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Pharmacognostical and phytochemical study of a plant *Urtica parviflora* Roxb. - A review

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Abstract

Urtica parviflora Roxb. is a perennial, monoecious herb found in moist and partly shady place. It is potent medicinal plant belongs to the family *Urticaceae*. It is growing at a height of 1700-2800 m. The whole plant and its parts are used in treating a number of disorders such as goiter, cough, allergies, alopecia and fevers. The plant has characteristics stinging hairs which are rich source of histamine and 5-hydroxytryptamine. The present review detailed focus on its pharmacognostical and pharmacological studies and its therapeutic importance.

Keywords: *Urtica parviflora* Roxb. Pharmacognostic, Pharmacological and Therapeutic activity

1. Introduction

Urtica parviflora Roxb. (Family-*Urticaceae*) is a perennial, monoecious herb found in moist and partly shady places of evergreen forest^[1, 2]. It is having a place with family *Urticaceae*. It grows to a height of 1700-2800 m from sea level. It is found in Bhutan, Nepal, Western China, and India, especially in Himalaya (lower altitude) Kashmir, Uttarakhand, West Bengal, Arunachal Pradesh, Tamil Nadu and Sikkim^[1, 3, 4]. It is an enduring plant which is commonly known as Himalayan stinging nettle and locally as Shishoon in kumaun and kaldiya or kandali in Garhwal. The nettle is considered to be as one of the nature's best herbs for it consists of proteins, calcium, phosphorus, iron, magnesium, beta-carotene, along with vitamins A, C, D, and B complex. The leaves of the plant have stinging hairs which are responsible for the burning sensation and itching sensation on the contacted skin surface attributed to the presence of histamine and 5-hydroxytryptamine^[4]. Young leaves of the plant are nutritious and are cooked as food in Western Himalayan region. This plant is used traditionally to cure various disorders. Young leaves of the plant are used to cure goiter and associated pain. The leaves are also used to cure the allergic disorders such as cold and cough. The leaf extract is used to cure baldness and also used in hair wash. The fresh leaves and roots of the plant are applied to cure the dislocation of bones. Due to the numerous medicinal uses, it is considered as an important medicinal plant^[1, 4].



Fig. 1: *Urtica parviflora* Roxb. Whole Plant and leaf^[1]

2. Geographical distribution^[5]

Urtica parviflora Roxb. Is mainly found in moist and shady places at height of 1700- 2800 meters from the sea level. It is found in Bhutan, Nepal, Western China and India. In India grows naturally in Kashmir, Uttarakhand, West Bengal, Arunachal Pradesh, Tamil Nadu and Sikkim.

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3. Cultivation and collection

Basically the nettle is considered as a weed. They have a perennial root system that spreads quickly and makes it very difficult to eradicate once it is established. The plants may be grown by the seeds or vegetative by divisions. Nettle seeds are small and they are easier to work with if they are mixed with some sand and a number of gardeners suggested that the herb seeds have a cold treatment prior to germinating. If seeds sow indoors, freeze the herb seeds for several weeks before sowing the stinging nettle seeds. Cover the trays or pots with a plastic dome or plastic wrap to keep the moisture high. If starting outdoors sow the stinging nettle seeds directly in the late fall so that the herb seeds can freeze through the winter. Once the seedlings are 3-4 inches in height, transplant them to the herb garden in early spring. Space plants approximately 20 cm apart. Water as needed during dry periods [6, 7, 8]. Young leaves and shoots are best harvested in spring through to autumn. Wait until the little nettles are 20 cm high. Be sure to wear gloves when harvesting to avoid the sting delivered by tiny hairs on the leaves and stem [9, 10].

If the nettle is very young only harvest the top bud and first leaf set. Harvesting the terminal bud will stimulate lateral bud growth causing the plant to become bushier and allowing harvest continually from the same plant. Do not harvest when flowering and avoid harvesting old leaves after flowering as these become unpalatable. Collect seeds when they are ripe. Autumn is the time when nettle roots are harvested and used in the preparation of various herbal remedies. To dry place on well-ventilated screen and place in a dark, warm and dry place [10, 11, 12].

4. Planting Directions

Table 1: Planting Directions

Temperature	65F
Average germ time	10-14 days
Light required	Yes
Depth	Surface sow seed and do not bury
Sowing Rate	7-10 seeds per plant
Moisture	keep seeds moist until germination
Plant spacing	15-18 inches

5. Pharmacognostic profile

5.1. Taxonomical categorization [13, 14]

Table 2: Taxonomical categorization

Kingdom	Plantae
Subkingdom	Tracheobionta
Super division	Spermatophyta
Division	Angiospermae
Class	Dicotyledone
Subclass	Archichlamydeae
Order	Urticales
Family	Urticaceae
Genus	Urtica
Species	<i>Urtica parviflora</i> Roxb.

5.2. Common regional and vernacular names [15, 13]

Urtica parviflora Roxb. Is known by several common regional and vernacular names

Table 3: Common regional and vernacular names

English	Nettle, Sting nettle, Himalayan stinging nettle
Nepalese	Sishnu
Bengali	Paharah bichuti
Gharwal	Kandli
Kumoun	Shishoon
Hindi	Bichubuti

5.3. Macroscopic studies

The Nettle is a perennial, monoecious herb 2-4 feet tall, found in moist and partly shady places of the evergreen forest. The plant generally grows up to 1 m height but may grow up to 2 m depending on place and soil condition. The plant has wide-spreading rhizomes that are long and stoloniferous and are bright in shading as the perennial roots. Leaves are dark green in color and coarsely toothed, with strong edges and a clear venation of the lower leaf surface. Leaves are 5-12 cm in length and 2-8 cm width. Both surfaces of the leaf are armed with stinging hairs. The leaves are borne oppositely on an erect wiry green stem. The stems are strong, hairy, less branched and quadrangular. The stem of the nettle can range between 25-50m in length and is green in young plants and purple/reddish in older ones. The grooved hollow stem of the plant is rigid, wiry and is covered with stinging hairs which release toxins. The whole plant is secured with erect and bristly glandular hairs whose tips come off when touched, transforming the hair into a needle that injects a stinging liquid, that contain acetylcholine, formic acid, 5-hydroxytryptamine, and histamine. The hairs on the leaves are especially excruciating. The plants lose their stinging qualities when they are dried. The plants blooms in mid-year; it has modes greenish or greenish white blossoms that hang down in drooping clusters which range from 4-7 cm in length. The fruiting time of the plant is from June-October Fruits are characteristics broadly ellipsoidal shaped achenes. They are yellow-green in color. They may be slightly compressed and are usually 1mm long [16, 17, 18, 19].

5.4. Microscopy

The leaves of *Urtica parviflora* Roxb. Found to have following characteristics: [1]

1. Upper and lower epidermis.
2. Consist of anomocytic stomata in the both epidermises.
3. 5 or 6 layers of collenchyma were visible.
4. Both epidermises covered by the thick cuticle.
5. The xylem and phloem vascular bundles is present.
6. Calcium oxalate prisms.
7. They don't contain palisade in the midrib region.

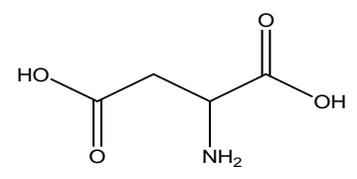
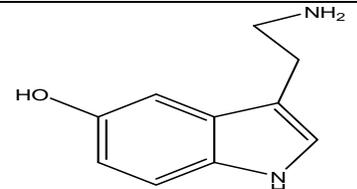
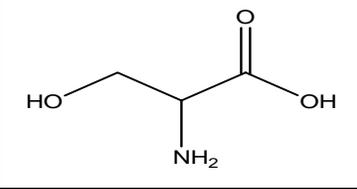
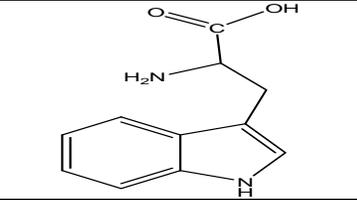
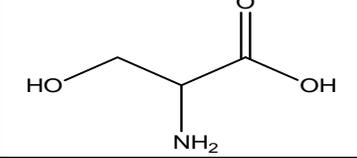
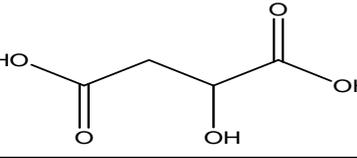
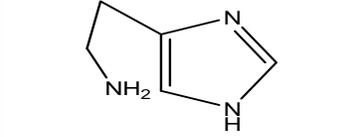
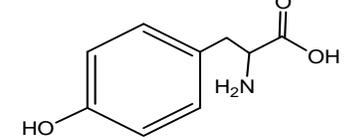
Table 4: Microscopic characters of *Urtica parviflora* Roxb. Leaf powder [1]

S. No.	Parameters	Observation
1.	Trichome	Unicellular
2.	Calcium oxalate crystals	Prism
3.	Epidermal cells	Elongated and uniform
4.	Stomata	Anomocytic

6. Phytochemistry [13]

U. parviflora Roxb. Contains several chemical constituents like histamine, serotonin (5-hydroxytryptamine) and acetylcholine. The other chemicals found in *U. parviflora* Roxb. Are malic acid, tryptophan, aspartic acid, serine and tyrosine and others such as alkaloids, flavonoids, phenols, polysaccharides, glycosides and tannins.

Table 5: Phytochemical constituent with their chemical structure ^[13]

Chemical name	Chemical structure	Chemical name	Chemical structure
Acetylcholine		Serotonin	
Aspartic acid		Tryptophan	
Serine		Malic acid	
Histamine		Tyrosine	

7. Chemical constituents

Stinging nettle is a powerhouse of nutrients. It contains on average 22% protein, 4% fats, 37% non-nitrogen extracts, 9-21% fiber, and 19-29% ash. The leaves contain about 4.8 mg chlorophyll per gram of dry leaves, depending on whether the plant was grown in the sun or shade. Surprisingly, more chlorophyll and carotenoids are found in plants that have been Grown in the shade. The dried leaf of nettle contains 40% protein ^[15].

Nettle stems contain a best fiber that has been traditionally used for the same purposes as linen and is produced by a similar retting process. Unlike cotton, nettles grow easily without pesticides *Urtica parviflora* Roxb. contains several chemical constituents' viz. histamine, serotonin (5-hydroxytryptamine) and acetylcholine. The other chemicals found in *Urtica. parviflora* Roxb. are malic acid, aspartic acid, serine, tyrosine and tryptophan. It is also rich in vitamins (Vit. C and α -tocopherol) ^[2, 9, 16].

8. Pharmacological activities

Pharmacological activities-research has been reported on the pharmacologica activities of *Urtica parviflora* Roxb.

Hepatoprotective activity: Ethanolic extract of leaves of *Urtica parviflora* Roxb. Was screened against carbon tetrachloride (CCl₄) induced hepatotoxicity in rats. The orally administered extract of *Urtica parviflora* Roxb. Was able to reduce elevated levels of aspartate aminotransaminase (AST), alkaline phosphatase (ALP), total bilirubin, and serum protein. The histopathology of the liver of the rats also confirmed the beneficial effects ^[17].

Wound healing activity: Methanolic extract of the leaves of *Urtica parviflor* was investigated for wound healing property in the rats using the excision, incision and dead space wound models by administering the methanolic extracts of the plant at the dose of 300mg kg⁻¹ day⁻¹ and by applying alcoholic

extracts (5%w/w) formulated as an ointment prepared by Indian pharmacopoeia method. Healing was assessed by the rate of wound contraction, time until complete epithelialization, granulation tissue weight, breaking strength, estimation of hydroxyproline and histopathological parameters. The test drug showed significant wound healing activities compared to the control. It significantly healed wounds at a dose of 300mg/kg/day ^[2].

Anti-oxidant activity: Antioxidant activity of hydromethanolic extract of *Urtica parviflora* Roxb. Was investigated by different in-vitro methods namely nitric oxide scanenging, DPPH scavenging, and reducing power assay. The antioxidant activity of the hydromethanolic extract of *Urtica parviflora* Roxb. Was compared with ascorbic acid as standard. The hydromethanolic extract of *Urtica parviflora* Roxb. roxb leaves was able to protect the cells from injuries caused by reactive oxygen species ^[4].

Cardioprotective activity: Hydroethanolic extract of *Urtica parviflora* Roxb. Leaf material was investigated for the cardioprotective property against doxorubicin-induced cardiotoxicity in rats. The hydroethanolic extract of *Urtica parviflora* Roxb. Protect the myocardium by decreasing the elevated level of malondialdehyde (MDA), elevating the diminished levels of glutathione (GSH), superoxide dismutase (SOD), catalase (CAT), and high density lipoprotein (HDL), with a concomitant decrease in the elevated levels of low density lipoprotein (LDL), and Triglyceride (TG). Hydroethanolic extract of *Urtica parviflora* Roxb. also significantly reduced the increased activities of aspartate aminotransferase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP), creatine phosphokinase (CPK) and lactate dehydrogenase (LDH). It revealed that Hydroethanolic extract of *Urtica parviflora* Roxb. exhibited significant cardioprotective action against cardiotoxicity induced by doxorubicin in Wistar rats ^[18].

Nephroprotective activity: an extract of *Urtica parviflora* Roxb. Was able to exert nephroprotective effect in PCM-induced nephrotoxicity in rat model. This action was evident by decrease in blood urea nitrogen (BUN) protein and creatinine levels [16].

9. Ethnobotanical uses

- Young leaves of the plant are used to cure goiter and associated pain. Young twigs with stinging hairs are applied to cure goiter or pain. The vegetable is eaten to cure cold and cough [1, 19].
- The leaves are also used to cure the allergic disorders such as cold and cough [1].
- The fresh juice of the leaves is used to cure fracture, dislocation of bone; and boils [1, 2].
- The plant decoction has been reported as febrifuge [2].
- Plant decoction used in the treatment of fevers, root juice applied in case of throat pain, also taken for gonorrhoea, roots decoction given in dog bite [11].
- Branches with leaves applied externally on sprains and swelling for their counter-irritant properties [11].
- Young leafy shoots taken as vegetables to get relief from rheumatic pain [11].
- Veterinary medicine, poultice from the root applied to alleviate inflammation of the fractured or injured parts of domestic animals [11].
- The stem fiber is of high quality and used to make cloth, fishing nets, and ropes and for some industrial materials [20].
- It also used in Fever and illnesses to women following to child birth [21].
- The leaves are used in dysentery, joint pain and liver disorders [4].
- The leaf extract is used in hair wash to prevent baldness.

10. Conclusion

Urtica parviflora Roxb is an essential herb with multiple remedies. *Urtica parviflora* Roxb. is one of the medicinal plant that contain many dynamic compounds that can be used a part of the treatment of many human diseases. It is used traditionally to cure many diseases. The plant has many phytoconstituents which shows vital pharmacological activity. There are many alkaloids and secondary compounds reported from the plants. The review shows pharmacognostic profile and pharmacological activity of the plant. Extracts and phytoconstituents isolated from this plant have shown to produce differed pharmacological response, which includes diuretic, analgesic, anti-inflammatory, and cardioprotective effects. *Urtica parviflora* Roxb. Traditionally is used to cure the allergic disorders, dislocation of bone, fever, goiter and associated pain.

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