

Phytochemical Constituent And Its Pharmacological Application Of Various Types Of Chemical Compounds Present In *Cocculus Hirsutus* (L.) Diels

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Abstract

This review gives a complete overview of the *Cocculus hirsutus* (L.) vegetation of *Cocculus* species (Synonym-*Cocculus villosus*, Family: Menispermaceae). Numerous phytoconstituents such as alkaloids, phenolic compounds, glycosides, and steroids are present mainly in leaves. Even though the fact that it is frequently used in conventional treatments for conditions including fever, malaria, joint discomfort, and skin conditions as a diuretic, laxative, and antiperiodic. The manufacturing of formulations has only been the subject of a very small number of studies. In the future, a well-developed formulation based on topical preparation and in-vivo investigations will be required, coupled with bioassay-guided studies to extract and identify the active ingredients, to demonstrate the formulation with good pharmacological activity of *C. hirsutus* plants.

Keywords: *Cocculus hirsutus*, Phytoconstituent, pharmacological activity.

I. Introduction

The medicinal plant has been used as a source of medicine in practically all cultures since time immemorial. People with chronic diseases suffer in underdeveloped countries due to a lack of modern treatment. The current situation displays a global appraisal of valuable traditional information that is intermittently spread over the world [4]. India is recognized as the world's herbal treasure trove. When other traditional medicines and

of a well-organized healthcare system. The bulk of the population, particularly those living in remote locations, still has limited or no access to modern treatment.

treatments fail, appropriate and sensible usage of the plant is often beneficial in the treatment of illness. Herbs are extremely adaptable when it comes to treating a wide range of health issues.



Fig 1. Leaves, Fruit, and Stem of *C. hirsutus*

(Plant belongs to the Kingdom Plantae, Tracheobionata Subkingdom, Magnoliophyta Division, Spermatophyta Subdivision, Magnoliopsida class, Magnolidae subclass, Ranunculales order)

Medicinal plants are extremely beneficial in the treatment and cure of ailments.

C. hirsutus has been shown to have natural antioxidant, anti-inflammatory, analgesic, anti-diabetic, anti-cancer, and spermatogenic properties. Natural property is better than a synthetic one. Synthetic antioxidants have been restricted due to their health risks and toxicity. Phenolic acids and flavonoids possess antioxidant activity. Phenolic compounds act as an antioxidant agent, by scavenging the free radicals due to the presence of hydroxyl group in them. Preliminary phytochemical analysis showed the presence of flavonoids, triterpenoids, anthocyanins, proteins, reducing sugars, alkaloids, tannins, glycosides, and quinines. Jasminitine, hirsute, and Christine are the main active constituent (alkaloids) of *C. hirsutus*. Leaves, stems, and roots (**Fig 1**) of *C. hirsutus* are mostly used in Indian traditional medicine to treat several ailments such as hepatic blockage, jaundice, bronchitis, diabetes mellitus, anorexia, gonorrhoea, and leprosy. [3]. From the investigation, we get no formulation was prepared with extract of *Cocculus hirsutus*

(L.) Diels. Therefore, the main objective of this paper is to collect and analyze the main pharmacological effects of that plant, which can then be used in various formulations to produce topical products based on the pharmacological activity of *Cocculus hirsutus* (L.) that benefit human health or treat skin conditions.

1.1. Convention Uses

The herb has formerly been used to treat rheumatic pain, epilepsy, hypertension, stomach pain, headaches, and the healing of scalp wounds. Sesame oil and the plant's juice are applied to the head and body to relieve the heat. Both internally and externally, the roots and leaves of *C. hirsutus* are utilized medicinally due to their significant therapeutic potential. Diluted leaf juice with sugar produces a good tonic, the juice contains mucilage, which when combined with water creates a jelly that can be used externally to treat skin conditions.

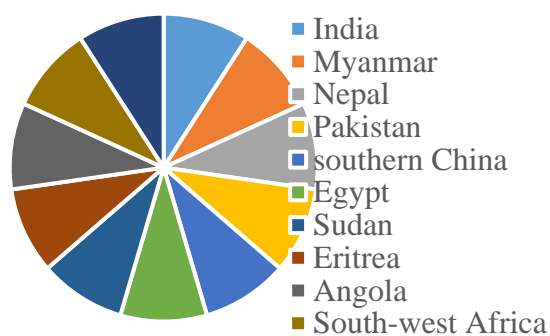


Fig 2. Geographical area of cultivation of *Cocculus hirsutus* (L.) plant

The application of different parts of the *Cocculus hirsutus* (L.) plants is discussed in **Table 1**.

Table 1: Application of different parts of the *Cocculus hirsutus* (L.) plants

Leaf	Root	Blossoms	Fruits
It is applied to the head to keep it cool	It is used as a laxative, demulcent, tonic, diuretic, and antiperiodic in the treatment of fever, malaria, joint pains, skin illnesses, constipation, and kidney difficulties.	It is used in cooking	It makes an intoxicating beverage

It is applied to relieve stomach discomfort	An oral mixture of <i>C.hirsutus</i> roots and <i>Caesalpinia crista</i> seed tangled in water to relieve gastrointestinal pain	-	-
It is applied to cure bleeding dysentery	To cure high body heat and sunstroke	-	-
It is applied to prurigo, impetigo, eczema, sores, cuts, wounds, other skin problems, urinary problems, fever, leucorrhoea, and acute gonorrhoea	-	-	-
It is applied to wound healing, nose bleeding, fertility medication, and in the menstrual cycle, regulation are all common uses	-	-	-

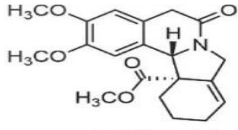
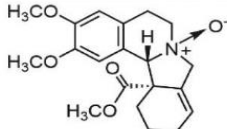
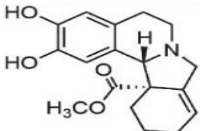
1.2. Phytochemical Constituents of *Cocculus hirsutus* plant

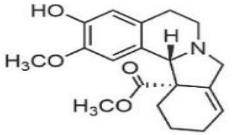

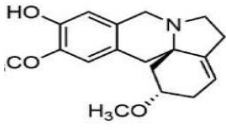
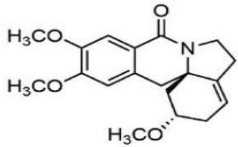
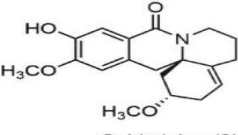
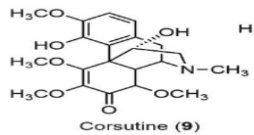
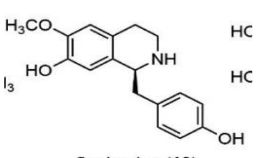
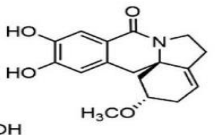
Although frequently utilized, *C. hirsutus* chemical components have not been well studied in traditional plant-based therapies. The overall chemical components contained in the entire plant part were discussed in this paper (**Table 2**). The plant contains ginnol, sitosterol, glycosides, sterols, and alkaloids, among them the vital component is alkaloids. All chemical components included in alkaloids are discussed in **Table 3**.


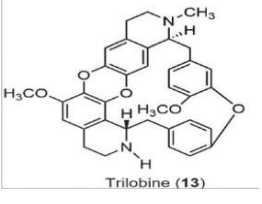
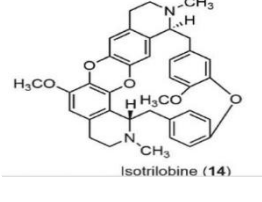
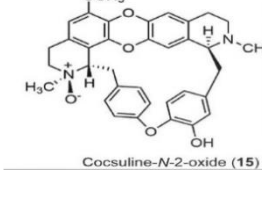
Table 2. Different types of phytochemical constituents present in plant parts

Root	Leaves	Stem	Aerial part
-	Alkaloids Flavonoids Others Compounds	-	-
Trilobine	Trilobine Rutin	Benzyl isoquinoline alkaloids	β -sitosterol
Coclaurine	Coclaurine Liquirtin	Monomethyl ether	28-acetyl botulin
Sterols	Isotrilobine Quercetin	-	-
Resins	Magnoflorine	-	-

Table 3: Name of the alkaloids from *Cocculus hirsutus* (L.)

Sl.No	Compound Name	Chemical Structure	Plant Part	Reference
1.	Jamtinine	 <p>Jamtinine (1)</p>	Whole plant	[21,20]
2.	Jamtine N-oxide	 <p>Jamtine N-oxide (2)</p>	Stems and roots	[21,25]
3.	Haiderine	 <p>Haiderine (3)</p>	Whole plant	[21]

4.	Hirsutine	 <p>Hirsutine (4)</p>	Whole plant	[21,24]
5.	Cohirsitin	 <p>Cohirsitin (5)</p>	Whole plant	[21]
6.	Cohirsitinine	 <p>Cohirsitinine (6)</p>	Whole plant	[21,24]
7.	Cohirsine	 <p>Cohirsine (7)</p>	Whole plant	[21,27]
8.	Cohirsinine	 <p>Cohirsinine (8)</p>	Whole plant	[21,28]
9.	Consulting	 <p>Consulting (9)</p>	Roots and stems	[29]
10.	Coclaurine	 <p>Coclaurine (10)</p>	Roots and stems	[21,22,23]
11.	Shaheenine	 <p>Shaheenine (11)</p>	Roots and stems	[21,25]

12.	Magnoflorine	 Magnoflorine (12)	Roots and stems	[21,30]
13.	Trilobine	 Trilobine (13)	Roots and stems	[21,22,23]
14.	Isotrilobine	 Isotrilobine (14)	Roots and stems	[21,22]
15.	Coastline-N-2-oxide	 Coastline-N-2-oxide (15)	Whole plant	[26]

2. Pharmacological Activities

Extracts and isolated chemicals from various plant parts of *C. hirsutus* have been discovered to have a variety of pharmacological actions.

2.1. Anti-Microbial Activity

The anti-mycobacterial activity of the aqueous extract of *C. hirsutus* against *Mycobacterium tuberculosis* H37Rv was investigated by Jethva et al., who found that the extract had a significant anti-mycobacterial activity with an inhibition percentage of 80.26 percent [2,33]. *C. hirsutus* has been shown to have antimicrobial activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Pseudomonas aureus*, and *Salmonella typhi* using agar diffusion methods with ethanolic and petroleum ether extract crude alkaloid fractions were screened at various concentrations and zones of inhibition were recorded, implying that ethanolic extract. Gupta et al. investigated the anti-mycobacterial activity of an ethanol extract of *C. hirsutus* leaf against *M. tuberculosis* H37Rv and other MDR strains. With MIC values of 500, 250, 250, 500,

and 500 g/mL, the extract demonstrated significant anti-mycobacterial action against *M. tuberculosis* H37Rv and MDR strains JAL 19187, JAL 1904, JAL-19126, JAL 19188 and JAL 19111 [34]. Devi et al. tested the antifungal activity of *C. hirsutus* aqueous extract against *Rhizopus arrhizus*, *solani* fungal strains, and *Fusarium Sclerotium rolfsii* and found that the extract was effective against *Fusarium solani* and *Sclerotium rolfsii* [2].

2.2. Anti-inflammatory and Analgesic

C. hirsutus has the potential to have analgesic and anti-inflammatory properties. Using the carrageenan-induced technique, *C. hirsutus* ethanolic extract showed anti-inflammatory efficacy in albino rats at a level of 100 mg/kg body weight. It exhibited a lot of activity [35].

2.3. Anti-Malarial Activity

Brahmam and Sunita tested the antimalarial efficacy of various extracts of *C. hirsutus* roots against two *Plasmodium falciparum* strains, 3D7 (chloroquine-sensitive strain) and K1 (non-chloroquine-sensitive strain) (chloroquine

resistance strain). Both chloroform and methanol extracts had significant antibacterial activity [2]. Elango et al. also found that ethyl acetate and acetone extracts of *C. hirsutus* leaves have larvicidal action against *Culex tritaeniorhynchus* and *Anopheles subpictus* [36].

2.4. Anti-Hyperglycemic Activity

When provided as an aerial component extract, *C. hirsutus* had an anti-diabetic effect in both normal and diabetic rats. However, in diabetic rats, the impact was more dramatic, with dosing for 15 days following streptozotocin-induced diabetes considerably lowering blood glucose levels. Following streptozotocin-induced diabetes, it was discovered that both the conventional medication (glibenclamide) and the methanolic extract of *C. hirsutus* were significantly superior to the control in terms of lowering blood sugar levels over time (15 days). *C. hirsutus* may help people with diabetes mellitus control their blood sugar levels [1]. The aqueous extract of *C. hirsutus* leaves increased glucose tolerance and lowered serum glucose levels. Diabetic rats' blood sugar levels were considerably decreased by total alkaloids. As a result, the antihyperglycemic effect of *C. hirsutus* has been attributed to alkaloids found in the roots [37]. In alloxan-induced diabetic mice, Badole et al. evaluated the anti-hyperglycemic effect of aqueous extract of *C. hirsutus* leaves. On the 28th day after delivery, serum glucose levels were significantly lower after oral administration of the extract at doses of 250, 500, and 1000 mg/kg. Oral treatment of the extract (1000 mg/kg) enhanced glucose tolerance in normal mice in an oral glucose tolerance test (OGTT) [2].

2.5. Antihepatotoxic Activity

Thakare et al. studied the liver toxicity activity of *C. hirsutus* methanolic extract in albino Wistar rats with ethanol-induced liver toxicity and discovered that oral administration of the extract at dose levels of 100, 200, and 400 mg/kg reduced significantly total bilirubin, LDH, AST, ALP, ALT, direct and cholesterol [38].

2.6. Diuretic and Laxative

The aqueous extract of *C. hirsutus* aerial parts (100 and 200 mg/kg, p.o.) was used in diuretic, laxative, and toxicological tests. In rats, it had a

substantial diuretic and laxative effect. The maximum dose of the ethanolic extract (400mg/kg, p.o.) considerably increased urine output. The control group's cation (Na^+ and K^+ ions) and anion (Cl^- ions) excretion increased considerably. The concentrations of Na^+ , K^+ , and Cl^- ions in serum were not affected by an ethanolic extract of *C. hirsutus* leaves (100, 200, and 400 mg/kg p.o.) or furosemide. The combination of an ethanolic extract of *C. hirsutus* leaves and furosemide enhanced creatinine excretion in urine but not in the serum.

2.7. Spermatogenic Activity

After 15 days of therapy, testosterone levels in the testes of *C. hirsutus* treated rats (both 400 and 800 mg/kg) were considerably greater than in the control group. The weight of the testis, its diameter, and seminiferous tubules all rose after a 15-day treatment with the extract. Spermatogenesis is also improving, with an increase in cauda epididymal sperm count. The increased availability of androgens is indirectly supported by the large increase in the weight of reproductive organs. Increased testicular weight and protein content imply improved testicular growth, as FSH is required for protein synthesis in the gonads [1].

2.8. Cardiotoxic Activity

On diabetic rats and a perfused frog in isolation hearts, methanol extract of *C. hirsutus* roots was tested for cardiotoxic action. On normal and hyperdynamic frog hearts, the methanol extract showed substantial cardiotoxic action. The methanol extract was fractionated using activity-guided fractionation. The butanol component of a methanol extract of *C. hirsutus* roots was shown to have cardiotoxic effects similar to ouabain [40].

2.9. Toxicological Studies

After giving the aqueous extract of the aerial portions of *C. hirsutus* to mice orally in a variety of doses ranging from 100 to 3000 mg/kg, Ganapaty et al. assessed the extract's showing acute toxicity. At all doses, the extract had a sedative effect and increased urine and feces, but no deaths were seen until 14 days following delivery [41]. The aqueous extract of *C. hirsutus* aerial parts was orally evaluated for acute toxicity in mice. The lethal dose of 50 (LD50) was determined. The acute toxicity was found to be higher than 3000 mg/kg [1].

3. Conclusion

Even though this plant species *Cocculus hirsutus* is a very important plant for its enormous number of medicinal properties such as anti-inflammatory, spermatogenic, diabetic, cardiogenic, antibacterial, diuretic, and laxative properties. *C. hirsutus* is a fast-growing, historically significant medicinal plant. To design a novel drug delivery system with *C. hirsutus* extract in the future and carefully planned in-vivo research. In the last few decades, several plants are being validated as food and medicines. But *C. hirsutus* plant has been selected for our project just as it's a neglected species which are rarely documented. The present study discussed the overall utilization of *C. hirsutus* plants such as pharmacological study, the medicinal value of phytochemical constituent, and the geographical area also.

Declaration: The authors declare that they have to know competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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