



ANTI-INFLAMMATORY ACTIVITY OF WILD AND CULTIVATED VARIETIES OF *ERANDA* (*RICINUS COMMUNIS* LINN.) ROOT

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ABSTRACT

In Ayurveda, *Eranda* (*Ricinus communis* Linn; Euphorbiaceae) root is highlighted for its anti-inflammatory and analgesic action and used as one of the ingredient in many compound formulations. *Ricinus communis* L. is available both in wild as well as cultivated state. Due to its high demand and less supply of wild variety root, its cultivated variety is fulfilling the market demand. Hence, the present study is carried to evaluate the anti-inflammatory activity of both the varieties of *Eranda* root. Decoction of both wild and cultivated varieties of *Eranda* root (10.8 ml/kg) were taken as test drugs, Phenyl butazone (100 mg/kg) as reference standard and experiment was carried out on Wistar strain albino rats following carrageenan induced paw edema model. Student's unpaired *t* test was applied for analyzing the obtained data, after one, three and five hours. Wild variety root decoction, at studied dose (10.8 ml/kg) level, showed marked decrease in paw edema, in comparison to normal control rats, after one hour (25.25%) and five hours (27.79%) of carrageenan injection. The wild variety root provides additional anti-inflammatory effect, in comparison to reference standard (in percentage form), after one hour (13.63%) and five hours (22.18%) whereas the cultivated variety decreased the inflammation after one hour (15.15%) and increase the inflammation after five hours (02.50%). Decoction of wild variety, of *Ricinus communis* L. root provided considerable suppression of carrageenan induced paw edema compared to its cultivated variety.

KEY WORDS: Anti-inflammatory, Ayurveda, *Ricinus communis*, *Eranda*.

INTRODUCTION

Ricinus communis Linn. (Euphorbiaceae), an annual or perennial bush or occasionally soft-wooded small tree up to 6 m. or more, found throughout in India, mostly under cultivation up to an elevation of 2000 meters.^[1] In the Ayurvedic system of medicine its leaf, root, flower, seed and seed oil^[2] is used in different diseases conditions. Its root is sweetish, heating, carminative and useful in inflammation, pains and diseases of the rectum and head.^[3] Further, its root has been highlighted as one of the best drugs having *Vrushya* (androgenic) and *Vatahara* (analgesic and anti-inflammatory) activities.^[4] Methanol extract of root has been reported for its anti-inflammatory and free radical scavenging activity.^[5]

R. communis is available both in wild as well as cultivated conditions. Due to the high consumption of its root, as an Ayurvedic raw drug, the roots of the cultivated variety are utilized mainly instead of the naturally available wild variety.^[6] Hence, the present study is carried out to compare the anti-inflammatory activity of both the varieties root in its *Kwatha* (decoction) form.

MATERIALS AND METHODS

Drugs

Fresh roots of wild (which grows wildly in the plain area without any agriculture procedure and without using any inorganic manure) variety (more than six months) and

cultivated (which grows under husbandry procedure with the uses of many inorganic manure) variety (six months old) were collected in the quantity of two kg each, 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 dried drug and 16 parts of water was taken in a clean vessel and boiled till it was reduced to 1/8th of the initial quantity. It was then filtered through a clean cloth to obtain the *Kwatha* (decoction).^[7] [Fig. 1, Fig. 2]

Preliminary Phytochemical Screening

Qualitative phytochemical screening was carried out for alkaloid, glycoside, flavonoid, terpenoid, phenol, protein, resin, tannin, carbohydrate and saponin following standard procedure.^[8]

Animals

Wistar strain albino rats of either sex, weighing between 150gm and 210gm 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., Jamnagar. Animals were exposed to natural day and night cycles with ideal laboratory condition in terms of ambient temperature (25±2°C) and relative humidity (50%–60%). They were fed with Amrut brand rat pellet feed supplied by Pranav Agro Industries and tap water was given *ad libitum*. The experiment was carried out after obtaining permission from Institutional Animal Ethics Committee (IAEC/10/2012/14).

Dose

Human dose of *Eranda* root is 30gm and it has to be administered as decoction with dosage of 60 ml, twice daily that is 120 ml/day.^[9] Rat dose calculation was done on the basis of body surface area ratio using the table of Paget and Barnes.^[10] The animal dose of decoction was fixed as 10.8 ml/kg body weight. The test drugs were administered according to the body weight of the animals by oral route. Stock solution of suitable concentration was prepared with deionized water freshly just prior to administration and administered with the help of suitable sized steel catheter sleeved onto a

syringe.

Experimental procedure

Experimental model winter at el,^[11] carrageenan induced paw edema was carried out to assess anti-inflammatory effect. In which twenty four animals were divided into four groups comprised of 6 animals each. Group A kept as normal control group received distilled water in dose of 10 ml/kg body weight of rats. Group B kept as positive standard group received phenyl butazone (100 mg/kg, ip). Group C and Group D kept as test drug treated group and received root decoction of wild variety and root decoction of cultivated variety (10.8 ml/kg body weight) respectively. The test drugs and vehicle were administered for five days to respective groups. On fifth day, initially left hind paw volume of each rat up to the tibio-tarsal articulation was recorded prior to carrageenan injection by using plethysmograph.^[12] One hour after test drug administrations, edema was produced by injecting 0.1 ml of freshly prepared 1% w/v carrageenan in sterile saline solution to the sub-plantar aponeurosis of the left hind limb. After injection the rats were administered distilled water in the dose of 2 ml/100gm body weight to ensure uniform hydration and hence to minimize variations in edema formation. Again, paw volume was recorded after 1 hr, 3 hrs and 5 hrs of carrageenan injection. Percentage increase in paw volume was recorded for each rat and data obtained in test drug treated groups were compared with normal control group [Fig. 3, 4, 5, 6].

Statistical analysis

Results were expressed as Mean±SEM as well as percentage change in paw volume in comparison with control group. Student's unpaired *t* test was used for analyzing the data. *P*< 0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

Preliminary Phytochemical Screening

Qualitative test for aqueous extract of plant showed presence of secondary metabolites such as alkaloid, tannin, saponin, terpenoid, flavonoid, glycoside, carbohydrate and absence of phenol, protein and resin, in the root of both the varieties of *Eranda*.

Medicinal properties in plants are mainly due to the presence of secondary metabolite.^[13] Alkaloids have been found to be responsible for

both anti-inflammatory and analgesic 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-inflammatory and anti-nociceptive 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 anti-inflammatory 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]

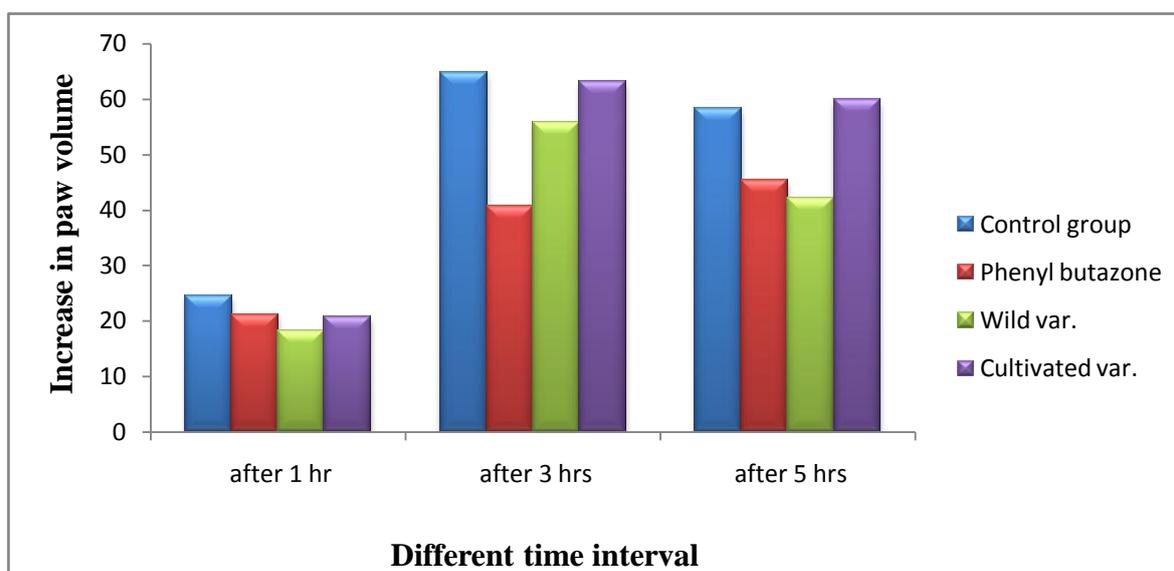
Anti-inflammatory activity

In the present study, wild variety root decoction showed marked decrease (25.25% and 27.79%) in percentage increase in paw edema in comparison to normal control rats after 1 hour and 5 hours of carrageenan injection in rats. Cultivated variety root decoction also showed decrease (15.15%) in percentage increase in paw edema in comparison to normal control rats after 1 hour of carrageenan injection in rats. On the other hand after 3 hours of carrageenan, the wild variety root decoction showed moderate suppression (14.06%) and cultivated variety root decoction showed mild suppression (2.51%) only when compared with normal control group. The observed effects were found to be statically non-significant but comparable with the results observed in reference standard group [Table 1 and Graph 1].

Table 1: Effect of *Eranda* Root Decoctions (Wild and Cultivated Varieties) on Carrageenan Induced Paw Edema in Albino Rats

Treatments	Dosage	% Increase in paw volume at different time interval after Carrageenan injection					
		1 hr	% change	3 hrs	% change	5 hrs	% change
Control Group	QS	24.34 ± 4.21	-	64.79 ± 4.15	-	58.28 ± 4.86	-
Phenyl butazone	100 mg/kg	21.03 ± 0.87	13.63↓	40.71 ± 5.10*	37.16 ↓	45.35 ± 3.91	22.18 ↓
Root decoction of wild variety	10.8 ml/kg	18.20 ± 2.71	25.25↓	55.68 ± 12.39	14.06 ↓	42.08 ± 7.96	27.79 ↓
Root decoction of cultivated variety	10.8 ml/kg	20.66 ± 3.62	15.15↓	63.16 ± 4.13	02.51 ↓	59.74 ± 3.88	02.50 ↑

Data = Mean ± SEM, ↓ = decrease, ↑ = increase, *P < 0.05 (unpaired t-test)



Graph 1: Effect of *Eranda* root decoctions (wild and cultivated varieties) on carrageenan induced paw edema in albino rats

Decoction of *Eranda* root of both varieties were administered prior to the induction of inflammation by carrageenan and pronounced anti-inflammatory effect of wild variety was detectable at both phases of the carrageenan induced inflammation model. It seems that the early phase of the carrageenan induced edema is related to the production of histamine, leukotrienes, platelet-activating factor and cyclooxygenase products, while the delayed phase of response has been related to neutrophil infiltration, production of neutrophil-derived free radicals, such as hydrogen peroxide, superoxide and hydroxyl radicals and release of other neutrophil-derived mediators. Inhibition of these mediators from reaching the injured site or from bringing out their pharmacological effect will normally ameliorate the inflammation and other symptoms.^[22]

Eranda root decoction inhibited both the phases of carrageenan induced inflammatory responses non-significantly compared to control group which indicates the action of test drug on concomitant release of mediators: histamine, serotonin and kinins on the vascular permeability and leukotrienes formation and release. The effect was more pronounced in decoction of wild variety of *Eranda* root compared to cultivated variety of *Eranda* root.

CONCLUSION

Decoction of wild variety, of *Ricinus communis* L. root provided considerable suppression of carrageenan induced paw edema compared to its cultivated variety. It is postulated that the wild variety should be preferred in place of cultivated one. However, further study with dose variation should be carried out to reach a final conclusion.

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PHOTOGRAPHS

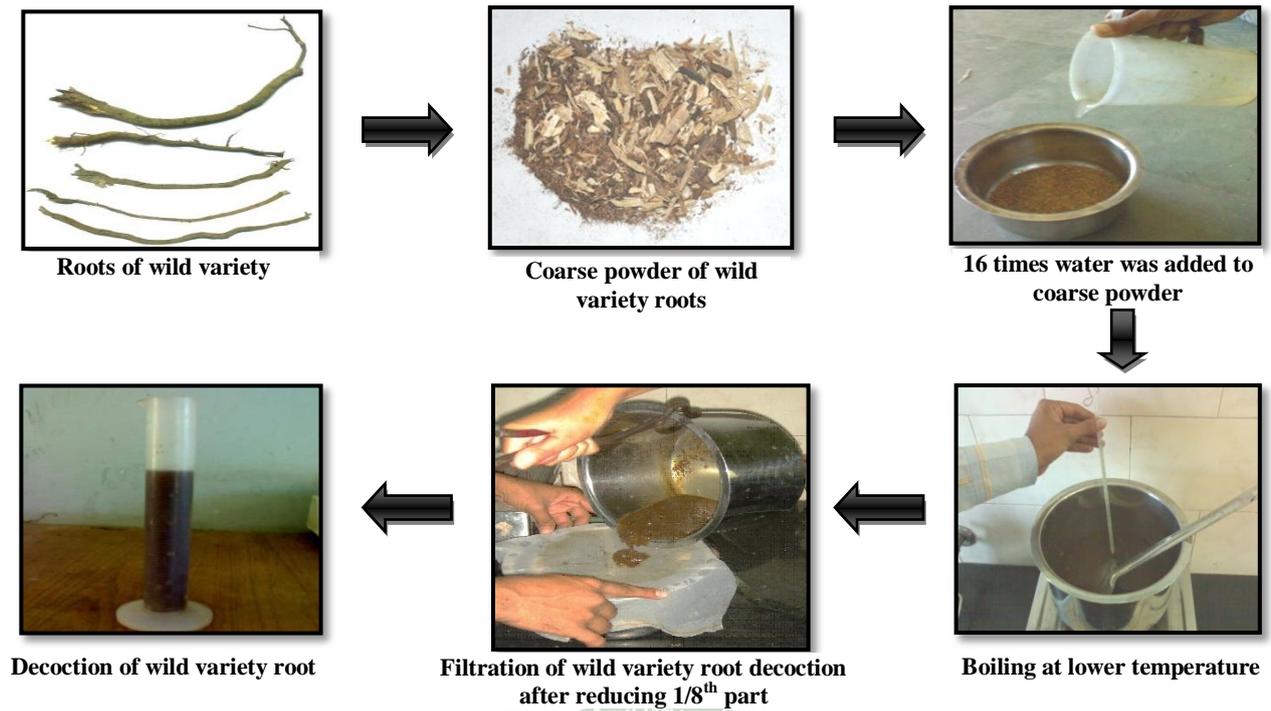


Fig. 1: Preparation of wild variety root decoction of *Eranda* (*Ricinus communis* Linn.)

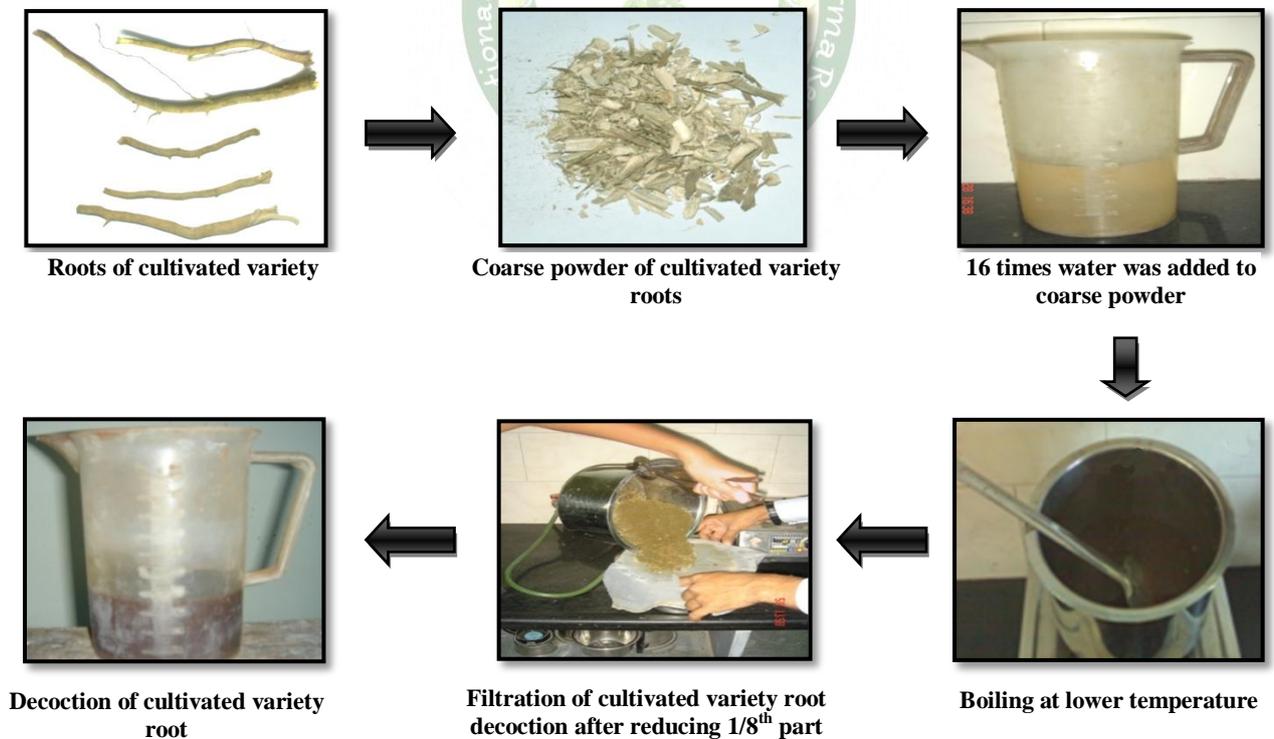


Fig. 2: Preparation of cultivated variety root decoction of *Eranda* (*Ricinus communis* Linn.)

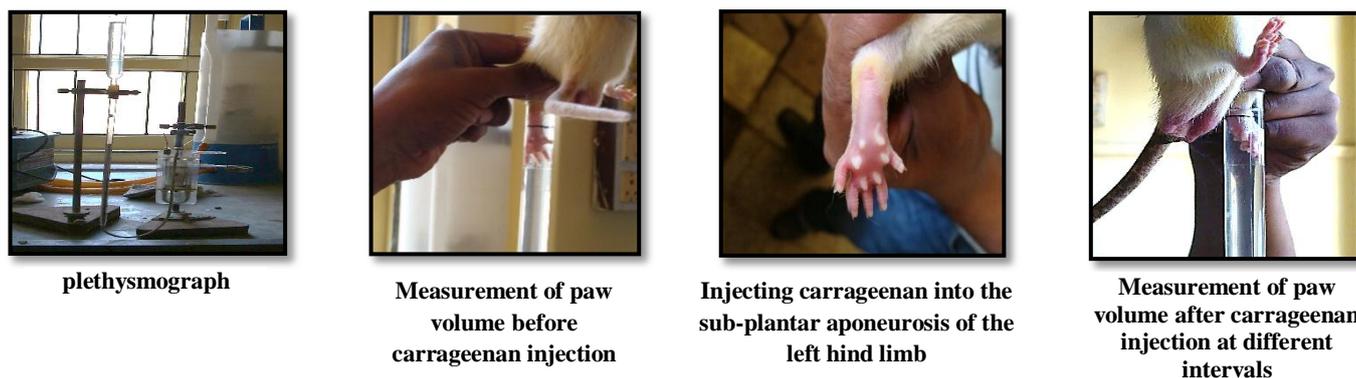


Fig. 3: General procedure of carrageenan induced paw edema for both varieties root decoction of *Eranda (Ricinus communis Linn.)*



Fig. 4: Paw volume was recorded after one hour of carrageenan injection



Fig. 5: Paw volume was recorded after three hours of carrageenan injection

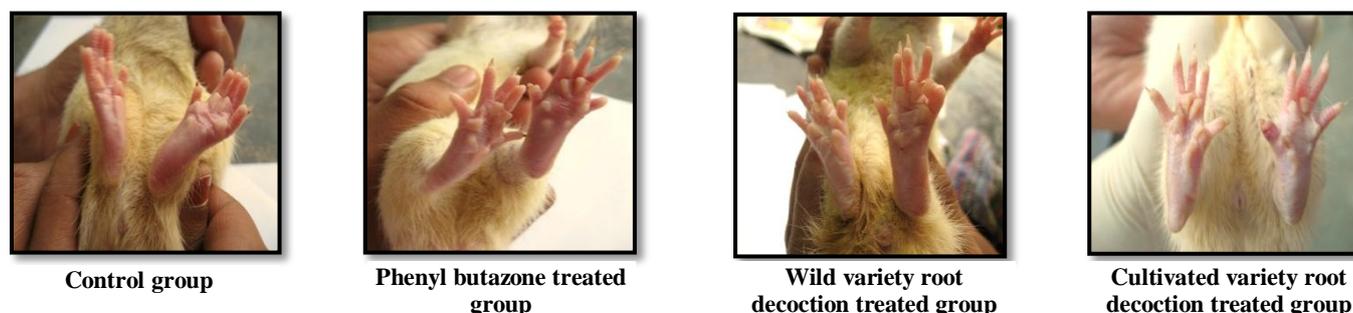


Fig. 6: Paw volume was recorded after five hours of carrageenan injection