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Review Article

Medical Use of *Cocculus Hirsutus* in the Management of Various Diseases

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ABSTRACT

Cocculus hirsutus (L.) Diels, also called Broom Creeper, is a long-living climbing plant in the Menispermaceae family. It grows in many places like India, Africa, Arabia, Sri Lanka, and Southeast Asia. For a long time, people have used this plant in Ayurveda, Siddha, and Unani medicine to treat things like fever, skin issues, urinary problems, inflammation, diabetes, and problems related to reproduction. Studies on the plant show that it has lots of helpful chemicals like isoquinoline alkaloids (such as cohirsine, hirsutine, and magnoflorine), flavonoids (like quercetin, rutin, and liquiritin), triterpenoids (like hirsutol), and phytosterols (such as beta-sitosterol). These chemicals help with protecting the body from damage, fighting infections, helping the liver, lowering blood sugar, improving the immune system, and even fighting cancer. This review brings together what people have known for a long time about the plant, along with what has been found through modern research. It covers things like how it's been used in traditional medicine, what chemicals it has, how it works in the body, any possible harmful effects, and how it's being protected. The review also connects what people have used it for in the past with what the science says now. This helps show how the plant could be useful in modern medicine and what more needs to be studied to make safe and effective herbal medicines.

INTRODUCTION

Medicinal plants are a big part of traditional ways of looking after health. *Cocculus hirsutus* has drawn attention from scientists because of how widely it's been used in traditional medicine and how promising it is for health treatments. Known

by different names like Jaljamani, Vasanvel, Kattu Kodi, or Velipparuthi, this plant is used to treat conditions connected with imbalance in Vata and Kapha doshas in Ayurveda. The roots, leaves, and stems are the main parts used, usually in the form of powders, liquid mixtures, or ointments.

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Modern studies have found that the use of this plant is linked to a variety of active chemicals, especially isoquinoline alkaloids and flavonoids. These chemicals may explain why it's been used to treat diabetes, protect the liver, and reduce inflammation. Although it has been used for a long time, there wasn't much detailed information about

its plant characteristics, chemicals, or effects on the body until recently. This review gathers information from old texts and new research to give a complete picture of *Cocculus hirsutus* for students and researchers in the field of herbal medicines and plant-based remedies.



Fig. Minor Cocculus hirsutus



Fig. Adult cocculus hirsutus

1. Botanical And Taxonomic Overview

2.1 Morphology and Habit

Cocculus hirsutus is a long-living, plant that grows by climbing, reaching up to 1.5 to 3 meters in height. Its thin, woody stem has fine yellowish hairs. The leaves are simple, arranged one per stem, and shaped like a heart or a broad oval, usually 4 to 8 centimeters long and 2.5 to 7 centimeters wide. They often have 3 to 5 veins coming out from the base, and both sides of the leaves are covered in dense hairs, which is why the plant's name includes "hirsutus", meaning "hairy".

The flowers are small, greenish-white, and separate into male and female parts. They grow in clusters at the leaf axils. Male flowers have 6 to 9 stamens, while female flowers have 6 staminodes and a top ovary. The fruits are round or oval and about 3 to 8 millimeters in size. When they're ripe, they turn purple-black and have one curved, kidney-shaped seed inside

2.2 Taxonomic Classification

1.	Rank	Taxon
2.	Kingdom	Plantae
3.	Subkingdom	Tracheobionta – Vascular plants
4.	Division	Magnoliophyta – Flowering plants
5.	Class	Magnoliopsida – Dicotyledons
6.	Order	Ranunculales
7.	Family	Menispermaceae
8.	Genus	<i>Cocculus</i> DC
9.	Species	<i>Cocculus hirsutus</i> (L.) Diels

2.3 Distribution and Habitat

This plant grows in the wild across India, Pakistan, Nepal, Myanmar, parts of tropical Africa, and the Middle East. It prefers warm climates, between 20 to 35 degrees Celsius, and grows well in sandy loam or red soils with a pH of 6 to 7.5. It can handle some shade and drought once it is established. It is often found in places like hedges, wastelands, field edges, and scrub forests, up to an elevation of 750 meters.

2.4 Etymology and Common Names

The name *Cocculus* comes from the Latin word for "small berry," which refers to the fruit type of this plant. The name *hirsutus* means "hairy," which describes the hairy texture of the stems and leaves. Common names include: Broom Creeper in English, Jaljamani in Hindi, Marathi, and Gujarati, Vasanvel in Marathi, Paimpatta in Tamil, Paimpatta Balli in Kannada, Anantamul in Bengali, and Jaljamni in Urdu.

3.1 Overview

Studies have found that *Cocculus hirsutus* contains various types of compounds like isoquinoline alkaloids, flavonoids, glycosides, steroids, and triterpenes. These compounds are found in different parts of the plant. The roots are rich in alkaloids, while the leaves have a lot of flavonoids and saponins.

3.2 Major Classes of Compounds

2. Phytochemistry Of *Cocculus Hirsutus*

Sr. no.	Class	Representative Compounds	Reported Biological Role	References
1.	Isoquinoline alkaloids	Cohirsine, Cohirsinine, Hirsutine, Magnoflorine, Colclaurine	Antihypertensive, hypoglycaemic, anti-inflammatory	[15 – 17]
2.	Flavonoids	Quercetin, Rutin, Liquiritin	Antioxidant, hepatoprotective	[18]
3.	Sterols	β -Sitosterol	Anti-inflammatory, cholesterol-lowering	[19]
4.	Triterpenes	Hirsutol, Lupeol	Cytoprotective, anti-ulcer	[20]
5.	Phenolic acids	Gallic acid, Ferulic acid	Free-radical scavenging	[21]

3.3 Phytochemical Analytical Findings

Tests on methanolic, ethanolic, and aqueous extracts show the presence of carbohydrates, tannins, saponins, and glycosides. Advanced techniques like HPTLC and GC-MS have identified over 40 kinds of volatile and non-volatile compounds. Magnoflorine and hirsutine are used as markers for quality control.

3.4 Quantitative Studies

The total phenolic content (TPC) is between 48 and 65 mg GAE/g extract, and the total flavonoid content (TFC) is between 22 and 30 mg QE/g, depending on the solvent used. These levels are linked to strong DPPH and ABTS radical-scavenging activity.

3.5 Synergistic Phytochemistry

When certain compounds like alkaloids and flavonoids are present together, they can have a combined effect that leads to a wide range of medicinal benefits. For instance, magnoflorine's



antioxidant properties can help enhance the antidiabetic effects of cohirsine in lab models.

3. Traditional And Ethnomedicinal Uses

4.1 Historical Context

Cocculus hirsutus has been used for a long time in traditional Indian medicine. Ayurvedic texts refer

to it as "Jaljamani," which is said to help balance the body's energies (Pitta, Vata, and Kapha). In Siddha medicine, it's known as "Kattu Kodi" and is used to treat urinary infections, skin inflammation, and sexual diseases. In Unani practice, it is used to help clean the blood and as a mild laxative.

4.2 Common Folk Applications

Sr. no.	Preparation	Part Used	Traditional Indication	Mode of Use
1.	Leaf paste	Leaves	Cooling agent, headache, fever	Applied to the scalp and forehead
2.	Decoction	Roots / stems	Fever, urinary pain, diabetes	Taken orally, 20-30 mL twice daily
3.	Infusion	Whole plant	Skin rashes, itching, eczema	Used as an external wash
4.	Powder	Dried leaves	Constipation, mild diuretic	2 g mixed with warm water
5.	Oil mixture	Leaf extract + sesame oil	Antipyretic, anti-inflammatory	Used for topical massage

4.3 Regional Practices

In northern India, people use the root decoction to treat fever and dysentery. In Maharashtra, the leaf juice is used for healing wounds and cleansing the skin. In southern parts, Tamil healers use a paste called Paimpattankodi for treating gonorrhoea and urinary problems. In Africa, this plant is used for managing malaria, stomach issues, and intestinal worms.

4.4 Pharmacognostic Relevance

These traditional uses across different cultures show that *Cocculus hirsutus* is widely recognized as a versatile medicine. The consistent use of it for things like reducing fever, inflammation, and increasing urine flow supports its use in modern research and treatment.

4. Pharmacological Activities

5.1 Antimicrobial Activity

Extracts made from methanol and ethanol show strong inhibitory effects against bacteria like *Staphylococcus aureus*, *Escherichia coli*, *Salmonella Typhi*, and *Pseudomonas aeruginosa*. The minimum inhibitory concentrations (MICs) range from 250 to 500 micrograms per milliliter. The alkaloid part of the plant also works against certain fungi like *Candida albicans* and *Aspergillus niger*.

5.2 Antimalarial Activity

Extracts from the roots and leaves have been shown to strongly reduce the growth of *Plasmodium falciparum*, both in strains that are sensitive and resistant to chloroquine. Chloroform and ethanol extracts reduce parasite growth by more than 80% at a concentration of 100 micrograms per milliliter. This effect is believed to



be caused by compounds similar to magnoflorine and hirsutine.

5.3 Antioxidant Activity

Aqueous and methanolic extracts of this plant show strong ability to neutralize free radicals, with an IC₅₀ of 32 micrograms per milliliter for DPPH. The antioxidant power is related to the total phenolic content. Quercetin and rutin are the key compounds responsible for these antioxidant effects.

5.4 Anti-inflammatory Activity

In tests using a model where paw swelling is caused by carrageenan, an ethanolic extract (400 mg per kg of body weight) reduces the swelling by 65%, which is similar to the effect of indomethacin [33]. This happens because the extract lowers the activity of COX-2 and TNF- α proteins.

5.5 Antidiabetic Activity

Mice with diabetes caused by alloxan showed a big drop in blood sugar levels after being treated with an aqueous leaf extract (250 to 1000 mg per kg) for 28 days [34]. The extract also improves how the body handles oral glucose. Flavonoids and alkaloids in the extract may help the pancreas make more insulin and stop certain enzymes that break down glucose.

5.6 Hepatoprotective Activity

A methanolic extract (200 mg per kg) helps protect the liver from damage caused by tying the bile duct, by reducing levels of AST, ALT, ALP, and bilirubin in rats [35]. When the liver tissue is examined under a microscope, it shows less damage and fewer deposits of collagen.

5.7 Immunomodulatory Activity

Extracts from the plant's above-ground parts boost the production of antibodies and increase the number of white blood cells in mice that were made weak by cyclophosphamide [36]. This response shows the extract helps both the body's humoral and cell-based immune systems work better.

5.8 Anticancer Activity

A methanol extract shows strong ability to kill cancer cells, specifically in MCF-7 (breast) and HeLa (cervical) cells, with an IC₅₀ of around 60 μ g/mL [37]. Alkaloids like hirsutine might trigger cancer cell death by affecting the mitochondria in the cells.

5.9 Diuretic and Nephroprotective Activity

An ethanolic extract (100 to 400 mg per kg) greatly increases urine volume and the amount of sodium and potassium excreted in rats [38]. When used together with furosemide, it gives a better diuretic effect without causing an imbalance in the levels of important minerals in the blood.

5.10 Other Reported Activities

Pain relief: A root extract reduces pain in mice caused by acetic acid [39]. Anti-worm: A crude extract stops *Pheretima posthuma* worms from moving in 10 minutes. Fever reduction: A leaf paste lowers body temperature in mice with fever caused by yeast [40].

5. Toxicology And Safety Profile

6.1 Acute Toxicity

When given a single dose up to 3 g per kg in mice, the extract did not cause any deaths or unusual behavior [41]. At higher doses, some mice were slightly sleepy or had a mild laxative effect.



6.2 Sub-Acute and Chronic Toxicity

Studying rats for four weeks with doses of 200 to 600 mg per kg per day showed no major changes in blood or other body test results. Examining the liver and kidney under a microscope showed normal structure [42].

6.3 Possible Adverse Effects

Using the extract for too long or in high amounts may lead to dehydration and an imbalance of minerals because it has a diuretic effect. Very high

doses might cause slight drowsiness in the central nervous system [43].

6.4 Contra-indications and Drug Interactions

Because the extract has a mild sedative and diuretic effect, it should be used carefully with other drugs that make people sleepy, lower blood pressure, or help pass urine. Pregnant and nursing women should not use it without supervision until more data from human studies is available [44].

6.5 Toxicological Summary Table

Sr. no.	Parameter	Observation	Reference Range	Conclusion
1.	LD50 (mg/kg, oral)	More than 3000	–	Practically non-toxic [41]
2.	ALT/AST levels	Normal	20 – 50 IU/L	No liver damage [42]
3.	Histopathology	Normal tissue structure	–	Safe at usual doses
4.	Behavioral signs	Mild sleepiness at more than 2 g/kg	–	Reversible [43]

6. Cultivation And Conservation

7.1 Propagation and Cultivation Requirements

Cocculus hirsutus grows in tropical and subtropical areas and can be grown from cuttings or seeds. It prefers well-drained sandy loam soil with a pH between 6 and 7.5, and it grows best with full or partial sunlight. The plant needs moderate watering, and too much water can cause root rot [45]. Growing from semi-hardwood cuttings (15 to 20 cm) treated with 1000 ppm indole-3-butyric acid leads to 80 to 90% success in rooting. The plant starts flowering after 4 to 5 months, and fruit develops within 3 months after that.

7.2 Harvesting and Post-Harvest Handling

Leaves and stems are collected during the flowering season (August to October), while roots are gathered after the plant has grown for one year. The materials are dried in the shade at 40°C and stored in sealed containers to keep the volatile compounds from disappearing [46].

7.3 Conservation and Sustainability

Overharvesting and damage to natural habitats are putting wild populations at risk in some Indian states. To keep the genetic variety of these plants safe, methods like growing plants in controlled environments, storing seeds, and involving local communities in conservation efforts are suggested [47].

7. Pharmaceutical And Biotechnological Applications



8.1 Standardisation and Quality Control

Using a technique called HPTLC with magnoflorine as a marker helps create a consistent and reliable pattern for identifying the plant [48]. Standardisation ensures that herbal products have the same strength and safety every time they are made.

8.2 Formulation Development

Extracts from *C. hirsutus* have been used in mixtures of different herbs for treating diabetes and protecting the liver. The ethanol extract from its leaves can be made into ointments or gels for treating wounds and reducing inflammation [49].

8.3 Biotechnological Approaches

Scientists have grown callus and cell cultures in the lab to make secondary metabolites. Using chemicals like methyl jasmonate can increase the production of alkaloids by two times [50]. These methods can help produce the plant's compounds without harming wild populations.

8.4 Pharmacokinetic and Drug-Delivery Prospects

Although not much is known about how the body processes these compounds, some computer models suggest that magnoflorine and cohirsine are well absorbed in the intestines and can pass through the blood-brain barrier [51]. Using tiny carriers or patches on the skin might help the body absorb more of these compounds.

8. Future Prospects And Research Gaps

Even though there is a lot of information about the traditional use and early medical effects of *C. hirsutus*, it still needs more study at a molecular and clinical level. Important areas that need attention are:

1. Finding new active compounds – Using advanced techniques like metabolomics might uncover new types of isoquinoline alkaloids and flavonoid derivatives.
2. Understanding how it works – Learning the exact biochemical pathways, such as how it affects insulin signaling or changes antioxidant enzymes, is needed.
3. Testing for safety – Long-term studies on how it affects reproduction are required to find safe doses for humans.
4. Conducting human trials – Controlled studies with people could confirm its effectiveness for diabetes, liver issues, and inflammation.
5. Producing it sustainably – Using lab-grown tissues and large containers could help create a steady

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9. CONCLUSION

Cocculus hirsutus (L.) Diels is a valuable medicinal plant with a long history of use and strong potential in medicine. Its chemical makeup, which includes isoquinoline alkaloids, flavonoids, triterpenes, and sterols, explains its antioxidant, antimicrobial, antidiabetic, liver-protecting, and anti-inflammatory effects seen in lab studies. The traditional use of this plant across India and Africa supports its use in medicine. Modern scientific methods also confirm its safety and consistency. To use this plant wisely, more research is needed to standardise it, test its safety, and conduct human



trials. With proper care for its natural habitat and the use of lab-grown methods, *C. hirsutus* could become a reliable source for new plant-based medicines to treat metabolic and inflammatory diseases.

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