

Anti-inflammatory activity of root bark and stem bark of *Shyonaka*

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ABSTRACT

Background: *Shyonaka* (*Oroxylum indicum* Vent.; Bignoniaceae) root bark is one of the ingredients of *dashamoola* (a group of 10 roots), and is used for its anti-inflammatory and analgesic action in a number of compound formulations in Ayurveda. **Aim:** Ayurvedic Pharmacopoeia of India (API) recommends using the stem bark instead of root bark. **Material and Methods:** An attempt has been made to study the anti-inflammatory activity of both root bark and stem bark *kashaya* (decoction) experimentally. **Conclusion:** Results showed significant anti-inflammatory activity of root bark and stem bark decoction.

Key words: Anti-inflammatory, Ayurveda, *dashamoola*, *Oroxylum indicum*, *shyonaka*

INTRODUCTION

Root bark of *Shyonaka* (*Oroxylum indicum* Vent.; Bignoniaceae) is one of the ingredient of *Dashamoola* and is found in many of the compound formulations in Ayurveda, which have been advocated with promising results in various diseases.^[1] *Dashamoola* is known for its anti-inflammatory, anti-helminthic, anti-bronchitis, anti-leukodermatic, antirheumatic, antianorexic activity and for treatment of leprosy and tuberculosis, etc.^[2,3] Apart from its use as an ingredient in *dashamoola*, *shyonaka* is used as a single drug internally and externally in *sotha* (~ inflammation), *amavata* (~ rheumatoid arthritis), and various other ailments.^[4] It is one of the ingredients in many important Ayurvedic formulations, such as *Dasamoolaristam*, *Dasamoola rasayanam*, *Amrutaristam*, *Chyavanaprasa*, and others.^[5] Owing to the

indiscriminate collection, overexploitation and uprooting of whole plants bearing roots, this valuable tree has become vulnerable in many states of India.^[6,7] Existence of *O. indicum* in natural population is highly threatened and has been categorized as vulnerable medicinal plant by the Government of India.^[8]

Various parts of this plant are utilized to cure many diseases. Leaves are emollient, that contain anthraquinone and aloe-emodin.^[9] Fruits are used in treating bronchitis, leukoderma, and helminthosis.^[10] Seed extract exhibits antimicrobial, analgesic, antitussive, and anti-inflammatory properties.^[11] Many flavones and traces of alkaloids are present in pods, seeds, stem, and root bark.^[12] Chemical studies of *O. indicum* led to the isolation of ellagic acid,^[13] 5,7-dihydroxy flavones (chrysin),^[14] 5-hydroxy-8-methoxy-7-O- β -D-glucopyranuronosyl flavone,^[15] stigmast-5-en-3-ol,^[16] 5,6,7-trihydroxy flavone (baicalein),^[17,18] 3, 4', 5, 7-tetrahydroxy-flavonol.^[19]

Ayurvedic Pharmacopoeia of India (API)^[20] advocates using stem bark of *O. indicum* in place of its root bark. According to Ayurveda root bark of *shyonaka* is used in different dosage forms, such as *kwatha* (decoction), *churna* (powder), and others.^[21] Ancient Ayurvedic literature opines that the properties and actions attributed to one part of the plant will be the same for the other parts too.^[22] Few studies on anti-inflammatory activity of the extract of *O. indicum* stem bark have been reported.^[23] But no work has been reported regarding the comparative anti-inflammatory activity of stem bark and root bark of *shyonaka*. Here an attempt has been made to compare

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the anti-inflammatory activity of root bark and stem bark of *Shyonaka*.

MATERIALS AND METHODS

Selection of experimental model

Winter *et al.*^[24] experimental model was adopted in which carrageenan was used to produce the paw edema.

Collection of the trial drugs

The root bark and stem bark of *Shyonaka* was collected from Dang district of Gujarat after proper botanical identification with the help of pharmacognosist. A voucher specimen of the trial drugs was preserved in the museum of the Department of Dravyaguna, I.P.G.T. and R.A., Jamnagar.

Instruments and chemicals used

Instruments such as weighing machine, monopan balance, syringe, needle, catheters, plethysmometer, and the chemicals like carrageenan, normal saline were used for the experimental study.

Pharmaceutical method of the trial drug

The obtained root bark and stem bark were shade dried and made into coarse powder. One part of the trial 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 *kashaya* (decoction).^[25]

Dose fixation and schedule

Human dose of *shyonaka* root bark is 25 g and it has to be administered as decoction with dosage 50 mL, t.d.s.^[26] Decoction was prepared by standard procedure. Human dose is 150 mL/day. However, to establish dose form for experimental purposes, rat dose calculation was done on the basis of body surface area ratio using the table of Paget and Barnes.^[27] The animal dose of decoction was fixed as 14 mL/kg body weight. The trial 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.

Animals and grouping

Wistar strain albino rats of either sex, weighing between 160 and 200g 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 natural day and night cycles with ideal laboratory condition in terms of ambient temperature (25°C±2°C) and 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 (Vide No. IAEC-04/08-10/M.Pharm.04).

The 18 animals, irrespective of sex were randomly grouped into 3 groups. They are Group A (water control), Group B (root bark decoction of *Shyonaka*), and Group C (stem bark decoction of *Shyonaka*) and each group comprised 6 animals.

Experimental procedure

Animals in group A were kept under water control. The animals in groups B and C were administered with trial drugs root bark and stem bark decoction of *shyonaka*, respectively, for 5 days at the dose of 14 mL/kg orally. On fifth day, 1 h after drug administration, initial paw volume was recorded and edema was induced in the right paw by injecting 0.1 ml freshly prepared 1% carrageenan in sterile saline solution into subplantar aponeurosis of the hind limb. After injection the rats were administered tap water in the dose of 2 ml/100 g body weight to ensure uniform hydration and hence to minimize variations in edema formation. Paw volume was recorded with the help of plethysmometer after 3 h after carrageenan injection.

Statistical analysis

Results were expressed as Mean±SEM. Student's unpaired *t* test was used for analyzing the data. *P*<0.01 was considered as statistically significant.

RESULTS AND DISCUSSION

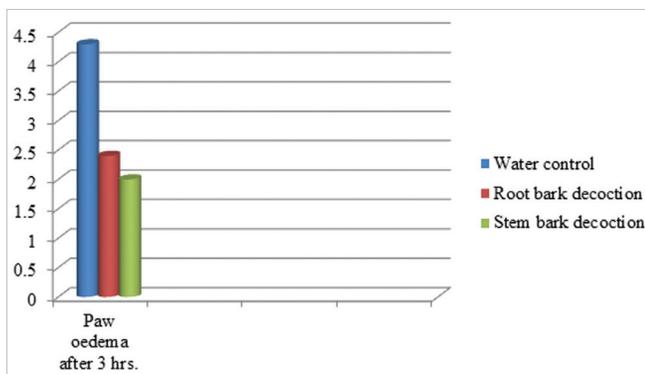
Being an ingredient of *dashamoola*, generally root bark of *shyonaka* is officially considered to be the part of the plant to be used in medicinal preparations in Ayurveda.^[28] A certain Ayurvedic classical text advocates that the properties and actions of different parts of the plant are same.^[22] Recent studies proved that major chemical constituents of *O. indicum* Vent. like Oroxyllum-A, Chrysin, and Baicalein were presented in alcoholic and water extract of root bark and stem bark.^[29]

Both root bark and stem bark decoction produced a considerable suppression in edema formation against carrageenan in comparison to the control group. Statistically significant decrease in paw edema was observed in both the groups (groups A and B) of *Shyonaka* decoction in comparison to the control group [Table 1]. The percentage of suppression of edema in group A is 26.30% and 22.70% in group B. The magnitude of suppression observed in decoction prepared from stem bark (Group B) is more than root

Table 1: Statistical analysis of root and stem bark of *O. indicum* decoction on carrageenan induced paw edema in albino rats

| Group | Drug | Dosage (mL/kg) | Paw edema after 3 h (Mean±SEM) | Percentage change |
|-------|---------------------|----------------|--------------------------------|-------------------|
| A | Water | Q.S | 90.16 ± 01.77 | – |
| B | Root bark decoction | 14 | 69.69 ± 05.15* | 22.70↓ |
| C | Stem bark decoction | 14 | 66.44 ± 06.03* | 26.30↓ |

↓ = Decrease. *P<0.01 (comparison to control group, unpaired t test)

**Figure 1:** Average of edema in control and trial groups

bark (Group A) [Table 1 and Figure 1]. So, stem bark decoction of *shyonaka* can be used as anti-inflammatory drug.

CONCLUSION

Root bark and stem bark of *Shyonaka* (*O. indicum*) provides significant anti-inflammatory activity. Hence, in the place of root bark, stem bark can be substituted. However, clinical studies should be carried out to prove the same.

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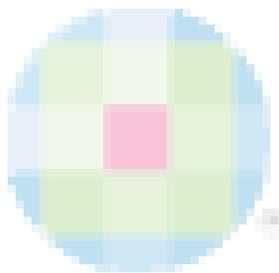
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