



A Review on Ayurvedic and Pharmacological Properties of *Patalgarudi (Cocculus hirsutus (L.) W.Theob.)*

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Abstract: Background: *Patalgarudi (Cocculus hirsutus (L.) W.Theob.)* (Menispermaceae) is an Ayurvedic medicinal plant which is not mentioned in Ayurvedic classical books but mentioned in latest Nighantus(Plant Encyclopedia) like Bhavprakash, Rajnighantus etc. According to Ayurveda this plant is having Guna- Sheet Ras-Katu, Veerya-Ushna, Vipaka-Katu, Vaatahar and Kaphahar. Many pharmacological studies have been conducted to investigate the properties of *Patalgarudi (Cocculus hirsutus (L.) W.Theob.)* in an attempt to authenticate its use as a multi-purpose medicinal agent. The main aim of this article is to collect and analyze the scientific information related to traditional uses, bioactive chemical constituents and pharmacological activities. **Methods:** Scientific information on *Patalgarudi C. hirsutus* was retrieved from the online bibliographic databases (e.g. MEDLINE/PubMed, SciFinder, Web of Science, Google Scholar and Scopus) and books from central library as well as library of Dravyaguna department of Sai Ayurved College, Hospital and Research Centre Sasure-Vairag-Solapur. **Results:** According to Ayurveda *Patalgarudi* it is effective against visha (poison), Rakta-shuddhikar(blood purifier), it is spermatogenic taken with sugar and black piper regularly. Different plant parts of *Patalgarudi C. hirsutus* were reported to be used for the treatment of fever, skin diseases, stomach disorders and urinary diseases. Alkaloids such as jasminitine, hirsutine, cohirsitine and their derivatives along with a few flavonoids, triterpene derivatives and volatile compounds were reported from whole plant or different plant parts. Extracts were evaluated for their antimicrobial, antidiabetic, immunomodulatory and hepatoprotective activities among others. **Conclusion:** The mechanisms of action for these properties are not fully understood. Preliminary studies have found various constituents of *Patalgarudi (Cocculus hirsutus (L.) W.Theob.)* exhibiting a variety of therapeutic effects. These results are very encouraging and indicate this herb should be studied more extensively to confirm these results and reveal other potential therapeutic effects.

Keywords: *Patalgarudi Cocculus hirsutus*; Menispermaceae;; Ayurvedic uses; alkaloids; pharmacological activity

1 INTRODUCTION: *Patalgarudi (Cocculus hirsutus (L.) W.Theob.)* is commonly known as Vasan vel in Marathi, Jal-jamani in Hindi and Broom-Creeper in English. It is slender climber with hairy leaves. This plant can be found in dry areas during and after the monsoon. This plant belongs to Menispermaceae family. The Menispermaceae family consists of about 70 genera and 500 species.¹ Among them, the genus *Cocculus* comprises about 10 species distributed in Asia, Africa, Australia and North America.¹ *Cocculus hirsutus (L.) W.Theob.* (syn. *Cebatha hirsuta (L.) Kuntze*, *Cebatha villosa C.Chr.*, *Cocculus aristolochiae DC.*, *Cocculus hastatus DC.*, *Cocculus hirsutus (L.) Diels*, *Cocculus holopeira-torrída Broun & R.L.Massey*, *Cocculus linnaeanus Kurz*, *Cocculus sepium Colebr.*, *Cocculus villosus DC.*, *Menispermum hirsutum L.*)² is a perennial climber distributed mostly in tropical and subtropical areas.³ In Asia, it is reported from India, Myanmar, Nepal and Pakistan and southern China⁴⁻⁶. This plant is used from time immemorial for the treatment of various diseases across India, Africa and China. In various parts of India, tribal and rural population still use this plant for the treatment of gynecological problems, weakness and bleeding disorders.

2 HISTORICAL REVIEW

According to Ayurveda its Rasapanchak of Patalgarudi is

Ras(taste)	-Tikt(bitter),
Gun(qualities)	-Laghu(light to digest),Picchil (Sticky)
Vipak(metabolism)	-Katu (undergoes pungent taste after digestion)
Veerya (potency)	-Sheet (cold)
Karm	-Vaat-Kaphaghna

Patalgarudi is indicated for raktshuddhi (blood purification), spermatogenesis, Dhahaghna (for coldness of the skin), Vishaghna (anti poison)

Various uses of Patalgarudi is mentioned in Raaj-Nighantu and Bhavprakaash –Nighantu

3 BOTANICAL DESCRIPTION

Broom-creeper is a climbing undershrub, often densely velvety. Leaves are 4-8 cm long, 2.5-6 cm broad or ovate-oblong, sometimes 3-5 lobed, base heart shaped, wedge-shaped or flat, tip blunt or with a small point. Leaves are densely velvety when young, later nearly hairless. Basal nerves are 3-5. Leaf stalk is 0.5-2.5 cm long. Male flowers have sepals hairy, the outer 3, oblong-lance shaped, 1.5-2 mm long, 0.5-0.8 broad, the inner 3 broadly ovate, 1.5-2.5 mm long, 1.7-2 mm broad. Petals are ovate-oblong, 0.5-1.5 mm long, 0.3-6 mm broad. Stamens are 0.7 – 1 mm long. Female flowers 1-3, on axillary stalks, rarely racemed. Perennial climber 2-3. Leaves 3-5 veined from the base, variable in shape, older leaves often distinctly 3-5 lobed, younger leaves oblong-ovate to somewhat obovate, covered in yellowish velvety hairs, apex with a small sharp mucro. Flowers in axillary clusters, unisexual, sepals densely hairy. Fruit somewhat ellipsoid, 4 mm in diameter, fleshy, purple-blue when ripe. Fruit is a dark purple berry, 4-8 mm long, 4-5 mm broad, endocarp annular or ribbed with a prominent dorsal crest, persistent. The juice of the ripe fruit yields a permanent bluish-purple ink and the roots as well as the leaves are used in native medicine. Flowering-December-March⁷

4 BOTANICAL CLASSIFICATION⁸

- Kingdom: *Plantae*
- Subkingdom: *Tracheobionata*
- Division: *Magnoliophyta*
- Subdivision: *Spermatophyta*
- Class: *Magnoliopsida*

- Subclass: *Magnolidae*
- Order: *Ranunculales*
- Family: *Menispermaceae*
- Genus: *Cocculus*
- Species: *Cocculus hirsutus*

5 VERNACULAR NAME⁹

Sanskrit-Patalgarudi,Dirghavalli, Vastadani

Hindi-Jal-jamani,Jamti ki bel

Marathi-Vaasanvel

Telagu-Dusara teega

Kannada-Soggadivalli

Gujarati-Vevati

Tamil-Kattukkodi

6 CHEMICAL CONSTITUENTS

The plant of *C.hirsutus* has been reported to contain essential oil, β - sitosterol, ginnol, glycosides, sterols and alkaloids¹⁰⁻¹¹. Preliminary phytochemical analysis of the leaves showed presence of alkaloids, phenolic compounds, flavonoids, glycosides, and carbohydrates. The phytochemical studies show the presence of bis-benzyl isoquinoline alkaloids; viz. shaheenine¹², cohirsinine¹³, hirsutine¹⁴, jamtinine¹⁵, jamitine- *N* –oxide¹⁶, cohirsine¹⁷, Cohirsitine¹⁹ and haiderine¹⁸ which are isolated from stem and roots . The alkaloids present in the leaves of *C.hirsutus* are Dtrilobine and DL-coclaurine, isotrilobine, (+)syringaresinol and protoquercitol²⁰. Roots are reported for the presence of D-trilobine and coclaurine, sterols and resins²¹.

7 AYURVEDIC USES:

According to Ayurveda Root of Patalgarudi is Ushna, Swedjanan, Saumya, Balvardhak, Mutrajanan, Grahi, Jwarahar, Vaathar. Extract made by Root of Patalgarudi when given with Piper, Ginger is useful in Joint pain, swellings as well as in Rheumatoid arthritis. It is useful in Syphilis. Poltis of leaves is useful in swellings, wounds when applied externally.²²

8 ETHNOBOTANY

In Konkan , the roots, rubbed with Bonduc nut, are administered as a cure for belly-ache in Children. The root is generally used as a gentle laxative.It has been extensively used as a alternative in rheumatic and venereal diseases. In Sind, the root and leaves are used in headache and neuralgic pain. The juice of leaves, mixed with water, has the property of coagulating into green jelly like substance, which is taken internally , sweetened with sugar, as cure for gonorrhoea. In Baluchisthan the mucilage is used to cure spermatorrhoea, taken in milk; it is used to for cough and to put on to sore eyelid and to soften breasts. 7

9 CHEMICAL CONSTITUENTS

Although widely used in traditional medicines and studied well for its pharmacological activities, the chemical constituents of *C. hirsutus* are not well explored. Earlier studies in 1960s and 1970s have reported the presence of alkaloids through preliminary phytochemical screenings and isolation and identification of a few alkaloids such as trilobine, isotrilobine, coclaurine and magnoflorine²³⁻²⁵ and other compounds i.e., β -sitosterol, ginnol and monomethyl ether of inositol.²⁶ Few studies performed during or after 1980s, have reported several

alkaloids from various plant parts. From whole plant and ethanol extract Jamtinine,^{27,28} Haiderine,²⁸ Hirsutine,^{28,29} Cohirsutine,²⁸ Cohirsutinine,^{28,30} Cohirsine,^{28,31} Cocculine-*N*-2-oxide t,³² Cohirsinine,^{28,33} are reported. From Stems and roots/ethanol extract Corsutine,³⁴ Jamtine *N*-oxide,^{28,35} Cocclaurine,^{28,24,25} Shaheenine,^{28,29} Magnoflorine s,^{28,24} Trilobine,^{28,24,25} Isotrilobine s,^{28,24} Three flavonoids rutin, liquiritin and quercetin were also reported from the leaves.³⁵ A triterpene derivative, hirsudiol is also reported from the ethanol extract of whole plant.³⁶ Similarly, beta sitosterol and 28-acetyl botulin were isolated from the aqueous extract of aerial parts.³⁷ Many studies have reported the preliminary phytochemical screening of the extracts and presence of carbohydrates, steroids, alkaloids, glycosides, flavonoids, tannins and saponins.³⁸

10 PHARMACOLOGICAL ACTIVITIES

The medicinal traits and pharmacological activities endorsed to various parts of *Coculus hirsutus* are detailed as follows:

a) Antidiabetic: Anti-diabetic effect was observed with *C. hirsutus* when given as an aerial part extract in normal as well as diabetic rats. The effect, however, was more pronounced in diabetic animals in which administration for 15 days after streptozotocin-induced diabetes, significantly reduced blood glucose levels. After streptozotocin induced diabetes, it was observed that both standard drug (glibenclamide) and methanolic extract of *C. hirsutus* were significantly superior to control in reducing blood sugar on long treatment (15 days). *C. hirsutus* could be of benefit in diabetes mellitus in controlling blood sugar.⁴⁰ The aqueous extract of leaves of *C. hirsutus* decreased the serum glucose level and improved glucose tolerance. Total alkaloids reduced the blood sugar level of diabetic rats significantly. Hence, the alkaloids in the roots of *C. hirsutus* have been reported to be responsible for the antihyperglycemic activity. The aqueous extract of leaves of *C. hirsutus* has antihyperglycemic activity as it lowers serum glucose level in diabetic mice and significantly increases glucose tolerance. The extract also prevents loss of body weight in diabetic mice.⁴¹ Total alkaloid fraction prepared from methanol extract of roots of *C. hirsutus* showed considerable hypoglycemic activity on alloxan-induced diabetic rats. The thin layer chromatography profile of total alkaloid fraction showed the presence of four alkaloids, whereas butanol fraction showed the presence of steroids and/or triterpenoids.⁴²

b) Diuretic and Nephroprotective Activity

Ganapaty et al. studied the diuretic activity of the aqueous extract of the aerial parts of *C. hirsutus* in normap mice and the extract at a dose of 100 and 200 mg/kg, p.o. showed significant increase in the urinary concentrations of Na⁺ and K⁺ suggesting potent diuretic activity.⁴³ Badole et al. carried out the acute and chronic diuretic activity of the ethanolic extract of leaves of *C. hirsutus* in normal rats and the extract significantly increased the urinary concentrations of Na⁺ and K⁺.⁴⁴ Gadapuram et al. reported the potent nephroprotective activity of the ethanolic extract of the leaves of *C. hirsutus* in 5/6 nephrectomized rat model.⁴⁵

c) Anti-Oxidant Activity

The aqueous extract of the leaves of *C. hirsutus* using 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical and reducing power assay, and the extract showed potent DPPH free radical scavenging assay with IC₅₀ values of 2.75 ± 0.3 µg gallic acid equivalents (GAE)/ml and reducing power activity with the value of 65.17 ± 4.8 U/mg GAE. The extract also showed the total phenolic content of 31.83 ± 3.1 mg GAE/g.⁴⁶ Rakkimuthu et al. studied the anti-oxidant activity of *C. hirsutus*. The results showed potent DPPH free radical scavenging activity, ABTS free radical scavenging activity, nitric oxide scavenging activity, reducing power, inhibition of lipid peroxidation and metal chelating activity assay as ascorbic acid.⁴⁷

d) Spermatogenic

Testosterone levels in the testes were significantly higher in methanolic extract (both 400 and 800 mg/kg) of *C. hirsutus* treated rats after 15th days of treatment compared to the control group. The chronic treatment of the extract for 15 days has increased in the weight of testis, its diameter and seminiferous tubules. There is also a progress in spermatogenesis and increase in *cauda epididymal* sperm count. The significant increase in the weight of reproductive organs is also indirectly supports the increase availability of androgens. Increased weight and high protein concentration of the testis indicates the enhancement of testicular growth as FSH is essential for protein synthesis in gonads⁴⁸.

e) Immunomodulatory Activity

The immunomodulatory activity of the combination (1:1, 2:1 and 1:2 ration) of leaves of *C. hirsutus* and flowers of *Sesbania grandiflora* (L.) Pers. (Fabaceae) in mice. The 1:1 combination mixture showed potent immunostimulatory activity.⁴⁹ Rastogi et al. evaluated the immunostimulatory activity of aqueous and ethanolic extract of aerial parts of *C. hirsutus* in normal as well as cyclophosphamide induced immunosuppressed rats. The extracts showed the dose dependent increase in the carbon clearance, humoral antibody (HA) titre, delayed type hypersensitivity (DTH) and white blood cell (WBC) count in a dose dependent manner and authors concluded that the extract was effective to stimulate the immune system and also to protect from the immunosuppressant.⁵⁰

f) Acute toxicity: The aqueous extract of *C. hirsutus* aerial parts orally evaluated for the acute toxicity in mice. The lethal dose 50 (LD50) was determined. The acute toxicity was found to be higher than 3000 mg/kg.⁵¹

12) CONCLUSION

C. hirsutus is having less reference as a medicine in Ayurvedic literature but having lot of references as a traditional medicine *C. hirsutus* is rich of chemical constituent, which have therapeutic and medicinal value like alkaloids, phenolic compounds, flavonoids, glycosides, and carbohydrates. *C. hirsutus* produces anti-inflammatory, antispermatogenic, antidiabetic, antitumour, antimicrobial, diuretic and laxative activity. *C. hirsutus* has great potential as anti-inflammatory drug and it can play a important role in developing new formulation for treating inflammation, diabetes and enhancing immunity. Still a lot of work to be done for exploring the evidences for use of this plant.

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