ORIGINAL ARTICLE

# Analgesic activity of wild and cultivated varieties of *Eranda* (*Ricinus communis* Linn.) root

**Krunal A. Doshi, Rabinarayan Acharya[1], B. Ravi Shankar[2], Mukesh B. Nariya[3]**
Department of Dravyaguna, Institute of Ayurvedic Pharmaceutical Sciences, Departments of [1]Dravyaguna, and [3]Pharmacology, Pharmacology Laboratory, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat, [2]Department of Pharmacology, Shri Dharmasthala Manjunatheshwara Centre for Research in Ayurveda and Allied Sciences, Udupi, Karnataka, India

**Context:** Root of wild and cultivated varieties of *Ricinus communis* Linn; Euphorbiaceae, known as *Eranda* in Ayurvedic system of medicine is used as an anti-inflammatory and analgesic drug. Roots of the cultivated variety available in plenty are utilised mainly instead of the naturally least available wild one. **Aims:** To evaluate the analgesic activity of wild and cultivated varieties of *Eranda* (*Ricinus communis* Linn.) root. **Materials and Methods:** Decoction of both wild and cultivated varieties of *Eranda* root (10.8 ml/kg) were taken as test drugs by oral route, Pentazocine sodium (20 mg/kg) as reference standard and experiment was carried out on Wistar strain albino rats of either sex. Radiant heat, is used for assessing analgesic activity with the help of instrument called as 'Tail Flick Analgesiometer' was selected (Tail flick response), after obtaining permission from Institutional Animal Ethics Committee (IAEC/10/2012/14). **Results:** Decoction of wild variety root (10.8 ml/kg) showed significant effect after 60 min, highly significant effect after 120, 180 and 240 min in the tail flick response compared to initial reading and control group. Decoction of cultivated variety (10.8 ml/kg) treated group showed significant effect after 120, 180 and 240 min in comparison to normal control group. **Conclusion:** Root of (*Ricinus communis* Linn.) wild variety showed more analgesic activity than its cultivated variety.

**Key words:** Analgesic, Ayurveda, *Eranda*, *Ricinus communis* Linn

## INTRODUCTION

In *Ayurvedic* system of medicine, different parts of *Ricinus communis* Linn. such as leaf, root, flower, seed and seed oil[1] are used to manage different disease conditions. Its root is reported as the best *Vrishya* (androgenic) and *Vatahara* (analgesic and anti-inflammatory),[2] useful in disease conditions like *Aamvata* (rheumatism), *Vastisula* (pain in urinary bladder), *Udararoga* (disease of abdomen), *Katisula* (lower backache) and *Jvara* (fever).[3] Methanol extract of its root has been reported for anti-inflammatory and free radical scavenging activity.[4]

*R. communis* L. is available both in wild as well as cultivated conditions. It is an annual or perennial bush or occasionally soft-wooded small tree up to 6 metres or more, found throughout in India, mostly under cultivation up to an elevation of 2000 metres.[5] Due to the high consumption of its root, as an *Ayurvedic* raw drug, the roots of the cultivated variety are utilised mainly instead of the naturally available wild one.[6]

Some experts are of opinion that the wild variety is superior than its cultivated variety.[7] It is reported that wild ginseng roots are 5-10 times more valuable than roots produced by artificial propagation.[8] Hence, the present study was planned to compare the analgesic activity of both the wild and cultivated varieties of *Eranda* root in albino rats.

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## MATERIALS AND METHODS

### Drugs

Fresh roots of wild (more than 6 months) and cultivated variety (6 months old) were collected, after proper identification of the plant as *Ricinus communis* Linn. (Euphorbiaceae), from the adjacent area of Jamnagar town of Gujarat, India, with the help of a taxonomist and a specimen (no. 1490 wild/1491 cultivated) of the two varieties were preserved in the department, for further reference. The obtained roots of wild and cultivated varieties were shade dried and made into coarse powder (85 #). One part of the trial drug and 16 parts of distilled water was taken in a clean vessel and boiled till it was reduced to 1/8$^{th}$ of the initial quantity. It was then filtered through a clean cloth to obtain the *kwatha* (decoction).[9]

**Address for correspondence:** Mr. Krunal A. Doshi, Department of Dravyaguna, Institute of Ayurvedic Pharmaceutical Sciences, Gujarat Ayurved University, Jamnagar - 361 008, Gujarat, India. E-mail: krunaldoshi760@gmail.com
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### Preliminary Phytochemical Screening

Qualitative phytochemical screening was carried out for alkaloid, glycoside, flavonoid, terpenoid, phenol, protein, resin, tannin, carbohydrate and saponin following standard procedure.[10]

### Animals and Grouping

Wistar strain albino rats of either sex, weighing between 150 and 200 g were used for experimental study. The animals were obtained from the animal house attached to the pharmacology laboratory of I.P.G.T. and R.A. Animals were exposed to ideal laboratory conditions in terms of ambient temperature (23°C ± 2°C) and humidity (50%-60%). They were fed with Amrut brand rat pellet feed supplied by Pranav Agro Industries and drinking water was given *ad libitum*. The experiment was carried out after obtaining permission from Institutional Animal Ethics Committee (IAEC/10/2012/14) as per guideline of CPCSEA, India.

### Dose Fixation and Schedule

The human dose of *Eranda* root (120 ml/day)[3] was converted to rat dose on the basis of body surface area ratio using the table of Paget and Barnes.[11] The animal dose of decoction was fixed as 10.8 ml/kg body weight. The test drugs and vehicle to control group were administered according to the body weight of the animals orally with the help of gastric catheter of suitable size, sleeved to a syringe nozzle.

### Experimental Procedure

Radiant heat, as a source of noxious stimulus is the most frequently used stimulus for assessing analgesic activity with the help of instrument called as 'Tail Flick Analgesiometer' was selected (Tail flick response).[12] Experimental animals were placed on the tail flick unit in such way that constant heat intensity was provided to the lower third of the animal's tail. When the animal flicked its tail in response to the noxious stimulus both the heat source and timer were stopped. A cut-off time of 15 seconds was set to avoid tail damage. The basal reaction time of each rat to radiant heat was recorded and those having tail flick latency (TFL) less than 15 seconds were selected.

Animals were divided into four groups i.e., A, B, C and D (having six animals in each group). Group A was kept as normal control and received distilled water in dose of 10 ml/kg body weight of rats. The groups B, C and D were kept as test drug treated groups. Group B kept as standard positive control and received pentazocine sodium (20 mg/kg, *i.p.*). Group C and Group D received decoction of wild variety (10.8 ml/kg, *po*) and decoction of cultivated variety (10.8 ml/kg, *po*) of *Eranda* root respectively. The TFL was recorded at the intervals of 30, 60, 120, 180 and 240 min after drug administration.

### Statistical Analysis

The obtained data has been presented as Mean ± SEM. Difference between the groups, statistically determined by Student's 't' test for paired and unpaired data to assess the statistical significance between the groups. The value $P < 0.05$, are considered as statistically significant.

## RESULTS

### Preliminary Phytochemical Screening

Preliminary phytochemical screening showed presence of alkaloid, tannin, saponin, terpenoid, flavonoid, glycoside, carbohydrate and absence of phenol, protein and resin, in the root of both the varieties of *Eranda*.

### Tail Flick Method

The obtained data when compared to its initial reading, showed that the standard drug produced highly significant increase, in the tail flick response after 30 min ($P < 0.02$), wild variety root showed significant effect after 60 min and 120 min ($P < 0.05$), highly significant effect after 180 min ($P < 0.01$) and after 240 min ($P < 0.02$) in the tail flick response, while cultivated variety treated group did not show any significant increase in tail flick response. It showed more time to react to radiant heat induced pain, in comparison to initial reading almost at all intervals except after 30 min [Table 1].

The obtained data when compared with control group showed that the standard drug provide significant effect after 30 min ($P < 0.05$), wild variety root showed significant effect after 120 min ($P < 0.05$) and highly significant after 180 min as well as after 240 min ($P < 0.001$). The wild variety also showed marked increase in tail flick response after

**Table 1: Effect of test drugs on tail flick response (TFL) in rats**

| Treatment | Duration of latency of tail flick response (Sec) recorded at different time intervals | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial | 30 min | % change | 60 min | % change | 120 min | % change | 180 min | % change | 240 min | % change |
| Control group | 3.43±0.28 | 3.35±0.31 | - | 3.45±0.26 | - | 2.83±0.26 | - | 2.70±0.22 | - | 2.39±0.24 | - |
| Pentazocine sodium | 2.1±0.21 | 8.50±2.09**@ | 240.0↑ | 3.83±0.79 | 64.38↑ | 2.83±0.31 | 13.20↑ | 2.67±0.33 | 23.04↑ | 2.33±0.33 | - |
| Wild variety | 2.93±0.40 | 2.21±0.25 | 24.57↓ | 4.07±0.29* | 38.90↑ | 4.06±0.33*@ | 38.56↑ | 4.38±0.33***γ | 74.06↑ | 4.39±0.42**γ | 49.83↑ |
| Cultivated variety | 3.44±0.53 | 2.97±0.56 | 13.66↓ | 3.97±0.62 | 15.40↑ | 4.19±0.38@ | 21.80↑ | 3.93±0.35@ | 14.24↑ | 3.77±0.55@ | 9.59↑ |

TFL – Tail flick response; Data expressed as mean±SEM, ↓Decrease, ↑Increase. *$P$<0.05, **$P$<0.02, ***$P$<0.01 (paired $t$ test) when compared to respective initial TFL reading. @$P$<0.05, γ$P$<0.001 (unpaired $t$ test) when compared with normal control group

60 min compared to control group but values found to be statically non-significant. Cultivated variety root showed significant increase in tail flick response after 120, 180 and 240 min ($P < 0.05$), compared to control group [Table 1].

## DISCUSSION

Medicinal properties in plants are mainly due to the presence of secondary metabolite.[13] Qualitative test for aqueous extract of plant showed, presence of secondary metabolites such as alkaloid, flavonoid, saponin, terpenoid, tannin, carbohydrate and glycoside in root of both the varieties. Alkaloids have been found to be responsible for both analgesic and anti-inflammatory actions in some natural products.[14] Flavonoid are known to target prostaglandins which are involved in the late phase of acute inflammation and pain perception.[15,16] Also, there are few reports on the role of tannins and saponin in anti-nociceptive and anti-inflammatory activities.[17-19] Saponin and terpenoid have also been reported to inhibit histamine release *in vitro*.[20]

In the present study wild variety root of *Ricinus communis* L. showed more pronounced analgesic activity than cultivated variety because, secondary metabolites of the plants need in their natural environments under particular conditions of stress and competition, which perhaps would not be expressed under monoculture conditions. Active-ingredient levels can be much lower in fast-growing cultivated stocks, where as wild populations can be older due to slow growth rates and can have higher levels of active ingredients.[21]

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.[22] Pain is defined as a subjective, unpleasant, physical and psychological experience observed as a result of the stimulation of identifiable nerve fibres with defined pathway to the brain via the spinal cord.[23] Pain often results from tissue damage that stimulates nociceptive receptors (nociceptive pain) but pain may also occur without nociception; here it could be as a result of damage to neural structures (neuropathic pain or neuralgia) while the former is often acute, self-limiting after healing and responds easily to analgesics, the latter is very difficult to treat, there may or may not be evidence of injury, causes chronic pain and will persist long after the initial injury has healed.[24,25]

The present study was aimed to evaluate the analgesic property of aqueous root extract of wild and cultivated varieties of *Ricinus communis* L. using the tail flick method. In the tail flick tests, oral pre-treatment with wild variety of *R. communis* L. caused a profound significant analgesia in the treated rats and cultivated variety of *R. communis* L. caused a moderate analgesia in the treated rats. Above procedure consists of behavioural methods that have been developed to study nociception in animals.[26] Animal response in these tests is usually integrated at the lower levels in the central nervous system, thus, giving information about the pain threshold. They are, therefore, used to detect narcotic and non-narcotic analgesics. It is well established that thermal nociceptive tests are more sensitive to opioid μ-agonists.[27] The data generated in the present study suggest that the involvement of μ-opioid receptor in the analgesic activity of *R. communis* L. varieties, from which the central involvement of the extract could be deduced.

In radiant heat tail flick model, the comparison of tail flick response at different time interval compared with its initial reading has more importance hence wild variety of *Eranda* root has produced pronounced effect compared to its cultivated variety of *Eranda* root.

## CONCLUSIONS

Wild and cultivated variety root decoction of *Eranda* (*Ricinus communis* Linn.) at same dose level shows highly significant and moderate analgesic effect respectively in radiant heat tail flick model in rats. However, it is suggested to carry out further study to evaluate analgesic effect of wild and cultivated variety root, at different concentrations.

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