

# Ayurvedic pharmacology and herbal medicine

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## Abstract

Ayurveda, a science of well-being with its unique approaches of social and spiritual life is in practice since centuries in the Indian sub-continent. Approximately, five decades have been passed when it is getting global attention for health benefits of community with its basic principles of healing. New terminology like herbal medicines appeared in contemporary era with a little bit difference at the level of pharmaceuticals, but therapeutics is almost same. In this review paper, we have tried to understand the effective mechanism of herbal medicines with ancient Ayurvedic terminology and its correlation with the contemporary researches. Therefore, we have selected some commonly used herbal drugs such as *Emblica officinalis* Gaertn. (*Phyllanthus emblica* Linn.) (*Amalaki*), *Commiphora wightii* (Arn.), Bhand (*Commiphora mukul*) (*Guggulu*), and one herbo-mineral drug Black Bitumen, or Mineral Pitch (*Shilajit*) for explanations of thrust and theme of the title. Our methodology to get data is just by referring relevant literature from the ancient *Samhita* (*Charaka Samhita* onward) period to contemporary peer-reviewed published papers in journals of repute. Experimental and clinical studies and practices of *Amalaki*, *Guggulu*, and *Shilajit* validated classical claims of the therapeutic effect of these drugs. There is the probability that ancient Ayurvedic pharmacology is at par to express genuineness of herbal medicines.

**Key words:** Ayurvedic pharmacology, herbal medicine, *Rasa-panchaka*

## INTRODUCTION

Ayurveda deals with a preventive and curative measure for the well-being of creature.<sup>[1]</sup> One of the unique approaches of this traditional science is to treat each human individually. The treatment is planned by physician's own vision and wisdom (*Yukti*) with the proper administration of therapies in accordance of patient individualistic *Dosha* (humors), *Prakriti* (constitution), and *Vikriti* (disease condition).<sup>[2]</sup> Each body is believed to determine the unique combination of physical, physiological, and psychological features of a creature. *Acharya Charaka* states; "a single drug may have many applications owing to its diverse actions just as a man is able to perform various actions."<sup>[3]</sup> For thousands of years, ingredients from Ayurvedic medicine have been connected to efficacy in a human being.<sup>[4]</sup> Ayurveda does not follow the organ-oriented anatomy and physiology of conventional medical science. Ayurveda adopts its own function-oriented approach through its alternative theories of *Panchamahabhuta* (five basic elements, viz., *Akasha*, *Vayu*, *Agni*, *Prathvi*, and *Jala*), *Tridosha* (three humors, viz., *Vata*, *Pitta* and *Kapha*), *Sapta-Dhatu* (seven major

bodily tissues, viz., *Rasa*, *Rakta*, *Mamsa*, *Meda*, *Asthi*, *Majja*, and *Shukra*), *Agni* (digestive and various other bodily tissues energy), *Ama* (toxic, morbid substance), *Ojas* (essence of seven *Dhatu*), and *Srotas* (body channels), etc., which cannot be fully explained in terms of scientific parameters of present era. Hence, to cope up these lacunae up to some extents, a critical literary and conceptual study of these Ayurvedic concepts as well as *Rasa-Panchaka* (drug related five properties), i.e. *Rasa* (taste)-*Guna* (property)-*Veerya* (potency)-*Vipaka* (metabolized end product) and *Prabhava* (effect) is necessary.<sup>[5]</sup>

## ASSESSMENT OF RASA-PANCHAKA AND DRUG ACTION

In the modern pharmacology, the drug action is quite often correlated with its chemical structure or active principle.

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However, in Ayurvedic pharmacology the drug action is attributed to certain principles/doctrines namely *Rasa*, *Guna*, *Virya*, *Vipaka*, and *Prabhava* of the active principles of the drug. These five basics are known as *Rasa-Panchaka*. The substances, like food or drug (*Dravyas*), acts by its innate qualities of *Rasa-Panchaka*. A review of the scientific implications of these principles (*Rasa-Panchaka*) of drug action is mandatory to understand the rationality of modus operandi of Ayurvedic drugs. *Dravyas* are of three categories, some alleviate *Doshas*, some vitiate *Dhatu*s, and some are good for the maintenance of positive health.<sup>[6]</sup> Apparently, it also means that the drugs have potentialities to prevent the diseases. The *Rasa* (taste) of a *Dravya* (substance) is felt at the commencement only, i.e., when the *Dravya* is exposed to the tongue (*Nipata*). *Vipaka* is inferred only after perceiving the final effects of digestion and metabolism is produced (*Karma Nishta*) while *Virya* is identified throughout the stay of the substance in the body (*Adhivasa*) and at the beginning through the contact with the tongue. The properties that exist in the causative factors (*Panchamaha Bhutas*) are present in the resultant factors (*Karya Dravyas*).<sup>[7]</sup> Modern pharmacology being interested in studying the actions of the drug on different systems or parts of the body describes all drugs based on *Karma*; they perform. In Ayurveda, in relation to pharmacodynamics, the properties of drugs have been described in terms of *Rasa-Panchaka*. *Virya* and *Vipaka* are directly related to biophysical and biochemical events of food substances and drugs.<sup>[7]</sup> *Charaka* defined that *Virya* as the power that performs work.<sup>[8]</sup> There is no action, which is not due to *Virya*. *Gunas* or physical properties of substances are modes (or different manifestations) of *Virya* or energy. *Charaka* has tried to explain regarding the identification or recognition of these *Gunas* at various contact points in the body during the journey of the drug such as *Gunas* identification at tongue level with the help of *Rasa* (*Nipatat*) by direct perception and through inference at *Dhatu* (tissue) level; with the terms such as *Vipaka* (*Nishtapaka*) and *Virya* (*Adhivasa*). *Prabhava* has been defined as the special property of a substance that produces actions different from and contrary to those ascribed to *Rasa*, *Guna*, *Virya*, and *Vipaka*.

### Panorama of Drugs in Ayurveda

The subject of usage of herbs and herbo-mineral drugs is as old as disease. Illness has been human being heritage from the beginning of the existence of life and the search for remedies to combat it is perhaps equally old. The drugs, such as *Amalaki*, *Guggulu*, and *Shilajit*, are mostly used in various Ayurvedic preparations [Tables 1 and 2].

#### ***Phyllanthus emblica* Linn. (*Amalaki*)**

The fruit of *P. emblica* Linn., (*Amalaki*); family Euphorbiaceae is one of the important constituents of many Ayurvedic preparations such as *Chyawanprash* and *Triphala* and is regarded as “one of the best rejuvenating herbs.”<sup>[9,10]</sup>

Traditionally, the fruit is useful as an astringent, cardiac tonic, diuretic, laxative, liver tonic, refrigerant, stomachic, restorative, alterative, antipyretic, anti-inflammatory, hair tonic, and digestive medicine.<sup>[10,11]</sup>

It is used for a variety of ailments such as anemia, hyperacidity, diarrhea, and eye inflammation, urinary disorders, leucorrhoea, jaundice, nervous debility, liver disorders, and cough.<sup>[12,13]</sup> It is reported to possess hepatoprotective, antioxidant, anti-mutagenic, cytoprotective, antitumor, antifungal, antimicrobial, hypolipidemic, and anti-atherosclerotic effects.<sup>[13-15]</sup> The fruit contains two hydrolysable tannins Emblicanin A and B, which have antioxidant properties; one on hydrolysis gives gallic acid, ellagic acid, and glucose, whereas the other gives ellagic acid and glucose.<sup>[16,17]</sup> The fruit of *Amalaki* (*Embllica officinalis* Gaertn.) have antioxidant and antiemetic properties. The efficacy of *E. officinalis* in relieving the dyspeptic symptoms as well as in promoting the healing of ulcers is well-known.<sup>[18]</sup> The anabolic activity of *E. officinalis* increases the positive nitrogen balance and the total protein level lead to an increase in body weight.<sup>[19]</sup> The different dosage forms of *Dhatri* (synonym of *Amalaki*) are *Dhatryarishta*, *Dhatravaleha*, etc., has been described in the context of *Panduroga*.<sup>[20]</sup> The data obtained from same dosage form of *Amalaki* prepared with different method shows that freeze-dried *Amalaki Rasayana* has weak anti-secretory and moderate anti-acid activity, whereas freeze-dried *Amalaki Churna* has marginal anti-secretory moderate anti-acid and weak anti-ulcer activity.<sup>[21]</sup>

#### ***Commiphora wightii* (Arn.) Bhand (*Commiphora mukul*) (*Guggulu*)**

In classics, the purified *Guggulu* should be administered along with other herbs in various formulations such as *Triphala Guggulu*, *Pancha Tikta Ghrtam Guggulu*, *Simhanada Guggulu*, *Chandra Prabha Vati*, *Arogyavardhini Vati*, *Amratadi Guggulu*, *Guggulu Tikta Kashaya*, *Kanchanara Guggulu*, *Kaisora Guggulu*, and *Gokshuradi Guggulu*. Here, applicability of various formulations is different. *Pancha Tikta Guggulu Ghrtam* is indicated in *Twak Gata Roga* (skin disorders), *Kanchanar Guggulu* in *Arbuda Chikitsa* (disorders of glands), *Gokshuradi Guggulu* in *Mutra Kriccha Roga* (urinary disorders), and *Simhanad Guggulu* in *Amavata* (rheumatism). The administration of *Guggulu* with other herbs has the effect of purging *Ama* (undigested food) from the body.<sup>[22]</sup> *Agnivridhikara* property of *Guggulu*, digestive power is an increase, which is able to digest *Amarasa* (undigested food), reduces the excessive production of *Kapha* and removes the obstructive *Srotas* (body channels). Because of *Ushna Virya* (warm potency), it also alleviates vitiated *Vata*. *Katu Rasa* (pungent taste), *Ushna Virya*, and *Kaphahara* properties help in *Agni Deepana*, *Pachana Karma* and digest the *Amadosh*. *Lekhana Karma* of *Laghu Guna* (property of lightness) and *Tikta Rasa* (bitter taste) removes the adhered *Dosha* from the *Dushita*

**Table 1:** Medicinal parts, organoleptic properties, action, and English equivalent terms of some common herbal/mineral drugs of Ayurveda

Drug	Parts use	Organoleptic properties				Action	English equivalent terms of diseases (as per the Ayurvedic Formulary of India)
		Rasa	Guna	Virya	Vipaka		
<i>Amalaki</i> , <sup>[31]</sup> <i>E. officinalis</i> Gaertn. (Fam. Euphorbiaceae)	Fresh fruit pulp; fresh juice; dried fruit	<i>Madhura</i> , <i>Amla</i> , <i>Katu</i> , <i>Tikta</i> , <i>Kasaya</i>	<i>Laghu</i> , <i>Ruksha</i>	<i>Sheeta</i>	<i>Madhura</i>	<i>Tridosahara</i> , <i>Vrisya</i> , <i>Rasayana</i> , <i>Caksusya</i>	Aphrodisiac effect, nutrient to body and mind with adapto-immuno-neuro-endocrino-modulator properties, good for eye sight
<i>Guggulu</i> , <sup>[32]</sup> <i>C. wightii</i> (Arn.) Bhand, Commiphora mukul Engl.), (Fam. Burseraceae)	Exudate	<i>Katu</i> , <i>Tikta</i> , <i>Kasaya</i>	<i>Laghu</i> , <i>Sara</i> , <i>Visada</i>	<i>Ushna</i>	<i>Katu</i>	<i>Balya</i> , <i>Rasayana</i> , <i>Varnya</i> , <i>Bhagnasandhanakrt</i> , <i>Medohara</i>	Provides strength, nutrient to body and mind with adapto-immuno-neuro-endocrino-modulator properties, gives complexion, heal bone fracture, reduces obesity
<i>Shilajit</i> , <sup>[33]</sup> black bitumen or mineral pitch	Gummy exudate that oozes from the rocks	<i>Tikta</i> , <i>Katu</i> , <i>Kashaya</i>	<i>Guru</i> , <i>Snigdha</i>	<i>Sheeta</i>	<i>Katu</i>	<i>Shoshaka</i> , <i>Chedaka</i> <i>Prameghna</i> , <i>Medohara</i> , <i>Hrdya</i>	Cures urinary disorders, obesity, use as a cardiac tonic

*E. officinalis*: *Emblica officinalis*, *C. wightii*: *Commiphora wightii*

**Table 2:** Active constituents, therapeutic uses with English equivalent terms and important formulations of some common herbal/mineral drugs of Ayurveda

Drug	Active constituents	Therapeutic uses with English equivalent terms (As per the Ayurvedic Formulary of India)	Important formulations
<i>Amalaki</i>	Ascorbic acid, tannins and gallotannins (dried fruit)	<i>Prameha</i> *, <i>Rasayana activity</i> *, <i>Daha</i> (burning sensation), <i>Raktapitta</i> (bleeding disorder), <i>Amlapitta</i> (dyspepsia), anti-peptic ulcer activity, antimicrobial activity, antioxidant activity, anti-diabetic property	<i>Chyavanaprasha</i> (fresh fruit), <i>Dhatri Lauha</i> , <i>Dhatryadi Ghrita</i> , <i>Triphala Churna</i>
<i>Guggulu</i>	Essential oil, gum, resin, steroids	<i>Shotha</i> (anti-inflammatory), <i>Amavata</i> (rheumatism), <i>Kati Sula</i> (backache), anti-infertility, <i>Medoroga</i> (anti-obesity), <i>Kustha</i> (diseases of skin), <i>Prameha</i> *, <i>Vatavyadi</i> (diseases of Vata dosa), <i>Granthi</i> (cyst), <i>Sopha</i> (edema), <i>Gandamala</i> (cervical lymphadenitis), anti-atherosclerotic activity, hypolipidemic activity	<i>Vatari Guggulu</i> , <i>Yogaraja Guggulu</i> , <i>Simhanada Guggulu</i> , <i>Kaisora Guggulu</i> , <i>Mahayogaraja Guggulu</i> , <i>Chandraprabha Vati</i>
<i>Shilajit</i>	Fulvic acid	<i>Prameha</i> *, <i>Jvara</i> (fever), <i>Pandu</i> (anemia), <i>Mandagni</i> (impaired digestive fires), <i>Sula</i> (pain), <i>Medoroga</i> *, <i>Gulma</i> (abdominal lump), <i>Pliha</i> (splenic disease), <i>Udarroga</i> (diseases of abdomen), <i>Hritashula</i> (angina pectoris), <i>Twak roga</i> (skin disorders), <i>Kustha</i> *	<i>Arogyavardhini Vati</i> , <i>Chandraprabha Vati</i> , <i>Shilajatvadi Lauha</i> , <i>Shilajatvadi Vati</i> , <i>Shiva Gutika</i> , <i>Shuddha Shilajatu</i>

\*Diseases with English equivalent terms repeated in the table

*Srotas* (vitiated body channels). The *Ushna* properties of *Simhanada Guggulu* do not allow the *Ama* to linger at the site of pathogenesis to create *Srotorodha*. It reduces *Srotorodha* and pain. It also has the antagonistic action of *Sheeta* and *Ruksha Guna* (property of cold and dryness) of *Vata*. Thus, it controls *Ama* and *Vata* together and minimizes the process of pathogenesis. *Katu Rasa* and *Tikta Rasa* have *Pachana*, *Agnideepana*, and *Srotovishodhana* properties. These properties are helpful in *Lekhana* action. It leads to the assimilation of undigested and immature *Amarasa*. Thus,

*Lekhana* action initiates *Srotosodhana* (clear the pathway of *Amarasa* induced obstructed circulation). *Kaishor Guggulu* and *Amrita Guggulu* are the two significant *Yogas* taken from *Bhaishajya Ratnavali* and are indicated in *Vatarakta Chikitsa*. The combination and properties of the drugs in both the preparations shows the efficiency of the *Yogas* in clearing the *Margavarana*.<sup>[23,24]</sup> *Guggulu* describes as an antiseptic, antibacterial, astringent, antispasmodic, and as a carrier for other drugs. Hypolipidemic activity of *Guggulu* has been shown by many researchers.<sup>[25-27]</sup>



### **Herbo-mineral drug black bitumen or mineral pitch (Shilajit)**

*Shilajit* is a highly recommended drug in the Ayurvedic and other traditional medicine system of India. It is a pale-brown to the blackish-brown herbo-mineral drug. It is composed of gummy exudate that oozes from the rocks of certain regions of central Himalayas in the summer months. It contains humus, organic plant materials, and fulvic acid as the main carrier molecules.<sup>[28,29]</sup> The fulvic acid helps in the transportation of these minerals into cells for maintaining and restoring their electrical potency, which prevents their decay and death. *Shilajit* helps in metabolism and promotes energy production in the body. It maintains the equilibrium between catabolism and anabolism, enhances the absorptive and detoxifying capacity of the body, and stimulates the immune system and blood formation in the body.<sup>[29]</sup> The therapeutic efficacy of the *Shilajit* is recommended in the treatment of obesity and hyperlipidemic conditions, after subjecting it to *Shodhana* therapy with *Triphala Kwatha* and *Gomutra*. *Triphala* has *Tridosha Shamana* property (especially *Kapha*) and *Gomutra* has *Katu*, *Tikta Rasa*, *Katu Vipaka*, *Ushna Virya*, and *Kapha-Vata Shamana* properties. During *Shodhana* therapy, it was expected that these properties will be transferred to *Shilajit* and enhance its efficacy in reducing the symptoms of obesity (*Meda*). The disease *Medoroga* originates due to consumption of *Kapha Vriddhikara Ahara*, *Vihara*, and *Manasa Nidana*. These factors derange *Jatharagni* (digestive energy) causing *Ama Anna Rasa*, which results in *Medodhatvagni Mandya* (diminished energy related to *Meda Dhatu*). This condition leads to the *Upachaya* of *Medodhatu* (mal-metabolism of *Meda Dhatu*), causing the disease *Medoroga*. *Shilajit* is having *Tikta Rasa*, *Katu Vipaka*, *Ushna Virya*, *Shoshaka*, and *Chedaka* properties, which reduces the *Kapha*, which normalizes the *Mandagni* (loss of digestive energy). Thus, the regulated *Jatharagni* checks the *Upachaya* of *Medodhatu* thereby causing *Lekhana Upashamana* of the disease *Medoroga*.<sup>[30]</sup>

## **DISCUSSION**

Herbal drugs and their formulations are used abundantly in the treatment of different disease condition and are delivered their action based on their basic properties. According to Ayurvedic science, in respect to disease, drug (s) used to maintain bodily elements in equilibrium state by increasing the diminished *Dosha*, *Agni*, *Dhatu*, and *Mala* and by decreasing the elevated element level in the patient. In contemporary period herbal medicine are practiced with its chemical and pharmacological studies which has been performed on a lot of plant extracts to know their chemical composition and to confirm the indications of traditional medicine.<sup>[34,35]</sup> Thus, Ayurveda has made a major contribution to the drug discovery process through reverse pharmacology, with new means of identifying active compounds and reduction of drug development costs.<sup>[4]</sup> The researches done in the last

60 years on herbal pharmacology have led confirmation of few concepts like reverse pharmacology and use of completely crude drugs in place of isolation of fractions for clinical trials. These leads have changed the mindset of researchers on herbal medicine.<sup>[36]</sup> Herbal medicines, also called botanical medicines or phytomedicines refer to herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients.<sup>[37]</sup> The plant materials include seeds, berries, roots, leaves, bark, or flowers.<sup>[38]</sup> Many drugs used in conventional formulations originally were derived from plants.

The Ayurvedic Pharmacopoeia of India has been relying on various Ayurvedic organoleptic, physicochemical, and pharmacological attributes of herbs.<sup>[39]</sup> Few herbals such as *Amalaki*, *Guggulu*, and herbo-mineral like *Shilajit* and their products are abundantly used in Ayurvedic practice. More than 50% of Ayurvedic formulations have these three drugs as one of the ingredients in it.<sup>[40,41]</sup> The differences can be noticed when these drugs are used in the different dosage form. Ayurveda is based on 5000 years of clinical practice. Hence, in place of conventional evidence-based medicine (EBM) clinical trials, practice-based clinical trials should be organized for Ayurveda.<sup>[42]</sup> EBM clinical trial regimens of Ayurveda practice limit the use of *Prakriti*, *Dosha Anubandha-Anubandhyatwa*, *Arambhaka* and *Anugami Dosha Vikala*, *Swanidana Prakopa Awaranajanya Prakopa*, *Prakriti Sama Samveta-Vikritishamasamveta*, and *Amavashtha-pakvastha*, which leads to a variation of dose, dosage form. Along with these Ayurveda also opines *Aushadhisevana-kala* (period of drug administration), *Anupana* (vehicle prescribes for drug administration), *Sahapana* (vehicle prescribes along with drug), *Pathyapathya* (wholesome diet and regulations), therapeutics like *Panchakarma* procedures which are strict to individual looms.<sup>[36]</sup>

In the present scenario, every traditional medical science is involving in research with recent available tools to reestablish the earlier knowledge. Sri Ramnath Chopra (1882-1973), father of the Indian Pharmacology, was a pioneer in the field of the experimental pharmacology of indigenous drugs for evaluating the effects of Ayurvedic drugs and plant extract on tissues and animals. Today, with the use of radiotracers and nuclear imaging techniques, he proposes to break new grounds in understanding the action of Ayurvedic drugs at the molecular level, particularly the *Rasayana* drugs and *Medhya Rasayana* (memory enhancing drugs).<sup>[43]</sup> Ayurveda describes "*Rasayana Chikitsa*" (rejuvenation therapy)<sup>[44]</sup> in which *Rasayana* drugs are used to modulate the neuro-endocrino-immune systems and found to be a rich source of antioxidants.<sup>[45,46]</sup> Many popular Ayurvedic drugs have multifarious properties ascribed to them. Obviously, their molecular targets are shared by many cell systems and cell membrane components such as phospholipase A2, phospholipase C, adenylyl cyclase and cAMP adenosine receptors, eicosanoids, ion channels and neuroreceptors

dopamine, serotonin, norepinephrine, and gamma-aminobutyric acid.<sup>[46]</sup>

The dietary supplement along with main treatment of disease is one of the unique approaches of Ayurveda, which is equally important with the drug in health care services to both preventive and curative aspects. As per Ayurvedic principles, even an acute poison can become a potent drug if it is properly administered. On the other hand, even a drug, if not properly administered, becomes an acute poison. Therefore, a wise patient desirous of longevity and health should not accept any medicine prescribed by a physician ignorant of the principles governing its application.<sup>[47]</sup>

## CONCLUSION

Properly prepared herbal medicines can cure and prevent human health on the highest level of therapeutic efficacy, if parameters of Ayurvedic pharmacology, such as *Dosha, Dhatu, Mala, Agni, Ama, Ojas, and Srotas* as well as *Rasa-Guna-Veerya-Vipak-Prabhava*, are taken care during prescription of herbal products.

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