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A Review on Ethanopharmacological aspect of Clitoria ternatea

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ABSTRACT:
Clitoria ternatea, also known as "Shankhpushpi" in Ayurveda, is a versatile medicinal plant that is widely used in traditional medicine systems throughout Southeast Asia. This review delves into the ethnopharmacological aspects of Clitoria ternatea, focusing on its various medicinal properties and therapeutic potential. A thorough literature search was conducted to gather information on its phytochemistry, pharmacology, and traditional applications. The plant contains a variety of bioactive compounds, including flavonoids, alkaloids, and triterpenoids, which contribute to its antioxidant, neuroprotective, anxiolytic, antidepressant, and memory-enhancing properties. Furthermore, Clitoria ternatea has long been used to treat a variety of ailments, including anxiety, insomnia, cognitive disorders, and inflammatory conditions. This review provides a critical analysis of the scientific evidence supporting the traditional uses of Clitoria ternatea and emphasizes its potential for development.

KEYWORDS: Clitoria ternatea, ethnopharmacology, phytochemistry, traditional medicine, medicinal plants, therapeutic potential.

I. INTRODUCTION

Clitoria ternatea, also referred to as butterfly pea or blue pea, is treasured in traditional Asian and tropical medicine systems. Cultivated for centuries, this botanical wonder is prized for its vivid blue blooms and has been deeply incorporated into traditional medicine. Clitoria ternatea presents itself as a veritable gold mine of conventional knowledge in the field of ethnopharmacology, providing an abundance of empirical data about its therapeutic uses and medicinal qualities.

Old medical systems have long acknowledged Clitoria ternatea's wide range of therapeutic uses, including traditional Chinese medicine and Ayurveda in India. It has historically been used to treat a variety of illnesses, such as fevers, inflammation, anxiety, and cognitive decline. Customary methods, such as preparing its roots through decoctions or infusions.

1.1. Plant Profile of Clitoria ternatea

Table 1: Vernacular names

English Name	Butterfly Pea
Hindi Name	Aparajita
Sanskrit Name	Vishnukranta, Girikarnika
Gujrati Name	Garnee
Malayalam Name	Shankhapushpam
Tamil Name	Kakkanam
Telugu Name	Dintena
Bengali Name	Aprajita

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Table 2: Taxonomy of plant

Kingdom	Plantae
Subkingdom	Viridaeplanta
Infrakingdom	Streptophyta
Division	Tracheophyta
Subdivision	Spermatophytina
Infrodivision	Angiospermae
Class	Magnoliopsida
Superorder	Rosanae
Order	Fabales
Family	Fabaceae
Genus	Clitoria L.
Species	Ternatea

1.2. Description of plant

Short, soft hairs cover the stem of this thin, climbing legume. It has deep roots and ornamental flowers. The leaves are pinnate and are stalked, arranged alternately. The 5-7 elliptic or ovate leaflets have a length of 2.5–5 cm. .

Each leaflet is 1.5–3.5 cm wide and 2.5–5 cm long. It has a slight papery or membrane-like consistency. This plant's solitary flowers come in a variety of colors, including white, pink, light or dark blue, funnel-shaped (4 cm by 3 cm), single or paired, standard obovate, blue with a yellow base, or entirely white.

Fig. 1 Clitoria ternatea whole plant with flower.

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II. PHYTOCHEMICAL CONSTITUENTS

The main flavonol glycosides found in flowers 3-O-beta-glucoside, 3-O-(6"-O-alpharhamnosyl-6"-O-malonyl), and 3-O-(2"-Oalpharhamnosyl-6"-O-malonyl)3-O-(2",6"-di-Oalpharhamnosyl) and betaglucosideThe petals were used to isolate the beta-glucoside of kaemferol (I), quercetin (II), and myricetin (III). 3-O-b-glucoside, 3-O-(2"-O-a-rahmnosyl), and minor delphinidin glycosidesThe delphinidin -bglucoside is 3-O-(2"-O-a-rahmnosyl-6"-Omalonyl)-b-glucoside.

From the flowers, eight anthocyanins were also extracted, including preternatins A3 and C4 and ternatins C1, C2, C3, C4, C5, and D3. Six of the flowers'ternatins were identified as highly acylated dephinidin derivatives in part. It was discovered that deacylternatin is delphinidin3, 3', 5'-tri-O-b-D glucopyranoside. There are no anthocyanins in white petals.The raw mature seeds contain minimal calcium (1.9 mg/100 g) and low quantities of condensed tannins (0-2.48 mg catechin/g) and protein precipitable polyphenols (0.16-0.77 mg tannic acid/g). Resin and tannin can be found in root bark. Tataxerone and taraxerol (VIII). Alkaloids, flavonoids, saponins, tannins, carbohydrates, proteins, and resins are all found in roots. (Trase GE et al 1983)

III. PHARMACOLOGICAL PROFILING

Anti-oxidant activity

Ascorbic acid was used as a positive control in the DPPH scavenging assay, and CT flower extracts showed a concentration-response connection in DPPH scavenging activity. Compared to ascorbic acid (5.34±0.09) µg/ml (y=0.0686x+45.017, R 2=0.98), CT demonstrated a higher IC50 (84.15±1.50) µg/ml. The ascorbic equivalent of CT flower extracts in the FRAP experiment, calibrated with standard ascorbic acid (y=0.007x+0.3769, R 2=0.9802), was 0.33±0.01 mmol/mg. These results demonstrate the antioxidant qualities of the CT flower extracts utilized in the study's preventive trials. (**Iamsaard S et al 2014).**

Anti-inflammatory and Anti-arthritic effect

Rats with arthritis that had swollen paws were considerably less swollen after using EECT. By lowering paw edema and arthritis symptoms, it also demonstrated anti-arthritic effects. By day 7, this impact became noticeable, and it persisted until day 14. These anti-inflammatory and anti-arthritic properties were further validated by biochemical and oxidative measures. **(Swathi KP et al 2020)**

Anti-convulsant activity

EECT increased the percentage of protection against MES-induced convulsions while reducing the length of hind limb tonic extension (HLTE) and overall recovery time at both tested dosages (200 mg/kg and 400 mg/kg). These findings suggest that EECT has an anticonvulsant effect on seizures brought on by maximal electroshock in a dose-dependent manner (MES). Furthermore, extended latency of clonic convulsions, shortened convulsion length, and decreased seizure scores showed that the extract had a dose-dependent anticonvulsant effect on PTZ-induced seizures in albino mice**. (Lahon et al 2016)**

Memory boost activity

C. ternatea Linn extracts are used in the Indian Ayurvedic "Medhyarasayana" to cure neurological problems, lengthen life, and improve memory. Prior studies using oral C. ternatea aqueous root extract in Wistar rats demonstrated a notable enhancement in memory and learning. An additional investigation into the effects of this extract at a dosage of 200 mg/ml on neural stem cells revealed greater differentiation and proliferation, indicating that it has neurogenic potential comparable to neurotrophic factors such as BDNF and Survivin, which may lead to improved memory and learning. **(Jiji KN et al 2020)**

Anti-diabetic activity

The potential use of Clitoria ternatea L. flower extract (CTE) to treat streptozotocin-induced diabetes in mice is being investigated in medical research. It assesses variables such as the liver weight ratio, IFNγ, and the expression of the GLUT4 protein. According to the findings, CTE, particularly at 400 mg/kg BW, may be useful in the treatment of diabetes because it affects the liver ratio, lowers IFNγ activity, and increases GLUT4 expression in the femoral muscle. These findings demonstrate how CTE's anthocyanin content may be used to treat diabetes**. (Onggowidjaja et al 2024)**

Anti-diarrheal activity

Rats treated with C. ternatea ethanol extract (CTE) were significantly protected against castor oil- and MgSO4-induced diarrhea at

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different dosages. Like common medications like loperamide and atropine sulfate, it also reduced castor oil-induced enteropooling, delayed gastric emptying, and slowed intestinal transit. These findings imply that C. ternatea may have use in the treatment of gastrointestinal problems, including diarrhea, because of its antidiarrheal characteristics. To validate these results and clarify the precise mechanism of action underpinning its antidiarrheal effect, more investigation is necessary. **(Pandhare RB et al 2018)**

Wound healing activity

When used topically or orally, C. ternatea extracts from both the seeds and the roots showed significant improvements in wound healing in a variety of animals. They worked just as well as cotrimoxazole ointment. According to this study, C. ternatea affects inflammation, proliferation, and remodeling at all stages of wound healing. The plant extracts were found to contain phenolic components; the seed extract had a notably high concentration of flavonol glycosides. **(Y.B. Solanki et al 2012)**

Anti-cancer activity

The chloroform extract of Clitoria ternatea L. showed evidence of amino acids, alkaloids, glycosides, flavonoids, tannins, saponins, and steroids based on preliminary phytochemical investigation. Considerable cytotoxicity was seen in terms of inhibiting cell growth against HepG2 cells (IC50 = 110.00±1.9 µg/ml) and HeLa cells (IC50 = 104.50±0.9 µg/ml). Furthermore, against Pheritima posthuma, the crude chloroform extract of Clitoria ternatea L. at doses of 25, 50, and 150 mg/ml shown strong anthelmintic action. **(L.K. Kanthal et al 2016)**

Anti-bacterial activity

In this work, we investigated the antibacterial efficacy of plant extracts from Clitoria ternatea against the urinary tract infection-causing bacterium Proteus mirabilis. Proteus mirabilis was detected in clinical samples after they were gathered and evaluated. Tetracycline, gentamycin, and ciprofloxacin were found to be effective in antibiotic sensitivity testing. Using acetone, isopropyl alcohol, and petroleum ether, extracts from Clitoria ternatea leaves showed variable antibacterial activity against Proteus mirabilis. Extracts containing acetone had the maximum action, but extracts containing isopropyl alcohol and petroleum ether had lesser activity. A phytochemical investigation found a number of bioactive substances.

IV. CONCLUSION

Clitoria ternatea, popularly referred to as butterfly pea, has attracted a lot of interest in ethnopharmacology due to its historical use and possible medicinal properties. Studies on ethnopharmacology have emphasized its many medicinal qualities, which include antibacterial, neuroprotective, anti-inflammatory, and antioxidant activities. These results imply that Clitoria ternatea has potential for use in traditional medical systems as a natural treatment. Nonetheless, more scientific investigation, specifically clinical studies, is necessary to verify its effectiveness, safety profile, and prospective uses in contemporary healthcare. The discovery of innovative medicines or nutraceuticals derived from Clitoria ternatea might benefit both traditional and evidence-based medicine if rigorous scientific research is combined with traditional knowledge.

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