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Ethnomedicinal and Pharmacological properties of Clitoria ternatea

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Abstract:

Clitoria ternatea commonly known as butterfly pea is an herbaceous perennial climber plant with elliptic, obtuse leaves. It grows as a vine or creeper, doing well in moist, neutral soil. Drug generally occurs in the form of leaves and leaflets, rachis broken with or without intact leaflets; it is a perennial twining herb having 7 leaflets, which are elliptic and obtuse. Leaves are pinnate 5-9 foliolate. The plant contains alkaloid, flavonoid, taraxerol, taraxerone, triterpenoid and anthocyanin as active chemicals that bring about its biological effects. Its extracts possess a wide range of pharmacological activities including antibacterial, anti-diabetic, anti-diarrheal, anti-fungal, anti-helminthic, anti-inflammatory, antimicrobial, antioxidant, and antipyretic activities, hypolipidemia, immunomodulatory, and wound healing. This review is an attempt to compile information on various ethnomedicinal uses of *Clitoria ternatea.* The scientific information was obtained from various sites such as Google scholar, PubMed, Wikipedia, Google, ChatGPT, and other scientific database. This Review will highlight Traditional importance of *Clitoria ternatea.*

Keywords: *Clitoria ternatea*, Anticancer effect, Antioxidant activity, Neuropharmacological effects, Anti-Cholesterol Activity.

INTRODUCTION:

Plants and herbs have been an important contributor to the quality of human life for thousands of years. Some of them are well known medicinal herbs. A large and increasing number of patients in the world use medicinal plants and herbs for health purpose. Due to changing life style the health of human being is lost day by day. There are hundreds of significant drugs and biologically active compounds developed from the traditional medicinal plants some active chemical constituents of *Clitoria ternatea* involved in management of life threatening disease and disorders. There are around 60 global species belonging to genus *Clitoria,* which originated from the tropical equatorial Asia, and later was distributed widely in South and Central America, East and West Indies, Africa, Australia[1-2].

Common Names:

Butterfly Pea, Asian Pigeonwings, Blue Pea, Cordofan Pea, Darwin Pea, Aparajita (in India).

TOXONOMICAL CLASSIFICATION OF *Clitoria ternatea*:

- **Kingdom:** Plantae (Plants)
- **Phylum:** Tracheophyta (Vascular Plants)
- **Class:** Magnoliopsida (Dicots)
- **Order:** Fabales (Legumes, Milkworts)
- **Family:** Fabaceae (Pea Family/Legumes)
- **Subfamily:** Faboideae (Pea subfamily)
- **Genus:** *Clitoria*
- **Species:** *Clitoria ternatea L*[5-6].

Plant Morphology:
It is a perennial herbaceous plant, with elliptic, obtuse leaves. It grows as a vine or creeper, doing well in moist, neutral soil. Drug generally occurs in the form of leaves and leaflets, rachis broken with or without intact leaflets; it is a perennial twining herb having 7 leaflets, which are elliptic and obtuse. Leaves are pinnate 5-9 foliolate. Flowers are showy, blue or white petals are unequal, style bearded below the stigma. Fruits pods are linear and compressed. The pods are 5-7 cm (2.0-2.8 in) long, flat with 6 to 10 seed, in each pod. Seeds are 6-10 and black in color. Plant flowers in rainy season and fruits in winter. Clitoria purpurea has dark blue colored papilionaceous flowers and Clitoria. It is grown as an ornamental plant and as a revegetation species (e.g., in coal mines in Australia), requiring little care when cultivated. As a legume, its roots form a symbiotic association with soil bacteria known as rhizobia, which transform atmospheric N2 into a plant-usable form (a process called nitrogen fixing), therefore, this plant is also used to improve soil quality through the decomposition of nitrogen rich plant material.

Chemical Constituents:
- **Plant:** Clitoria ternatea herbaceous plant contain tannins, phlobatannin, carbohydrate, saponins, triterpenoids, phenols, flavonoids, flavanol, glycosides, proteins, alkaloids, anthraquinones, anthocyanins, cardiac glycosides, stigmast-4-ene-3,6-dione, volatile oils and steroids[10].
- **Seed:** The fatty acid content of Clitoria ternatea seeds includes palmitic, steric, oleic, linoleic, and lenolenic acids. Seeds also contained cinnamic acid, anthoxanthin glycosides, a highly basic small protein named finotin, water soluble mucilage, dephinidin 3, 3‟ 5‟ triglucoside and beta sitosterol[7].
- **Leaves:** Leaves contain 3 monoglycerides, 3-rutinoside, 3-neohisperidoside, 3- orhamnosyl Glycoside, kaempferol- 3- o-rhamnosyl, aparajitin, beta-sitosterol, and essential oil[8].
- **Flower:** Flower contains delphinidin-3, 5-diglucoside, delphinidin-3ß- glucoside, and malvidin- 3ß - glucoside, kaemphferol, p-coumaric acid[9].
- **Root:** Contains ß- carotene, stigmast-4 - ene- 3, 6, diene, taraxerol & teraxerone, starch, tannins and resins[9].

Traditional use:
Clitoria ternatea is known as *Aparajita* in Bengali which is used as a well-known Ayurvedic medicine. All the part of the herb (leaf, root, shoot) is used as medicine. In traditional Ayurvedic medicine, it has been used for centuries as a memory enhancer, nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing and sedative agent. It is also used in neurological disorders. Seeds and leaves were widely used as a brain tonic and to promote memory and intelligence. Juice and flowers were used as an antidote for snake bite. Seeds were used in swollen joints; crushed seeds are taken with cold or boiled water for urinary problems. some other traditional uses are given in Table No 1[10-11].

Pharmacological uses:
Anticancer effect:
The in vitro cytotoxic effect of petroleum ether and ethanolic flower extracts (10, 50, 100, 200, 500µg/ml) of *Clitoria ternatea* was studied using trypan blue dye exclusion method. Both extracts exhibited significant dose dependent cell cytotoxic activity. For petroleum ether extract the concentration 10µg/ml showed 8% reduction in cell count, however, 100% reduction was observed at 500µg/ml. In case of ethanolic extract, 10µg/ml concentrations possessed 1.33% reduction in cell count, while at 500µg/ml 80% reduction in cell count was observed[12].

Antioxidant Activity:
Extracts of *Clitoria ternatea* flowers are used in Thailand as a component of cosmetics and the chemical composition of the flowers suggest that they may have antioxidant activity. The aqueous extracts of *Clitoria ternatea* were shown to have stronger antioxidant activity than ethanol extracts[13].

Neuropharmacological Effects:
C.ternatea is reported to be a good "Medhya" (toning the brain) drug mainly used in the treatment of "Masasika roga" (mental illness).The intraperitoneal administration of alcoholic extract of stem, flower, leave and fruit of *C.ternatea* to rats and mice, has been reported to produce sedation and diminished alertness[14].

Anti-Cholesterol Activity:
C. ternatea flower has been reported to possess anti-cholesterol oxidation capabilities. The inhibitory effect on the oxidation of human copper-induced low-density-lipoprotein (LDL) cholesterol was examined by using 50 µL of 2.5 µL/mL of *C. ternatea* flower crude lyophilized extracts (CLE) and partially purified extract (PPE), respectively. After some hours of incubation, PPE showed higher inhibition compared to CLE. Both demonstrated the phenolic compound's protection against human LDL cholesterol oxidation. The extraction was obtained using distilled water, methanol, and a combination of both (1:1) after 6, 12, and 24 h soaking times. The observation was conducted in an emulsion model; the *C. ternatea* flower extract was used to inhibit cholesterol oxidation and was determined after 24 and 48 h. At 6 h soaking time, the combined solvents yielded 63.9 µg/mL of anthocyanin in the extract and inhibited 89.8% of 7-ketocholesterol production in emulsion. These studies demonstrated that phenolic compounds, mainly anthocyanins from *C. ternatea*, provide anti-cholesterol and antilipidemic properties, which provide defense against the oxidation of human LDL and cholesterol[15-16].

Diuretic Activity:
The powdered form of dried whole root and ethanol extract were evaluated for diuretic activity and only single I.V. dose of extract produce moderate increase in urinary excretion of Na, K and decrease in Cl but no change in urine volume. Also, an appreciable effect was seen on oral dosing.

CONCLUSION:
Clitoria ternatea is widely distributed throughout various tropical regions. The plant appears to have a broad spectrum of activity on several aliments various part of the plant has been explored for Anticancer effect, Antioxidant activity, Neuropharmacological effects, Anti-Cholesterol Activity and many other activities. These are also reported in containing Carbohydrates, Proteins, Flavonoids, Sterol glycoside, Vitamins and Minerals. The plant is preclinically evaluated to some extent.

Table No1: Traditional uses of *Clitoria ternatea*.

Useable part of Clitoria ternatea	**Function**
Flower	Food colour
Root	Nootropic, anxiolytic, antidepressant, anticonvulsant and antistress activity
Whole plant	Treat sexual ailments such as: infertility and gonorrhea
Clitoria ternatea extract	Heat stable function

Table No2: Phytochemical constituents present in *Clitoria ternatea*

Test	Result
Anthocyanins	+++
Flavonoids	++
Phenolics	++
Tannins	+
Alkaloids	±
Saponins	+
Glycosides	+
Steroids	-

Key: "+++"High presence, "++" Moderate presence, "+" Low presence, "±" Doubtful/Variable presence, "-" Absent

CONFLICT OF INTEREST:
The authors do not have any conflict of interest to declare.

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