

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

Krunal Doshi, Ilanchezhian R.¹, Rabinarayan Acharya¹, Patel B. R.¹, Ravishankar B.²

Department of Medicinal Plant, ¹Dravyaguna, ²Head Pharmacology Lab, Institute for Postgraduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat, India

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- 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

Address for correspondence:


Dr. Rabinarayan Acharya, Department of Dravyaguna, Institute for Postgraduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat - 361 008, India.
E-mail: ayurilan@yahoo.com

Received: 15-Aug-2011

Revised: 20-Oct-2011

Accepted: 27-Oct-2011

Access this article online

Quick Response Code: 	Website: www.jaim.in
	DOI: 10.4103/0975-9476.104434

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

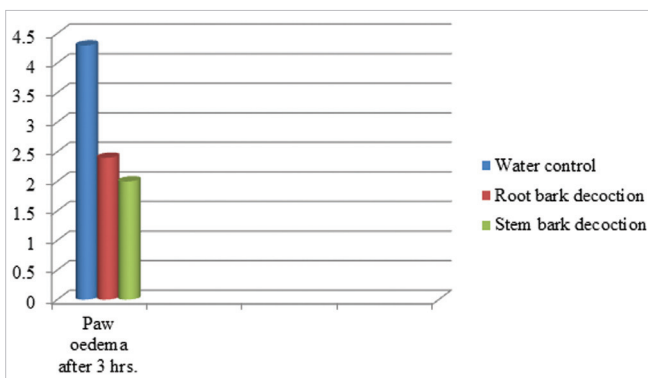
Being an ingredient of *dashamoola*, generally root bark of *shyonaka* is officially considered to be the part of the plant to be used in medicinal preparations in Ayurveda.^[28] A certain Ayurvedic classical text advocates that the properties and actions of different parts of the plant are same.^[22] 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.

REFERENCES

- Sharma PV. Dravyaguna vijnana, Vol. 1. Varanasi: Chaukhamba Bharati Academy; 2006. p. 125.
- Manonmani S, Vishwanathan VP, Subramanian S, Govindasamy S. Biochemical studies on the antiulcerogenic activity of Cauvery 100, an Ayurvedic formulation in experimental ulcers. *Indian J Pharmacol* 1995;27:101-5.
- Bhattacharjee SK. Hand book of aromatic plants. Jaipur: Pointer Publishers; 2000.
- Chunekar KC, Pandey GS. Bhavaprakasha Nighantu. 10th ed. Varanasi: Chaukhamba Bharati Academy; 1999. p. 283-5.
- Anonymous. The Herbal Pharmacopoeia of India. Mumbai: Regional Research Laboratory, Jammu and Indian Drug Manufacturer's Association; 1998. p. 165.
- Darshan S, Ved DK. A balanced perspective for management of Indian Medicinal Plants. *Indian For* 2003; 129:275-8.
- Jayram K, Prasad MN. Genetic diversity in *Oroxylum indicum* (L) Vent. (Bignoniaceae) a vulnerable medicinal plant by random amplified polymorphic DNA marker. *Afr J*

- Biotechnol 2008;7:254-62.
- Ravi Kumar K, Ved DK. 100 Red listed medicinal plants of conservation concern in Southern India. Bangalore: Foundation for revitalisation of local health traditions; 2000. p. 1-467.
- Nakahara K, Roy MK, Alzoreky NS, Na-Thalang V, Trakoontivakorn G. Inventory of indigenous plants and minor crops in Thailand based on bioactivities. 9th JIRCAS International Symposium-value addition to Agricultural Product. 2002. p. 135-9.
- Parrotta JA. Healing plants of Peninsular India. New York, USA: CABI Publishers; 2001.
- Rasadah MA, Houghton PJ, Amala R, Hoult JR. Antimicrobial and anti-inflammatory activity of extracts and constituents of *Oroxylum indicum* Vent. *Phytomedica* 1998;5:375-81.
- Uddin K, Sayeed A, Islam A, Rahman AA, Ali A, Khan GR, *et al.* Purification, characterization and cytotoxic activity of two flavonoids from *Oroxylum indicum* Vent. (Bignoniaceae). *Asian J Plant Sci* 2003;2:515-8.
- Maitreyi Z, Khandhar A, Jain S. Quantification of Baicalein, Chrysin, Biochanin-A and Ellagic Acid in Root Bark of *Oroxylum indicum* by RP-HPLC with UV Detection. *Eur J Anal Chem* 2008;3:245-57.
- Babu KS, Babu TH, Srinivas PV, Kishore KH, Murthy US, Rao JM. Synthesis and biological evaluation of novel C (7) modified chrysin analogues as antibacterial agents. *Bioorg Med Chem Lett* 2006;16:221-4.
- Nair AG, Joshi BS. Oroxindin - A new flavone glucuronide from *Oroxylum indicum* Vent. *J Chem Sci* 1979;88A:323-7.
- Rasadah A, Houghton M, Raman PJ. Antimicrobial and anti-inflammatory activities of extracts and constituents of *Oroxylum indicum*. *Phytomedicine* 1998;5:375-81.
- Chen L, Song H, Du Q, Jianrong L, Ito Y. Analysis of Flavonoids in the Extracts from the Seeds of *Oroxylum indicum* using high speed countercurrent Chromatography/ Mass Spectrometry. *J Liq Chrom Relat Technol* 2005;28: 1549-55.
- Chen LJ, Games DE, Jonathan J. Isolation and identification of four flavonoid constituents from the seeds of *Oroxylum indicum* by high-speed counter-current chromatography. *J Chromat A* 2003;988:95-105.
- Kaisarul Islam M, Zahan Eti I, Ahmed Chowdhury J. Phytochemical and Antimicrobial Analysis on the Extract of *Oroxylum indicum* Linn. Stem-Bark. *Iran J Pharmacol Ther* 2010;9:25-8.
- Anonymous. The Ayurvedic Pharmacopoeia of India, Part 2, Vol. 1., Formulations. 1st ed. New Delhi: Govt. of India, Ministry of Health and Family welfare; 2007. p. 55, 65, 135.
- Anonymous. The Ayurvedic Formulary of India, 1, Vol. 3, 2nd ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare; 2000. p. 210-1.
- Bhatta K, Swami L, editors. Sidhabheshaja Manimala. 2nd ed. Varanasi: Krishnadas Academy; 1999. p. 7.
- Laupattarakasem P, Houghton PJ, Hoult JR, Itharat A. An evaluation of the activity related to inflammation of four plants used in Thailand to treat arthritis. *J Ethnopharmacol* 2003;85:207-15.
- Winter CA, Risley EA, Nuss GW. Carrageenan induced edema in hind paw of rat as an assay for antiinflammatory drugs. *Proc Soc Exp Biol* 1962;111:544.
- Sharangadhara. Sharangadhara Samhitha. Srivastava S, editor. 1st ed. Varanasi: Chaukhamba Orientalia; 1996. p. 135.
- Anonymous. The Ayurvedic Pharmacopoeia of India, Part 1, Vol. 3., 1st ed. New Delhi: Govt. of India, Ministry of Health and Family Welfare; 2007. p. 210-1.
- Paget GE, Barnes JM. Evaluation of drug activities, Pharmacometrics. Lawranle DR, Bacharch AL, editors. Vol. 1. New York: Academic Press; 1964.

28. Sharma PV. Dravyaguna Vijnana. Vol. 2. Varanasi: Chaukhamba Bharati Academy; 2001. p. 469-71.
29. Doshi K, Ilanchezhian R, Acharya R, Patel BR, Harisha CR, Shukla VJ. A comparative phyto-pharmacognostical evaluation of stem and root of shyonaka (*Oroxylum indicum* Linn.). Int Res J Pharm 2011;2:66-73.

How to cite this article: Doshi K, Ilanchezhian R, Acharya R, Patel BR, Ravishankar B. Anti-inflammatory activity of root bark and stem bark of Shyonaka. J Ayurveda Integr Med 2012;3:194-7.

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

Author Help: Online submission of the manuscripts

Articles can be submitted online from <http://www.journalonweb.com>. For online submission, the articles should be prepared in two files (first page file and article file). Images should be submitted separately.

1) **First Page File:**

Prepare the title page, covering letter, acknowledgement etc. using a word processor program. All information related to your identity should be included here. Use text/rtf/doc/pdf files. Do not zip the files.

2) **Article File:**

The main text of the article, beginning with the Abstract to References (including tables) should be in this file. Do not include any information (such as acknowledgement, your names in page headers etc.) in this file. Use text/rtf/doc/pdf files. Do not zip the files. Limit the file size to 1024 kb. Do not incorporate images in the file. If file size is large, graphs can be submitted separately as images, without their being incorporated in the article file. This will reduce the size of the file.

3) **Images:**

Submit good quality color images. Each image should be less than **4096 kb (4 MB)** in size. The size of the image can be reduced by decreasing the actual height and width of the images (keep up to about 6 inches and up to about 1800 x 1200 pixels). JPEG is the most suitable file format. The image quality should be good enough to judge the scientific value of the image. For the purpose of printing, always retain a good quality, high resolution image. This high resolution image should be sent to the editorial office at the time of sending a revised article.

4) **Legends:**

Legends for the figures/images should be included at the end of the article file.