle size was found to be 2.2 nm with Zeta Potential of -44.2 mV. UV-Spectrum of Tamra Bhasma showed maximum absorption at 574 nm and FT-IR analysis showed 27 peaks between the wavelengths 3956.11 – 883.46 cm⁻¹.

Conclusion: Hence it can be concluded that both the parameters are essential for the qualitative and quantitative analysis of proper formation of the Bhasma.

Key words: Ancient Parameters, Modern analytical Parameters, Tamra Bhasma

INTRODUCTION

Ayurveda is the oldest medical system in the world that uses processed metals/minerals in the form of Bhasma for therapeutic purposes. Most of the preparations of Rasa Shastra are Herbo-mineral-metallic in nature, as they contain minerals and metals as an integral part of their formulations along with specified herbs. Innate qualities of these formulations are quick action, lesser dose, tastelessness, and prolonged shelf life. Use of metals in medicine is often associated with toxicity, but Ayurveda made them into biocompatible form by certain detoxification processes such as Shodhana, Marana, and Bhavana which removes the toxic potential from metals and imparts them with therapeutic efficacy of a high grade. The use of Bhasma as a potential drug is facilitated mainly because of two reasons. First, because these materials are being routinely used as effective drugs for centuries and second, these drugs do not show any noticeable side effects in recommended therapeutic doses. World Health Organization has also accepted that traditional medicines may need less rigorous preclinical toxicological evaluations since their safety of use has been documented historically.

In spite of these facts, Bhasmas of metals are always under debate, not only in the sense of its therapeutic excellence but also for unnecessary hue and cry about their toxicity. This is largely because of ignorance about the rationality of the methods of processing adopted in the preparation of these Bhasmas before they are actually used in therapeutics. These preparations pass through a series of laborious procedures of Shodhana, Bhavana, Marana, Amrutikarana, etc., which have their impact in making these metals/minerals safe for therapeutics. Hence, in the present study, an attempt has been made using various analytical tests such as X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), and particle size analysis (PSA); zeta potential (ZP), UV-spectroscopy and Fourier transform infrared spectroscopy (FTIR) to rule out the safety, toxicity and to gain knowledge of identity, form,
particle size, surface morphology and structure, and contents of Tamra Bhasma.

MATERIALS AND METHODS

Parada, Gandhaka, and Tamra were obtained from the local market of Vijayawada. Entire preparation of Tamra Bhasma was carried out in the Department of Rasa Shastra and Bhaishajya Kalpana, TTD’s S.V. Ayurvedic College, Tirupati. Requirement for XRD: Model - Powder X-ray Diffractometer D8 advance, Manufacturer - Bruker Germany. SEM and EDS: Model - EVO MA 15, Manufacturer - Carl Zeiss – Germany; PSA and ZP: Model - Horiba scientific Particle Size and ZP Analyzer, and Manufacturer - Horiba Instruments, Irvine, CA 92618 USA; UV-spectroscopy: Model - Nanodrop 8000 Spectrophotometer and Manufacturer - Thermo Scientific, India.

Pharmaceutical Process

The pharmaceutical procedures adopted in this study are Shodhana, Bhavana, Marana, and Amrutikarana. Shodhana of Parada was done by mardana with Kshara traya (Sarja Kshara, Yava Kshara, and Tankana) for 3 days.[1] Shodhana of Gandhaka was performed by puta method using cow’s milk.[2] Equal quantities of Shodhitha Parada and Gandhaka were taken and made into Kajjali.[3] Tamra Patras were subjected to Samanya shodhana by nirvapa in Taila, Takra, Gomutra, Aranala and Kulattha Kwatha for 7 times;[4] Visesha shodhana was done by dola yantra swedana in Gomutra for 3 h.[5] Equal quantities of Kajjali and Shodhitha Tamra Patras were triturated in a khalwa yantra using Nimbu Swarasa. Chakrikas of uniform size were prepared and placed in a Sharava and subjected to Sharava samputikarana. This was subjected to Laghu puta, and the entire procedure was performed for 18 times.[6] Then, the Tamra Bhasma having all the Bhasma laxanas have been attained. Then, the obtained Tamra Bhasma was triturated with Kumari Swarasa and subjected to Amrutikarana procedure by Laghu puta for 7 times.[7] In this way, entire preparation of Tamra Bhasma was carried out.

Analysis of Tamra Bhasma using Ancient Parameters (Bhasma Pariksha)

The final Bhasma was analyzed for quality control as described in the ancient texts and the following observations were made:

- **Rekhapurnatwa:** After proper trituration, small amount of bhasma was taken in between thumb and index finger. It filled the fine lines of fingers. Rekhapurnatwa was obtained after 14th puta.
- **Varitatratwa:** After proper trituration, small amount of bhasma was sprinkled on the surface of water. Bhasma being light floated on the surface of water. This was obtained after 18th puta.
- **Nischandaratwa:** Small quantity of bhasma was observed under bright sunlight for the presence of any free shiny metal particle. There was no shining particle observed in the Bhasma after 3rd puta.
- **Niswadu Pareeksha:** When a small amount of the bhasma was kept on tongue, there was not any feeling of taste/untoward sensation.
- **Dantagre Na Kach Kacha Bhavathi:** When a small amount of the bhasma was placed between the teeth, no sandy feeling was appreciated.
- **Anjana Sadrishya Sukshmatwa:** The bhasma prepared was fine like collyrium.
- **Avami:** Ingestion of small amount of the bhasma did not produce any nausea/vomiting.
- **Amla Pareeksha:** Tamra Bhasma was taken in little quantity and sprinkled over the curd taken in a watch glass and kept undisturbed for 24 h. No bluish discoloration was seen after 24 h.
- **Nimbu Swarasa Pareeksha:** Very little quantity of Tamra Bhasma was added to the fresh Nimbu Swarasa taken in a test tube and kept aside for 24 h. On the next day, there was no color change in the lemon juice.
- **Discoloration was not found in Dadhi Pareeksha and Amla Pareeksha after 16th Puta.**

Analysis of Tamra Bhasma using Modern Parameters

XRD

Tamra Bhasma was subjected to XRD at the Department of Physics, Yogi Vemana University, Kadapa, Andhra Pradesh.

Procedure

The sample was powdered in an agate mortar to very fine powder, and it was mounted in sample tray of machine. X-Ray beam bearing a wavelength of 1.5418740 Å from copper source is passed on the sample. Detector was set to identify diffracted beams between 10 and 70° of 2θ range. Intensity are plotted on a graph by “Origin Pro 8.5 SR2” Data Analysis Software. Various compounds consisting similar diffraction pattern were identified by matching their peaks with corresponding JCPDS Crystallographic cards. For even better accuracy and precision, XRD soft files were also analyzed for corresponding phase/entry matching with Crystallographic Open Database (COD - 20120320) – USA, after plotting values in PANalytical X’Pert high score plus software 3.0.0.123, UK.

SEM and EDS

The practical was performed at the Department of Physics S.V University, Tirupati.
Procedure of SEM
Specimen of the sample to be analyzed was directly kept on the specimen holder for visualization. As the sample employed has nonconductive nature, the sample surface was coated by carbon using arc melting technique. Then, the dried powder was observed under the microscope at 1,000X to 10,000KX, and the micrographs were taken with the inbuilt camera.

Procedure of EDS
Electron beam excitation is used in SEM. A detector is used to convert X-ray energy into voltage signals; this information is sent to a pulse processor, which measures the signals and passes them on to an analyzer for data display and analysis. The detector used in EDS is often the lithium drifted silicon detector which is operated at liquid nitrogen temperatures. Sample of Tamra Bhasma was placed on the specimen holder and subjected to EDS. When the sample was bombarded by the SEM’s electron beam, electrons are ejected from the atoms comprising the sample’s surface. The resulting electron vacancies are filled by electrons from a higher state, and an X-ray is emitted to balance the energy difference between the two electron’s states. The X-ray spectrum thus acquired gives the information on the elemental composition of the material under examination.

PSA and ZP
The practical was conducted at the Department of Science and Technology, PURSE, S.V. University, Tirupati.

Procedure of PSA
The sample was mixed in water and shaked for 10 min. Then, it was poured into the sample chamber, where it passes through the laser beam as a homogeneous stream of particles. The scattering of light occurs over a wide range of angles on interacting with the particles in the suspension which are moving by Brownian motion. Based on this scattering pattern of the sample, particle size distributions are calculated comparing with the appropriate optical model.

Procedure of ZP
A 1% concentration of Tamra Bhasma was prepared in distilled water. The particles were well dispersed before analysis, and the sample was taken in a 1ml syringe and injected slowly into the capillary cell (cuvette) through the sample port. Care was taken to see that air bubbles are not formed during this process. As the sample comes out from the second port of the capillary cell, the injection process is stopped. This indicates complete filling of the sample into the capillary cell. The sample ports are then covered with lids, and the capillary cell was then placed into the sample holder of the zetasizer instrument for analysis.

UV-spectroscopy
Practical was performed at the Department of Science and Technology, PURSE, S.V. University, Tirupati.

Procedure of EDS
About 5 g of Tamra Bhasma was macerated with 100 ml of solvent in a closed flask for 24 h, shaking frequently during 6 h and allowed to stand for 18 h. It was filtered, taking for UV spectroscopic study. The spectra were taken at 200–800 nm from the peak obtained, the \( \lambda_{\text{max}} \) value was calculated.

FTIR
This practical was conducted at Padmavathi Mahila University, Tirupati.

Procedure
The sample was placed in the potassium bromide plate of FTIR spectrometer, and the interference pattern was detected by the infrared detector as variations in the infrared energy level, and the obtained spectral information was calculated.

RESULTS

XRD Studies
XRD of Tamra Bhasma shows major peaks of Hgs (cinnabar) and copper sulfide (CuS) compounds with hexagonal structure. A minor peak showed the existence of copper oxide (\( \text{Cu}_2\text{O}_3 \)) compound with tetragonal structure. The presence of sharp peaks indicates the highly crystalline nature of Bhasma. The HgS peaks were detected at a diffraction angle of 26.49, 31.19, 43.59, 45.75, and 51.74, and CuS peaks were detected at a diffraction angle 29.27, 31.80, 47.88, 32.81, 52.67, and 59.27 and \( \text{Cu}_2\text{O}_3 \) was detected at a diffraction angle of 28.09 [Tables 1 and 2, Figure 1].

SEM
SEM micrograph of Tamra Bhasma showed the distribution of particles as clusters of irregular shaped flakes at 3KX and 5KX magnifications [Figures 2 and 3].

Figure 1: X-ray diffraction graph of Tamra Bhasma
Rugmini, et al.: Tamra Bhasma standardization

**Table 1: The details of matching peaks of XRD data for Tamra Bhasma**

<table>
<thead>
<tr>
<th>Element/Molecule</th>
<th>JCPDS Ref. No</th>
<th>(\theta)</th>
<th>Intensity</th>
<th>FWHM</th>
<th>h</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>HgS (Cinnabar)</td>
<td>00-042-1408</td>
<td>26.49</td>
<td>100</td>
<td>0.336</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>31.19</td>
<td>93</td>
<td>0.192</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>43.59</td>
<td>21</td>
<td>0.432</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.75</td>
<td>19</td>
<td>0.12</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>51.74</td>
<td>13</td>
<td>0.192</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CuS (Copper sulfide)</td>
<td>00-006-0464</td>
<td>29.27</td>
<td>65</td>
<td>0.264</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CuS (Copper sulfide)</td>
<td>01-074-1234</td>
<td>31.80</td>
<td>100</td>
<td>0.336</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CuS (Copper sulfide)</td>
<td>00-024-0060</td>
<td>47.88</td>
<td>62</td>
<td>0.288</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32.81</td>
<td>44</td>
<td>0.192</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52.67</td>
<td>23</td>
<td>0.24</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>59.27</td>
<td>34</td>
<td>0.24</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cu4O3 (Copper oxide)</td>
<td>00-033-0480</td>
<td>28.09</td>
<td>100</td>
<td>0.12</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 2: Crystal details of JCPDS entries**

<table>
<thead>
<tr>
<th>Name</th>
<th>HgS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space group</td>
<td>P3221</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Hexagonal</td>
</tr>
<tr>
<td>Cell parameters</td>
<td>(a=4.1495) A(^{\circ}) (b=4.1495) A(^{\circ}) (c=9.4970) A(^{\circ}) (Z=3.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>CuS (00-006-0464)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space group</td>
<td>P63/mmc</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Hexagonal</td>
</tr>
<tr>
<td>Cell parameters</td>
<td>(a=3.7920) A(^{\circ}) (b=3.7920) A(^{\circ}) (c=16.3440) A(^{\circ}) (Z=6.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>CuS (00-074-1234)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space group</td>
<td>P63/mmc</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Hexagonal</td>
</tr>
<tr>
<td>Cell parameters</td>
<td>(a=3.7900) A(^{\circ}) (b=3.7900) A(^{\circ}) (c=16.3400) A(^{\circ}) (Z=1.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>CuS (00-024-0060)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space group</td>
<td>P63/mmc</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Hexagonal</td>
</tr>
<tr>
<td>Cell parameters</td>
<td>(a=3.7960) A(^{\circ}) (b=3.7960) A(^{\circ}) (c=16.3600) A(^{\circ}) (Z=6.00)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Cu4O3 (00-033-0480)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space group</td>
<td>I41/amd</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Tetragonal</td>
</tr>
<tr>
<td>Cell parameters</td>
<td>(a=5.8370) A(^{\circ}) (b=5.8370) A(^{\circ}) (c=9.9320) A(^{\circ}) (Z=4.00)</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Analytical study plays an important role in the standardization of the drugs. Ayurveda, the ancient system of medicine is gaining recognition throughout the world, and many herbal, metal, and mineral drugs are now clinically tested and accepted. However, one of the impediments in the acceptance...
of the ancient systems of medical preparation is the lack of standard quality control profiles. The quality of the drugs, that is, the profile of the constituents in the final product has implication in efficacy and safety.

XRD has been in use in two main areas, for the fingerprint characterization of crystalline materials and the determination of their structure. Each crystalline solid has its unique characteristic X-ray powder pattern, which may be used as a “fingerprint” for its identification. Once the material has been identified, X-Ray crystallography may be used to determine its structure, i.e., how the atoms pack together in the crystalline state and what the interatomic distance and angle, etc. XRD is one of the most important characterization tools used in solid-state chemistry and material science. Size and the shape of the unit cell for any compound can be detected most easily using the diffraction of X-rays. Major peaks of HgS and CuS, a minor peak as Cu4O3 were seen in the XRD of Tamra Bhasma. The presence of sharp peaks indicates the highly crystalline nature of Bhasma. The presence of minor peak as Cu4O3 may be due to repeated incinerations performed during the preparation of Tamra Bhasma. HgS occurs in two forms cinnabar and metacinnabar. Formation of cinnabar requires a temperature of more than 270°C, while metacinnabar forms at a temperature ranging from 20°C to 90°C. Hence, we can justify the formation of Cinnabar from the heat produced due to laghu puta (514°C). The shape of crystals was found to be hexagonal. Higher temperatures (>165°C) are required like that of in Bhasma making, to enhance reaction and yield pure CuS in the solid-state reaction. This indicates that

Table 3: The quantity of all the elements in Tamra Bhasma

<table>
<thead>
<tr>
<th>Element</th>
<th>Weight%</th>
</tr>
</thead>
<tbody>
<tr>
<td>O K</td>
<td>21.74</td>
</tr>
<tr>
<td>Al K</td>
<td>1.11</td>
</tr>
<tr>
<td>Si K</td>
<td>4.21</td>
</tr>
<tr>
<td>S K</td>
<td>23.67</td>
</tr>
<tr>
<td>K K</td>
<td>0.88</td>
</tr>
<tr>
<td>Ca K</td>
<td>1.19</td>
</tr>
<tr>
<td>Cu K</td>
<td>32.93</td>
</tr>
<tr>
<td>Hg M</td>
<td>14.28</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 4: Details of peaks obtained in FTIR analysis of Tamra Bhasma

<table>
<thead>
<tr>
<th>Sample name</th>
<th>Number of peaks</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamra Bhasma</td>
<td>27</td>
<td>3956.11, 3883.08, 3844.27, 3788.05, 3706.54, 3608.97, 3628.97, 3546.11, 3502.93, 3374.59, 3341.66, 3212.23, 3121.92, 3029.61, 2962.28, 2890.17, 2812.25, 2722.83, 2564.40, 2496.49, 2388.01, 2287.54, 2233.46, 2154.83, 1814.14, 1588.53, 883.46</td>
</tr>
</tbody>
</table>

FTIR: Fourier transform infrared spectroscopy
copper and sulfur might have reacted at higher temperatures in the absence of oxygen resulting in the formation of CuS.

SEM is an analytical technique to know the surface morphology of the drug. It uses electron beam rather than light to form a figure. It is capable of producing high-resolution figures of a sample surface, which means that closely spaced features can be examined at high magnification. Due to the manner in which the figure is created, SEM figures have a characteristic three-dimensional appearance and are useful for determining the surface structure of the sample, i.e., topography. It can magnify objects to extreme levels where even structure of nanoparticles could be clearly visible. Distribution of particles as clusters and irregular shaped flakes were seen in the micrographs of Tamra Bhasma. This may be due to hexagonal and tetragonal shaped structures of compounds found in the XRD. The surface area of Tamra Bhasma was observed to be smooth, may due to the involvement of procedures such as Shodhana, Bhavana, and Marana in the preparation of Tamra Bhasma.

Energy-dispersive X-ray spectroscopy (EDX) is an analytical technique used for elemental analysis or chemical characterization of a sample. It relies on the investigation of an interaction of some source of X-ray excitation and a sample. EDS of Tamra Bhasma revealed the significant presence of elements such as oxygen, sulfur, copper, and mercury. The presence of other elements such as aluminum, silica, potassium, and calcium may be due to

| Table 5: Various peaks obtained in FTIR analysis of Tamra Bhasma and their correlation with compounds |
|---|---|---|---|
| Peak | Actual peak | Bond | Type of bond | Appearance |
| 3610–3670/cm | 3608.97 | O–H | Alcohols, phenols | Broad |
| 3500–3560/cm | 3546.11 | O–H | Alcohols, phenols | Strong, Broad |
| 3200–3400/cm | 3374.59 | O–H | Alcohols, phenols | Strong, Broad |
| 2400–3200/cm | 3121.92 | N–H | Ammonium ions | Multiple broad peaks |
| 2100–2260/cm | 2233.46 | C=C | Alkynes | Medium |
| 1670–1820/cm | 1814.14 | C=O | Carboxylic acids/derivatives | Strong |
| 1550–1640/cm | 1588.53 | N–H | Amide | Weak to strong |
| 860–900/cm | 883.46 | C–H | Aromatic | Strong |

FTIR: Fourier transform infrared spectroscopy
the addition of herbal ingredients during the preparation of Tamra Bhasma.

The size of the particles in the drug plays a major role in its therapeutic action and efficacy. Particle size and surface area of solid drug are inversely related to each other. The mean particle size of Tamra Bhasma is 2.2 nm. This shows Shodhana, Bhavana, and Marana procedures employed in the preparation of Tamra Bhasma have reduced the particle size. The nanosize of the drug is indicative of its quick absorption and faster dispersion into body resulting in better therapeutic efficacy. ZP is a measure of the magnitude of the electrostatic or charge repulsion or attraction between particles, and is one of the fundamental parameters known to affect stability. The ZP (mean) value of Tamra Bhasma found to be ~44.2 mV which indicates its high colloidal stability. High ZP indicates easy dispersion, whereas less ZP indicates strong aggregation of particles in suspension. High colloidal stability of Tamra Bhasma indicates its easy dispersion in the body fluids by reaching the target site quicker resulting in high therapeutic potential.

UV-spectroscopy refers to absorption spectroscopy or reflectance spectroscopy in the ultraviolet-visible spectral region. Different molecules absorb radiation of different wavelengths. An absorption spectrum will show a number of absorption bands corresponding to structural groups with the molecule. Electromagnetic spectrum of U.V region is from 190 to 400 nm whereas for the visible region it is 400–800 nm. UV-spectrum of Tamra Bhasma showed maximum absorption at 574 nm which shows its absorbency in the visible region.

FTIR was performed to detect the presence of functional groups or organic legends in Tamra Bhasma. Infrared spectroscopy deals with the infrared region of the electromagnetic spectrum that is light with a longer wavelength and lower frequency than visible light. When infrared light or radiation hits a molecule, the bonds in the molecule absorb the energy of the infrared and respond by vibrating. Tamra Bhasma showed 27 peaks between the wavelengths 3956.11–883.46/cm. Absorption peaks of alcohols and phenols, (O – H) stretching bonds were observed in between 3610 and 3670/cm, 3500 and 3600/cm, and 3200 and 3400/cm. Two peaks of C = O stretching vibrations indicate carboxylic acids, were observed between 1670 and 1820/cm, multiple peaks were obtained due to N-H stretching vibrations between 2400 and 3200/cm. C=C stretching vibrations at 2100–2260 indicates presence of alkynes. A peak at 883.46/cm represents C–H stretching vibrations having aromatic structure. N-H

**Figure 7:** UV-spectrum of Tamra Bhasma

**Figure 8:** Various peaks obtained in Fourier transform infrared spectroscopy analysis of Tamra Bhasma
stretching vibrations containing amides was observed at the peak of wavelength 1588.53/cm. This indicates that there are no complex structures in Tamra Bhasma.

**CONCLUSION**

From the present study, it can be confirmed that Tamra Bhasma is a nano-sized particle with high dispersion rate to the target site proving its high therapeutic efficacy. The presence of major peaks of HgS, CuS and a minor peak of Cu₄O₃ shows the complete transformation of elemental Tamra into bioavailable compound form (Bhasma). Free metal was not found in the Tamra Bhasma, representing the absence of toxicity and adverse effects. All these modern analytical tests help in bringing the hidden facts said by our Acharyas to the contemporary scientific world evidencing its safety.

**REFERENCES**


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Role of standardization factor in quality evaluation of Ashwagandha (Withania somnifera Dunal.)

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Abstract

There has been escalating wakefulness and universal adequacy of the utilization of ayurvedic medicines in today’s medical and alternative profession. Renaissance of public awareness in traditional medicine is escalating in both the developing and developed countries. This augmentation in the use of ayurvedic drugs has also given rise to a variety of abuse and adulteration of the raw ayurvedic drugs important to consumers and manufacturers leading to the lethal penalty. Quality evaluation of raw ayurvedic drugs is a significant tool in the formulation of high-quality ayurvedic medicines. The present work seeks to enlighten the stakeholders in ayurvedic drugs on the necessity to ascertain the quality consideration with the help of higher analytical tools and well-defined standardization methods. Ashwagandha (Withania somnifera Dunal.) belonging to the family Solanaceae is commonly known as Indian ginseng and is used in Ayurvedic medicine more frequently for the treatment of various ailments. Work on standardization presumes the vital significance. However, no supportive data are available on microscopic characteristics and standardization of the same. In this article, a study has been made to fix the parameters including macroscopic, microscopic, physicochemical analysis, and thin-layer chromatography profile to ensure the use of only genuine and uniform material of such ayurvedic remedies. The obtained values/ ranges can be used as standards for quality control of the Ashwagandha.

Key words: Ashwagandha, quality control, standardization, thin-layer chromatography

INTRODUCTION

Based on the concentration of their active component, physicochemical standardization, and in vitro parameters, the raw drugs are standardized to determine the quality formulations.[¹] Each plant has a tremendous number of highly complex chemical substances whose structure is difficult to determine. To ensure the efficiency and safety profile of phytopharmaceutical, therefore, it should be standardized and pharmaceutical excellence must be permitted. The WHO impresses on the qualitative and quantitative process for distinguishing the samples and quantification of the markers of biological and chemical origin. If a principle active constituent contributing to therapeutic efficacy is known, then it becomes most suitable form to standardized their compounds. Markers can be implemented where the active ingredients are not yet known and should be specific for analytical quantification.[²,³]

Ashwagandha consists of dried mature roots of Withania somnifera Dunal. (Family: Solanaceae), a perennial shrub, found in wasteland, cultivated field, and open grounds throughout India, widely cultivated in certain areas of Madhya Pradesh and Rajasthan, roots collected in winter, washed, and cut into short pieces.[⁴]

Previous studies reported that the presence of major biochemical constituents of Ashwagandha root is steroidal alkaloids and steroidal lactones in a class of constituents called withanolides.[⁵] At present, 12 alkaloids, 35

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withanolides, and several sitoindosides from this plant have been isolated and studied alkaloids and withanolides.\[^{6,7}\] The various alkaloids include withanine, somniferine, somnine, somniferinine, withananine, psuedo-withanine, tropine, psuedotropine, 3-a-glyoxyloxytropane, choline, uscohygrine, isopelletierine, anaferine, and anahydrine. Two acyl steryl glucosides, namely, sitoindoside VII and sitoindoside VIII and two glycowithanoloids, namely, sitoindoside IX or sitoindoside X have been isolated from the root. Survey of the literature showed that no systematic approaches have been made to study the pharmacognostical parameters of this medicinal plant. The present investigation deals with the studies on some important pharmacognostical characteristics, namely, macroscopic, microscopic characters together with physicochemical parameters, preliminary phytochemical test, and thin-layer chromatography (TLC) of the root of *W. somnifera* as powdered form.

**MATERIALS AND METHODS**

Drug sample was purchased from *Gola Dinanath* market of Varanasi, UP. It was authenticated in the laboratory of the Department of Dravyaguna, Faculty of Ayurved, IMS, BHU. The plant material was ground into powder, filtered by sieve 80#, and the fine powder, so obtained was used for further analysis. The standardization parameters were determined according to the methods detailed in the Ayurvedic Pharmacopoeia of India Organoleptic characters and particle size of the sample was verified. Physicochemical analysis for loss on drying at 105°C, alcohol soluble extractive value, water-soluble extractive value, hydroalcohol extractive value, total ash value, acid insoluble ash value, and water-insoluble values was carried out in triplicate in the studied sample. For microscopic study, transverse section of root was prepared after staining with safranine and fast green. then transverse section mounted in dpf. Preliminary phytochemical analysis of different extracts was performed using specific reagents by employing standard procedures.\[^{4}\]

TLC was performed on (5 × 10) aluminum packed silica gel 60F254 TLC plate (Merck, Darmstadt, Germany). Before use, the plate was dried in an oven at 105°C for 5 min, and the sample was applied as 9 mm band by means of sample applicator (Camag Linomat-5, Switzerland) equipped with a 100 μL microsyringe. The developing solvent was allowed to ascend to 90 mm with ethyl acetate:methanol (8:2) (V/V) as a mobile phase in a twin trough chamber, previously saturated for 20 min by lining with thick Whatman filter paper. The room temperature was 27°C and relative humidity was 37%. After the development of chromatogram, the plate was removed and completely dried in air at room temperature. The spots produced were observed before and after derivatization then vanillin - sulphuric acid sprinkled over the plate and the spots were seen in daylight and ultraviolet light at 254nm and 366nm.\[^{8}\] the images were taken by mean of photo documentation system [Camag Reprostar 3]. RF value was calculated by dividing the distance travelled by spots by the distance travelled by solvent.

**RESULTS AND DISCUSSION**

**Organoleptic and Macroscopic Characters**

The organoleptic macroscopic characters include - roots are straight, unbranched with varying in thickness according to age and bear fiber like secondary roots. The outer surface becomes grayish yellow with longitudinal wrinkles. The crown consists of 2-6 remains of stem base, stem base variously thickened and nodes become prominent on the side from where petiole arises. The odor is characteristic, taste is bitter and acrid as shown in Figure 1.

**Microscopic Characters**

Transverse section of root shows cork exfoliated or crushed when present isodiametric and non lignified. The cork cambium is composed of 2-4 diffused rows of cells. The secondary cortex consists of about twenty layers of compact parenchymatous cells and phloem consists of sieve tubes, companion cells, phloem parenchyma. Cambium consists of 4-5 rows of tangentially elongated cells. Secondary xylem forms a hard closed vascular ring, separated by multiseriate medullary rays and few xylem parenchyma as shown in Figure 2.
Physicochemical Parameters

Ash of any organic material is composed of their non-volatile inorganic components. The extraction of any crude drug with a particular solvent yields a solution containing different phytoconstituents. It is useful for the estimation of specific constituents, soluble in that particular solvent used for extraction. Physicochemical parameters of *W. somnifera* such as total ash, water-soluble ash, acid-insoluble ash, loss on drying, ethanol soluble extractive value, and water-soluble extractive value were carried out and are summarized in Table 1.

### Preliminary Phytochemical Analysis

The root powder was extracted with water and ethanol. These extracts were tested for the presence of different phytoconstituents. The results of phytochemical qualitative analysis are tabulated in Table 2. Preliminary phytochemical studies revealed the presence of alkaloids, flavonoids, proteins, saponins, carbohydrates, steroids, phenols, glycosides, etc.

### TLC Profile

The TLC profile of ethanol extracts of *W. somnifera* along with ethyl acetate:methanol (8:2) as mobile phase resolved major spots at Rf 0.15, 0.46 (all gray) at visible light, (all black) at 254 nm, and (all white) at 366 nm Figure 3.

### CONCLUSION

Herbal medicines manufacturing necessitate crude drugs as foundation material. Efficacy of any drug depends on the authenticity of the raw material used for its preparation. Adulteration in the authentic raw material of *W. somnifera* causes worsening in the preferred therapeutic consequences of a particular drug. The present pharmacogonstic study was done on the sample of following in a series of physicochemical parameters such as total ash, water soluble ash, acid-insoluble ash, loss on drying, ethanol soluble extractive value, and water-soluble extractive value and loss on drying at 105°C, preliminary phytochemical screening, TLC profile, and microscopic identification. These parameters substantiate that the drug is persuasive and authentic. Hence, it can be concluded that these parameters are supportive in identification and standardization of the drug. Further studies on phytochemical and pharmacological studies are required to boost up the studies.

### ACKNOWLEDGMENT

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Analysis of Ayurvedic drug combinations in view of Samskara

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Abstract

Introduction: Drugs are combined to increase the activity apart from obtaining few other advantages. Whether the drugs are of herbal or mineral origin such combinations are seen to offer many advantages. A certain amount of freedom has been given to practitioner to combine the drugs but strictly on the basis of Standards explained in Ayurvedic texts. Samskara and Gunantradhana (addition of Properties) are the prime essentials of drug formulation. By Samskara, transformation of inherent attributes to the drug Formulations take place.

Methods: The Samskaras or various factors which achieve the gunantradhana (addition of properties) are water, heat, cleaning, Maceration, region, Season, flavor, and trituraion (bhavana). It is only to obtain adequate color, taste, touch, and smell which can act decisively in a specific disease. It is felt that because of these above factors formulations might have acted eliminating the clinical features.

Conclusion: In the present review, various factors that influence the combination of drugs which attributes transformations of qualities are critically analyzed.

Key words: Drug formulations, Factors, Kala, Samskara, Samyoga, Shodhana

INTRODUCTION

Samskara has several meaning in Indian Philosophy, namely, mental satisfaction, recollection, and psychological mark particularly in the development of certain qualities in human life. In Ayurveda, Sanskara means Gunataradhana[1] (transformation of inherent attributes). Of the three major principles of Ayurveda,[2] namely, Hetu, linga, and Aushadhi, Aushadhi holds a very imperative place. However, the Aushadh utilized should be safe and effective. According to Charaka while explaining the Virechana drugs (which is generally applicable to any drug), he has clarified the properties of a drug which relieves the disease quickly and easily and which does not cause any discomfort, especially to the vital organs, i.e., marmas like heart, the anal region, or other internal organs. More than anything else any formulation which flush out morbid doshas completely from the body, is considered as an ideal formulation even it is teekshna in nature.[3] The vaidyas has the authority as far as the entire process of Chikitsa is concerned. Vaidyas can make a firm decision about the drug or drugs that he desires to choose. It may be a single herbal drug or a single mineral drug, or it may be a combination of two or more herbal or mineral drugs. The question naturally arises as to why the drugs are used in combinations. From the era of Charaka till today, such combinations are used. A combination often involves a more chemical process than a physical one. By these combinations, Gunataradhana, i.e., transformation of inherent attributes occurs. Due to many dosic variations (amshamsha kalpana) and interaction of doshas, dooshyas, and malas, combination of drugs becomes important. As per Kashyapa,[4] drugs of opposite rasa may exist with differing guna or veerya or even vipaka. However, when they are combined judiciously, they do not act antagonistically. On the contrary, they combine to act beneficially. By the virtue of the gunataradhana brought about by the factors such as Samyoga, Vishlesha, Kala, and samskara, a combination of drugs in spite of its smaller dosage can actually be more effective in eradicating the disease. Similar drugs when combined become more potent by their combined chemical and pharmacological action.

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CONCEPT OF GUNATARADHANA
(TRANSFORMATION OF INHERENT ATTRIBUTES)

Role of Samyoga (Addition of Ingredients)

Samyoga incorporates the standard of utilizing the whole of intelligence available in a plant, not just a partial value captured in an isolated ingredient. The composition of one formulation mainly depends on various criteria such as primary herbs target a specific area of health, supporting herbs that improve the activity of the essential herbs and strengthen their healing action, bioavailability herbs that enable your body to absorb and utilize the nutrients, herbal cofactors that expel impurities and the impacts of ideal processing from body, balancing herbs that counter balances any potential inconveniences, or side effects that can accompany with the benefits of a particular herb. Used together, these distinctive types of herbs, accurately mixed, create a whole that is greater than the sum of its parts and result in a final formula that has the twin benefits of wholeness and balance.

Role of Vishlesha (Elimination of the Ingredients)

As per Sushruta chikitsa, if there is yoga which contains a few drugs prescribed in a disease, drugs of similar qualities may be added to the same yoga without any apprehension. Further, more he has given a green signal even to remove the drugs from yoga if considered unnecessary if the constituent’s drugs are numerous. As per Kashyap, the yogas which are prescribed by our sheers in classics, with combinations of certain drugs, in a specific disease should be used in the same form, without any alteration what so ever. This statement seems to be contradictory to the one made by Sushruta mentioned earlier. However, from author point of view it is important that formulations described in different literatures can not require any drastic changes.

Role of Kala (Proper Season and Recommended Duration of Time)

Jatarasam is the term employed by the Acharyas for Asava/ Aristha after which the final product can be used, and this may take anything from a few days to a few months as can be seen in the following table.

<table>
<thead>
<tr>
<th>Text</th>
<th>Minimum time limit</th>
<th>Maximum time limit</th>
</tr>
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<tbody>
<tr>
<td>Cha. Sa.</td>
<td>7 days</td>
<td>1½ months</td>
</tr>
<tr>
<td>Su. Sa.</td>
<td>7 days</td>
<td>4 months</td>
</tr>
<tr>
<td>A. S.</td>
<td>7 days</td>
<td>6 months</td>
</tr>
<tr>
<td>A. H.</td>
<td>15 days</td>
<td>1 month</td>
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</tbody>
</table>

It is to be noted that this is the minimal period advised for the fermented product before internal use, i.e., to acquire Jatarasam stage, which needs to be confirmed by the various tests prescribed. However, the concept of Kala Samskara needs more deliberation given with the intelligent excerpt from Sharangadharana Samhita. The medicated ghee or oil should not be prepared in a single night and the period should be lingered so that more fat-soluble content of the drug is absorbed in the Sneha, thereby making the Sneha more potent. The duration of Snehapaka depends on the Drava dravya used in the Snehapaka Kalpana. For example - if dugdha is used in Sneha Kalpana as a Drava dravya, then Snehapaka should be continued at least for two nights. Likewise, if svarasasa is used, then paka should be done for 3 ratris. If paka has to be done with takra, aranala, etc., then the duration should be of 5 ratris. If Snehapaka has to be done with mula and valli, then it should be done for 12 nights and paka should be completed on a single night if brihi and mamsarasas are used.

Role of Samskara

The change in quality and property may be due to the role of water, heat, cleanliness, habitat, time, season, flavor, and containers. These factors affect both the dietary supplements as well as medicinal drugs. The drugs either dietetic one or medicinal value obtained from natural sources undergo certain processing known as Samskara which can alter a change the natural qualities and properties of said drugs. It can be said that both a simple process of combination as well as the other mechanical/natural factors play an important role in bringing about a change in the medicinal combination.

Role of Water

The role of water in this context is to make hard and rough texture change to smooth and soft as well as extract the active principle of said drug. The therapeutically valuable part is termed as “Saara Bhaaga” in the terminology of Ayurveda. This can be achieved through particular processing. Numerous a times, the substance may contain more than one therapeutically helpful constituent. Different techniques may be required to separate out such valuable constituent. The components dissolve in water are extracted in water, whereas solvents such as fat, oil, or alcohol are required to extract ingredients soluble in those solvents. A combined solvent system is also used sometimes. Depending on the requirement, different procedures are adopted to extract therapeutically useful ingredients. Water being universal solvent is utilized for the majority of extractions. According to some texts, utilization of particular extraction system relies on the specific disease condition, the objective patient, and the source substance. A portion of the plants require particular extraction technique for obtaining expected therapeutic action, for example, Centella asiatica “Mandookparni” and Tinospora cordifolia “Guduchi” should be utilized only in the form of expressed juice for their “Rasayana” impact and Convolvulus pleuricaulis “Shankpushpi” should only be

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utilized in the form of paste (Kalka). Dosage forms involved to extract the therapeutic useful part are Swaras (if plant parts may not contain enough moisture to obtain the juice by applying mechanical pressure, in such cases, two parts of water are added to the ground plant material and it is left to soak overnight).[16] Kwaatha (by boiling the finely powdered plant material in required quantity of water till all the active ingredients are extracted completely in the water).[17] Hima and Phanta (finely powdered plant material is soaked overnight in six parts of water to obtain cold infusion and finely powdered plant material is soaked in hot water and thoroughly mixed to obtain hot infusion).[18,19] Arka (drugs soaked in water using the Arkayantra).[20] Ksheera Paka (to attain water-soluble, fat-soluble, and protein-soluble active principle from the drug).[21] oil/ghee (role of water is one of the important as per principle of these preparation oil liquid media and parts are normally required for the preparation of medicated ghee/oil).[22] Aasava or Aristas (prepared with cold water or from the decoction of the drug through fermenting process of medicinal plants).[23] Avalaha (after strained decoctions (Kwaatha)[24] are boiled down, sugar or jigger is added to it making a thick paste), Ghana (the water content of the “kwatha” is evaporated by subjecting it to slow heating).[25] Lepa (water, cow’s urine, oil, and ghee are some of the media used for mixing),[26] and Sattva (water extractable solid substance collected from a plant).[27] purification. In general purification, only cleanliness for separation from a mixture can be done, but in medicinal purification, the quality, toxicity, and physical and chemical nature of the drug may change. Hence, the qualities and property of purification are important for medicinal point of view. Visha is fatal for human body when taken inside the body, due to purification the toxicity of that poison has been minimized and can be used as a medicine. Aconite after purification valuable in acting against anti-pyretic, analgesic effect. Tingling sensation of tongue and dryness of tongue were observed before purification. Different methods of shodhana such as swedana[32] (boiling with fluids), mardana[33] (triturating in stone motor and pastel with and without heating), moorchhana[34] (triturating up to fine crumbling of Hg), patana[35] (distillation/extraction through Trividh patna strategy and soxhlet method), avapa[36] (addition of specific materials from outside, in liquefied state of metals), nirvapa[37] (heating and dipping/pouring/quenching of red hot metals in liquid media), galana[38] (filtration through filter paper, fine cloth with strong texture, or through shrive), prakshalana[39] (washing/cleaning with water or liquid media), bhavana[40] (addition of liquids for triturating with the help of stone motor and pestle and drying, but in case of large-scale industries, the same is done with end-“runner,” edge-runner, and wet grinder, of different capacity), shoshana[41] (drying in sunrays/over fire/through air nowadays the scientific appliances use that is hot air oven and drying chambers), bharjana[41] (roasting [gairika and hingu]/toxicification [tankana and sapatika], samyoga[42] (addition of materials for qualitative improvement, potentiating of drug efficacy through synergetic action), and vibhaga/vishlesh[43] (separation dirt substances [sand, schits, and other particles] are subjected to be separated through shodhana process of Guggulu and shilajatu/or separation of Pb, Sn, and Zn from Hg through Trividh patna[35] as artificial adulterants). As well as according to Rasa shastra, Sanskara plays an important role for using mercury in aushadhikarana, and Shodhana leads various purifications methods to eradicate all the blemis associated with mercury which is called as Dwadash Rasa dosha.

**Role of Heat**

Heat plays an important role for preparing different compounds in Ayurveda as well as modern pharmaceutics. In Ayurveda, heat application is utilized for different preparations such as Phanta, Avalaha, Arista, and Bhasma (Puta) (heating system is a specialized strategy of giving heat to the material for changing them into bhasma form).[28] Musa (Crucible) is utilized for purifying and extraction of metal from the mineral.[29] Kosthi (furnace) is exceptionally designed furnaces for providing heat during the procedure of satvapatana.[30] Kupipakva, pottali, parpati a wide range of minerals and metallic preparations so on where heat is necessary. By giving Agni from outside, one can increase the rate of transformation which is a particular method of giving heat to the material for converting them into bhasma form. During the process of transformation, either heat is formed, i.e., liberated, known as exothermic reaction or heat is required for the process of transformation, known as endothermic reaction. The contrast among transformation and samskara is that transformation can take place in any manner forming any dravya.[31] However, samskara is making transformation in a proper way, by providing required conditions, to get the expected resultant. Thus, the process which is creatively done in a proper way is termed as samskara.

**Role of Shodhana (Cleaning)**

In Rasa shastra and Bhaishajya kalpana, medicinal purification plays an important role apart from general...
Role of Desha (Habitat)

Habitat plays an important role in medicinal drug production and collection, for example, Himavata prabhava produces property of Saumyata, and Vindhayavata prabhava produces Agneyata in herbs. The surroundings during fermentation play an important role in the following respects; the place must be clean and dry, hygienic, away from direct air and light, entry, minimum temperature variation. Dhanya rashi[44] or otherwise simply the open space have been the locations specified by Acharya Caraka and Susruta. However, later on, Acharya Shodhala[45] contributed some new places for placing the Sandhana Patra, which are Bhugarbha, Suryatapa, Chaulyagra,[48] Koshthasara,[49] and Yogachintamanikara added one new place for Sandhana, i.e., Ashwashala. The main reason behind the isolation of Sandhana Patra in Dhanyarashi is for maintenance of temperature; it avoids contamination and provides appropriate temperature, and moreover, avoids wide fluctuation in the temperature, facilitating the Asuta Prakriya. It is established fact that the fermenting microbes are highly sensitive to wide temperature fluctuations and by this easily get damaged rather than sustained slightly higher or lower than required temperature. Nowadays, temperature requirements are easily met with steam or cold jackets to the fermenter vessel and the temperature to be maintained depends on the strain of the microorganisms, usually ranging from 25°C to 35°C.

Role of Kala (Time/Season)

Ancient learned scholars have precisely appreciated the role of Desha, Ritu, and Dravya in the completion of the fermentation reaction. Jatarasam[50] is the apt term employed by the Acharyas after which the final product can be used, and this may take anything from a few days to a few months. It is to be noted that this is the minimal period advised for the fermented product before internal use, i.e., to acquire Jatarasam stage, which needs to be confirmed by the various tests prescribed. However, the concept of Kala Samskara needs more deliberation given with the intelligent excerpt from Sharangadhara Samhita.

Role of Bhavana (Triturition)

Any powder form of drugs immersed with any liquid media, water, decoction, milk, kanji, hima, and swaras in a stone mortar and pestle and triturated for a definite period when the liquid are dried up, thereafter the same can be put in sun rays in daytime and moonlight at night is regarded as one bhavana or one triturition likewise successive bhavana or repeated bhavana process be done. Yadava ji told keeping triturated drug with sunray and moon ray for expanding the effectiveness, limiting the toxicity quality, the pulsating capacity and bioorganic qualities so on. In modern pharmaceutics, also mentioned the influence of light, heat, air and water in the preparation of medicines.

Role of Bhajana (Container)

During pharmaceutical processing, container plays an important role in relation to Samskara. Ghee kept for 10 days in Kansya patra (Bronze) loses its quality potency and changes container poisons quality. Preparation of triphala kalka in iron pot increases the potency of said drugs and acts as Rasayana drug in Rasayana therapy. In Ayurveda, Rasa Rasayana therapy drugs are indicated to keep in a container containing full of paddies such as in Rasaraj Rasa and Yogendra Rasa.

Role of Vasana (Flavoring)

The technique of flavoring the oil is called as patrapika.[50] Some selected drugs are used for this purposes which are called Gandha dravyas. Gandha dravyas are not only utilized for flavoring the oil but also used for the preservation of Sneha, to increase the potency of the Sneha and also used to get good color. Ela, Chandana, Kunkuma, Agaru, Muramamsi, Kankkola, Jatamamsi, Shati, Swetachandana, Tejapatra, Granthiparni, Karpura, Ushira, Kasturi, Nakhiputi, Sailaja, Subha, Methika, and lavanga, all these drugs are considered as gandha dravya. They are used as for aromatic purpose in sri visnu taila and many other Sneha preparations. The wise physicians will add 1/8th quantity of gandha dravya kalka to the total quantity of oil. However,
CONCLUSION

Samskara and Gunantradhana are the prime essentials of drug formulation. It is only to obtain adequate color, taste, touch, and smell which can act decisively in a specific disease. It is felt that because of these above factors formulations might have acted eliminating the clinical features. All the concepts require more elucidation since it is a vast subject in current concepts of science, a single term in Ayurvedic texts may explain various phenomena about the subject.

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Concept of Shodhana with special reference to Lauha

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Abstract

Introduction: Shodhana (Purification) is the essential step to be performed on substances especially related to Rasashastra. Marana (Incineration of minerals) is always preceded by Shodhana treatment. Methods: Shodhana means elimination of physical impurities, reduction in practical size, reduction in hardness, elimination of chemical impurities, conversion of chemical form, minimization of toxicity, induction of the desired qualities, and increase the therapeutic efficacy of the drug. Conclusion: The present paper gives the details of different Shodhana treatments and their applied aspect with special reference to Lauha.

Key words: Lauha, purification, Shodhana

INTRODUCTION

Ayurveda is a well-documented Traditional system of Indian Medicine. Rasashastra, an offshoot of Ayurveda popular from medieval period, mostly deals with the therapeutic utilization of metals and minerals. Lauha (iron) is a very essential element of the body system for treating many diseased conditions as well as for physiological existence. Shodhana was one of the steps for converting raw substance into dosage form. The process whereby the external and internal impurities of a substance are removed is called “Shodhana.” With this process, not only the physical impurities of the metal are expelled out but it also potentiates the therapeutic estimation as well as the transmutation of the metallic properties of Lauha as required. In the context of Lauha (iron) “Dravya-Dosha” can be assumed to be the inherent properties of the Lauha which includes heaviness, stiffness, nausea, and malaise. Apart from that, under Vishesha Shodhana of iron “Giri dosha” is mentioned and it is this giri dosha, which ultimately is responsible for the above-mentioned features of heaviness, stiffness, malaise, etc. As per Acharya Nandi purified Lauha if used after incineration is as efficacious as the “Amrita” (nectar). Thus, overcome the undue hazards of metals, and for making them suitable for further processing, Shodhana is mandatory.

Background

The word Lauha is used for all metals. According to McDonnell and Keith, it means “Red” and may be used for Tamra and/or Kansya in Vedic literature. The word “Ayasa” is also found in Rigveda, but in Stimer’s opinion, it signifies Kansya rather than Lauha. In Atharva Veda, two terms are used for Ayasa, namely, Shyamayasa and Lohitayasa for Tamra and Kansya, respectively. Two types of Ayasa are also seen in “Satapatha Brahmana” also, which are “Lohayasa” referring to Lauha and Ayasa referring to Tamra - as per Antel. Vajasaneyi Samhita described six metals, namely, Hiranaya, Ayasa, Shyama, Lauha, Seesa, and Trapu, where Shyma is black in color and can be presumed to iron whereas Lauha is red and thus can be predicted as Tamra and remaining Ayasa is nothing but Kansya. In Chandogyaa Upanishad and Jaminiya Upanishad, the term “Kalayasa” is used for Iron. In Charaka Lauha is mentioned as one of the metallic drugs and is indicated for Rasayana karma as in Lohadi rasayana and therapeutically for specifically curing “Pandu disorder” has been one of the ingredients of Navayasa churna, Vyoshadi ghrita, Lauha churna, Triphaladi Lauha, Daruvaridradi Lauha, etc. In Sushruta Samhita, it is used for preparing surgical instruments apart from its use in various diseases such as Prameha, Prameha pidika, Shotha, Pleehodara Pandu, Niruddha prakash, Sleshmaja granthi, etc.

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Arbuda, Medoroga, Kushtha, Raktabhishyanda, Upadansha, Palitya, Khaliyta, and Pandu. In Ashtanga Hridaya Iron is supposed to be the best for treating Pandu roga apart from its use in various Netra vikara, Prameha, Pandu roga, Udara roga Arsha, etc. Apart from Vedas and Brihatrayee Lauha has been abundantly described among various Nighantus as well as the texts of Rasashastra.

**MATERIALS AND METHODS**

Important texts of *Ayurveda* commencing from Charaka Samhita (CS) to Rasendra mangal, Rasa sara, Rasa hridaya tantra, rasa ratnagar, rasa kaumudi *Rasa Ratna Samuccaya, Rasendra Sara Sangrahा, and Bhaishajya Ratnavali* (BR) have been the sources for *Lauha Kalpas*. BR being a comprehensive source for *LK’s* was the main source, and the other important formulations are selected from other classics and enumerated according to the method of preparation.

This process of Shodhana can be studied under two headings:
- Samanya Shodhana (methods applicable for all metals)
- Vishesha Shodhana (methods applicable for iron only).

**Samanya Shodhana**

Various methods advocated in classics for Samanya Shodhana are shown in Table 1.

Thus, the overall result of Shodhana includes removal of inherent doshas, tempering of the metal, the addition of organic matter to the metal, therapeutic estimation, etc.

**Vishesha Shodhana**

As stated before that the process of Shodhana is governed to prepare metal for further processing. This fact is also applicable for Vishesha Shodhana too. However, the methods adopted here are little but tedious than before, and specific drugs are advised for specific metal to disintegrate further. Apart from heating and quenching other methods such as listed below have also been advocated.

<table>
<thead>
<tr>
<th>Impregnation</th>
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<th>Quenching</th>
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<tr>
<td>Boiling</td>
<td>→ Washing</td>
<td></td>
</tr>
<tr>
<td>Smearing</td>
<td>→ Heating</td>
<td>→ Quenching</td>
</tr>
<tr>
<td>Heating</td>
<td>→ Impregnation</td>
<td></td>
</tr>
</tbody>
</table>

**DISCUSSION**

The process of Shodhana or purification is the preliminary stage in the processing of the metal. Here purity does not signify a stage of attaining chemical purity devoid of other elements rather a state of incorporation of other materials into the substance purified. The importance of Shodhana is multidimensional, viz. First, the Shodhana process will bring about the dissociation and elimination of the associated contaminants (giri dosha). Thus leading to concentration of the metal proper which in turn helps in enhancement of the pharmacological properties of the particular material (guna vridhi), second, this process renders the material to be suitable for further processing, third, it detoxifies/neutralizes the adverse effects present, if any in the material, fourth, it imparts additional or some new desirable pharmacological properties in the material.

The elevated temperatures and the carbon formed while heating will help in reduction of the material. Similarly, the trace elements present in the prescribed liquid media as well as pH of the liquid media will all help in either dissociation or elimination of the impurities if present. These observations are supported by the following explanation given on modern texts too. On heating a metal to a desired level, the metal expands with alteration of grain boundary and grain boundary energy. The crystal lattice gets disturbed with relatively jumping of the electrons from their relative shell. This, in turn, creates some vacancies in the crystal lattice structure. On quenching such metal in to a liquid media immediately develops fracture in the crystal structure due to the fact of sudden temperature change. Further, the organic material from quenching media then filled up the vacancies, which were created on the verge of heating process. This successive process of heating and quenching thus disintegrates the metal further. Considering organic solvents (liquid media) prescribed for this special purpose, it is evident that they either come under Kshar varga, Amla varga, Lavana varga, or Vida varga, i.e., either they are, basic, acidic or neutral in nature These varga are specifically delineated for Shodhana, Jarana, Dravana, Putana, and Bhasmikaran karma which are nothing but the ways to subitize the metal such as Kshara varga[77] for Jarana, Shodhana, Malanashana, Amla varga[78] for Dravana, Jarana, Shodhana, Tejana, Lavana varga[79] for Shodhana, Bhasmikaran, Vida varga[80] for Shodhana, Putana, Deepana, and Pachana.

**CONCLUSION**

It might be concluded that the traditional arrangement of purification (Śodhana) can impact the phytochemical, pharmacological, and toxicological profile of the medications and consequently helpful in expanding safety profile and viability of the drugs. It is advantageous to receive Śodhana process according to Rasashastra literatures. Thus, the overall result of the process of Shodhana is the removal of inherent dosha, infiltration of organic material so as to make a metallo-herbal complex, reduction of crystal size, tempering of the metal.
Table 1: Various methods adopted for Samanya Shodhana

<table>
<thead>
<tr>
<th>Name of the text</th>
<th>Principle followed</th>
<th>Ingredients</th>
<th>No. of quenching</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. M.[2]</td>
<td>Imprégnation Heating Quenching</td>
<td>Jambira Rasa ↓ Decoction of Karkoti and Shringi.</td>
<td>-</td>
</tr>
<tr>
<td>Rasa.[3]</td>
<td>Heating Quenching</td>
<td>Snuhi + Arka Kshira + Halini + Kanchuki + Chitraka + Gunja + Karanja + Datura + Hayagandha + Naktamala + Ingudi + Indravaruni (Paste) Mahisha takra (quenching)</td>
<td>-</td>
</tr>
<tr>
<td>R. R (Rasa)[5]</td>
<td>Heating Quenching</td>
<td>Taila → Takra → Gomutra → Kanji → Arka Kshira → Kulattha kasaya → Nimbu rasa</td>
<td>7</td>
</tr>
<tr>
<td>A.P.[8]</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>R.Ch.u[9]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Y.T.[10]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R. Pu.[12]</td>
<td></td>
<td></td>
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<tr>
<td>R. Sam.[13]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. T[14]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R.J.N.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.K. (Kriya)[15]</td>
<td>Heating Quenching</td>
<td>Til taila → Takra → Gomutra → Kanji/Aamala → Kulattha Kashaya</td>
<td>7</td>
</tr>
<tr>
<td>R.R. (Rasa)[16]</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>R.R.S[17]</td>
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<tr>
<td>R.S.S[18]</td>
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<tr>
<td>R.Chi.[19]</td>
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<tr>
<td>A.P.[20]</td>
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<tr>
<td>A.T.[21]</td>
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<tr>
<td>Y.R.[22]</td>
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<td></td>
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<tr>
<td>V.R.R. Su[23]</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>R.Pra.[24]</td>
<td></td>
<td></td>
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<tr>
<td>Rm.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>R.P.[25]</td>
<td>Heating Quenching</td>
<td>Takra → Kanji → Gomutra → Til taila → Kulattha Kwatha</td>
<td>3/7 or 21</td>
</tr>
<tr>
<td>A.P.[26]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.S. M. K.[27]</td>
<td>Heating Quenching</td>
<td>Taila → Takra → Kanji → Gomutra Kwatha → Kulattha Kwatha</td>
<td>3</td>
</tr>
<tr>
<td>Vai. Chin.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Yo. Chan.[28]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R. Sam.[29]</td>
<td></td>
<td></td>
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<tr>
<td>R.J.N[30]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M.[31]</td>
<td>Heating Quenching</td>
<td>Til taila → Takra → Gomutra → Kulattha Kwatha</td>
<td>7</td>
</tr>
<tr>
<td>Vai. Kau</td>
<td>Heating Quenching</td>
<td>Gomutra → Kulattha kasaya → Til taila → Takra → Kanji</td>
<td>7</td>
</tr>
<tr>
<td>A.F.I.[33]</td>
<td>Heating Quenching</td>
<td>Taila → Takra → Kanji → Gomutra Kwatha → Kulattha Kwatha</td>
<td>3</td>
</tr>
</tbody>
</table>
### Table 2: Various methods adopted for Vishesha Shodhana

<table>
<thead>
<tr>
<th>Name of the text</th>
<th>Procedure adopted</th>
<th>Drugs used</th>
<th>Repetition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.M.[34]</td>
<td>Heating → Quenching</td>
<td><em>Hansahva, Blya, Amrita, Ratnamalika,</em> Phalatrika, Tumbaru, Gopali, Gorasna, Guduchi</td>
<td>-</td>
</tr>
<tr>
<td>Rasa.[35]</td>
<td>Heating → Dhalana</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rasa.[36]</td>
<td>Maceration → Washing → Incineration</td>
<td>Triphala Kwatha → Triphala Kwatha → Tankana + Ghrita + Madhu</td>
<td>-</td>
</tr>
<tr>
<td>R.H.T[37]</td>
<td>Impregnation → Putana</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.K. (Amriti)[38]</td>
<td>Smearing → Sun-drying → Heating → Quenching</td>
<td>Shashaka rakta → Takra, Taila, Sauvira, Sarpi, Madhu, Arka Ksheera, Jambira rasa, Kulattha rasa</td>
<td>7</td>
</tr>
<tr>
<td>A.K. (Kriya)[40]</td>
<td>Smearing/ → Heating</td>
<td>Shashaka rakta</td>
<td>3</td>
</tr>
<tr>
<td>R Chu.[41]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R.R.S.</td>
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<td></td>
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<tr>
<td>R.P.S.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>A.K. (Kriya)[42]</td>
<td>Heating → Quenching</td>
<td>Triphala kwatha</td>
<td>7</td>
</tr>
<tr>
<td>R.R (Rasa)[43]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>L.S.[44]</td>
<td></td>
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<tr>
<td>R.R.S.[45]</td>
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<tr>
<td>R.S.S.[46]</td>
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<td></td>
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<tr>
<td>A.P.[47]</td>
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<tr>
<td>R.Chin.[48]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.M.[49]</td>
<td></td>
<td></td>
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<tr>
<td>A.T.[50]</td>
<td></td>
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<tr>
<td>Y.R.[51]</td>
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<td></td>
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<tr>
<td>R.T.[52]</td>
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<tr>
<td>R Chu.[53]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.K. (Kriya)[54]</td>
<td>Pachana → (Boiling) → Washing</td>
<td>Gomutra → Dhanyamala (8 times)</td>
<td>-</td>
</tr>
<tr>
<td>R.R. (Rasa)[55]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.Chu.[56]</td>
<td>Smearing → Heating</td>
<td>Shashaka rakta</td>
<td>3</td>
</tr>
<tr>
<td>R.R.S.[57]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.R. (Rasa)[58]</td>
<td>Smearing → Heating → Quenching</td>
<td>Shashaka rakta → Triphala kwatha</td>
<td>3</td>
</tr>
<tr>
<td>A.P.[59]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R.T.[60]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.P.[61]</td>
<td>Smearing → Heating → Quenching</td>
<td>Arka Kshira → Triphala Kwatha</td>
<td>-</td>
</tr>
<tr>
<td>R.T.[62]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.R.R.Su.[61]</td>
<td>Smearing → Heating → Quenching</td>
<td>Shashaka rakta → Triphala/Chincha/Arka</td>
<td>3</td>
</tr>
<tr>
<td>R.Chu.[62]</td>
<td>Smearing → Heating → Quenching</td>
<td>Samudra lavana → Triphala kwatha</td>
<td>7</td>
</tr>
<tr>
<td>R.R.S.[63]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>R.P.S.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V.R.S.Su.[63]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.J.N.[64]</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Table 2: (Continued)

<table>
<thead>
<tr>
<th>Name of the text</th>
<th>Procedure adopted</th>
<th>Drugs used</th>
<th>Repetition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.Chu.[65]</td>
<td>Heating → Quenching</td>
<td>Chincha patra swarasa/Kwatha</td>
<td>7</td>
</tr>
<tr>
<td>R.R.S.[66]</td>
<td>Heating → Quenching</td>
<td>Triphala Kwatha prepared in Gomutra</td>
<td>7</td>
</tr>
<tr>
<td>R.R.S.[67]</td>
<td>Heating → Quenching</td>
<td>Triphala Kwatha + Gomutra (1:1)</td>
<td>7</td>
</tr>
<tr>
<td>R.J.N.[68]</td>
<td>Heating / Quenching</td>
<td>Acc. to Doshas, viz., V - Madhura-Snigdha, P - Madhura-sheetal, K - Katu-Tikta-Kasaya - Tikshna</td>
<td>-</td>
</tr>
<tr>
<td>A.P.[69]</td>
<td>Heating → Quenching</td>
<td>Shasaka-Rakta → Kshara, Amla, etc.</td>
<td>-</td>
</tr>
<tr>
<td>A.P.[70]</td>
<td>Heating → Quenching</td>
<td>Kshira, Taila, Ghrita, Gomutra</td>
<td>-</td>
</tr>
<tr>
<td>A.P.[71]</td>
<td>Heating → Quenching</td>
<td>Kadali mula rasa</td>
<td>-</td>
</tr>
<tr>
<td>R.R.[72]</td>
<td>Heating → Quenching</td>
<td>Sambhalu rasa</td>
<td>-</td>
</tr>
<tr>
<td>R.S.K[73]</td>
<td>Boiling → Washing</td>
<td>Gomutra → Water</td>
<td>21</td>
</tr>
<tr>
<td>A.P.</td>
<td>Smearing → Heating → Quenching</td>
<td>Shasaka rakta/Aka kshira → Triphala Kwatha</td>
<td>3</td>
</tr>
<tr>
<td>R.J.N[74]</td>
<td>Sun Drying → Boiling (Dola yantra)</td>
<td>Five salts+ two Kshara, +Shobhanjana+Amla varga</td>
<td>-</td>
</tr>
<tr>
<td>A.F.[75]</td>
<td>Heating → Quenching</td>
<td>Triphala Kwatha-Gomutra (1:1)</td>
<td>7</td>
</tr>
</tbody>
</table>

REFERENCES

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A review on Samanya Sodhana of Parad

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Department of Rasashastra and Bhaishajya Kalpana, UAU, Rishikul Campus, Haridwar

Abstract

Ayurveda, which has been widely recognized as a system of health care, has its historical roots in the Indian subcontinent. It has been practised in India for more than 5000 years. Glory of Ayurveda is spreading worldwide. Ayurvedic medicines basically are of herbal as well as of mineral origin. According to classics, drugs of herbo-mineral origin, i.e., the rasaushadhis are best in therapeutics. Mercury is backbone of Rasashastra as the whole branch is named after it. However, many questions are now being raised by scientific and non-scientific community worldwide regarding the safety and efficacy of rasaushadhis. Global resurgence of Ayurveda has necessitated its scientific validation in terms of both therapeutic efficacy and safety that ultimately depends on the quality control of ayurvedic pharmaceutical processes. Rasashastra has the potential to convert a poisonous substance into therapeutically useful drug after undergoing through a number of processes among which Sodhana is very important. Sodhana in Ayurveda is not only just elimination of undesired substances but also enhances medicinal properties, reduces toxic principles, addition of extraneous properties etc. A lot of methods are mentioned in Rasashastra for paradshodhana, of which the widely used are the sodhana by garlic, lime, and rock salt or by nagavalli, ardrak, and kshartraya. To show the acceptability of parad as a medicine, it is the need of hour to prove that these procedures not only reduce the toxicity but also enhance the therapeutic efficacy. Mercury must be used for medicinal purpose only after preclinical studies, i.e., quality, safety, and efficacy of the drug. A number of researches have been done in this regard. In this study, we have made an attempt to review on such researches to make out the probable outcome of Sodhana of Parad.

Key words: Nagvalli, Parad, Rason, Sodhana

INTRODUCTION

Rasashastra (science of alchemy) is a branch dealing with the study of substances used as medicines in Ayurveda and their detoxification and processing. It deals with Parad (mercury) which is considered to be the heart of Rasashastra. Rasa Dravyas include minerals and metals which are mainly Bhumij in origin (obtained from earth), and Parad (mercury) is also one among them.

Without shodhan we cannot use any drug in medicine. In the texts of Rasashastra, many purification methods described for metals and minerals. Depending on the toxicity, few are purified with the general purification (Samanya shodhana) methods and some with specific (Visheshshodhan) methods. By the purification, physical and chemical impurities are removed, and hence, metals are free from toxicity and metals become suitable for the further procedures like Marana. That is why shodhan is very essential for Ayurvedic herbomineral preparations. Parad is available in liquid state and it has quality to easily absorb, the metals, and minerals. For the purification of parad, several methods have been adopted in the rasa texts.

As Ayurveda is itself a huge science, it does not need any explanations but to reveal its glory in modern globalised era it’s the need of hour to explain its concepts scientifically according to modern science. So here an attempt has been made to explain the concept of samanyaasodhan of parad on the grounds of modern science based on several scientific research articles published in leading journals and publications.

MATERIALS AND METHODS

The review centralizes on published research articles in the MEDLINE, PubMed, Google Scholar, Science direct, ASL,
and Scopus. Study criteria based on research articles and publications related to Parad sodhana, scientific explanations of reactions in parad sodhana, and biochemical reactions related to garlic, mercury, lime, salt etc. Method adopted is prospective logical scientific literary research.

**Concept of Sodhan**

Before preparation of herbomineral combination, purification of metallic substances is necessary to reduce the concentration of chemicals.[1] It is essential because higher concentrated chemical may cause adverse effect on human body.[2] Hence, these chemicals should be neutralized to its normal pharmacological actions. Hence, this shodhan concept is very important.

The process of eliminating the impurities of the metallic substances by means of Svedana (vaporing), Prakshalana (performing frequent ablations), Galana (straining fluids), Avapa (substances are added into the liquefied metals), Nirvapa (metals are burnt to red hot and dipped in liquids), Bhavana (levigation), and Bharjana (frying in pan) specific process and techniques with the help of specifically mentioned Aushadha dravya (plant juices or animal products) is known as Sodhana.

Sodhan in Ayurveda is not only elimination of undesired substance but also it has some outcomes such as:-
- Conversion of metals and minerals into herbomineral/organomineral compound
- Enhancing/masking medicinal properties
- Reducing toxic properties
- Chemical and physical properties get changed
- Extraneous matter is added to impart the therapeutic effect into original matter.

**Samanya Sodhan of Parad (mercury)**

In Ayurveda, various doshas are mentioned in different Rasgranthas, observed during the use of Ashodhit parad. It has also mentioned that the shudha parad is not toxic and possesses roganashak property and acts as medicine. Hence, in the present era, the toxicity of mercury is produced by the Ashudh form of mercury. Several methodologies have been adopted by Acharyas time to time as per circumstances for parad sodhana:

<table>
<thead>
<tr>
<th>Rasagarthna</th>
<th>Parad Samanya Sodhan by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rasatarangan[3]</td>
<td>- Sudharaj (lime), Rason (garlic), Saindhav lavan (rock salt) - Nagvalli (betel), Ardrak (ginger), Kshartraya (Yavakshar, Sajjikshar, Tankad)</td>
</tr>
</tbody>
</table>

Ayurved Prakash[6]
- Rason (garlic), Raai (Brasicajuncia), Kaanji, Gwarpatha, Kakhmachi, Trifala, Saindhav lavan, Nausadar

Rasendra Sar Samgrah[5]
- Shrikhand, Devdaru, Kakjanga, Jayanti, Musali, Ghritkumari
- Gandhak, Jambeeri nimbu
- Jayanti, Erand, Ardrak, Makoya
- Haridra, Ishtika churna, Girdhoom, Trifala, Ghritkumari, Chitrak, Trikatu

Among all these, the widely used methods for samanya sodhan of Parad are by Rason (garlic), Sudharaj (lime), and Saindhavlavan (rock salt) or by Nagvalli (betel leaves juice), Ardrak (ginger rhizome juice), and Kshartraya (Yavakshar, Sajjikshar, and Tankan).

In the first method, parad is triturated with equal quantity of lime for 3 days and strained through a double-layered cotton cloth, and then, it is further triturated with equal amount of scraped garlic and rock salt (half of parad) till the paste becomes black. Then, the blackish paste is washed with water to get suddha parad.

In the second method, parad is triturated with expressed juice of betel leaves and fresh rhizomes of ginger along with Kshartraya (Yavakshar, Sajjikshar, and Tankan) for 3 days and washed with Kanji to get Suddha parad.

**Explanation of Parad Sodhan**

Chemical and electrical processes take place on the surface of mercury. A study shows that even the irradiation effect of mercury while trituration is suppressed and neutralized by garlic.[6] Due to churning, surface tension decreases and increment in temperature takes place.[7] Heat produced due to friction of the pestle and mortar seizes the heat labile impurities. Open trituration in khalva allows atmospheric oxygen to react within a self-created magnetic field. Mercury interferes with the capacity to quench highly reactive oxygen species to form inorganic mercury compounds.

Lime is a preferred precipitant for the removal of heavy metals.[8] The mechanism governing the metal removal
process is determined as chemical precipitation and adsorption at high pH.[9] Unlike the case for many heavy metals, high pH does not reduce mercury solubility. Except for cadmium, little fraction of copper and lead in the adsorption residues desorbs in acidic media. Hence, lime also provides alkaline media to stabilize mercury and enhance the removal of copper, cadmium, lead, and other heavy metals.

Garlic has been proved as a best antidote for heavy metal poisoning.[10] Hence, processed garlic is augmented with antidote itself. One step ahead in safety to select it as a best drug for sodhana of parad and logically used. Fresh bulb of garlic contains allin, allicin, and volatile oils.[11] When garlic is crushed, enzyme alliinase is exposed which converts allin into its optical isomer Allicine within 10 s.[12] Allicin is unstable (pure Allicine at room temperature has a half-life of 2–16 h) and converts readily into mono-, di-, tri-, and poly-sulfides, sulfur oxide, and other compounds such as ajoene, which is a secondary degradation product of allin, are presumably the most active compound responsible for any multiple bonding along with mercury.[13]

Hg+Ajoene (Sulfur oxide) → Mercuric sulfuroxide

Garlic (Allicin-organsulfur) and Hg reaction is a redox. Sulfur and mercury form a best covalent bond, and as a result, the triturated product turns black in color though many of mercury salts are turned to white powders or crystals. It is a miniature concept of Kaijali (mercuric sulfide) itself. Hence, the drug designers of ancient time have proposed parad samanya shodhana using garlic.

A give and take principle is followed between mercury and garlic. The raw Parad (mercury) contains of iron (4.7800), copper (4.5840), zinc (1.2280), silver (0.3040), tin (3.7560), cadmium (2.0534), lead (2.3400), and arsenic (2.6500) elements in ppm levels before the purification.[14,15] After the purification with the help of AAS analysis, the results of elements are iron (2.5760), copper (2.6520), zinc (0.2800), silver (0.0440), tin (1.6090), cadmium (0.1330), lead (0.9036), and arsenic (1.0146) ppm levels.[16] Hence, by above mentioned purification method, the ppm levels of these elements are greatly reduced. It also incorporates new elements in Shodhit Parad (new elements such as B, Ca, Cr, and Ti are detected). The selenium and germanium trace elements found in garlic extract[17] are another area of explanation showing some unknowing effect on mercury.

Saindhav lavan (rock salt) consists of 95–98% sodium chloride, 2–4% polyhalite (potassium, calcium, magnesium, sulfur, oxygen, and hydrogen), 0.01% iodine, and micro amounts of numerous trace minerals.[18] It also aids the process along with garlic.

When the whole blackish paste is washed with water at the end of the procedure, the mercuric sulphuroxide get hydrolyzed to produce mercury. In this mercury, heavy metals such as iron, copper, zinc, silver, tin, cadmium, lead, and arsenic are reduced in concentration while some new elements are added such as B, Ca, Cr, and Ti.

**DISCUSSION**

As per the concept of Ayurveda, “even a strong poison can be converted to an excellent medicine if processed and administrated properly.”[19] On the other hand, even the most useful medicine may become a poison if handled incorrectly. Over time, Ayurvedic practitioners have tried to develop a number of traditional methods to convert toxic substances to useful medicines. It may be justified that traditional system of purification (Sodhana) can influence the physicochemical, pharmacological, and toxicological profile of the raw drugs and thereby useful in increasing safety profile and efficacy of the drugs. It is worthwhile to adopt Sodhana processes as per Indian system of medicine in the development of herbomineral formulations with application of modern technology to assess its safety and efficacy.

This review discusses the Sodhan procedure of ayurvedic pharmaceutics which is relevant to answer queries regarding the safety of rasashaadhis. Considering the above concepts, this review emphasizes on possible correlation of classical particulars and researches of contemporary time. We have tried to pace with recent advances, and thus, a primitive theoretical explanation is proposed. Particular drug or media mentioned for specific methods of sodhana indicate some basic relation between the indicated drug and parad. We can also explain the possible interactions of these organic and inorganic constituents with Parad on account of surface tension, heat transfer, redox reaction, adsorption, and formation of organometallic compounds. Ultimately, these are the molecules used for further procedures or therapeutics.

**CONCLUSION**

For the shodhan of Parad, many methods were adopted in the rasa texts, but most common method described in Rasatarangini in which Parad is triturated with equal quantity of lime for 3 days and strained through a double-layered cotton cloth, and then, it is further triturated with equal amount of scraped garlic and rock salt (half of parad) till the paste becomes black. Then, this blackish paste is washed with water to get sudha parad. Sulfur present in garlic forms covalent bond with mercury. It causes to potentiate the therapeutic efficacy besides isolating impurities. After the purification, iron, copper, zinc, silver, tin, cadmium, lead, and arsenic in ppm levels reduce and come within the permissible limits. Some new elements are also added in the final outcome such as B, Ca, Cr, and Ti.

Thus, this method may be explained on the grounds of modern science, how scientific methodology has been
developed by ayurvedic experts of those days for making mercury (parad) therapeutically useful by using garlic, lime saindhav.

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A review article on medicinal uses of Saindhava Lavana in various Yogas w.s.r to Charaka Samhita

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Abstract

Ayurveda, the traditional Indian medicine system, not only deals with the treatment of disease but also about the prevention of disease and maintenance of health for which major Ayurvedic texts such as Charaka Samhita have indicated many dravyas (medicines). Ayurveda uses various dravyas (medicines) that originate in nature. These dravyas (medicines) in Ayurveda on the basis of their origin in nature are classified as three types, some medicines are derived from plant origin in Ayurveda other are derived from earth, rocks etc and yet other class of drugs is derived from animal origin. The Lavanas (salts) are derived from earth and rocks. There are five types of salt in Ayurveda known as Pancha Lavana of which Saindhava Lavana is one. Saindhava which is understood to be rock salt has been considered the best by Acharya Charaka among the Pancha lavanas. There are various uses of Saindhava lavana as a medicinal ingredient in Charaka Samhita apart from it being a daily dietetic inclusion. Thus, the article highlights the various formulations of medicines where Saindhava lavana is used as an ingredient of drug in Charaka Samhita.

Key words: Audbhida, Ayurveda, Dravya, Jangama, Lavana, Parthiva, Saindhava

INTRODUCTION

Charaka Samhita describes five types of salts that are Pancha lavanas which are: Saindhava, Sauvarchala, Samudra, Bida, and Audbhida. Ayurveda medicines originate in nature in the form of above-mentioned jangama, audbhida, and parthiv dravyas. Pancha lavana is parthiva dravyas. Saindhava lavana is widely used in Ayurvedic system of medicine in various medicinal formulations. Acarya Charaka opined in Vimanasthana that among dravyas that should not be used in excess there are three kshar, lavana and pippali. In this respect acarya has instructed for the appropriate dose of lavana. Thus lavana has the property Apatbhadram which means that if used properly leads to good results and if used in excessive amount leads to weakness and lassitude. According to Charaka acharya, there are regions where Lavana is used excessively even along with milk which is unwholesome. Hence, lavana is dietetic inclusion and also a medicinal ingredient but in appropriate quantity. Among the five lavanas indicated in Charak Samhita, Saindhava lavana has been regarded as the best of all which accounts for the greatest use of Saindhava among these five salts. Charaka Samhita describes the properties of Saindhava lavana in the Annapanavidhi adhyaya which are as follows: It is the best among salts, palatable, promoter of digestion, aphrodisiac, conducive for eyesight, alleviator of all the three doshas, and slightly sweet in taste, and it does not cause burning sensation. Lavanas are easily available in nature and also widely used by people as in daily diet. Saindhava lavana being the most important since all acharyas of Ayurveda regard it as the best form of salt, and thus, the article would enumerate the various references where Saindhava lavana has been used in medicinal formulations of Charaka Samhita.

LITERARY REVIEW

Ayurveda considers Ahara (food), Nidra (sleep) and Brahmacharya (austerity) as the Upstambha or foundation of life. Ahara has been described first and given utmost importance. In this respect ahara that is healthy for the body and does not vitiate the tridoshas has been told by the acharyas to be included in the daily dietetic regimen, Saindhava Lavana being one of them. Apart from being an important source of micronutrients in the diet when

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<table>
<thead>
<tr>
<th>Formulation</th>
<th>Usage form</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vrsya pupalika</td>
<td>A medicine having aphrodisiac properties</td>
<td>C. Chi 2/4/19</td>
</tr>
<tr>
<td>As a recipe for different types of visama jvara</td>
<td>Inhalation of hingu and vasa (muscle fat) of vyaghra (tiger) taken in equal quantity and mixed with rock salt</td>
<td>C. Chi 3/302</td>
</tr>
<tr>
<td>A netraanjana (collyrium) in visham jvara</td>
<td>This netraanjana is applied to the eyes as a treatment in visham jvara</td>
<td>C. Chi 3/306</td>
</tr>
<tr>
<td>Haphushadi ghrit</td>
<td>It is used in treatment of gulma</td>
<td>C. Chi 5/71</td>
</tr>
<tr>
<td>Shatyadi churna and shatyadi gutika</td>
<td>It is used in treatment of gulma</td>
<td>C. Chi 5/86</td>
</tr>
<tr>
<td>Bhallatakadi ghrit</td>
<td>Used in the treatment of Gulma</td>
<td>C. Chi 5/144</td>
</tr>
<tr>
<td>Nasya in Kushta roga</td>
<td>Inhalation of this churna eliminates krimi, Kustha and Kapha dosha</td>
<td>C. Chi 7/48</td>
</tr>
<tr>
<td>Kusthadi lepa in Kustha roga</td>
<td>A lepa (medicated paste) is made in combination with other drugs used in skin diseases</td>
<td>C. Chi 7/93</td>
</tr>
<tr>
<td>Kushta nashak lepa</td>
<td>2 lepas have been made using Saindhava lavana which are effective in Mandala Kushta</td>
<td>C. Chi 7/122</td>
</tr>
<tr>
<td>Edgajadi lepa</td>
<td>A lepa has been made which is useful in Mandala and Dadru Kushta</td>
<td>C. Chi 7/126</td>
</tr>
<tr>
<td>Manahshiladi lepa</td>
<td>A lepa has been prepared using Saindhava lavana which is useful in Sweta Kushta</td>
<td>C. Chi 7/167</td>
</tr>
<tr>
<td>Other two lepas for Sweta Kushta</td>
<td>A lepa is made along with neelkamal etc.</td>
<td>C. Chi 7/169</td>
</tr>
<tr>
<td>Apasmar nashak Ghrit</td>
<td>A medicated ghrit is prepared which is a medicine for Apasmar, heart diseases and diseases caused by evil effects of bad planets</td>
<td>C. Chi 10/26</td>
</tr>
<tr>
<td>As a medicine for kshat ksheena (Phthisis)</td>
<td>A medicine is prepared with the fat of goat fried with sura (a type of alcohol) and mixed with Saindhava lavana</td>
<td>C. Chi 11/27</td>
</tr>
<tr>
<td>Saindhavadi churna</td>
<td>A churna is prepared with Saindhava and Sauvarchala lavana effective in kshat ksheena (Phthisis)</td>
<td>C. Chi 11/85</td>
</tr>
<tr>
<td>Vidangadi kshaar</td>
<td>A kshaar is prepared which is a treatment for Plihodara and Gulma</td>
<td>C. Chi 13/80</td>
</tr>
<tr>
<td>As a pathya in Udararogas</td>
<td>Pleehodara should be treated with a drink made by Saindhava lavana</td>
<td>C. Chi 13/104</td>
</tr>
<tr>
<td>As a pathya in Udararogas</td>
<td>Badhodara should be treated with a drink made by Saindhava lavana</td>
<td>C. Chi 13/105</td>
</tr>
<tr>
<td>Hapushadi Churna</td>
<td>Used as a medicine in Udarogas</td>
<td>C. Chi 13/134</td>
</tr>
<tr>
<td>Shireeshbejjadi lepa</td>
<td>Used as a medicine in Arsh chikitsa</td>
<td>C. Chi 14/53</td>
</tr>
<tr>
<td>Traiushnadi churna</td>
<td>Used as a medicine in Arsh chikitsa</td>
<td>C. Chi 14/63</td>
</tr>
<tr>
<td>Dashmooladi ghrit</td>
<td>Used as a medicine in Grehni chikitsa</td>
<td>C. Chi 15/85</td>
</tr>
<tr>
<td>Panchamooladi ghrit and churna</td>
<td>Used as a medicine in Grehni chikitsa</td>
<td>C. Chi 15/88</td>
</tr>
<tr>
<td>Marichadi Churna</td>
<td>Used as a medicine in Grehni chikitsa</td>
<td>C. Chi 15/109</td>
</tr>
<tr>
<td>As a drug to induce emesis</td>
<td>Used as a medicine in Hikka Swas chikitsa</td>
<td>C. Chi 17/75</td>
</tr>
<tr>
<td>Tejovatyadi ghrit</td>
<td>Used as a medicine in Hikka Swas chikitsa</td>
<td>C. Chi 17/142</td>
</tr>
<tr>
<td>Vidangadi churna</td>
<td>Used as a medicine in Kasachikitsa</td>
<td>C. Chi 18/47</td>
</tr>
<tr>
<td>Vidangadi leh</td>
<td>Used as a medicine in Kasachikitsa</td>
<td>C. Chi 18/52</td>
</tr>
<tr>
<td>Saindhavadi yoga</td>
<td>Used as a medicine in Kasachikitsa</td>
<td>C. Chi 18/63</td>
</tr>
<tr>
<td>Khadirsara is mixed with Saindhav</td>
<td>Used as a medicine in Kasachikitsa</td>
<td>C. Chi 18/64</td>
</tr>
<tr>
<td>A leha is made for Kshaya</td>
<td>Treatment of Kshaya by a leh in Kasachikitsa</td>
<td>C. Chi 18/180</td>
</tr>
</tbody>
</table>

(Contd...)
The medicinal formulations where Saindhava lavana as an ingredient has been used by acharya Charaka are provided in the following Table 1.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Use in Ayurvedic Formulation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atisar nashak yoga</td>
<td>As a medicine in atisarchikitsa C. Chi 19/28</td>
<td></td>
</tr>
<tr>
<td>Medicated Ghrit prepared</td>
<td>As a medicine in Chardichikitsa C. Chi 20/24</td>
<td></td>
</tr>
<tr>
<td>Kaphaj chardi chikitsa yoga</td>
<td>As a medicine in Chardichikitsa C. Chi 20/34</td>
<td></td>
</tr>
<tr>
<td>Kshaaragad</td>
<td>As a medicine in Vishachikitsa C. Chi 23/102</td>
<td></td>
</tr>
<tr>
<td>Pippiliyadi anjana</td>
<td>As a medicine in Vishachikitsa C. Chi 23/183</td>
<td></td>
</tr>
<tr>
<td>Karnikanashak yoga in Vishachikitsa</td>
<td>As a medicine in Vishachikitsa C. Chi 23/203</td>
<td></td>
</tr>
<tr>
<td>Medicated decoction</td>
<td>As a medicine in Maddratyachikitsa C. Chi 24/111</td>
<td></td>
</tr>
<tr>
<td>Shyamaadri Pradhman churna</td>
<td>As a medicine in Trimarmiyachikitsa C. Chi 26/15</td>
<td></td>
</tr>
<tr>
<td>As a nasya in Pratishayaya</td>
<td>As a medicine in Trimarmiyachikitsa C. Chi 26/141</td>
<td></td>
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<tr>
<td>Peetak churna in Mukharogas</td>
<td>As a medicine in Trimarmiyachikitsa C. Chi 26/196</td>
<td></td>
</tr>
<tr>
<td>Devdarvayadi tail</td>
<td>As a medicine in Trimarmiyachikitsa C. Chi 26/223</td>
<td></td>
</tr>
<tr>
<td>Ksharartail</td>
<td>As a medicine in Trimarmiyachikitsa C. Chi 26/227</td>
<td></td>
</tr>
<tr>
<td>Brihatyadi Varti</td>
<td>As a medicine in Trimarmiyachikitsa C. Chi 26/240</td>
<td></td>
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<tr>
<td>Vatsakadi lepa in Urustambh</td>
<td>Medicine for Urustambhachikitsa C. Chi 27/55</td>
<td></td>
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<tr>
<td>As a medicinal yoga for Sarvang gat or ekkang gata vayu</td>
<td>Medicine for Vatavyadhikitsa C. Chi 28/98</td>
<td></td>
</tr>
<tr>
<td>Moolakadi tail</td>
<td>Medicine for Vatavyadhikitsa C. Chi 28/167</td>
<td></td>
</tr>
<tr>
<td>Pippiliyadi yoga</td>
<td>Medicine for Yoniyapadchikitsa C. Chi 30/54</td>
<td></td>
</tr>
<tr>
<td>Saundhavadi tail</td>
<td>Medicine for Yoniyapadchikitsa C. Chi 30/58</td>
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<tr>
<td>Arkadi Varti</td>
<td>Medicine for Yoniyapadchikitsa C. Chi 30/71</td>
<td></td>
</tr>
<tr>
<td>Pippiliyadi Varti</td>
<td>Medicine for Yoniyapadchikitsa C. Chi 30/72</td>
<td></td>
</tr>
<tr>
<td>As a medicinal yoga to induce emesis</td>
<td>Emetic in Madanphalkalpadhyaya C. K 1/14</td>
<td></td>
</tr>
<tr>
<td>Inhalational drug to induce emesis</td>
<td>Emetic in Madanphalkalpadhyaya C. K 1/19</td>
<td></td>
</tr>
<tr>
<td>Trivritadi virechana yoga</td>
<td>Medicine for inducing purgation C.K 7/65</td>
<td></td>
</tr>
<tr>
<td>Baladi niruha vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 3/15</td>
<td></td>
</tr>
<tr>
<td>Shiraadi niruha vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 3/37</td>
<td></td>
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<tr>
<td>Palash vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 3/45</td>
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<tr>
<td>Chandanadi niruha vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 3/51</td>
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<tr>
<td>Panchamooladi Vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 3/59</td>
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<tr>
<td>Rasnaadi niruha vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 3/63</td>
<td></td>
</tr>
<tr>
<td>Saundhavadi anuvasana tail</td>
<td>Medicine to instill oily enema in Vastisutriyasiddhiadhyaya C.Si 4/13</td>
<td></td>
</tr>
<tr>
<td>Vishuchika, alasaka nashak vasti</td>
<td>Medicine to instill enema in Vastisutriyasiddhiadhyaya C.Si 12/18</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

Acharya Charak has mentioned that ahara (diet) is a cause of both origins of body and disease. Proper growth of the body and maintenance of health depends on optimum and balanced diet. Acharyas opine that the whole universe is made up of Panchamahabhutas that is Akash Vayu Agni Jala Prithavi. The human body is the component of universe that is “yat pinde tat brahmanai.” This Panchabhautika body is nourished by none other than the Panchamahabhutas themselves, and thus, whatever Āharawe consume has a direct and close relation...
to our body and mind. Ayurveda advocates that according to the origin, jangama, audbhida, and parthiva dravyas are to be utilized for the maintenance of health and getting cured from disease. Lavana is one of the important parthiva dravyas used in diet since Charaka Acharya holds that among foods that should be used often for maintenance of health, Saindhava lavana is one.\(^6\) Apart from it being a dietetic inclusion, it is also used in various drug preparations for the treatment of diseases. It is held that wherever acharyas have used the term Lavana in Samhitas it is to be taken as Saindhav lavana if not specified otherwise. Saindhava lavana has been used in various medicinal formulations for internal as well as external use. Among the external uses of Saindhava lavana, there are various lepas (ointments) that have been made such as lepas useful in Mandala and Dadru Kustha, Vatsakadi lepa in Urustambh chikitsa, and Peetak churna in Mukharogas. Saindhava lavana is used as a medicine to induce emesis as well in formulations to induce purgation. Furthermore, most basti preparations both asthapana basti and anuvasa basti are made with Saindhava as an ingredient. Saindhava lavana is also used to prepare aphrodisiac medicines. In Yonivyapada chikitsa, there are various oils that are made from Saindhava lavana to be administered in the form of tampons. Other variety of formulations where Saindhava lavana is used are those where there is agnimandhya (impairment in digestion) such as Saindhava lavana being used in churnas indicated in Gulma chikitsa, Grehni chikitsa, ksha ksheena (Phthisis) chikitsa, and Kasa chikitsa. Furthermore, Saindhava lavana is added in various medicines for snehana in Panchakarma. Saindhava lavana is used in oleation therapy of Hikka Swas\(^7\) by which an inference can be drawn that it is vistransansamartham (capable of laxative effect) in its property. Saindhava lavana is used in combination with drugs used in upnah swedan for external application.\(^9\) Lavana if used in preparation of snehan (oleation) therapy formulations easily facilitates oleation therapy due to it having the property of abhishyandi (to break up the aggregation of doshas). Other reason of adding Lavana (saindhav) to Sneha kalpanas is the vyavayi property of lavana that is to easily circulate in the srotas and get digested later. Saindhava lavana unlike other Lavanas owing to its property of not causing any burning sensation has been used in internal application such as in basti (enema) or in anjana (eye salves). Saindhava lavana owing to its aphrodisiac properties is used in yogas that have spermatopoietic properties. It is used in anjana formulations due to it being conducive for eyes. Thus, Saindhava lavana due to it being a balancer of tridosha is considered the best among Pancha lavanas.

**CONCLUSION**

Saindhav Lavana is mentioned as an integral part of the balanced diet as stated by Acharya “Lavana Annadravya Ruchikaranam”\(^7\) by which an inference can be drawn that it is indicated to be added in less quantity to diet. Apart from it being a source of nutrients in the daily diet, it is also used in various medicinal formulations of Charaka Samhita. Saindhava lavana is the one that is used most often in medicinal formulations in Charaka Samhita. Thus, it is concluded that Saindhava lavana due to its tridosha shamak properties has been widely used in various medicinal formulations. It can be hypothesized that wherever Saindhava lavana has been used in external application such as in various skin diseases it could be for increasing the availability and permeability of various lepas into the skin since it is visyanandkari\(^8\) in its property (that is to liquefy due to jala mahabhut predominance). In addition, Saindhava lavana is added in almost all the basti preparations indicated in Siddhisthana of Charaka Samhita. Thus, Saindhava lavana is an important constituent of basti dravyas probably due to it being a promoter of digestion and increasing the penetration of the enema into the intestine also it is vistransansamartham (capable of laxative effect) in its property. Saindhava lavana is used in combination with drugs used in upnah swedan for external application.\(^9\) Lavana if used in preparation of snehan (oleation) therapy formulations easily facilitates oleation therapy due to it having the property of abhishyandi (to break up the aggregation of doshas). Other reason of adding Lavana (saindhav) to Sneha kalpanas is the vyavayi property of lavana that is to easily circulate in the srotas and get digested later. Saindhava lavana unlike other Lavanas owing to its property of not causing any burning sensation has been used in internal application such as in basti (enema) or in anjana (eye salves). Saindhava lavana owing to its aphrodisiac properties is used in yogas that have spermatopoietic properties. It is used in anjana formulations due to it being conducive for eyes. Thus, Saindhava lavana due to it being a balancer of tridosha is considered the best among Pancha lavanas.

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Clinical significance of Pathya and Anupana

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Abstract

In Ayurveda, four-folds of treatment described by acharya Sushruta are ahara, achara, sanshamana, and sanshodhana. Pathya refers to anything which is beneficial to the srotas/channels of the body which in other words are called patha. Pathya could be either in the form of ahara, vihara, or aushadha itself. Pathya ahara and vihara are given prime importance as they play a key role in prevention as well as early recovery from disease while treating them. This is the reason for which all acharyas have mentioned specific pathya ahara and vihara along with the drug formulation in the treatment of every disease. Anupana is another important factor which directly influences the drug action by increasing the bioavailability of drugs and brings about their quick action. Besides these, samyoga, vishlesha, kala, sanskara, and yukti, are the other significant factors which also influence the drug efficacy.

Key words: Anupana, Ayurveda, pathya, pathya ahara-vihara

INTRODUCTION

To fulfill both the aims of Ayurveda, swasthya-rakshana and vikara-prashamana, four-folds of treatment are described by Acharya Sushruta which are Ahara (diet), Achara (conducts), Sanshamana (Aushadha/medicine), and Sanshodhana (panchkarma/purification). Among these procedures, all acharyas have preferred Ahara and Achara first to be followed whether for health maintenance or for treatment purpose. This is because the only source of bala (strength), varna (complexion), and ojas (immunity) in our body is Ahara; and also attainments of health or occurrence of ailment, both depends on quality and type of ahara. Besides this, while prescribing shamana or shodhana chikitsa, patients are always advised to follow pathya ahara and achara. This indicates the significance of pathya in treatment as it plays major role in quick recovery from any disease. Thus, this article emphasizes influence of pathya and apathyahara- vihara on Ayurvedic drug efficacy along with other accessory but highly important components of effective and successful management principles of Ayurveda.

Aim/Objective

The aim of this study is to interpret and explore the significance of pathya ahara and vihara in the treatment of disease and their impact on drug action.

MATERIALS AND METHODS

Various relevant Ayurvedic literatures were studied and analyzed to understand the meaning of pathya, their mode of action in curing disease, necessity of pathya, factors affecting the role of pathya ahara and vihara, and some other specific factors which influence the drug potency.

Concept of Pathya

Pathya word is derived from its root word Patha whose literal meaning is a way or channel, the channels of dosha and dhatu, or the whole body. In shabdakalpadrum, according to Shabdachandrika, certain substances which are beneficial to srotas and assist in treatment for early recovery are pathya. Synonyms of pathya mentioned in

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Apte dictionary are salutary, wholesome, beneficial, and agreeing with said of a medicine, diet, advice, etc. Thus, anything which is beneficial to the body along with the channels of the body and is not troublesome to it is called pathya. According to Charak, the drugs or the regimes which do not adversely affect the body and mind are considered as pathya (wholesome), while those which adversely affect them are regarded as apathyā (unwholesome). However, this cannot be accepted as a general rule in absolute terms because there are various factors such as maatra, desha, kala, and dosha which changes the quality of pathya to apathyā and vice versa. Thus, due to this criteria, pathya is individual for everyone. It could be either ahara, vihara, or aushadha as in Rasayana adhyaya. Caraka has mentioned the synonyms of bhashaja one of them being pathya besides hita, chikitsa, vyadhihara, sadhana, aushadha, prayashchita, prashamana, and prakriti-shapana. In various contexts, pathya and hita are used synonymously. In shabdakalpadrum, the word Hitā indicates substances which help for movement and nourishes the body; as a result, it becomes auspicious to one’s own body. According to Apte dictionary, the synonyms of hita are suitable, proper, good, useful, advantageous, beneficial, wholesome, salutary, etc. Pathya is considered as aushadha and its significance is stated by Lolimbaraja that if a person follows the dietary rules for particular disease there is very little significance or requirement of drug application; and when a person is exposed to apathyā the drug application will have no value because drug taken will not be able to cure disease. Opposite to pathya, anything which vitiates the srotas (channels) within the body is defined as apathyā.

Mode of Action of Pathya

Doshas get aggravated in either of the two different ways, namely, kathinya (with compactness) which occurs internally, and oonbhava (without compactness) which occurs in gross form; two being the chaya and achaya prakopa of doshas, respectively. By pathya ahara and vihara (wholesome food and regimes), these compact and non-compact doshas get softened or reduced in quantity, respectively, as a result, of which the morbid manifestation will be of mild nature. This means, doshas which are vitiated chronically or acutely, severe or mild, are soft by pathya, i.e., their potency of causing disease is made milder. This leads to lightening of severity of that disease. In Rasayana adhyaya, Charak has stated pathya to be one of the synonyms of chikitsa which reveals that following the pathya ahara and vihara in itself is a treatment procedure. For this, Charak further in chikitsa sthana stated that if any kind of disease occurs even on taking pathya, then one should either increase the quantity of pathya or should continue the intake of pathya for long duration.

Anupana

Bheshaja avacharana (drug administration) requires yukti. Anupana (vehicle) forms an integral part of treatment as it directly influences the efficacy of drug action. The word Anupana literally means the liquid which is drunk with or after ahara (meal) or aushadha (medicine). It should possess the properties which are opposite to ingested food but should not be contradictory to the dhatus (body tissues). Anupana, to be taken with or after meal or with medicine, in healthy or ill patient, is decided by considering the dosha involved, bala (strength) and avastha (stage) of the rogi (patient) and roga (disease); and the aushadha to be given.

Mode of Action of Anupana

a. Effect on ahara (food): Anupana taken after food brings about the following actions - draws the ingested food down in alimentary canal, splits the food bolus into smaller form, moistens and softens the food, provides medium for digestion, and makes the digestion easier.

b. Effect on Aushadha (medicine): Anupana when taken along with Ayurvedic drug, assists drug to spread quickly in whole body, enhances the properties of drug, disintegrations of their constituents, spreads with in fraction, and helps in circulation of drug.

c. Effect on vyadhi (disease): Anupana also acts directly on disease besides supporting drugs. For example, takra is the Anupana of chitrakadi vati in graham roga but itself it is also a medicine for graham roga owing deepana, grahi, and laghu properties.

In a healthy individual, Anupana taken after meal brings about tarpana (refreshment), preenana (pleasure), urjaska (energetic), brinhana (nourishment), ayurvedhaka (increases life span), jeevana, bala (strength), dridanga (firmness), suka swasthya (health), rochana (tasty), deepana (appetizer), vrishya (aphrodisiac), and varnya (enhances the complexion). It helps in breakdown, softening, digestion, proper assimilation, and instant diffusion of the food ingested.

Acharya Sushruta has mentioned Anupana according to diseases and according to different ahavavarga.

Besides these pathya and Anupana, some other factors also influence directly the action of drug administered. These factors are (a) samyoga (addition of ingredients), (b) vishlesha (elimination of ingredients), (c) kala (appropriate time of administration), (d) samskara (processing), and (e) yukti. By virtue of these factors when utilized appropriately, even a small quantity of drug may produce more powerful effects and otherwise even a formulation in large quantity may produce very mild effects.

a. Samyoga - Samyoga or combination is one of the integral factors which increases or decreases the efficacy of drug. This combination could be of two things, many things and one thing with another such combinations are temporary (anitya). Addition of a drug whose ingredients possess similar potency as that of main drug, then the effect of formulation becomes more powerful even on taking in small dose. Similarly, adding a drug having opposite
potency, then the effect of that formulation even taken in larger dose becomes milder. This makes it suitable to prescribe formulation/drug according to the requirement of koshtha, i.e., nature of bowel of particular patient. For example, shweta nishotha/trivrata is a mild purgative; if it is given to a patient with krura-koshtha then purgation does not happens. Hence, trivrata is added with snuhi-ksheera to obtain desired purgation.

b. **Vishlesha** - It is also known as division (absence of combining factors) or separation (consisting of non- combination, distinctness, and plurality).\(^\text{[17]}\) This factor also influences the drug response. For example, combination of kakarashataka gana with parada bhasma and its formulations is strictly prohibited as it hampers the drug action. Similarly, combination of vidahi and guru ahara with shilajatu is prohibited as both possess same properties. Furthermore, kulattha (excellent drug for breaking stones) should be avoided till shilajatu drug (producing firmness in body like stone) is used because both have mutually contradictory effects.\(^\text{[18]}\)

c. **Kala** - **Kala** refers to time of drug administration which varies according to the rogi-avastha (nature of the patient), roga-avastha (nature and stage of disease), dina (different parts of the day), jirna-lakshana (stage of digestion of food), and the ritu (season).\(^\text{[19]}\) Rogi avastha refers to the condition of patient and his bala/ strength. Pravara-avara-madhya are the classes of rogi bala and the type of drug formulation depends on these classes. Palatability of drug is also made according to these balalavastha. Roga-avastha refers to the stage of disease whether severe, moderate, or mild. The patient suffering from fever should be given peya, kashaya, medicated milk, ghee, and purgation therapy consecutively at an interval of 6 days after observing the time of disease. Potency of drug formulation is also made according to the stages of any disease. Regarding the time with reference to the different parts of the day, morning time is the most suitable time for the administration of emetic therapy. After watching the signs of proper digestion (hunger, evacuation of stool and urine, lightness of body, and purity), medicines should be given to patient thereafter; otherwise, the medicine will produce harmful effects. **Kala** also reveals bhashya-kala described by all acharyas which are according to the type of dosha vitiation or the type of disease. For example, in apana vayu vikriti drug is administered before meal and in vyana vayu vikriti after morning breakfast.\(^\text{[20]}\) Ritu or season also becomes important factor according to which potency of drug is decided/changed. Wholesome food and regimes according to different seasons have been mentioned in detail in ritucharya adhyaya.

d. **Samskara** - Modification in the natural properties of different dravya is called samskara. It involves the administration of properties of other substance within them. Caraka has mentioned 10 type of methods through which samskara is accomplished. These are agni samyoga, jala, shaucha, manthana, desha, kala, vasana, bhavana, and kala prakarsha.\(^\text{[21]}\) Conversion of guru dravya into laghu dravya and laghu into guru; mridu veeya (less potency) drug into tiksha veeya and vice versa, according to the requirement, is done by samskara procedure.

e. **Yukti** - Yukti depends on the dose (matra) of therapy and time (kala) of administration. Success of treatment depends on the observance of this yukti and a physician, proficient in the principles of yukti is always superior to those who are acquainted with the drugs only.\(^\text{[22]}\) Efficacy of drug is influenced by this factor as it involves the planning of dose of drug, its Anupana, time of administration, pathya, and apathy to be followed.

**DISCUSSION**

Pathya and Anupana are the two most important factors which influence the efficacy of Ayurvedic drugs. Concept of pathya and apathy has been described in detail by all acharyas revealing its significance not only in ill patients but in healthy individuals too. Pathya is in three forms, namely, ahara, vihara, and aushadha; and it covers and accomplishes two main objectives of Ayurveda. Area of pathya action may be dosha, dhatu, srotas, etc., but different acharyas specifically described the action of pathya on srotas. Srotas are also called Patha in this sense. Pathya is beneficial for srotas as stated in Shabdakalpastrum. It maintains the srotas in healthy state both structurally and functionally. Panchabhautika sangathana and prabhava of pathya ahara and aushadha help the srotas to remain in their normal patency. Pathya vihara for healthy person is designed in such a way that it may prevent any type of srotodushiti. In healthy person, pathya vihara helps in improvement of saama condition and makes the channels or srotas obstruction free. These pathya ahara and vihara are specific according to the prakriti of the healthy person and the vitiated dosha and dhatu in an ill patient. Various factors such as matra, desha, and kala change the qualities of pathya to apathy and vice versa. Thus, pathya is individualized for everyone.

While mentioning the causative factors of any disease, acharyas have focused on apathy sevana which plays a key role in pathogenesis of any disease. During pathogenesis, apathy sevana leads to kha-vayugnya of patha (channels) which leads to srotodushiti. Due to this srotos-dushti, srotas become unable to transport ahara rasa from the mahasrotas to various dhatu. This results in dhatu vijnana and because of disturbed metabolism vitiation of the three doshas occurs. This further leads to dosha-dushya-sammarma and finally the occurrence of disease. Pathya helps in early recovery of disease and using pathya in healthy individual, the role of medicine becomes minimum because pathya increases the agni of body and improves patency of srotas, i.e., the aama condition and inadequate digestion are prevented so that the
digested ahara rasa properly reaches to various body tissues/dhatus. Thus, pathya removes factors responsible for kha-vaiyunya and makes dhatus healthy by nourishing them. Moreover, as we know that dhatus are main dashyta of body, so pathya not only removes kha-vaiyunya but also strengthens the dashyta/dhata. Therefore, pathya may help in prevention of dosha-dushya sammurchana which is a responsible cause for pathogenesis.

Besides pathya, Anupana stands with its own importance in influencing the efficacy of drug formulations. Anupana being in a liquid form becomes very good vehicle which assists the drug to reach its destination point where it has to be acted on. Thus, helping the drug to spread quickly and easily within channels of body, Anupana increases the bioavailability of Ayurvedic drugs. Along with this, Anupana itself possesses the properties of medicine to directly act in diseased condition. This reveals that the area of action of Anupana is aushadha.

Samyoga, Vishlesha, Kala, Sanskara, and Yukti are the things which are described in the light of pathya, i.e., all these things are for making different ahara and vihara pathya and hita. Different dravya are used in combination in different proportions according to these factors and prakriti and conditions of person to make things pathya and hita. For example, use of haritaki as ritu-haritaki (according to different seasons) and use of different rasa by different persons.

It seems that by the use of pathya, the action or effect of aushadha may be increased in two ways: First, pathya may directly decrease the pathogenic condition by samprapti vighatana by increasing agni and making dhatus healthy. Second, pathya helps the aushadha dravya to reach at the site of pathogenesis by making the channels/srotas patent.

**CONCLUSION**

The concept and planning of pathya described in Ayurveda is a unique methodology as it gives multidimensional opportunity for maintenance of health and management of disease/disorder.

1. It helps in maintaining integrity of srotas and agni.
2. Further, channelization of pathya materials in respective dhatus is very good therefore assimilation and nourishment by these substances are quite good.
3. Pathya increases the potency of srotas so that drugs reach to their destiny in proper way.
4. By increasing agni, pathya also helps aushadha to being digested and to make their proper functions.

Anupana is another integral part of treatment as it directly influences the efficacy of drugs. This is the reason for which Anupana is specific for each and every Ayurvedic drug formulation; also it varies according to the disease too.

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Analytical standardization of Mandura Bhasma

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Abstract

Background: Rasa Shastra is an independent branch of Ayurvedic medicine, which deals with preparation of the drugs of metals and minerals with higher efficacy in lower dose and good palatability. Mandura Bhasma is an important formulation mentioned in Rasa Shastra texts obtained from the incineration of Raw Mandura. The pharmaceutical procedures involved in the preparation of Mandura Bhasma are Shodhana, Bhavana and Marana. Objective: To assess the safety and to understand about the identity, form, particle size and surface morphology of the Mandura Bhasma. Materials and Methods: Mandura bhasma was subjected to analysis through various techniques like X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDS), Particle size analysis (PSA), Zeta Potential (ZP), UV-Spectroscopy and Fourier transform Infra-Red spectroscopy (FTIR). Results and Conclusion: XRD of Mandura Bhasma showed major peaks of Fe₂O₃ (Iron oxide) and a minor peak K₂SO₄ (Potassium Sulphate). SEM micrographs showed irregular distribution of more or less Rhombohedral particles. EDS analysis confirmed the significant presence of elements viz. Fe-38.09%, O- 29.38%, Ca- 0.40%, and K-0.52%. Particle size was found to be 3.2 nm with Zeta Potential of -32.7 mV. UV- Spectrum of Mandura Bhasma showed maximum absorption at 300 nm. FTIR test showed 26 peaks between the wavelength 3696.60 cm⁻¹ to 632.67 cm⁻¹. This shows that Raw Mandura has been completely transformed into compound form (Bhasma) without any traces of free elemental form.

Key words: Analytical tests, Mandura Bhasma, safety, toxicity

INTRODUCTION

Analytical study is a process which helps in identification of quantitative and qualitative data of a substance, the components of a solution or mixture, or the determination of the structures of chemical compounds. It gives us the knowledge about identity, size, structure of chemical constituents, and physical properties. It hints us about toxic properties of drugs if any.

Ayurvedic drugs are time tested for their efficacy and need no validation for their administration to patients. However, in the present scientific era, there is a change in the mindset of patients. Safety of the drug to be administered is at par with its efficacy. An analytical study is an essential part of any research work. It tells us about the correlation between pre-determined hypothetical values and actual results obtained. It gives us valuable information about safety, efficacy, stability, and contraindications of any formulation. The presence of free metal or particles of large size in any formulation can lead to damage to vital organs of the body.

Hence, highly sensitive modern parameters are employed for gaining information about identity, form, particle size, and structure of contents of the formulation. Considering this, an effort has been made to analyze Mandura Bhasma through various modern parameters such as X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray analysis, particle size analysis (PSA), and zeta potential (ZP); UV-Spectroscopy and Fourier transform infrared spectroscopy (FTIR).

MATERIALS AND METHODS

Mandura and Triphala were obtained from local market of Chennai, Tamil Nadu. Gomutra was collected from the Goshala, TTD, Tirupati. Entire preparation of Mandura Bhasma was carried out in TTD’s Sri Srinivasa Ayurveda Pharmacy and Department of Rasa Shastra and Bhaishajya Kalpana, S.V. Ayurvedic College, Tirupati. Requirement for

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Pharmaceutical Process

The main pharmaceutical procedures involved in the preparation of Mandura Bhasma are Nirvapa, Bhavana, and Marana. Mandura was taken and subjected to Shodhana by Nirvapa in Gomutra Triphala Kashaya for 7 times. Then, the Shodhita Mandura was triturated with Kumari Swarasa and subjected to Marana by Gaja puta for 7 times, till the bhasma attains all the Bhasma lakshanas as mentioned in the classics. Thus, obtained Mandura Bhasma was collected and preserved in an airtight container.

Analysis of Mandura Bhasma using Ancient Parameters (Bhasma Pariksha)

- Rekhapurnatva: After proper trituration, a small amount of bhasma was taken between thumb and index finger. It filled into the fine lines of fingers. Rekhapurnatva was obtained after 6th puta.
- Varitaratwa: After proper trituration, a small amount of bhasma was sprinkled on the surface of the water. Bhasma being light floated on the surface of water. This was obtained after 7th puta.
- Niswadu Pareeksha: When a small amount of the bhasma was kept on tongue, there was not any feeling of taste/unward sensation. This was obtained after 7th puta.

Analysis of Mandura Bhasma using Modern Parameters

XRD

Mandura Bhasma was subjected to XRD at the Department of Physics, Yogi Vemana University, Kadapa, Andhra Pradesh.

Procedure

The sample was powdered in an agate mortar to very fine powder, and it was mounted in sample tray of the machine. X-ray beam bearing a wavelength of 1.5418740 Å from copper source is passed on the sample. Detector was set to identify diffracted beams between 10 and 70 degrees of 2 range. Obtained soft files of XRD consisting values of 20 and intensity are plotted on a graph (20 on X-axis and Intensity of Y-axis) using “Origin Pro 8.5 SR2” Data Analysis Software. Various compounds consisting similar diffraction pattern were identified by matching their peaks with corresponding JCPDS Crystallographic cards. For even better accuracy and precision, XRD soft files were also analyzed for corresponding phase/entry matching with Crystallographic Open Database (COD - 20120320) - USA, after plotting values in PANalytical X’Pert high score plus software 3.0.0.123, UK.

SEM and EDS

The practical was performed at the Department of Physics S.V University, Tirupati.

Procedure of SEM

Specimen of the sample to be analyzed was directly kept on the specimen holder for visualization. As the sample employed has nonconductive nature, the sample surface was coated by carbon by arc melting technique. Then, the dried powder was observed under the microscope at 1,000X to 10,000KX, and the micrographs were taken with the inbuilt camera.

Procedure of EDS

Electron beam excitation is used in SEM. A detector is used to convert X-ray energy into voltage signals; this information is sent to a pulse processor, which measures the signals and passes them on to an analyzer for data display and analysis. The detector used in EDS is often the Lithium drifted Silicon detector which is operated at liquid nitrogen temperatures. Sample of Mandura Bhasma was placed on the specimen holder and subjected to EDS. When the sample was bombarded by the SEM’s electron beam, electrons are ejected from the atoms comprising the sample’s surface. The resulting electron vacancies are filled by electrons from a higher state, and an X-ray is emitted to balance the energy difference between the two electrons’ states. The X-ray spectrum thus acquired gives the information on the elemental composition of the material under examination.

PSA and ZP

The practical was conducted at the Department of Science and Technology, PURSE, S.V. University, Tirupati.

Procedure of PSA

The sample was mixed in water and shaked for 10 min. Then, it was poured into the sample chamber, where it passes through the laser beam as a homogeneous stream of particles. The scattering of light occurs over a wide range of angles on interacting with the particles in the suspension which are moving by Brownian motion. Based on this scattering pattern of the sample, particle size distributions are calculated comparing with the appropriate optical model.

Procedure of ZP

A 1% concentration of Mandura Bhasma was prepared in distilled water. The particles were well dispersed before analysis, and the sample was taken in a 1ml syringe and injected slowly into the capillary cell (cuvette) through the
sample port. Care was taken to see that air bubbles are not formed during this process. As the sample comes out from the second port of the capillary cell, the injection process is stopped. This indicates complete filling of the sample into the capillary cell. The sample ports are then covered with lids, and the capillary cell was then placed into the sample holder of the zetazizer instrument for analysis.

**UV-spectroscopy**

Practical was performed at the Department of Science and Technology, PURSE, S.V. University, Tirupati.

**Procedure**

5 g of Mandura Bhasma was macerated with 100 ml of solvent in a closed flask for 24 h, shaking frequently during 6 h and allowed to stand for 18 h. It was filtered, taking for UV spectroscopic study. The spectra were taken at 200–800 nm from the peak obtained the λmax value was calculated.

**FTIR**

This practical was conducted at Padmavathi Mahila University, Tirupati.

**Procedure**

The sample was placed in the potassium bromide plate of FTIR spectrometer, and the interference pattern was detected by the infrared detector as variations in the infrared energy level, and the obtained spectral information was calculated.

## RESULTS

### XRD Studies

XRD of Mandura Bhasma shows major peaks of Fe₂O₃ (iron oxide) with Rhombohedral structure. A minor peak showed the existence of K₂SO₄ (potassium sulfate) with Rhombohedral structure. The Fe₂O₃ peak was detected at a diffraction angle of 24.29, 33.28, 35.74, 49.55, 54.23, and 57.71, K₂SO₄ peak was detected at a diffraction angle of 27.42 [Tables 1 and 2, Figure 1].

### SEM

SEM micrographs of Mandura Bhasma showed the irregular distribution of more or less Rhombohedral particles at 5KX and 10KX magnification [Figures 2 and 3].

### EDS

EDS analysis of Mandura Bhasma confirmed the presence of following elements, namely, C - 29.37%, O - 29.38%, Al - 0.71%, Si - 1.21%, Cl - 0.33%, K% - 0.52%, Ca - 0.40%, and Fe - 38.09% [Figure 4 and Table 3].

### PSA

The mean particle size of Mandura Bhasma is 3.2 nm [Figure 5].
Table 1: The details of matching peaks of XRD data for Mandura Bhasma

<table>
<thead>
<tr>
<th>Element/Molecule</th>
<th>JCPDS Ref. No</th>
<th>2θ</th>
<th>Intensity</th>
<th>FWHM</th>
<th>H</th>
<th>K</th>
<th>L</th>
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<tbody>
<tr>
<td>Fe₂O₃ (iron oxide)</td>
<td>00-013-0534</td>
<td>24.29</td>
<td>28.66</td>
<td>0.216</td>
<td>0</td>
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<td></td>
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<td>1</td>
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<td></td>
<td>54.23</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>57.71</td>
<td>16.00</td>
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<td>0</td>
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<td>K₂SO₄ (potassium sulfate)</td>
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<td>27.42</td>
<td>4.8</td>
<td>0.384</td>
<td>1</td>
<td>0</td>
<td>2</td>
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XRD: X-ray diffraction

Table 2: Crystal details of JCPDS entries

<table>
<thead>
<tr>
<th>Name</th>
<th>Fe₂O₃</th>
</tr>
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<td>Space group</td>
<td>R-3c</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Rhombohedral</td>
</tr>
<tr>
<td>Cell parameters</td>
<td>a=A° b=5.0130 A° c=13.7370 A°</td>
</tr>
<tr>
<td>Z</td>
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</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>K₂SO₄</th>
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</thead>
<tbody>
<tr>
<td>Space group</td>
<td>R-3c</td>
</tr>
<tr>
<td>Crystal system</td>
<td>Rhombohedral</td>
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<tr>
<td>Cell parameters</td>
<td>a=5.0310 A° b=5.0130 A° c=13.7370 A°</td>
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<tr>
<td>Z</td>
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Table 3: The quantity of all the elements in Mandura Bhasma

<table>
<thead>
<tr>
<th>Element</th>
<th>Weight%</th>
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</thead>
<tbody>
<tr>
<td>C K</td>
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</tr>
<tr>
<td>O K</td>
<td>29.38</td>
</tr>
<tr>
<td>Al K</td>
<td>0.71</td>
</tr>
<tr>
<td>Si K</td>
<td>1.21</td>
</tr>
<tr>
<td>Cl K</td>
<td>0.33</td>
</tr>
<tr>
<td>K K</td>
<td>0.52</td>
</tr>
<tr>
<td>Ca K</td>
<td>0.40</td>
</tr>
<tr>
<td>Fe K</td>
<td>38.09</td>
</tr>
<tr>
<td>Totals</td>
<td>100.00</td>
</tr>
</tbody>
</table>

ZP

The ZP (mean) value of Mandura Bhasma was found to be ~32.7 mV which indicates high colloidal stability [Figure 6].

UV-Spectroscopy

UV-spectrum of Mandura Bhasma showed maximum absorption at 300 nm [Figure 7].

FTIR [Figure 8, Tables 4 and 5]

Mandura bhasma showed 26 peaks between the wavelength 3696.60cm⁻¹ to 632.67cm⁻¹ with different types of bonds like alcohols, phenols, ammonium ions, amines, alkyl, vinyl and bromo alkanes.

DISCUSSION

An analytical study is the application of a process or a series of processes to identify and/or quantify a substance. Quality of a drug depends on its formulation, processing, and applications. It is essential to fix some standards for the manufacture of drugs so that the genuineness of the drug is not compromised. Ayurvedic texts have described several methods for quality control of finished products such as Rekhapurnatwa, Varitaratva, Nishchandratva, and Nirutha[5] to achieve a specific acceptable standard Bhasma. However, it is the need of the hour to use modern technology to explore the relevance of these concepts so that, they may be interpreted in the light of contemporary scientific language to make it relevant with the modern health care. With this aim, the Mandura Bhasma was prepared and analyzed for quality control, on the parameters described in Ayurvedic texts as well as modern technology.

XRD has been in use in two main areas, for the fingerprint characterization of crystalline materials and the determination of their structure. Each crystalline solid has its unique characteristic X-ray powder pattern, which may be used as a “fingerprint” for its identification. Once the material has been identified, X-ray crystallography may be used to determine its structure, i.e., how the atoms pack together in the crystalline state and what the interatomic distance and angle, etc., XRD is one of the most important characterization tools used in solid state chemistry and materials science. Size and the shape of the unit cell for any compound can be detected most easily using the diffraction of X-rays. Major peaks of Fe₂O₃ and a minor peak of K₂SO₄ were seen in XRD reprint. Mandura is considered as rusted iron; its chemical formula is Fe₂O₃.H₂O. During Shodhana and Marana process the water portion of Mandura may get
Kumar, et al.: Mandura Bhasma standardization

Table 4: Details of peaks obtained in FTIR analysis of Mandura Bhasma

<table>
<thead>
<tr>
<th>Sample name</th>
<th>No. of peaks</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandura Bhasma</td>
<td>26</td>
<td>3948.38, 3910.29, 3877.61,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3835.65, 3777.79, 3696.20,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3661.14, 3530.76, 3482.79,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3440.28, 3408.47, 3350.91,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3173.91, 3101.49, 3034.32,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2934.72, 2683.49, 2380.68,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2343.95, 1754.98, 1659.29,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1578.47, 1479.61, 959.69,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>632.67</td>
</tr>
</tbody>
</table>

FTIR: Fourier transform infrared spectroscopy

The significant presence of elements such as iron and oxygen. The presence of other elements such as Calcium, Aluminum, Potassium, and Silica may be due to the addition of herbal ingredients during Shodhana and Bhavana.

The size of the particles in the drug plays major role in its therapeutic action and efficacy. Particle size and surface area of solid drug are inversely related to each other. The mean particle size of the particles of Mandura Bhasma is 3.2 nm. The nanosize of drug is indicative of its quick absorption and faster dispersion into body resulting in better therapeutic efficacy. ZP is a measure of the magnitude of the electrostatic

FTIR: Fourier transform infrared spectroscopy
or charge repulsion or attraction between particles, and is one of the fundamental parameters known to affect stability. The ZP (mean) value of Mandura Bhasma was found to be −32.7 mV which indicates high colloidal stability. High ZP indicates easy dispersion toward target site, whereas less ZP indicates strong aggregation of particles in suspension.

UV-spectroscopy refers to absorption spectroscopy or reflectance spectroscopy in the ultraviolet-visible spectral region. Different molecules absorb radiation of different wavelengths. An absorption spectrum will show a number of absorption bands corresponding to structural groups with the molecule. Electromagnetic spectrum of U.V region is from 190 to 400 nm whereas for the visible region it is 400–800 nm. UV-Spectrum of Mandura Bhasma showed maximum absorption at 300 nm in the UV region.

FTIR was performed to detect the presence of functional groups or organic legends in Mandura Bhasma. Infrared spectroscopy deals with the infrared region of the electromagnetic spectrum.

### Table 5: Various peaks obtained in FTIR analysis of Mandura Bhasma and their correlation with compounds

<table>
<thead>
<tr>
<th>Peak</th>
<th>Actual peak</th>
<th>Bond</th>
<th>Type of bond</th>
<th>Specific type of bond</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600–3700/cm</td>
<td>3696.20/cm</td>
<td>O–H</td>
<td>Alcohol</td>
<td>Low concentration</td>
<td>Broad</td>
</tr>
<tr>
<td></td>
<td>3661.14/cm</td>
<td></td>
<td>Phenols</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3500–3560/cm</td>
<td>3530.76/cm</td>
<td>O–H</td>
<td>Carboxylic acids</td>
<td>High concentration</td>
<td>Strong, broad</td>
</tr>
<tr>
<td>3400–3500/cm</td>
<td>3482.79/cm</td>
<td>N–H</td>
<td>Primary amines</td>
<td>Any</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>3440.28/cm 3408.47/cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3200–3400/cm</td>
<td>3350.91/cm</td>
<td>O–H</td>
<td>Alcohols</td>
<td>High concentration</td>
<td>Broad</td>
</tr>
<tr>
<td></td>
<td>3034.32/cm 2934.72/cm</td>
<td></td>
<td>Phenols</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2400–3200/cm</td>
<td>3173.91/cm 3101.49/cm</td>
<td>N–H</td>
<td>Ammonium ions</td>
<td>Any</td>
<td>Multiple broad peaks</td>
</tr>
<tr>
<td></td>
<td>3034.32/cm 2934.72/cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1640–1680/cm</td>
<td>1659.29/cm</td>
<td>C–C</td>
<td>C=C (both sp²)</td>
<td>Any</td>
<td>Medium</td>
</tr>
<tr>
<td>1450/cm</td>
<td>1479.61/cm</td>
<td>C–H</td>
<td>Alkyl</td>
<td>Methylene</td>
<td>Strong</td>
</tr>
<tr>
<td>965/cm</td>
<td>959.69/cm</td>
<td>C–H</td>
<td>Vinyl</td>
<td>Trans-disubstituted</td>
<td>Strong</td>
</tr>
<tr>
<td></td>
<td>632.67/cm</td>
<td>C–X</td>
<td>Bromoalkanes</td>
<td>any</td>
<td>Medium to strong</td>
</tr>
</tbody>
</table>

**Figure 8:** Various peaks obtained in Fourier transform infrared spectroscopy analysis of Mandura Bhasma
that is light with a longer wavelength and lower frequency than visible light. When infrared light or radiation hits a molecule, the bonds in the molecule absorb the energy of the infrared and respond by vibrating. Mandura Bhasma showed 26 peaks between the wavelength 3696.60/cm and 632.67/cm. O-H stretching vibrations peaks were observed between 3600–3700/cm, 3500–3560/cm, and 3200–3400/cm wavelengths. Alcohols, phenols, and carboxylic acids were observed in the peaks. Multiple peaks with N-H stretching vibrations containing primary amines and ammonium ions were observed at the wavelengths 3400–3500/cm and 2400–3200/cm. A single peak containing C-C bond and C-X bond of medium intensity was found at 1659.29/cm and 632.67/cm, respectively. Alkyl and vinyl bonds of strong intensity were observed at 1479.61/cm and 959.69/cm wavelengths.

CONCLUSION

The present study confirms the structural and chemical transformation of Mandura into bioabsorbable compound form (Mandura Bhasma). To avoid any toxicity and adverse effects of Bhasma, the complete transformation of base mineral into Bhasma form is prime requisite. Proper formation of Bhasma is checked through various Bhasma Pariksha as mentioned in the Rasashastra texts. These Bhasma Pariksha are qualitative in nature, and they do not reveal anything about their characterization. Hence, to overcome this lacuna, modern analytical parameters such as XRD, SEM, EDS, PSA, ZP, and FTIR are very helpful. Hence, both the ancient and modern parameters must be used for the justification of the formulation, for a safe therapeutic approach.

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Source of Support: Nil. Conflict of Interest: None declared.
Standardization influencing the quality profile of *Vidarikand* (*Pueraria tuberosa* DC.)

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Abstract

**Introduction:** There has been rising alertness and worldwide capability of the utilization of Ayurvedic prescriptions in today’s medical profession. Revival of public consciousness in traditional remedy is growing in both the developing and developed nations. This amplification in the use of Ayurvedic drugs has also given grown to a range of abuse and adulteration of the raw Ayurvedic drugs important to consumers and manufacturers leading to the fatal punishment. Standardization of raw Ayurvedic drugs is a substantial implement in the formulation of high-class Ayurvedic medicines. **Materials and Methods:** In this article, a study has been made to fix the parameters including macroscopic, microscopic, physicochemical analysis, and thin-layer chromatography profile to ensure the use of only authentic and homogeneous material of such Ayurvedic therapies. **Result:** This study looks for inform the stakeholders in Ayurvedic drugs on to determine the quality deliberation with the help of higher analytical tools and well-defined standardization techniques. **Discussion:** Vidarikanda (*Pueraria tuberosa* DC.) belonging to the family Fabaceae and is used in Ayurvedic fraternity more frequently for the management of various disorders. Work on quality evaluation supposes the vital connotation. However, no supportive data are available on microscopic characteristics and standardization of the same. The obtained values/ranges can be used as standards for quality evaluation of the Vidarikanda.

**Key words:** Quality profile, standardization, thin-layer chromatography, Vidarikanda

INTRODUCTION

*Vidarikand* (*Pueraria tuberosa* DC.) is commonly known as *Indian kudzu*. Bhavaprakash mention the *Vidarikand* in its *Guduchyadi varga* they mention the synonyms of *Vidarikand* as *Swdukanda*, *Krostri*, *Sita*, *Ikshugandha*, *Kshirvalli*, *Kshirshukla*, and *Payasvani*.¹ It is a perennial climber with woody tuberculated stem. It is a climbing, coiling, and trailing vine with large tuberous roots, distributed nearly throughout the India except in very humid or very arid regions and ascending up to 1200 m.² Vidarikanda is the dried tuber of *P. tuberosa* DC. (Family Fabaceae), a large, perennial climber with tuberous roots, up to 60 cm long and 30 cm thick, even weighing up to 35 kg, from about 5 or 10 kg; they are distributed nearly throughout India.³ Previous studies reported the tubers contain wide range of phytochemical constituents; 85.1% dry matter, 64.6% carbohydrates, 28.4% crude fibers, 10.9% protein, and 0.5% ether extract.⁴ Tubers are rich in isoflavonoids such as puerarin, daidzein, genistein, and genistin.⁴¹ Survey of literature showed that no systematic approaches have been made to study the pharmacognostical parameters of this medicinal plant. The present investigation deals with the studies on some important pharmacognostical characteristics, namely, macroscopic, microscopic characters together with physicochemical parameters, preliminary phytochemical test, and thin-layer chromatography (TLC) of the dried tuber of *P. tuberosa* as powdered form.

MATERIALS AND METHODS

Drug sample was purchased from *Gola Dinanath* market of Varanasi, UP. It was authenticated in the laboratory of the

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Department of Dravyaguna, Faculty of Ayurved, IMS, BHU. The plant material was ground into powder, filtered by sieve 80# and the fine powder so obtained was used for further analysis. The standardization parameters were determined according to the methods detailed in the Ayurvedic Pharmacopoeia of India organoleptic characters and particle size of the sample was verified. Physicochemical analysis for loss on drying at 105°C, alcohol-soluble extractive value, water-soluble extractive value, hydroalcohol extractive value, total ash value, acid-insoluble ash value, and water-insoluble values was carried out in triplicate in the studied sample. Regarding microscopic analysis preparing slides in water stained with iodine and mounted with glycerin. Preliminary phytochemical analysis of different extracts was performed using specific reagents by employing standard procedures.[3]

TLC was performed on (5 × 10) aluminum packed silica gel 60F254 TLC plate (Merck, Darmstadt, Germany). Before use, the plate was dried in an oven at 105°C for 5 min. and sample was applied as 9 mm band by means of sample applicator (Camag Linomat - 5, Switzerland) equipped with a 100 μl microsyringe. The developing solvent was allowed to ascend to 90 mm with ethyl acetate:methanol (8:2) (V/V) as a mobile phase in a twin trough chamber, previously saturated for 20 min by lining with thick Whatman filter paper. The room temperature was 27°C and relative humidity was 37%. After development of chromatogram, the plate was removed and completely dried in air at room temperature. Observed the spots produced before and after derivatization with vanillin-sulfuric acid reagent at daylight and ultraviolet light at 254 nm and 366 nm.[5] Documented the images by means of photodocumentation system (Camag Reprostar 3). Measured and recorded the distance of each spot from the point of its application and calculated the Rf value by dividing the distance travelled by the spots by the distance travelled by the front of the solvent system.

RESULTS AND DISCUSSION

Organoleptic and Macroscopic Characters

Dried cut pieces of tuber, 3–5 cm large, 2–4 cm broad, and fibrous; outer surface where present, light brown in color; outer surface, where epidermis is present, is light brown with transverse warts and ridges; cut surface creamy; fleshy, transverse small warts, and ridges are found on the surface, texture smooth; sweet in taste, no particular smell (cut pieces of the tubers of Ipomoea digitata, substitute of P. tuberosa, are cubical, smooth, light cream in color and can easily be distinguished) [Figure 1].

Microscopic Characters

T.S. of whole root tuber is slightly wavy in outline, epidermis not discernible, 3–4 layers of cork cells, followed by 5–7 layers of parenchymatous cells present; cork cambium brown in color and 2 or 3 cells thick, endodermis well developed; pericycle fibrous followed by two layers of stone cells filled with sandy crystals; phloem consists of sieve tubes along with companion cells, patches of bast fibers, and phloem parenchyma; xylem pentarch in young root consists of vessels with scalariform cross perforation, tracheids, xylem fibers, and parenchyma. The medullary rays and phloem cells are filled with starch grains which are polygonal, 2–5 μm in diameter, simple or two to many compound, hilum usually indistinct, occasionally a central cleft, lamellae indistinct. In macerated preparation, crystal fibers are multicellular, articulated, each cell carrying a crystal of calcium oxalate, some of the articulated fibers are swollen in the middle like a bulb pipette. Powder - Grayish-brown, no characteristic odor, bitter in taste; shows parenchyma filled with starch, septate fibers in the form of crystals fibers as well as shaped bulb like pipette; vessels with simple and scalariform cross perforation plates, stone cells, and starch as described under microscopy [Figure 2].

Physicochemical Parameters

Ash of any organic material is composed of their non-volatile inorganic components.[6] The extraction of any crude drug with a particular solvent yields a solution containing different phytoconstituents. It is useful for the estimation of specific constituents, soluble in that particular solvent used for extraction.[7] Physicochemical parameters of P. tuberosa such as total ash, water-soluble ash, acid-insoluble ash, loss on drying, ethanol-soluble extractive value, and water-soluble extractive value were carried out and are summarized in Table 1.

Preliminary Phytochemical Analysis

The tuber powder was extracted with water and ethanol. This extract was tested for the presence of different
phytoconstituents. The results of phytochemical qualitative analysis are tabulated in Table 2: Preliminary phytochemical studies revealed the presence of alkaloids, flavonoids, proteins, saponins, carbohydrates, steroids, phenols, glycosides, etc.

**TLC Profile**

The TLC profile of ethanol extract of *P. tuberosa* along with ethyl acetate: methanol (5:5) as mobile phase resolved major spots at Rf 0.25, 0.39, and 0.87 (Gray) at visible light, (all black) at 254 nm, and (all white) at 366 nm [Figure 3].

**CONCLUSION**

An Ayurvedic medicine producing requirements crude drugs as base material. Efficacy of any drug depends on the genuineness of the raw material used for its manufacturing. Adulteration in the authentic raw material of *P. tuberosa* causes deterioration in the favored therapeutic significance of a particular drug. The present pharmacognostical study was done on the sample of *P. tuberosa* of physicochemical parameters such as total ash, water-soluble ash, acid-insoluble ash, ethanol-soluble extractive value, water-soluble extractive value and loss on drying at 105°C, preliminary phytochemical screening, TLC profile, and microscopic identification. These parameters validate that the drug is persuasive and authentic. Hence, it can be concluded that these parameters are supportive in standardization and quality evaluation of the drug.

**ACKNOWLEDGMENT**

The authors are very grateful to Mr. Arun Kr Srivastava who helped in their laboratory to carry out the quality evaluation of *P. tuberosa*.

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Source of Support: Nil. Conflict of Interest: None declared.
Standardization of Kesar using pharmacopoeial parameters for its authenticity

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Abstract

Background: Kesar (Crocus sativus Linn.) is very well known plant used since time immemorial in traditional systems of medicine all over the world. When it is related to the authenticity of the samples available in market whether they are genuine or not everyone doubtful regarding reliability of the available market samples. Aim: The aim of the study was to check the authenticity of a market sample of Kesar for checking its purity. There is rapid adulteration in the samples due to the high coast for money business hence assessment of correct sample for the use of medicinal purpose is necessary. Materials and Methods: We have followed the standard parameters mentioned in Ayurvedic Pharmacopoeia of India Part I, Vol-4 for authenticating sample of Kesar such as microscopic study, color test using various chemicals, thin-layer chromatography (TLC), and high-performance TLC. Result: Test sample found genuine on the parameters of Ayurvedic Pharmacopoeia of India.

Keywords: API, Authenticity, Kesar, Standardization parameters

INTRODUCTION

Kesar is well known medicinal plant as well as a spice used in Indian traditions. It is also called as Kunkuma which consists of dried style and stigma from the flowers of Crocus sativus Linn. Kesar belongs to the family Iridaceae. It is a small bulbous perennial, 15–25 cm high and cultivated by corms in the Kashmir valley, especially in the Pampore plateau, at about 1600 m.[1]

It has a light purple color dioecious flower with three vivid crimson stigmas and three yellow stamens. The three crimson stigmas of it are the most valuable part of the plant. These stigmas are rich in aroma, flavor, and color, used as aromatic or coloring agent in various food preparations also used in pharmaceutical and cosmetic manufacturing.

In spite of medicinal use Kesar is renowned as the most expensive spice; its market price ranks among the highest in foods, reaching 20,000 €/kg and more for some protected designation of origin productions in 2015, and it is the highest priced high-value agricultural product in the world. Saffron can be found on the market in the form of entire dried stigmas or as a finely-ground powder. Among the major candidates for adulteration, saffron is one of the most targeted foods and spices. As a consequence, adulteration represents a real and major concern for the saffron market, and such practice is more often performed in ground stigmas.[2] Nowadays, topics such as food authenticity, genuineness, and the detection of adulteration in food products, usually economically motivated, are increasingly important for consumers, regulatory agencies, and the food industry.[3]
Stigma composed mostly of elongated, thin-walled, parenchyma cells containing coloring matter; at the upper end numerous cylindrical papillae or trichomes up to 150 microns long present; pollen grains, a few, spherical, nearly smooth, from 40 to 120 microns in diameter; occasionally germinated and exhibiting pollen tubes.

<table>
<thead>
<tr>
<th>Analytical test</th>
<th>Findings</th>
<th>Reference (API; Part 1, Volume IV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity, purity, and strength</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Purity (%)</td>
<td>Foreign material&lt;2</td>
<td></td>
</tr>
<tr>
<td>2. Loss on drying at 105°C (%)</td>
<td>4</td>
<td>&lt;14</td>
</tr>
<tr>
<td>3. Total Ash value (%)</td>
<td>3</td>
<td>&lt;7.5</td>
</tr>
<tr>
<td>4. Acid insoluble Ash (%)</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>5. Absence of Fixed oil or glycerin</td>
<td>Pressing between clear filter paper, the paper does not display translucent oily spots</td>
<td></td>
</tr>
<tr>
<td>6. Colorimeter assay</td>
<td>The color of the solution matched with N/100 potassium dichromate and strength of the color was not less that of an equal depth in mm of the N/100 potassium dichromate</td>
<td></td>
</tr>
<tr>
<td>Chemical color tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Sulfuric acid test</td>
<td>When reacts with H2SO4 and turned bluish color immediately, which finally changes to purple to red</td>
<td></td>
</tr>
<tr>
<td>2. Water</td>
<td>Yellow color</td>
<td></td>
</tr>
<tr>
<td>3. Methanol</td>
<td>Yellow color</td>
<td></td>
</tr>
<tr>
<td>4. Benzene</td>
<td>Colorless</td>
<td></td>
</tr>
<tr>
<td>5. Chloroform</td>
<td>Colorless</td>
<td></td>
</tr>
<tr>
<td>6. Xylene</td>
<td>Colorless</td>
<td></td>
</tr>
<tr>
<td>Phytoconstituents analysis (qualitative)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Alkaloids -ve</td>
<td>-------</td>
</tr>
<tr>
<td>II</td>
<td>Flavonoids -ve</td>
<td>-------</td>
</tr>
<tr>
<td>III</td>
<td>Proteins -ve</td>
<td>-------</td>
</tr>
<tr>
<td>IV</td>
<td>Carbohydrates -ve</td>
<td>-------</td>
</tr>
<tr>
<td>V</td>
<td>Saponins -ve</td>
<td>-------</td>
</tr>
<tr>
<td>VI</td>
<td>Steroids -ve</td>
<td>-------</td>
</tr>
<tr>
<td>VII</td>
<td>Tannins -ve</td>
<td>-------</td>
</tr>
<tr>
<td>VIII</td>
<td>Phenols -ve</td>
<td>-------</td>
</tr>
<tr>
<td>IX</td>
<td>Glycosides +ve</td>
<td>Glycoside +</td>
</tr>
<tr>
<td>X</td>
<td>Free amino acids -ve</td>
<td>-------</td>
</tr>
</tbody>
</table>
CONCLUSION

The test sample of Kesar was found authentic on the standardization parameters laid by Ayurvedic Pharmacopoeia of India, Part I, Volume 4

REFERENCES


Source of Support: Nil. Conflict of Interest: None declared.
**Therapeutic study of Anu Taila in Pranavaha Srotodushti**

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**Abstract**

**Purpose:** Anu Taila is one of the best medicines described for Nasya Karma in various ayurvedic classics. The purpose of this clinical trial was to determine clinical efficacy of Anu Tail in the management of Pranavaha Srotodushti (respiratory disorders).

**Methods:** An open-label clinical trial was carried out on 50 patients of either sex in between the age of 18 and 70 years at P.G. Department of Roga Evam Vikriti Vijnana, National Institute of Ayurveda, Jaipur. The duration of treatment was 30 days. Clinical evaluation was done by assessment criteria of signs and symptoms of Pranavaha Srotodushti and by spirometry. **Results:** Anu Tail is effective in increased forced vital capacity, forced expiratory volume in one second, and peak expiratory flow rate of studied cases and also found statistically very significant at \( P < 0.01 \) level with \% improvement of 2.23\%, 1.65\%, and 3.85\%. Result showed highly significant \( (P < 0.001) \) regarding subjective parameters - Kasa and Abhikshanam with \% relief of 13.85\% and 15.07\% and objective parameters – eosinophil \% and total eosinophil count with \% improvement of 10.13\% and 2.46\%. **Conclusion:** It can be concluded that Anu Tail Pratimarsha Nasya is clinically effective in Kasa, Pratishyaya, Atisristum, and Abhikshanam.

**Key words:** Anu Tail, Kasa, Pranavaha Srotodushti, Pratimarsha Nasya

**INTRODUCTION**

Food, air, and water are vital to the very subsistence of the life. “Air” is the first and foremost factor and it has got its prime importance for the survival. Among all the systems in the human body, respiratory system is very important as the breathing sustains life, but the natural breathing brings health and happiness. It helps in clearing the mind and calms the emotions, thereby releasing the brisk flow of energy within us. At present era, transport, power plants, oil refining, burning crop waste, fumes from paints, varnish, aerosol sprays, nuclear weapons, and toxic gases are main anthropogenic sources responsible for air pollution.

The concept of Srotasa is among the fundamental concepts of Ayurveda. The health and disease depend on the proper structure and function of these channels of the body. Pranavaha Srotasa are that kind of Srotasa from which Prana (Prana Vayu) diffuses in whole body and nourished them. In our Ayurvedic literature, “Vayu Dushti” word is not described as a causative factor of Pranavaha Srotodushti or for Shwasa Rogaa. In place of this, “Vayu Dushti” is used as a causative factor in Janpadodhvansa.\(^1\)

Due to Chhaya (emaciation), Sandharan (retention of natural urges), Lakshana Atisristum and Sashabdam (excessive dry food), Vyayamai (excessive exercise), Chudhit (prolong hunger condition), and Anya Daruna Karma, Pranavaha Srotas are get vitiated.\(^2\) Acharya Charaka has described that Raj (dust), Dhoom (smoke), Vata (Anil), Sheetal Sthana (cold places), Sheetal Pan (cold drinks), Vyayama (excessive exercise), Gramya Dharma (excessive intercourse), Adhva (excessive walking), Raksha Anna (fatless diet), and Vishamashanata (irregular diet) are the main causative factor of Shvasa Roga.\(^3\)

Rupa of Pranavaha Srotodushti is clearly described by Acharya Charaka Atri Sristum (prolong expiration), Atri Badham (obstructed inspiration), Kapitam (disturbance in rhythm), Alpalpam (effortless inspiration or decrease tidal volume), Abhikshanam (increase respiratory rate), Sashabdam (additional sounds during respiration), and Sashulam (painful respiration).\(^4\)

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Mobile: 8003001002. E-mail: katarashobha090@gmail.com
Respiratory system is looking more analogous to Pranavaha Srotas. As we look the Rupa of Pranavaha Srotodushti, described by Acharya Charaka, then we found that these all are such kinds of symptoms, which arises when respiratory system becomes disturbed. According to Acharya Charaka, Pranavaha Srotodushti should be treated like Shvasa Roga. Anu Tail is one of the best medicines described for Nasya Karma in various classics. Acharya Charaka advocates Anu Tail Nasya for the sound health of sense organs. Pranavaha Srotodushti should be treated like Shvasa Roga.

**Aims and Objectives**

The aim of this study is to evaluate the efficacy of Anu Tail as Pratimarsha Nasya in cases of Pranavaha Srotodushti.

**MATERIALS AND METHODS**

**Selection of Patients**

On the basis of epidemiological study, 50 patients were registered for the Upashayatmaka study, who were clinically suffering from Pranavaha Srotodushti.

**Inclusion Criteria**

The following criteria were included in the study:
1. Adults more than 18 years and <70 years either of gender.
2. All patients with clinical features of Pranavaha Srotodushti were selected.

**Exclusion Criteria**

The following criteria were excluded from the study:
1. Less than 18 years and more than 70 years.
2. Patients suffering from major illness.
3. Pregnant woman.
4. Uncooperative patients.

**Assessment Criteria**

1. Upashayatmaka study was assess on the basis of subjective parameters - Lakshana of Pranavaha Srotodushti, etc.
2. Subjective parameters as per CRF in Ayurvedic parameter - Dashvidha Priksha, etc.

**Laboratory Investigations**

The following investigations were carried out in all selected patients for clinical trial before and after the trial to assess the effects of trial drug. The investigations were:

- Complete blood count - hemoglobin (Hb)%, TLC, and eosinophil %
- Erythrocyte sedimentation rate (ESR)
- Total eosinophil count (TEC)
- Spirometry-forced vital capacity (FVC), forced expiratory volume in one second (FEV₁), FEV₁/FVC, and peak expiatory flow rate (PEFR)

**Trial Drug**

Anu Tail (Charakokt) - PratimarshaNasya

Dose - 2 drops in each nostril twice a day (BD).

Trial duration - 30 days.

Follow-up: Patients were followed up every 15 days for 1 month.

**OBSERVATION AND RESULTS**

**[TABLES 1-19]**

**A. Subjective improvement**

**B. Objective improvement**

**Subjective Improvement**

The effect of therapy on cardinal sign and symptoms has been assessed by giving a specific gradation to these symptoms which has been described earlier (Wilcoxon paired test):

1. Pranavaha Srotasa Priksha was 2.48 which get reduced to 2.28 A.T. The relief was 8.06% and the improvement is statistically very significant ($\textbf{P} < 0.01$)}

**Table 1: Age-wise distribution of patients**

<table>
<thead>
<tr>
<th>Age group (in years)</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–30</td>
<td>15 (30)</td>
</tr>
<tr>
<td>31–40</td>
<td>17 (34)</td>
</tr>
<tr>
<td>41–50</td>
<td>11 (22)</td>
</tr>
<tr>
<td>51–60</td>
<td>3 (6)</td>
</tr>
<tr>
<td>61–70</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

**Table 2: Gender-wise distribution of patients**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>29 (58)</td>
</tr>
<tr>
<td>Female</td>
<td>21 (42)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

**Table 3: Religion-wise distribution of patients**

<table>
<thead>
<tr>
<th>Religion</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindu</td>
<td>40 (80)</td>
</tr>
<tr>
<td>Muslim</td>
<td>10 (20)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>
Table 4: Education-wise distribution of patients

<table>
<thead>
<tr>
<th>Education</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>14 (28)</td>
</tr>
<tr>
<td>Primary</td>
<td>9 (18)</td>
</tr>
<tr>
<td>Middle</td>
<td>9 (18)</td>
</tr>
<tr>
<td>High school</td>
<td>8 (16)</td>
</tr>
<tr>
<td>Graduate</td>
<td>7 (14)</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 5: Occupation-wise distribution of patients

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic police</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Driver</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Swiper</td>
<td>4 (8)</td>
</tr>
<tr>
<td>Service</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Shopkeeper</td>
<td>6 (12)</td>
</tr>
<tr>
<td>Student</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Housewife</td>
<td>11 (22)</td>
</tr>
<tr>
<td>Labor</td>
<td>15 (30)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 6: Socio-economic status wise distribution of patients

<table>
<thead>
<tr>
<th>Socioeconomic status</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper middle</td>
<td>6 (12)</td>
</tr>
<tr>
<td>Middle</td>
<td>11 (22)</td>
</tr>
<tr>
<td>Lower middle</td>
<td>15 (30)</td>
</tr>
<tr>
<td>Lower</td>
<td>18 (36)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 7: Addiction wise distribution of patients

<table>
<thead>
<tr>
<th>Addiction</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tea</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Coffee</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Smoking</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Alcohol</td>
<td>4 (8)</td>
</tr>
<tr>
<td>None</td>
<td>17 (34)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 8: Diet pattern wise distribution of patients

<table>
<thead>
<tr>
<th>Diet pattern</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetarian</td>
<td>28 (56)</td>
</tr>
<tr>
<td>Non-vegetarian</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

2. *Shvasakrichhata* was 2.40 B.T. which get reduced 2.22 A.T. The relief was 7.50% and the improvement is statistically very significant ($P < 0.01$).

3. *Kasa* was 1.62 B.T. which get reduced 1.40 A.T. The
Table 15: Ahara Shakti wise distribution of patients

<table>
<thead>
<tr>
<th>Ahara Shakti</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pravar</td>
<td>10 (20)</td>
</tr>
<tr>
<td>Madhyama</td>
<td>23 (46)</td>
</tr>
<tr>
<td>Avar</td>
<td>17 (34)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 16: Vyayama Shakti wise distribution of patients

<table>
<thead>
<tr>
<th>Vyayama Shakti</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pravar</td>
<td>15 (30)</td>
</tr>
<tr>
<td>Madhyama</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Avar</td>
<td>13 (26)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (100)</td>
</tr>
</tbody>
</table>

Table 17: Prevalence according to Aharaj Nidana of patients

<table>
<thead>
<tr>
<th>Aharaj Nidana</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vidahi</td>
<td>32 (64)</td>
</tr>
<tr>
<td>Guru</td>
<td>39 (78)</td>
</tr>
<tr>
<td>Vistambhi</td>
<td>34 (68)</td>
</tr>
<tr>
<td>Ruksha</td>
<td>25 (50)</td>
</tr>
<tr>
<td>Abhishyandi</td>
<td>37 (74)</td>
</tr>
<tr>
<td>Sheetal Jala</td>
<td>33 (66)</td>
</tr>
<tr>
<td>Sheetal Ahara</td>
<td>30 (60)</td>
</tr>
<tr>
<td>Vishamashana</td>
<td>41 (82)</td>
</tr>
<tr>
<td>Other VataVardhakAhara</td>
<td>29 (58)</td>
</tr>
<tr>
<td>Other KaphaVardhakAhara</td>
<td>36 (72)</td>
</tr>
</tbody>
</table>

Table 18: Prevalence according to Viharaj Nidana of patients

<table>
<thead>
<tr>
<th>Viharaj Nidana</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raj</td>
<td>41 (82)</td>
</tr>
<tr>
<td>Dhoom</td>
<td>41 (82)</td>
</tr>
<tr>
<td>Kshayat</td>
<td>20 (40)</td>
</tr>
<tr>
<td>Aatap</td>
<td>39 (78)</td>
</tr>
<tr>
<td>Vegaghata</td>
<td>43 (86)</td>
</tr>
<tr>
<td>AdhvaGaman</td>
<td>17 (34)</td>
</tr>
<tr>
<td>Sheetal sthana</td>
<td>19 (38)</td>
</tr>
<tr>
<td>Vyayama</td>
<td>15 (30)</td>
</tr>
<tr>
<td>Other VataVardhak</td>
<td>22 (44)</td>
</tr>
<tr>
<td>Vihara</td>
<td></td>
</tr>
<tr>
<td>Other KaphaVardhak</td>
<td>36 (72)</td>
</tr>
</tbody>
</table>

Table 19: Prevalence of Pranavaha Srotodushti according sign and symptoms

<table>
<thead>
<tr>
<th>Sign and symptoms</th>
<th>Number of patient (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atisristam</td>
<td>30 (60)</td>
</tr>
<tr>
<td>Atibaddham</td>
<td>16 (32)</td>
</tr>
<tr>
<td>Kupitam</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Alpalpam</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Abhikshanam</td>
<td>28 (56)</td>
</tr>
<tr>
<td>Sashabdam</td>
<td>30 (60)</td>
</tr>
<tr>
<td>Sashulam</td>
<td>19 (38)</td>
</tr>
<tr>
<td>Kasa</td>
<td>15 (30)</td>
</tr>
<tr>
<td>Pratishyaya</td>
<td>6 (12)</td>
</tr>
</tbody>
</table>

Table 19: Prevalence of Pranavaha Srotodushti according sign and symptoms

<table>
<thead>
<tr>
<th>Sign and symptoms</th>
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</tr>
<tr>
<td>Other KaphaVardhakAhara</td>
<td>36 (72)</td>
</tr>
</tbody>
</table>

10. Pratishyaya was 1.48 B.T. which get reduced 1.30 A.T. The relief was 12.16% and the improvement is statistically very significant ($P < 0.01$).

Objective Improvement

Hb% was increased 0.41% and the improvement is statistically not significant ($P > 0.05$).

TLC was decreased 0.78% and the improvement is statistically significant ($P < 0.05$).

Eosinophil% was decreased 10.13% and the improvement is statistically highly significant ($P < 0.001$).

ESR was decreased 6.27% and the improvement is statistically significant ($P < 0.05$).

TEC was decreased 2.46% and the improvement is statistically highly significant ($P < 0.001$).

FVC was increased 2.23% and the improvement is statistically very significant ($P < 0.01$).
FEV₁ was increased 1.65% and the improvement is statistically very significant ($P < 0.01$).

FEV₁/FVC was increased 3.85% and the improvement is statistically very significant ($P < 0.01$).

PEFR was increased 3.29% and the improvement is statistically very significant ($P < 0.01$).

**DISCUSSION**

**Age**

Maximum number of patients (34%) were found in 31–40 years age group, followed by 20–30 years age group (30%). It may be due to more patients who were registered in 31–40 years age group than followed by 20–30 years age group.

**Gender**

Maximum number of patients (58%) were male and females were 42%. It may be due to in the survey number of males were higher than females. Number of males were higher than female, so male patients were more than female.

**Religion**

Maximum number of patients (80%) were Hindu and Muslim (20%), this signifies the demographical dominance of the community in the region and religion, and as such, it does not have any impact on the existence of the disease.

**Education, Occupation, and Socioeconomic status**

Maximum number of patients were illiterate (28%), labor (30%), and lower class (36%). Probable cause of this may be that illiterate people were lower economic status and they were labor class. They are more prone to face direct Anal (excessive fire and sunlight), Anil (polluted air), Raj (dust), and Dhoom (smoke), and excessive physical activity leads to vitiation of Vata Dosha and finally produces Pranavaha Srotodushti.

**Addiction**

Maximum number of patients (44%) were addicted to smoking, and the probable cause of this may be that smoker was continuously receiving excessive Raj and Dhoom from the smoke of their bidi, cigarette, etc. As it is an established factor that smoke of cigarette contains more than 1000 mater (Raj) and many gases in which nicotine (Raj) and CO (Dhoom) are most hazardous which produces Pranavaha Srotodushti.

**Diet**

Maximum number of patients (56%) were vegetarian, and the probable cause of this is not completely understood.

**Sharirik Prakriti**

Number of patients of Vata-Kapha Prakriti was high (46%) than other Prakriti, it may be due to that Vata and Kapha Doshas are mainly involved, and in Vata-Kapha person, it is easily vitiated to produce Pranavaha Srotodushti.

**Sara, Samhanana, Pramana, Satmya, Satva, Ahara Shakti, Vyayama Shakti**

According to Sara, Samhanana, Pramana, Satmya, Satva, Ahara Shakti, and Vyayama Shakti, maximum patients were from Madhyama categories, it may be due to more proportion of population fallen under Madhyama categories in comparison to Pravar and Avar categories, so the number of Madhyama categories of patients are high.

**Aharaj and Viharaj Nidana**

On looking the Aharaj and Viharaj Nidanas, it was found that mostly patients used to take more Kapha-Vardhak Ahara, and at the same time, they were used to live in Vata-Vardhak atmosphere. Ahara increases their Kapha, Vihara increases their Vata, and thus, both have more tendency to produce Pranavaha Srotodushti.

**Pranavaha Srotodushti Lakshanas**

According to Lakshana Atisristam and Sashabdam were found in 60% patients. Abhikshanam was 56% and Sashulum was found in 38% of patients. Atibaddham was 32% and Kasa was found in 30% of patients. Pratishyaya was 12% and Kupitam was found in 10%. Alpalpam was not found in any patient. Above observations show the predominance of Kapha and Vata Doshas in this disease.

**Probable Mode of Action of Anu Tail Pratimarsha Nasya**

All the drugs contained in the Anu Tail possess Tikta (74.07%), Madhura (59.25), Katu (37.03%) Rasa; Laghu (70.37%), Ruksha (55.55%), and Snigdha (40.74%) Guna; and Sheeta Virya (51.85%), Ushna Virya (48.14%), and Vata Kapha Shamaka (33.33%) properties. Most of them having anti-inflammatory, antiviral, antibacterial, and antipyretic properties.

1. Due to Sukshama and Vyavayi Guna of Anu Tail possesses a good spreading capacity through minute Srotas.
2. Laghu, Tikshna, Ruksha Guna, and Ushna Virya remove the Margavarana.

3. By the above two properties (Sukshama and Vyavayi) of the drugs administered by Nasya removes the obstruction and alleviate Vata Prakopa.

4. Indriyadadhyakaratva, Balya, Preenana, and Brimhana properties can increase general and local immunity.

5. Madhura Rasa, Sheeta Virya, Snigdha Guna, and Tridosahara properties promote the nourishment of Dhatus which ultimately increases the general and local immunity.

6. Majority of ingredients possess anti-inflammatory activity which also prevents the inflammatory process.

7. Bacteriostatic property of ingredients will arrest the secondary infection.

**CONCLUSION**

1. *Anu Tail Pratimarsha Nasya* was clinically and significantly effective in Kasa, Pratishyaya, Atisristum, and Abhikshanam.

2. Maximum improvement was noted down in decreasing eosinophil % and TEC.

3. Improvement was also noted down in increasing of FVC, FEV1, and PEFR.

**REFERENCES**


**Source of Support:** Nil. **Conflict of Interest:** None declared.
Factors influencing safety of Ayurvedic formulations

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P.G Department of Rasa Sashtra and Bhaisjya Kalpana Rishikul Campus Haridwar, Uttarakhnd Ayurveda University, Uttarakhand, India

Abstract

The use of herbal medicine continues to expand rapidly across the world. Many people now take herbal medicines or herbal for their health care in different national health care settings. However, mass media reports of adverse events tend to be sensational and give a negative impression regarding the use of herbal medicines in general rather than identifying causes of these events, which may relate to a variety of issues. The world health organization (WHO) received an urgent request from its member states, through the national pharmacovigilance centers participating in the WHO international drug monitoring programme and drug regulatory authorities to assist member states to strengthen national capacity in monitoring the safety of herbal medicine and in analyzing the causes of adverse events.

Key words: Pharmacovigilance, safety study, World Health Organization

INTRODUCTION

The worldwide consumption of herbal medicines is enormous, so that in terms of population exposure alone, it is essential to identify the risks associated with their use. Safety of herbal medicine is therefore an important public health issue. There is a widespread misconception that “natural” always means “safe,” and a common belief that remedies from natural origin are harmless and carry no risk. However, some medicinal plants are inherently toxic. Herbal medicines are frequently used in conjunction with other medicines, and it is essential to understand the consequences of such combined use and monitor whether any adverse effects are arising.[1,2]

Objective

Reported and documented side effects (according to established principles of pharmacovigilance) of a herb or herb mixture, its closely related species constituents of the herb and its preparation/finished product should be taken into account when decision are made about the need for new pharmacological or toxicological studies. The absence of any reported or documented side effects is not an absolute assurance of safety for herbal medicines. However, a full range of toxicological tests may not be necessary. Suggested tests include immunotoxicity, genotoxicity, carcinogenicity and reproductive toxicity. World Health Organizations (WHO’s) research guidelines for evaluating the safety of herbal medicines can also be consulted for these as well as for other appropriate toxicity tests.[1]

MATERIALS AND METHODS

In general, traditional procedure based therapies are relatively safe, if they are performed properly by well trained practitioners. To avoid safety related accidents we should follow the safety testings of ayurvedic herbal and herbo mineral medicines.

Assessment of Safety

This should cover all relevant aspects of the safety assessment of a medicinal product. A guiding principle should be that, if the product has been traditionally used without demonstrated harm. In its origins Ayurveda was carefully and systematically developed. As a result, it is now being confirmed by measures of many scientific parameters. It not only provides well-based medical cures for disease,
but its holistic approaches use unique principles of diet, lifestyle and, particularly, therapeutics, to balance and enrich all aspects of the physiology and psyche. In light of these aspects of Ayurveda past and present, the system’s potential for promotion of health and wellness is well-acknowledged.\[3\]

On the other side of the coin, Ayurveda treatments have come under attack for several reasons. Unethical companies are under scrutiny for the production of adulterated and misbranded medicaments by inaccurate methods, while some of its practitioners have indulged in illegal practice.

All these events led the Department of AYUSH, Ministry of Health and Family Welfare, Government of India, to implement a National Pharmacovigilance Program for Ayurveda, Unani, and Siddha systems of medicine, in order to systematically monitor adverse drug reactions.\[2\]

**Pharmacovigilance in Ayurveda**

Pharmacovigilance is defined as “the detection, assessment, understanding, and prevention of adverse effects of drugs or any other possible drug related problems.” This definition plainly covers the objectives of the AYUSH program and its coverage area as per the WHO guidelines.

Although a technical term equivalent to “pharmacovigilance” does not feature in Ayurvedic texts, the spirit of pharmacovigilance is vibrant throughout Ayurveda’s classical literature. The Brihattrayi and Laghutrayi repeatedly emphasize the major goals of pharmacovigilance, to improve patient care and safety during treatment, and thus to promote rational use of medications. These are recurrent themes of Ayurvedic pharmacology (Dravyaguna), pharmaceutics (Rasa Shastra and Bhaishjya Kalpana), and therapeutics (Chikitsa). It is probable that these basic principles of Ayurveda gave rise to the common belief that Ayurvedic medicines are safe.

The Ayurvedic literature gives details of drug-drug and drug-diet incompatibilities based on elaborately described qualitative differences in ingredients or quantitative proportions. These factors undoubtedly prevent the onset of many otherwise unfortunate reactions. Ayurveda’s Anupan therapeutic method and Shodhan pharmaceutics principles probably also contribute to the prevention of many undesired and unforeseen events. Prevention of this kind is a major goal of pharmacovigilance programs.

**Method**

In the conduct of non-clinical research on herbal medicines, standard methods are usually employed. However, the use of novel technologies and methods resulting from scientific progress should be encouraged.

1. Pharmacodynamic and general pharmacological methods should utilize animal models or bioassays that closely relate to human disease as described by either traditional or modern medicine (see Guidelines).
2. Toxicological methods.
   Animal and other toxicity studies are conducted according to generally accepted principles, referred to collectively as good laboratory practice, which should be consulted in order to design appropriate studies.
   a. Systemic toxicity tests
      - Systemic toxicity tests refer to alteration of either physiology, anatomy (gross or microscopic) or clinical chemistry (including haematology) that result from pathological changes in any organ distant from the site at which a herbal medicine is administered.
      i. Acute toxicity tests aim to determine toxic manifestations of the test substance that occur when animals are exposed to one or more doses of the test substance within a single 24-h period.
      ii. Long-term toxicity tests aim to determine toxic reactions when animals are exposed to the test drug for periods as long as their lifetime. In such tests, the animals are observed for behavioural changes as well as anatomical, physiological and biochemical manifestations of tissue damage. If pathological changes are detected during the period of drug administration, and the changes are not serious, it may be advisable to determine whether such changes are reversible after the drug is withdrawn. Thus, observations are made at intervals during continuous administration of the drug and then, at intervals after the drug has been withdrawn to determine whether such pathology is reversible.
   b. Local toxicity tests are done to determine the local irritation and/or systemic absorption of a herbal medicine used for local applications (such as respiratory inhalants, drugs applied to skin or mucosa).
   c. Special toxicity test - For herbal medicines containing commonly used herbs which have been used clinically for a long period of time, some countries may not require special tests. Mutagenicity tests, however, are commonly required. If any deviation from traditional use is contemplated (such as new use, new preparation, and new route of administration or more prolonged administration), additional toxicity tests such as carcinogenicity, teratogenicity and reproduction studies may be recommended.

**Documentation of Safety Based on Experience**

As a basic rule, documentation of a long period of use should be taken into consideration when assessing safety. This means that when there are no detailed toxicological studies, documented experience of long term use without evidence of safety problems should form the basis of risk assessment.
The period of use, the health disorders treated, the number of users and the countries with experience should be specified. If a toxicological risk is known, toxicity data must be submitted. The assessment of risk whether independent of dose or related to dose should be documented. In the latter case, the dosage specification must be an important part of the risk assessment. An explanation of the risks should be given, if possible.

RESULT

Research and evaluation of herbal medicines without a long history of use or which have not been previously researched should follow WHO’s research guidelines for evaluating the safety of herbal medicine.

DISCUSSION

Herbal medicines are generally regarded as safe based on their long standing use in various cultures. However, there are case reports of serious adverse events after administration of herbal products. In a lot of cases, the toxicity has been traced to contaminants and adulteration. However, some of plants used in herbal medicines can also be highly toxic. Assessment of the safety of herbal products therefore is the first priority in herbal research.

CONCLUSION

One problem in ensuring safety of a therapy is variable quality control in the manufacture of the therapy equipment. The most effective safety measures therefore are to ensure that the equipment used is of good quality and the practitioner who use it should have good knowledge.

REFERENCES


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Pharmaceutical standardization of Kaseesadi Churna and Kasisadi Varti

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Abstract

Rasa Shastra is a branch of medicine, which deals with the preparation of drugs with metals and minerals having higher therapeutic efficacy, possessing innate qualities such as quick action and less dose; Kaseesadi Churna is one such formulation mentioned in Charaka Samhita Chikitsa Sthana indicated in Picchila Yoni Srava. Kaseesadi Churna mentioned in Charaka Chikitsa Sthana is for oral administration. In the present study, along with oral use of Kaseesadi Churna, it was modified and used locally in the form of Varti. Sodhana, Bhavana, Marana, and Vartinirmana are the important steps involved in preparation of Kaseesadi Churna and Kasisadi Varti. Ayurveda has obstacles in its way to provide quality treatment because of the unavailability of safe and efficacious drug. Hence, there is a need of proper standardization of Ayurvedic drugs at various levels starting from selection and collection of raw material to the final product. Therefore, the present study has been planned to standardize the method of preparation of efficacious herbomineral compound, i.e., Kaseesadi Churna and Kasisadi Varti. The detailed Pharmaceutical study of Kaseesadi Churna and Kasisadi Varti will be discussed in full Paper.

Key words: Kaseesadi Churna, Pharmaceutical study, Rasaoushadi, Standardization, Varti

INTRODUCTION

Rasa Shastra is the pharmaceutical branch of Ayurveda which deals with the preparation of drugs using metals and minerals. Several specialized pharmaceutical procedures such as Shodhana\(^1\), Jarana\(^2\), Marana, and Murchchana\(^3\) are adopted for these mineral materials to convert them into safe, non-toxic, and efficacious forms. The Rasa aushadhies are highly potent, fast acting, and capable of alleviating dreadful and incurable diseases. Rasa aushadhies\(^4\) have more shelf life as compared to herbal formulations.

In today’s scenario, on account of improper intake of diet, stress with the changing lifestyle, and complaints of gynecology like slimy vaginal discharges, i.e., Pichchila Yoni Srava is becoming a challenging problem for women. Treatment with modern medicines reduces the discharge temporarily. Hence, Kaseesadi Churna\(^5\) and Kasisadi Varti are undertaken to find a complete and safe solution for Pichchila Yoni Srava (slimy vaginal discharge) through Ayurveda.

The study is aimed at:
Pharmaceutical standardization of Kaseesadi Churna and Kasisadi Varti.

MATERIALS AND METHODS

Chief reference: Charaka Samhitha Chikitsa Sthana 121/30.

Total pharmaceutical study was carried out in five stages:

<table>
<thead>
<tr>
<th>Stage I</th>
<th>Shodhana of Kaseesa(^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marana of Kaseesa(^7)</td>
</tr>
<tr>
<td></td>
<td>Preparation of Kaseesa Bhasma</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage II</th>
<th>Shodhana of Kankshi(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preparation of Kankshi Bhasma(^9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage III</th>
<th>Preparation of Triphala churna(^10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preparation of Manjista churna.</td>
</tr>
<tr>
<td></td>
<td>Preparation of Dhataki churna.</td>
</tr>
<tr>
<td></td>
<td>Preparation of Amrasthi churna</td>
</tr>
</tbody>
</table>

| Stage IV | Preparation of Kaseesadi churna |
|          | Preparación de Triphala kwatha \(^11\) |
|          | Bhavana of Kaseesadi churna with Triphala kwatha. |
|          | Preparation of Kasisadi vari |

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Showing the Preparation of Kaseesadi Churna

Procedure

- Bhringaraja panchangas were pounded in khalwa yantra and made into paste. The obtained paste was squeezed through a cloth to collect the swaras. Kaseesa was pounded and converted into powder in Khalwa yantra. Bhringaraja swaras was added to this and triturated. The same procedure was repeated for 3 times. Finally, Shuddha Kaseesa was obtained.
- Fresh Suchipatra is taken, washed with water and cut into small pieces with the help of knife. Pieces of Suchipatra were converted into paste form with the help of mixer grinder machine. Paste was squeezed through the cotton cloth and Swaras of Suchipatra was obtained. Shuddha Kasisa was levigated continuously by adding Suchipatra Swara till it becomes thick paste. Then, pellets (chakrikas) which are 2 cm in diameter and 1cm thick were prepared and kept on an earthen saucer and were allowed to dry. After proper drying, the earthen saucer was covered by another earthen saucer and junction was sealed by double folded mud smeared cloth and again allowed for complete drying. Then, the sarava samputa was subjected for Putapaka (10 Prastha cow dung cake). After self-cooling, the Sarava Samputa was taken out and opened. The material was collected and ground. Again this procedure was repeated 3 times.
  - Kankshi was powdered in khalwa yantra and placed in a vessel and heat was given continuously. This procedure was continued until it turns into very light powdery substance. Finally, Sodhita Kankshi was taken out and made into fine powder. Shuddha Kankshi was placed in an earthen saucer. Then, another earthen saucer was placed over it and sandhibandhana was done. Then, the sarava samputa was subjected for Laghu Puta. After self-cooling, the Sarava Samputa was taken out and opened. The material was collected and ground.
  - Amalaki, Haritaki, and Vibhitaki were taken in equal quantities. Then, these three drugs were taken separately in Khalwa yantra and made into powder and filtered through a cloth to get fine powder and mixed together.
    - Dried Manjistha moola was checked for any external impurities, worms and insects and cleaned. Then, it was kept in khalwa yantra and pounded. Manjista powder was filtered through a cloth to get fine powder.
    - Dried Dhataki pushpa was checked for any external impurities, worms and insects and cleaned. Then, they are kept in khalwa yantra and pounded. Dhataki powder was filtered through a cloth to get fine powder.
    - Dried Amrasthi was checked for any external impurities, worms, insects, and cleaned. Then, they are kept in khalwa yantra and pounded. Amrasthi powder was filtered through a cloth to get fine powder.
    - Kaseesa bhasma and Kankshi bhasma were taken in khalwa yantra and mixed together. Triphala churna, Manjista churna, Dhataki churna, and Amrasthi churna were added to the mixture for further trituration. All above drugs are uniformly triturated to form homogenous mixture. The product obtained is Kaseesadi churna.
  - Shuddha Kaseesa and Shuddha Kankshi were taken in khalwa yantra and Triphala churna, Manjista churna, Amrasthi churna, and Dhataki churna were added to it, trituration was carried out. Then, Bhavana was given with Triphala Kashaya for 1 day. Then, this mixture was placed in hot sun for drying. After drying, it was made into fine powder.
    - Then, Cocoa Butter was melted in mild heat and above fine powdered drug was mixed and filled in molds to form Varti. The product obtained is Kasisadi Varti.

Observations

- Bhringaraja swaras was greenish brown in color with pH of 6.9.
- After Sodhana, the color of Kaseesa was ash green.
- When pieces of Suchipatra were converted into the paste
form, it was found green in color. After squeezing the paste, whitish-green Swarasa was obtained.

- Maximum temperature obtained is 668°C for Kaseesa bhasma and it was red in color.
- Sodhita Kankshi was white in color. Maximum temperature obtained during laghu puta was 469°C and color of Kankshi bhasma was white.
- Triphala churna obtained was very fine.
- After powdering, Manjista churna was red in color.
- After powdering, the Dhataki churna was brown in color.
- After drying, the Amrasthi became brittle, light in weight, and cream in color.
- The color of the homogenous mixture turned brown.
- Triphala kwatha was dark brown.
- After completion of bhavana of the homogenous mixture with Triphala kwatha, the color of the mixture turned black.
- Immediately after filling in molds, liquid drug becomes solid.

Precautions

- While extracting the juice from Bhringaraja care should be taken so that it should not spill off.
- Trituration was done carefully to avoid spilling during Kaseesa Sudhana.
- Fresh Suchi patra should be taken and it should be washed properly with water.
- All the equipment (mixer jar, steel vessel, and cloth) should be cleaned properly before use. In 10 Prastha cow dung cakes, first 2/3 part was filled by cow dung cakes. Pyrometer was arranged underneath Sarava Samputa.
- Continuous stirring was done carefully to avoid sticking at the bottom of the vessel during bhavana of Shuddha Kaseesa with Snuhi patra swarasa.
- Chakrikas were arranged in single layer in earthen saucer.
- Material was collected carefully after incineration. Temperature was recorded carefully.
- While pounding, there should not be any spillage for Manjista, Dhataki, Triphala, and Amrasthi churnas.

RESULTS

Table 1 showing the result of preparation of Kaseesadi churna.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Initial weight (g)</th>
<th>Final weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaseesa</td>
<td>500</td>
<td>475</td>
</tr>
<tr>
<td>Kankshi</td>
<td>1000</td>
<td>580</td>
</tr>
<tr>
<td>Triphala</td>
<td>700</td>
<td>690</td>
</tr>
<tr>
<td>Manjista</td>
<td>700</td>
<td>690</td>
</tr>
<tr>
<td>Dhataki</td>
<td>700</td>
<td>690</td>
</tr>
<tr>
<td>Amrasthi</td>
<td>700</td>
<td>690</td>
</tr>
<tr>
<td>Total</td>
<td>4300</td>
<td>3815</td>
</tr>
</tbody>
</table>

DISCUSSION

- The pharmaceutical procedures adopted in this study are Shodhana, Marana, and Bhavana. Shodhana is done for Kaseesa and Kankshi. It is done to convert materials into suitable form for further procedures, remove visible and invisible impurities, to reduce the toxicity and to enhance the therapeutic property. Marana was done for Kaseesa and Kankshi. It makes mineral materials adaptable, absorbable, and assimilable. Bhavana was carried out at two stages. Bhavana with Snuhi Patra Swarasa in the preparation of Kaseesa bhasma and bhavana with Triphala kashaya in the preparation of Kasisadi varti.
- Kaseesa Sudhana.
- Kaseesa sodhana was done by bhavana with Bhringaraja Swarasa for 3 times.
- Reason to select Bhringaraja as bhavana dravya.
- The reason to select Bhringaraja as bhavana dravya is that it acts such as kanduhara and vranaropana, and by nature, it has antimicrobial activity. To obtain these qualities in Kaseesa, Bhringaraja swarasa bhavana is considered as the best choice.
- Kaseesa Marana:
  - In puta system of heating, there is gradual rise and fall of temperature which helps in making the material more agnisthayi (heat stable). It cannot regain its form back after complete procedure. Laghu puta system of heating was suitable for the preparation of Kaseesa bhasma. The maximum temperature recorded during puta was 668°C and it was maintained for a period 4–5 min. After that the gradual fall in temperature was noted over a period of 4 h before reaching room temperature. The material turned to soft powder after complete process, which indicates that the temperature was sufficient for the formation of the desired compound.
  - While doing Kaseesa Bhavana with Snuhi patra Swarasa, continuous 2 h levigation was given. Acharya Charaka has described Bhavana as one of the samskaras. It is described that during the preparation of any medicine, bhavana with swarasa of specific dravya is given. It enhances the bala (potency) of aushadhi dravya. The Subhavit dravya, i.e., dravya after satisfactory levigation can work efficiently even in small quantity. For bhavana, swarasa used can be of the dravya having same Virya to that of bhavya dravya or it can be of the same, i.e., of bhavya dravya. The particle size also gets reduced by this procedure.
  - Chakrikas were arranged in single layer in saucer. Chakrikas were having 2 cm in diameter and 1 cm
thickness because every particle should get adequate heat for incineration. Chakrika should be placed directly in Sharava to avoid loss. For drying of Chakrika, it took long time. It may be because Kaseesa, i.e. ferrous sulfate contains water of crystallization and it has tendency to absorb moisture from air. Acharya Yadavaji Trikamji in his book Rasamrita, especially remarked that Chakrika should be dried well because wet Chakrika after subjecting to Pata causes blackening of Bhasma. [8] In Kaseesa Bhasma [15], Vishista Varna (sindhura) is the main test. After drying of Chakrika, Sharava Sampputikarana was done and subjected to Pata. 29.51% Kaseesa Bhasma was obtained.

- Kankshi Sodhana:
  During Kankshi Sodhana, Nirjalikarana has to be done. In that water content has to be evaporated by giving continuous heat[16]. During this process, molecules present in Alum were evaporated and the weight of Kankshi was almost reduced up to 42%. After purification, Shuddha Kankshi which was obtained is white in color.

- Kankshi Marana:
  Kankshi can be used directly after sodhana. Shuddha Kankshi was taken in sharava and sampputikarana was done. It was subjected to laghu puta. The maximum temperature recorded during laghu puta was 469°C and it was maintained for a period 4–5 min. After that, the gradual fall in temperature was noted over a period of 1 h before reaching room temperature. The material turned to very soft powder after complete process, which indicates that the temperature was sufficient. Incinerated Kankshi which was obtained is white in color. Moreover, this is called Shubhra Bhasma.

- Preparation of Kaseesadi churna:
  For the preparation of the final drug, i.e., Kaseesadi Churna, Kaseesa bhasma, and Kankshi bhasma were taken in equal quantity and mixed thoroughly in khalwa yantra to form uniform mixture. Later, Triphala Churna, Manjista Churna, Amrasthi Churna, and Dhataki Churna were added to it and again mixed to form homogenous mixture. 

- Preparation of Varti:
  In Ayurveda, different types of Varti are mentioned such as Netra Varti, Guda Varti, Yoni Varti, and Vrana Varti. Kaseesadi churna mentioned in Charaka Chikitsa Sthana is for oral administration. In the present study, along with oral use of Kaseesadi churna, it was modified and used locally in the form of varti.

- The ingredients of Kaseesadi churna were subjected to bhavana with Triphala kashaya to enhance antimicrobial activity and vdana sodhana and ropana properties.

  Initially, gum acacia (2–5%) was used as a binding agent in the preparation of varti. When 5% gum acacia was added the varti became very hard. Therefore, 2% gum acacia was tried for the preparation of varti. This varti was introduced in the vagina and observed after 24 h. Very little amount of the drug was disintegrated and the remaining portion of the drug was left as such.

  - Cocoa butter is a highly stable vegetable fat which remains solid at room temperature but easily melts in the vagina. Therefore, 5% of cocoa butter was tried as a binding agent in the preparation of varti.
  - Triphala kashaya bhavita Kaseesadi churna was taken. Cocoa butter was heated to melt. Bhavita Kaseesadi churna was added to the melted cocoa butter and poured into the mold and vartis were obtained.

  Reasons for selection of varti:
  Varti is a locally acting preparation. Most of the etiological factors responsible for Pichchila Yoni Srava are confined to vagina and cervix such as candida and trichomonas. Hence, locally acting like varti will be more beneficial in this condition.

  Advantages of varti:
  - It gives additional support to systemic therapy.
  - Result can be observed rapidly.
  - The patients will be psychologically assured as they are regularly monitored by the physician.

CONCLUSION

- Pharmaceutical study was conducted in several experiments to obtain the contents in desired form for the preparation of Kaseesadi yoga (Kaseesadi Churna and Kasisadi Varti) as per actual reference. All the contents were mixed in required proportions, i.e. Kaseesa bhasma, Kankshi bhasma, Triphala Churna, Manjista Churna, Amrasthi Churna, Dhataki Churna, and trituration were done to prepare Kaseesadi Churna. Anupana for Kaseesadi Churna mentioned in classics is Honey. To provide comfort to the patient, to know the effectiveness, Kaseesadi Churna is modified as Kasisadi Varti.

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10. Sarangadhara Samhitha Madhyama Khanda 6/1.

Source of Support: Nil. Conflict of Interest: None declared.
Figure 1. Bhringaraja Panchangas

Figure 2. Preparation of Bhringaraja Swarasa

Figure 3. Bhringaraja Swarasa

Figure 4. Kaseesa Bhavana With Bhringaraja Swarasa

Figure 5. Snuhi Patra

Figure 6. Snuhi Patra Swarasa
Figure 7: Kaseesa Bhavana with Snuhi Patra Swarasa

Figure 8: Formation of Chakrikas of Kaseesa

Figure 9: Laghu Puta of Kaseesa

Figure 10: Kaseesa after inceneration

Figure 11: Asuddha Kankshi

Figure 12: Dried Triphala
Figure 13: Kaseesa Bhasma

Figure 14: Suddha Kankshi

Figure 15: Trinhala Churna

Figure 16: Dried Manjista

Figure 17: Dried Dhataki

Figure 18: Preparation of Kaseesadi Churna
Figure 19. Kaseesadi Churna

Figure 20. Triphala Kashaya

Figure 21. After Bhavana of Kaseesadi Churna with triphala Kashaya

Figure 22. Kaseesadi varti
Standardization influencing the quality evaluation of Shatavari (Asparagus racemosus Willd.)

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Abstract

There has been rising alertness and worldwide capability of the utilization of ayurvedic prescriptions in today’s medical profession. Revival of public consciousness in the traditional remedy is growing in both the developing and developed nations. This amplification in the use of ayurvedic drugs has also given grown to a range of abuse and adulteration of the raw ayurvedic drugs important to consumers and manufacturers leading to the fatal punishment. Standardization of raw Ayurvedic drugs is a substantial implement in the formulation of high-class Ayurvedic medicines. This study has been performed to inform the stakeholders of Ayurveda to determine the quality of drug with the help of higher analytical tools and well-defined standardization techniques. Shatavari (Asparagus racemosus Willd.) belonging to the family Liliaceae is commonly known as Satavari and is used in Ayurvedic fraternity more frequently for the management of various disorders. Work on quality evaluation supposes the vital connotation. However, no supportive data are available on microscopic characteristics and standardization of the same. In this article, a study has been made to fix the parameters including macroscopic, microscopic, physicochemical analysis, and thin-layer chromatography profile to ensure the use of only authentic and homogeneous material of such Ayurvedic therapies. The obtained values/ranges can be used as standards for quality evaluation of the Shatavari.

Key words: Quality evaluation, shatavari, standardization, thin-layer chromatography

INTRODUCTION

Shatavari consists of tuberous roots of Asparagus racemosus Willd. (Fam. Liliaceae), an ascending, spinous much branched, perennial climber found throughout the country.[¹] Shatavari stands for “who have a hundred spouse or acceptable to several.” It is believed that it is common tonic as well as female health rejuvenator. A. racemosus is the renowned drug in Ayurveda, has characteristics such as madhur rasas, madhur vipaka, and sheet-veerya, and capable in treating som roga, chronic fever, and internal heat (excessive Pitta).[²,³] Charak Samhita and Ashtanga Hridaya describe that the A. racemosus is used to treat women’s health ailments.[⁴-⁷] A. racemosus is a well-known Ayurvedic rasayana. Root of A. racemosus has been reported as bitter-sweet, emollient, cooling, nerve tonic, galactogogue, and aphrodisiac, rejuvenating, and antiseptic. Beneficial effects of the root of A. racemosus are suggested in nervous disorders, diarrhoea, dysentery, tumors, inflammations, hepatic disorders, bronchitis, hyperacidity, and certain infectious diseases.[⁸,⁹] Previous studies reported that the presence of wide range of phytochemical constituents of Shatvari is mentioned as follows:

a. Steroidal saponins, known as shatvarins. Shatvarins I–VI are present. Shatvarin I is the major glycoside with 3-glucose and rhamnose moieties attached to sarsasapogenin,[¹⁰-¹³] Previous studies reported that the presence of wide range of phytochemical constituents of Shatvari is mentioned as follows:

b. Oligoprostansoside referred to as immunoside.[¹⁴]

c. Polycyclic alkaloid-asparagine A, a cage type pyrrolizidine alkaloid.[¹⁵-¹⁷]

d. Isoflavones-8-methoxy-5, 6, 4-trihydroxy isoflavone-7-0-beta-D-glucopyranoside.[¹⁸]

e. Cyclic hydrocarbon-racemosol, dihydrophenantherene.[¹⁹,²⁰]

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Survey of literature showed that no systematic approaches have been made to study the pharmacognostical parameters of this medicinal plant. The present investigation deals with the studies on some important pharmacognostical characteristics, namely, macroscopic, microscopic characters together with physicochemical parameters, preliminary phytochemical test, and thin-layer chromatography (TLC) of the root of *A. racemosus* as powdered form.

**RESULTS AND DISCUSSION**

**Organoleptic and Macroscopic Characters**

The plant possess organoleptic characteristics such as cream in colour and sweetish in taste. Macroscopically the plant depicts tuberous root with tapering ends with 10–30 cm length and 0.1–0.5 cm thickness [Figure 1].

**Microscopic Characters**

The microscopic section of the plant shows an outer layer of piliferous cells which are ruptured at some places to convert in to small, thin-walled, rectangular asymmetrical cells and a few number of cells elongates to form unicellular root hairs; cortex comprises of 25–29 layers, distinct in two zones, outer and inner cortex; outer cortex consists of 6 or 7 layers, compactly arranged, irregular to polygonal, thick-walled, lignified cells; inner cortex comprises of 21–23 layers, oval-to-polygonal, thin-walled, tangentially elongated cells with intercellular spaces; stone cells, either singly or in groups, form a discontinuous to continuous ring in the upper part of this region; and raphides of calcium oxalate also present in this region, 2 or 3 layers of stone.

Cells encircle the endodermis; endodermis composed of thin-walled parenchymatous cells; pericycle presents below...
endodermis, stele exarch, and radial in position; xylem consists of vessels, tracheids, and parenchyma; xylem vessels have pitted thickening; phloem patches consist of usual element; pith composed of circular-to-oval parenchymatous cells, a few cells slightly lignified [Figure 2].

Physicochemical Parameters

Ash of any organic material is composed of their non-volatile inorganic components.[32] The extraction of any crude drug with a particular solvent yields a solution containing different phytoconstituents. It is useful for the estimation of specific constituents, soluble in that particular solvent used for extraction.[33] Physicochemical parameters of A. racemosus such as total ash, water-soluble ash, acid-insoluble ash, loss on drying, ethanol-soluble extractive value, and water-soluble extractive value were carried out and are summarized in Table 1.

Preliminary Phytochemical Analysis

The root powder was extracted with water and ethanol. This extract was tested for the presence of different phytoconstituents. The results of phytochemical qualitative analysis are tabulated in Table 2. Preliminary phytochemical studies revealed the presence of alkaloids, flavonoids, proteins, saponins, carbohydrates, steroids, phenols, glycosides, etc.

TLC Profile

The TLC profile of ethanol extract of A. racemosus along with chloroform:methanol (5:5) as mobile phase resolved major spots at Rf 0.69, 0.53, 0.33, and 0.92 (gray and yellow) at visible light, all black at 254 nm, and all white at 366 nm as shown in Figure 3.

CONCLUSION

Preparation of Ayurvedic medicine requires crude drug as a base material. Efficacy of any drug depends on the genuineness of the raw material used for its manufacturing. Adulteration in the authentic raw material of A. racemosus causes deterioration in the favored therapeutic significance of a particular drug. The present pharmacognostical study was done on the sample of A. racemosus of physicochemical parameters such as total ash, water-soluble ash, acid-insoluble ash, ethanol-soluble extractive value, water-soluble extractive value and loss on drying at 105°C, preliminary phytochemical screening, TLC profile, and microscopic identification. These parameters validate that the drug is persuasive and authentic. Hence, it can be concluded that these parameters are supportive in standardization and quality evaluation of the drug.
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Antioxidant study in flower extracts of *Nyctanthes Arbor-tristis* (L.): An important ayurvedic medicinal plant
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*Nyctanthes arbor-tristis* (L.) popularly known as “Parijat” belongs to the family Oleaceae and is widely used in the traditional system of medicines and in Ayurveda in India. It has immense pharmacological properties. In the present study, the flowers were shade dried and extracted in three different solvents such as ethyl acetate, ethanol, and water. The antioxidant activities were evaluated by four different *in vitro* assays 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging, superoxide radical scavenging, lipid peroxidation inhibition assay, and ferric reducing antioxidant power (FRAP) determination. The polyphenolic content in the extracts was also measured. The maximum total ethanol, antioxidant activity was observed in ethanolic extract of the flower. The EC$_{50}$ value in the ethanolic extract of flower for DPPH free radical scavenging activity is 406.37 ± 2.45 μg/ml. The higher phenolic content was found in aqueous extract (177.0 ± 0.17 μg/mg gallic acid equivalent). Flavonoid content was higher in ethanolic extract (29.25 ± 0.13 μg/mg equivalent to rutin) of flower than other two extracts. This indicates that polyphenolic constituents might be responsible for the antioxidant potential of the flower. Ethanolic extract of the flower was found most potent in antioxidant activity in all assays. Thus, the ethanolic extract of the flower can be used as a cheap natural source of antioxidants and can be used in the pharmaceutical industry and Ayurvedic system of formulation as a cheap source of medicine.

Role of *Pathya* in management of disease
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*Ayuerveda* is a science of life with two main objectives maintenance and promotion of positive health and cure of the diseases. To fulfill both the purposes, our acharyas have mentioned the great role of *pathya* along with treatment. A drug will not be effective until taken with proper *pathya* (food management). Acharya Charak had stated that wholesome food is one of the causes for the growth and well-being of humans while unwholesome food is the root of all diseases. Charak had counted food first in the series of three supporting pillars of life along with sleep and controlled sexual activity. Sushrut had

Systematic review of the concept of collection and preservation of ayurvedic herbs
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Most of the ayurvedic medication has raw herbs as its core ingredient the safety, efficacy, and quality of ayurvedic medicines are depend on the way they are stored. Collection of specific drugs played a most role in Ayurveda. All drugs in ayurveda are panchbhotika in constitution. Therefore, due consideration should be given to the type of land, soil, direction, users, etc. Herbal medicine is the oldest form of health care known to the humankind. With the increasing use due consideration should be given to the type of land, soil, direction, users, etc. Herbal medicine is the oldest form of health care known to the humankind. With the increasing use of herbal medicine, its marketing and safety have become a major concern for health authorities. The safety and efficacy of ayurvedic herbal medicine can be achieved by proper storage and handling of herbs for various ayurvedic dosage forms. Various guidelines are provided for selecting herb, but very few guidelines are provided for storage, preservation, and labeling of herbal medicine.

Conceptual study of factors influencing the dose and mode of administration of Rasayan W.S.R. To Triphala Rasayana
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According to our ancient texts Rasayan drug are used against a multiplicity of seemingly various disorders. Rasayan is not only a drug therapy but it is a rejuvenation recipes, dietary regimen, and especially in health enhancing and correcting the conduct. Nowadays, Rasayan is having much wider application. Rasayan may be of three types Kamya, Ajasrik, and Naimittik Rasayana and on the basis of mode of administration classified into Kuti pravesik and Vatatapik. It acts on the cell and body tissue. In the present study, mainly focus on the factors which influence the dose and mode of administration of Triphala Rasayana. Triphala is a marvelous drug using it in a proper way, and in proper quantity, the people can live more than 100 years with ought any disease and geriatrics. Charaka samhita states that there is no curable disease in the universe which is not effectively cured Rasayan when it is administered at the appropriate dose and time in combination with suitable drug and by adopting the prescribed method.
further supported the fact by stating that food is the cause of vitality, strength, complexion, and Oja. Pathya is the one which keeps the person healthy, maintains normal body functions leads to proper functioning of the organs, nourishes the mind and intellect, prevents disease, and at the same time correct the irregularities that may occur in the body. Thus, everyone should abstain from Apathya (unwholesome to body) and follow pathya (wholesome to body) as prevention is better than cure.

**Quality control and safety aspect of Rasashastraies W.S.R. to bhasma a review**

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Most of the populations about 80% of the world rely almost exclusively on traditional medicine for their primary health care needs as per the WHO. However, recently many questions were raised regarding the safety, quality, and standard of Ayurvedic drugs. Ayurvedic Rasashastraies have good preventive, curative, rejuvenating potential and remarkable efficiency in curing chronic and degenerative diseases. Bhasma is safe when prepared and used properly, if when prepared in improper can lead injurious to health. This led to the decline the quality of Rasashastraies. Quality and safety is a burning topic in Ayurvedic drug industry today. Tremendous work is going on Ayurvedic drug standardization, but it is not an easy task as preparations described under diverse. In this article, an attempt has been made to focus on the Ayurvedic Rasashastraies, and to summarized various methods available for quality and safety of Rasashastraies, i.e., Shodhana, Marana, standardization techniques according to Ayurvedic parameters, physicochemical evaluation, and qualitative analysis will be discussed.

**Role of shodhana karma in improving efficacy of rasa dravya**

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Shodhana, which, literally, means purification and converting drugs suitable for the further procedure. Shodhana is procedure necessary for every drug before taking it for Pharmaceutical and therapeutically purposes. The aim of shodhana is to remove the physical and chemical properties in the sample of raw drugs. Shodhana is also meant for marana process of minerals and metals for further internal uses. Shodhana is a process which not only eliminates physical and chemical impurities but also increases the efficacy of the drugs by removing harmful effects from the substances. The processes of eliminating the impurities from the minerals and metals (metal) depend according to different means such as Swedana, Mardana, Prakshalana, Galana, Avapa, Nirvapa, and Bhavana comes under Shodhana.

**Factors influencing during collection, procurement, and storage of raw material**

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The raw dravya should be collected according to the principles or procedures laid down in Ayurveda, to achieve the desired medicinal value. To denote richness in the inherent quality of the Dravya, Acharya has given indication of Kala, Bhumi, Panchbhattika, etc., during which they should be collected and the specified parts selected. For medical purpose will contain more virya - potentiality or active principles. The storage of raw Ayurvedic herbal drug can be improved by emphasizing on good storage house for storage of herbs, testing of raw herbs as per API format, and tips for good storage of herbs, etc. In raw material, a number of factors affect the cost of production of raw products. These factors may be the quality of raw material, nature of the product, labor cost, production process, wastage of material, cost of preservation, transportation cost, office expenses, etc.

**A classical vehicle for drug administration - Anupana**

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Ayurveda is an ancient science which not only cures the disease but also a science of well-being. Bheshaja avacharana (Drug administration) is a unique and broadly described science in Ayurveda and Anupana is an essential part of this. Anupana is a fluid vehicle which is taken along with or after medicine. According to Ayurveda “the liquid media which opposite to food and similar to body tissue is known as Anupana.” Anupana has an important role to increase Aushada Bala (strength of Medicine) as well Rogi bala (strength of patient). By changing the Anupana, one medicine can be used in different diseases. According to Acharya Charaka Anupana refreshes body and help in easily digestion of medicine. It reduces adverse effect of drug, increases the action of drug and also acts as an Agni deepana (Appetizer). In present paper, many factors which affect the Anupana is described. Furthermore, reveals the actions and importance of Anupana in Ayurvedic practice.

**Factors influencing collection of raw drugs**

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**Introduction:** Procurement is the first step of medicine preparation. In Ayurveda collection of raw material is related to its efficacy and medicinal value besides the simple gathering.
There are several parameters mentioned in Ayurvedic classics for the collection of crude drugs which are very relevant even in contemporary prospective. These parameters include the factors such as geographical distribution (Desh), Land (Bhoomi), Season (Ritu), Direction (Disha), Astrological factors (Nakshatra, Graha, etc.), Part required (Graahyaang), and Quality of crude drug. In various Rasashastra treatise, several factors have also been mentioned for collection of mineral and metallic crude drugs. **Materials and Methods:** The review centralizes on published research articles in the MEDLINE, PubMed, Google Scholar, Science direct, and Scopus, etc. Search criteria included research articles and publications written with key words Collection, Crude Herbs, and Crude minerals. **Aim:** Purpose of this article is to provide a scholarly review of the literature of text and research studies for factors influencing the collection of raw drugs (herbal as well as mineral). **Conclusion:** After the review of various texts and scientific research documents we conclude that there are several factors mentioned in Ayurvedic classics influencing the collection of crude drugs which are very scientific, relevant and are the need of contemporary era as well.

**Unique concept of anupana to enhance efficacy of ayurvedic medicine**
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The recommendation of medicine and Ahara is incomplete in Ayurveda without the practice of Anupana. Bheshjavacharana vidhi is unique principle of Ayurvedic medication, including Anupana. This is an integral part of preventive and curative health care. The concept of Anupana (vehicle) is practiced in Ayurveda and in Indian tradition since time immemorial. Anupana aids or assists the action of main ingredients. This unique science has the facilities to select vehicle according to constitution of an individual, dosha, roga, and drug selected. Anupana affect the efficacy by various factors such as Anupana dravya, matra, kala, and method of Anupana. By the Yukt of Vaidya, a specific Anupana with specific dravya can give specific effects in predominance of particular doshas and rogas of a rogi. With different Anupana, a single Aushadha dravya can be given in different rogas. The action and usefulness of Anupana in digestion and distribution of food and medicine were very well known. Anupana works with various ways for improving efficacy and other things. Out of them, enhancement of bioavailability of draya is most important property. Anupana must be practiced with proper textual knowledge and recently researched guidelines, to obtain the highest efficacy of food and medicine. Nowadays, the concept of yogavahi has been also accepted by modern medical science in terms of bioenhancer. Hence, more emphasis should be given on Anupana to obtain the highest efficacy of Ayurvedic consultation both for medicine and Ahara.

**Importance of aushadha kaal with special reference to ahara**
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**Pharmaceutical standardization of vyoshadi gutika - A polyherbal formulation**
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Ayurvedic Expert

In ancient system of Indian Medicine various single or compound herbal, mineral, and herbomineral drugs are being used for the treatment of many acute and chronic diseases. The authenticated Ayurvedic medicines are more effective with least side effects, as compared to modern ones. The clinical efficacy of any...
drug changes with the variation in the processes of growing, harvesting, storage and drying of raw drugs, and method of preparation of the final product. Therefore, it is essential to standardize raw materials of any compound formulation as well as its finished product to maintain its quality control and therapeutic efficacy. Various standard procedures and analytical methods have been mentioned in “The Ayurvedic Pharmacopoeia of India.” Vyoṣhadi Gutika is a polyherbal formulation, beneficial in Pīnasā, Shvasa, Kasa, Aruchi, Svarabhedā, and Pratihāyā. It contains Shunthi, Maricha, Pippali, Amlavetas, Chavya, Talisa, Chitrakā, Jiraka, Tintidika, Dalchini, Ela, Tejapātra, and Guda. Procurement of these raw materials should be done by proper macroscopic identification and authentication of individual drugs by applying various physicochemical parameters, as per limits of API standards. Physicochemical analysis of raw drugs and Vyoṣhadi Gutika is to be done on different parameters such as foreign matter, loss on drying, total Ash value, acid insoluble ash, aqueous soluble extractive value, alcohol soluble extractive value, and volatile oils. Thin layered chromatography of Vyoṣhadi Gutika and its qualitative estimation for phytochemicals should also be done by adopting standard procedures. It may prove to be a milestone in the field of standardization of this formulation.

Quality control and standardization of bhasma
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According to Ayurveda bhasma means conversion of metal into a form which is irreversible. Standardization of bhasma is very necessary to confirm its identity and to determine its quality and purity. It will also make sure the safety effectiveness and the acceptability of the formulation. However, the most important challenge faced by these formulations is lack of complete standardization. An attempt has been made to summarize the ancient and the advanced methods available for standardization of bhasma such as verna, varitara, rekhabhurantatvam, nirutthā, atomic absorption spectrometry, Fourier-transform infrared, scanning electron microscope, and NPST.

Factors influencing by the storage condition and stability of ayurvedic medicine
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Ayurveda is a well-documented traditional system of Indian medicine. It is one of the most ancient systems of life. Acharīya Sharangdhar first mentioned about Śāvīryāṭā Avadhi of various formulation that is known as Shelf life or expiry date, i.e., stability in the modern system of medicine. The stability is aimed, assuring that the drug or drug product remains within the specification established to ensure its identity, strength, quality, and purity. Environmental factors such as temperature, light, air, and humidity can affect stability. Many factors are influencing the storage condition including heat, air, light, and moisture. The temperature of storage is one of the most important factors that can affect the stability of medicine. The shelf life period of each drug will depend on the various factors such as environmental factor, storage condition, container humidity, and packing. All these factors can be prevented by proper and carefully preparation and packing.

Importance of yusha kalpana and its therapeutic effects
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Health and disease start from proper and improper food, respectively. No medicine is equivalent to food, and hence, it is considered as Mahābhāṣajyā. It reflects the siddhant of “Pathye sati gadārtya kimoushdhnisevanaāh” of Acharīya Lolimbraj. The role of dietary regimen in the form of Pathya Kalpana for prevention of disease is one of the peculiarities of Ayurveda. Different Acharīyas have mentioned various Pathya Kalpana such as Manda, Peya, Vilepi, and Yusha. Yusha (soup) being one of them, indicated as a wholesome diet for a person under ayurvedic medication or during and after purificatory procedures. In ancient literatures, disease-specific Yushas are suggested which make the treatment much more effective. It can be adopted easily as routine diet for prolonged time and prevents the progress of the diseases if taken in Sandhya Vasta.

Evidence-based seasonal changes in phytochemical of plant parts - A review
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A rational and well-developed pharmacological and pharmaceutical basis forms the foundation of therapeutics in Ayurveda. It is the medicine which forms the link between the Physician, disease, and the patient. Ayurvedic system of medicine has included herbs as one of its most powerful ingredients which are recorded in the literature such as Vedas and Samhitas. To achieve the desired medicinal value, these herbs should be collected according to the principles or procedures laid down in Ayurveda. To denote richness in the inherent quality of the dravyas, Acharīya Chārāka has given indications of season, during which they should be collected and specified part to be collected. The scientific rationale of the recommendation to collect particular part of the plant in a specific season is based on so many interesting evidences. It is observed that those parts of the plants do have more medicinal potency in the suggested collection season, and also they grow faster after collection of useful part of those plants in recommended season. In this paper, the author tried to validate the principle of seasonal collection of different parts of plants in different seasons.
Factors influencing at different levels of manufacturing of Vati kalpana
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Pancha Kashaya Kalpanas are the base of all Ayurvedic formulations. Vati Kalpana, the solid medicament in the form of rolled preparation, is undoubtedly centuries old. Easy administration of the drugs, better palatability and better accuracy of dosages forms make it is unique formulation. In Astanga Smagraha, Vati Kalpana is described as upkalpana of Kalka kalpana. Acharya Sarangdhār has mentioned a separate chapter for preparing Vati. Vati is prepared with the combination of Kashtaushadhi dravya, Churna, Bhasma, Sudha, Rasoparasa, Sadharana rasa, Guda, Sarkara, Guggulu, Jala, Swarasa, Mutra, etc., drugs. A specified manufacturing process is given for every single vati which can be saagni (prepared from heat addition) or Niragni (prepared without adding heat); the method for tablet manufacturing should be in accordance with the characteristic of substances used. Manufacturing process decides that how will the final product work. Hence, one should always know the factors which can affect the manufacturing process. These factors include raw material to packaging of the final product. In this review article, we will discuss about these factors in detail.

Criteria for selecting anupan in ayurveda
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Ayurveda, science of healing that enhances longevity restoring the health from diseases as well as by conserving natural health. Ancient sages through their deep knowledge of ancient science and practical experiences gave rise of divergent theories; Anupan is one of such proposition. Administration of medicines in Ayurveda is a science by itself, and Anupan plays an integral part of it. Unpretentiously to say Anupan is liquid consumed immediately after foods or medicines. Anupan augments absorption of drug/food, reduces unrewarding effects, does synergic effect and Anupan as a vehicle of drug, helps to reach it to the specific target. Criteria for selecting Anupan are based on Kaal, Aushadh, Aahar, Vihar, Prakrati, Vikriti, etc.

Pathya aahara-vihara and their influence on the efficacy of ayurvedic medicine
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Ayurveda is a complete life science and holistic approach in health management. The first aim of Ayurveda is to maintain the health of a person so that no disease should manifest. Treatment of disease is the second aim of Ayurveda. The concept of pathya aahar-vihara is one of the good concepts in Ayurveda. Apart from being a part of regime of healthy living, Acharyas asked the concept of pathya as a part of the treatment of the disease. The term of pathya, aahar-vihara is the peculiarity of Ayurveda. Pathya words include materials substance and specific regimes but in general, these words particularly used for food articles and lifestyle in the text of Ayurveda. Acharya Charka had counted food item first in the series of three supporting pillars of life. Acharya Sushruta also supported the food item is the cause of vitality, strength, complexion, etc. As per Ayurveda, most of the aliment develops due to faulty eating habits, so Ayurveda deals with pathya chikitsa in a very scientific way. The body includes dhatu, dosha as well as their channels. The purpose of intake of pathya aahar-vihara (wholesome diets), etc., is to maintain the normal health and alleviate the various diseases. The proper use of diet not only prevents the disease but also play major role in the management of the disease. It is possible if one uses diet considering the tridosha, satmya of a person as well as panchbhattuk composition of the dietary substance.

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The classical methods and the benefits of modified techniques of bahya sneha
- Sneha - indicates or includes oiliness,
- Unctuousness, viscosity, lubricity, etc.

Sनेह सारो अयम् पुष्पः Snehā भूस्वरूपः Snehā सादयस्व भवन्ति (śūnya)
Sneha is the essences of “human life” itself is dependent on sneha.
- The entire strength of an individual is dependent on sneha.

Classification of Sneha (acc to usage)

It is mainly of two types,
1. Bahya sneha
2. Abhyantarā

The external use of unctuous substances on the body can be done in the following methods.

Abhyanga, Lepa, Mardhana, Udvartana, Samvahanā, Moordhātāla, Gandusha, Akshi Tarpana, Pariseka, and Nasa Tarpana.

Abhyanga makes the body soft and controls Vata, mitigates Kapha, provide nourishment to tissue, good complexion, and strength to the body.
- Mode of action of bahya sneha whether it is absorbed into the skin and the role of bhrājaka pitta.
- Indications and precautions for shirodhara and pizhichil.
Therapeutic study of Shilajeet in Vatik Prameha Upadrava (Diabetic Neuropathy)

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Introduction: Chronicity and poor blood glucose control lead to complication which is an unavoidable condition in case of diabetes mellitus. Accessible, affordable and effective treatment therapy has become a global demand in this regard. Hence, the present study is aimed to achieve the goal and to assess the efficacy of Shilajeet in the management of Prameha and Vatik Prameha Upadrava. Materials and Methods: Total 35 patients were registered; the age group above 18 years irrespective of either sex, diagnosed case of type 2 diabetes mellitus and having complication patients were selected for trial. All the patients were divided into three subgroups on the basis of HbA1C level Group A (6.5–7%), Group B (7.1–8.5%), and Group C (>8.5%). Subjective criteria were Prabhuṭa Avila-Mutrata, Trishaṇa, Karā-Pada daha, and Suptata, etc., and Wilcoxon matched-Pairs signed rank test used for it. Objective criteria were complete blood count, erythrocyte sedimentation rate, HbA1C, fasting blood sugar, postprandial blood sugar, lipid profile, urine test, and paired t-test used for it. 32 patients had completed the trial and administered Shilajeet capsule 500 mg BD for 2 months. Results: Nearly 100% improvement was found in Prabhuṭa-Mutraṭa and Avila-Mutraṭa in Group B and C, and statistically it is significant. In Group C HbA1C level BT mean score was 9.26 which declined to 7.53, so it indicates 18.76% relief and statistically it is significant (P = 0.0020). The present study indicated that there are more improvement subjective parameters than the objective parameters.

Factors affect the efficacy of Ayurvedic drugs

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In the present era, faith of Ayurvedic drugs increases because of more or less no side effect from Ayurvedic formulations. No doubt that Ayurvedic drugs are effective in various diseases even that no any side effect. Our Acharya’s says that no diseases arise on earth that is not effectively cure by Ayurvedic treatment till now. If patients follow instructions of diet, daily activity, Anupan, etc. Ancient Acharya’s defined all diseases with its management in text. However, nowadays, the effectiveness of Ayurvedic medicine is questioned mark because of many factors which are affecting the efficacy of Ayurvedic medicine. These factors are may be - (1) soil pollution and use of pesticides, ayurvedic drugs are not grows up with their natural healthy environment and having natural rasa, guna, veerya, and vipak, (2) not follows proper classical manufacturing processing, (3) lack of proper diagnosis of diseases as per Ayurveda and selection/indication of accurate Ayurveda drugs, (4) improper taking Ayurvedic medicine with their anupan, at right time, with indicated and contraindicated food and daily activity, etc., and (5) improper Ayurvedic medical diagnosis with improper analysis prakriti of patients, level of Doshas in body according to ritucharya, status of Dhatu, Agni, etc. Hence, that we have need to improve fault at various levels which affect the effectiveness of Ayurvedic drugs.

Acute and subchronic toxicity study of Manahshila

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Manahshila has been used in classical Indian remedies for the treatment of diseases of respiratory, skin, and digestive systems, psychological disorders, and certain eye disorders. In the present study, Ashodhita and Shodhita Manahshila were subjected to toxicity study to determine the role of...
Shodhana on the safety profile of Manahshila in rats. Ashodhita and Shodhita Manahshila were administered to rats for 28 following days at the doses of 0.7, 3.5, and 7 mg/kg. Animals were sacrificed on the 29th day and parameters such as body weight changes, food–water intake, hematological, serum biochemical, and histopathology of different organs even at therapeutic dose level (0.7 mg/kg). Whereas, Shodhita Manahshila did not produce any sign and symptoms of toxicity at therapeutic dose level (0.7 mg/kg) and therapeutic equivalent dose (TED) 5 (3.5 mg/kg) while at higher dose of TED 10 (7 mg/kg) Shodhita Manahshila has mild toxicity in liver, kidney, and brain on repeated administration for 28 days in rats. These observations indicate the role of Shodhana and effect of dose in the expression of toxicity of the medicinal products.

Yusha – A pathya Ahara Kalpana
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Diet is said to be basis of life, strength complexion, ojas, growth and development, perspicuity of indriyas, happiness, clarity of voice, lustre, pleasure, increase of dhatu, intellect, health, etc., to achieve benefits mentioned above one should consume pathya ahara. There are certain conditions where the individual suffer from gastric trouble, agnimandya, balakshaya, dhatu kshaya, etc. In these conditions, aushadh druvya are difficult to digest for these patients because aushadh druvya depends on agni and bal. In such cases, pathya kalpana should be prescribed to maintain both bala and agni. Different acharyas have mentioned various pathya kalpana such as manda, peya, vilepi, and yusha yusha being one of them, indicated as pathya ahara for both healthy and diseased individual. It can be adopted easily as routine diet for prolonged time and prevents the progress of diseases.

Factors affecting the efficacy of Ayurvedic medicines W.S.R to Pathya-Apathya
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Ayurveda has a holistic approach in health management. Diet and lifestyle play a key role to sustain life and are very essential for maintaining good health. At present, these two factors have become an elaborate and organized specialty. In modern orientation, only components of the diet are taken into consideration, while the Ayurvedic approach is quite distinct. Here, the concept of Pathya-Apathya is defined in general, for specific diseases and also with certain drugs. In terms of efficacy, Pathya-Apathya acts such as a catalyst and inhibitor, respectively, i.e., they enhance or suppress the activity of a substance with which it will be taken. Such as consumption of kulatha is Apathya with Shilajit, mamsa rasa and odana are considered as Pathya with Danti haritaki (C.Ci S/160) while consuming bhallataka, milk and ghrit mixed odana are Pathya. Pathya-Apathya influences the pharmacokinetic parameters (absorption, distribution, metabolism, and excretion) of a single drug or formulation and effects their efficacy.

Anupanain efficacy of ayurvedic medicines
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Anupana forms an integral part of drug delivery system. It is taken with or immediately after drug formulation and is different to the main drug used in treatment. Anupana described in Ayurveda is not just a medium to swallow the medicine but a lot more than that. All the Brihattrayee have given special importance to anupana and it relates greatly with the efficacy of drugs. The medicine with a specific vehicle has a great role in interference with the efficacy of drugs. Anupana generally chosen contains the opposite properties as that of the drug but must not be incompatible. Acharya Sushruta has mentioned anupana according to dosha, vyadhi, and even according to ahara varga revealing the significance of anupana. Anupana have multidimensional effects. It acts as nutritive, preventive, and curative aspect. Drugs become more potent when given with specific anupana. It aids the action of drugs and enhances the properties of drug along with which it is taken.

General consideration of Pathya Kalpana (Ayurvedic dietetic regimen) with special reference to neutraceutics
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The literal meaning of the term Pathya is “Patha,” i.e., various channels or openings of the body which carry the genuine part (Sara bhag) of diet to the target tissues of the body. Hence, any food materials which are wholesome and soothing to our body can be recognized as Pathaya Ahaar. Ayurveda prescribes specific diet patterns in the diseased condition or to lead a healthy life which is also known as Pathya. According to Siddhanta (principles) of Ayurveda, derangement of the digestive power (Agni) occurs in many diseases which is the prime reason for the formation of vitiated toxic substance and malformation of body tissues. As per the prime objective of Ayurveda is to maintain the health of a healthy person first and the diseased person should be treated latter. Regarding to that, Pathya is recommended in routine to maintain the health and could be practiced in Dinacharya (daily regimen). It may be believed same the functioning of
neutraceutics which are administered to the body, not for a specific disease but to maintain the health. Row food material is converted into different forms using different samskaras which changes their physical and chemical properties mostly modern dietetics focuses on natural food whereas Ayurveda follows the holistic approach for the maintenance of health. Different Ayurvedic preparations such as Mand, Paeya, Vilepi, Yavagu, and Yush are included under Pathya Kalpana.

**Importance of Pathya Ahar and Vihar during Netra chikitsa**

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Ayurveda believes that to achieve and maintain healthy living it is essential to practice healthy ahar and vihar. Diet and lifestyle also play an important role in the treatment of various diseases. In Chakradutta, it is stated that in netra roga 3 days light meal or 3 days fasting should be done to achieve good results. In Amavastha of Netraroga, Sweda, pralep, tiktras diet, parishek, and fasting should be followed, and anjana, purana, and decoction should not be used. Not following proper way leads to aggravate doshas which causes difficulty during treatment of disease. Disease results from the disturbance in homoeostasis of tridoshas (vata, pitta, and kapha) which are affected by dietetic factors, lifestyles as well as environmental factors.

**A scientific overlook of Shodhan concept in Ayurveda: Purification of metals and minerals**

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Nature has gifted various resources to human beings. Herbs, metals, and minerals are among them. Uses of these resources in medical treatment are not new for this world. Ayurveda has shown various paths to use these resources in medical treatment since a longtime year back. Rasashastra (Ayurvedic pharmaceutics) which is one of the prestigious branches in Ayurvedic medicine system deals with the use of metal and minerals and their purification method before its use on the human body as a medical treatment for various ailments. A number of purification measures are present for the metals and minerals in this branch. However, some purification methods are there which covered a great range of metals and minerals. Heating, quenching, and triturating are among them. This paper will deal with these Shodhan process and probable mode of scientific concepts behind them, which totally convert the metallic properties into medicinal properties.

**Factors affecting the efficacy of Ayurvedic drugs W.S.R. to Vati Kalpana**

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In Ayurveda, since times immemorial, a constant effort had been directed toward the betterment of effectiveness of medicine. By taking into consideration, the factors such as the efficacy of a medicament and demand of present era various dosage forms have been developed. Vati Kalpana (tablets) is the most acceptable dosage form nowadays. Hence, the factors responsible to maintain the efficacy of vati (tablets) should be kept in mind during its preparation. To ensure the efficacy, all the standardized parameters during the collection of raw drugs as have been given in ancient treatises and also given in PLIM should be followed. By following the guidelines of GMP, a tablet should be manufactured with proper SOP. Final product should also be checked for standardized aspects given for vati (tablet) in PLIM. When the product fulfills all the above criteria, then, it will show desired therapeutic effects in patients. Moreover, the resultant of improved efficacy would be palatability, shortened disintegration and dissociation time, brisk releasing of active principles, increased absorption rate and thus the achievement of desired result.