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TRADITIONAL HERBACEOUS PLANT CLITORIA TERNATEA – A REVIEW

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ABSTRACT

Clitoria ternatea is a perennial herbaceous plant, from the Fabaceae family. commonly known as 'Butterfly pea, has been used for centuries as a memory enhancer, nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing and sedative agent. pharmacological activities including antimicrobial, antipyretic, anti-inflammatory, analgesic, diuretic, local anesthetic, antidiabetic, insecticidal, blood platelet aggregation-inhibiting and for use as a vascular smooth muscle relaxing properties. This plant has a long use in traditional Ayurvedic medicine for several diseases.

KEYWORDS: Clitoria Ternatea, Traditional medicinal plant, Pharmacological activity.

INTRODUCTION

Clitoria ternatea belongs to family Fabaceae, generally known as Katarolu (Sinhala), Kokkattam (Tamil), Aparajitha (Bengali), and Asian Pigeon wing (English), is a perennial twinning medicinal plant, which has been widely used in traditional and Ayurveda systems of medicine in many parts of the world.[1]

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. Clitoria ternatea showed wide range of pharmacological activities including antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic antipyretic and many other pharmacological effects[2] Additionally, C. ternatea has been widely used in traditional medicine, particularly as a supplement to enhance cognitive functions and alleviate symptoms of numerous ailments including fever, inflammation, pain, and diabetes.[3] This Review will highlight Traditional importance of Clitoria ternatea.

Plant profile

Aparajita's botanical name is Clitoria ternatea and belongs to Fabaceae (Papilionaceous) family.

Synonyms: Clitoria albiflora Mattei, Clitoria bracteata Poir., Clitoria mearnsii De Wild., Clitoria tanganicensis Micheli, Clitoria zanzibarensis Vatke.[4]

Taxonomic classification

Kingdom: Plantae

Subkingdom: Viridaeplanta

Infrakingdom: Streptophyta

Division: Tracheophyta

Subdivision: Spermatophytina

Infrodivision: Angiospermae

Class: Magnoliopsida

Superorder: Rosanae

Order: Fabales

Family: Fabaceae

Subfamily: - Faboideae

Genus: Clitoria L.

Species: Clitoria ternatea.[5,6]

Common names

Arabic: Mazerion Hidi, Baslat el-Zuhoor; **Bengali** : Aparajita, **Chinese**: die dou; **English**: blue-pea, bluebellvine, butterfly-pea, cordofan-pea, Darwin-pea; **French**: honte; **German**:

blaue Klitorie; **Hindi**: Aparajita, **Portuguese**: clitória-azul, clitória; **Punjabi**: Koyal; **Sanskrit**: Girikarnika, Vishnukranta; **Spanish**: conchitas papito, azulejo, zapatico de la reina, zapotillo; **Swedish**: himmelsärt; **Tamil**: Kakkanam and **Telugu** : Dintena.[4,6]

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 (Figure 1). 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. (Figure 2) 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 N_2 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.[7]

Fig 1: -The flowers of C. Ternatea

Fig 2: -The pod of C. Ternatea

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.[8,9]

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.[10,11]

Leaves: - Leaves contain 3 monoglycerides, 3-rutinoside, 3-neohisperidoside, 3- o-rhamnosyl Glycoside, kaempferol- 3- o-rhamnosyl, aparajitin, beta-sitosterol, and essential oil.[12]

Flower: -Flower contains delphinidin-3, 5-diglucoside, delphinidin-3ß- glucoside, and malvidin- 3ß - glucoside, kaemphferol, p-coumaric acid.[12]

Root: Contains ß- carotene, stigmast-4 - ene- 3, 6, diene, taraxerol & teraxerone, starch, tannins & resins.[12]

Ayurvedic Properties

- GUNA (Characteristics): - Laghu (Light), Rooksha (Dry).
- RASA (Taste): - Katu (Pungent), Tikta (Bitter), Kashya (Astrigent).
- VIPAKA (After taste that Develops Post Digestion): - Katu (Pungent).
- VIRYA: - Sheeta (Cold Potency).[13]

Pharmacological Effects

Special activity

Clitoria ternatea planet is very commonly used in Panchakarma treatments these are very effective for balancing doshas in the body and bringing about internal as well as external detoxification. Because of its impact on the nervous system, it is used to treat many vata vitiated disorders in body.[13]

Effect on learning and memory

The effects of Clitoria ternatea aqueous root extract on learning and memory in rat pups (7 days old) using open field behavior test, spontaneous alternation test, rewarded alternation test and passive avoidance test were observed. The results of this study showed that the oral treatment of Clitoria ternatea roots extracts at different doses significantly enhanced memory in rats. Clitoria ternatea aqueous root extract for learning and memory improvement using open field behaviour test, passive avoidance test and, spatial learning test (T-maze test) in neonatal rat pups (7days old). Neonatal rat pups were incubated during growth spurt period at the dose of 50 and 100mg/kg of aqueous root extract for 30 days. Clitoria ternatea root extract had memory enhancing properties which had little or no effect on the general motor activity but showed improved retention and spatial learning performance at both time points of behavioural tests. This memory enhancing property was marked in neonatal rats (which

were in their growth spurt period) treated with Clitoria ternatea 100mg/kg bodyweight for 30 days. Thus, it appears that treatment with Clitoria ternatea extract results in permanent change in the brain which was responsible for the improved learning and memory.[14]

Effect on general behavior

Ethanol extract of the root of Clitoria ternatea shows significant neuropharmacological activity.[31]

Central nervous effect

Seeds and leaves of Clitoria ternatea have been widely used as brain tonic and believed to promote memory and intelligence. The activity of Clitoria ternatea in Alzheimer's disease was studied to investigate its efficacy and to identify the major bioactive constituent attributing the activity. The result showed that the aqueous extract of Clitoria ternatea was beneficial in Alzheimer's disease through many mechanisms. The isolated compounds may act as a lead compounds for identifying new derivatives which could use for improving memory. Shankhpushpi, a well-known drug in Ayurveda, is extensively used for different central nervous system (CNS) effects especially memory enhancement. Different plants were used under the name shankhpushpi in different regions of India, leading to an uncertainty regarding its true source. Plants commonly used under the name shankhpushpi are: Convolvulus pluricaulis Chois., Evolvulus alsinoides Linn., both from Convolvulaceae, and Clitoria ternatea Linn. (Leguminosae). The memory-enhancing activity of these three plants was investigated.[5]

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, 10 µg/ml concentration possessed 1.33% reduction in cell count, while, at 500µg/ml 80% reduction in cell count was observed.[15]

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.[16]

Respiratory system

It is used in common cold, cough, asthma as it acts as an expectorant and reduces the irritation of respiratory organs. Besides this, whole plant is used for smoking. Decoction is used for gargling in throat manifestations. The sticky phlegm in cough and asthma is relieved, when the root juice with milk is given. It is also capable of curing whooping cough if taken orally.[17]

Antioxidant Activity

Extracts of Clitoria ternatea (butterfly pea) 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.[18]

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.[19] It is also used in neurological disorders.[20] 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 1.

Table: Traditional uses of Clitoria ternatea.

Useable part of Clitoria ternatea	**Function**
Flower	Color food[21]
Root	Nootropic, anxiolytic, antidepressant, anticonvulsant and antistress activity[21]
Whole plant	Treat sexual ailments such as: infertility and gonorrhea[22]
Clitoria ternatea extract	Heat stable function[23]

Plant parts used: Leaves, seeds, bark, fruits, sprouts and stems were used medicinally.[24]

CONCLUSION

Clitoria ternatea is not only a Medicinal plant but also a Traditional Herbaceous Plant. It has so many traditional usages as well a number of medicinal usages. Even, it is useful a memory enhancing and anxiolytic agent and treatment of some incurable diseases such as cancer, neurological disorder, hyperglycemia, urinary disorder, goiter, respiratory disorders, nootropic, antistress, antidepressant, anticonvulsant etc. Extracts of the roots, seeds and leaves of Clitoria ternatea have long been in clinical use in the Ayurvedic system of medicine and in other systems of medicine. Various pharmacological activities along with their mode of action. Therefore, it can be evaluated clinically and Traditional for the efficacy and safety of Clitoria ternatea in various types of dementia.

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