

**ETHANOPHARMACOLOGY, PHARMACOGNOSY AND PHYTOCHEMICAL
PROFILE OF *CLITOREA TENATEA* LINN: AN OVERVIEW**

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Summary

The present work is directed towards the extensive study of widespread applications of *Clitoria ternatea* (Aparajita) in the treatment of various life threatening diseases and disorders. *Clitoria ternatea* (Aparajita) from ancient times has a place in the heart of Hindus due to its sacred value for the lord Shiva. As the world is switching towards the natural therapy as compared to the allopathy scientist has been interested in the development of newer plant based medicines for the treatment of various life threatening diseases and disorders. In ayurveda from the era of Charaka and Sushruta the herb had been of keen interest due to its wide spectrum of biological activities.

Key words: Ethanopharmacology, phytochemistry, *Clitoria ternatea*, *aparajita*.

Introduction

Clitoria ternatea L. is a member of the family Fabaceae, commonly known as 'Aparajita' or Girikarnika¹. It is a perennial climber widely used in the traditional Ayurvedic system of Indian medicine for treating a wide variety of ailments. The flowers of this have the shape of human female pudenda, hence the Latin name of the genus "*Clitoria*", from "clitoris". (Synonyms: *Clitoris principissae*.) "*Ternatea*", the name of the species, comes from Ternate, a location in Indonesia. In some languages (Tamil, Malayalam) it is named after the seashell, which is a euphemism for a woman's external sexual organs^{2,3,4}. In the traditional system of medicine 'Aparajita' is considered as a 'Medhya' drug to improve intelligence and enhance memory function⁶. It is also used in the treatment of chronic bronchitis, dropsy, goiter, leprosy, mucous disorders, sight weakness, skin diseases, sore throat and tumors. It was used traditionally to cure sexual ailments, like infertility and gonorrhoea, to control menstrual discharge, and also as an aphrodisiac. Aparajita grows throughout India. It is a beautiful-looking plant, hence cultivated in gardens. It is a perennial twining herb having 7 leaflets, which are elliptic and obtuse; there are few varieties with white, violet and blue flowers.

Cultivation and collection-

Clitoria ternatea adapted to a wide range of soil types (from sands to heavy clays) of moderate fertility but is extremely well adapted to heavy clay alkaline soils, and especially on clay soils which are too shallow for leucaena (*Leucaena leucocephala*). *Clitoria ternatea* adapted to pH 4.5-8.7 but prefers medium to high pH. It requires summer rainfall of 500 mm over 3 months but grows best between 700-1,500 mm AAR. Drought tolerant and will survive in years which have only 400 mm rainfall and a dry season of 5-6 months or longer even if heavily grazed. Warm (wet) season growth up to 2,000 m in equatorial Africa and to latitude 24°S. *Clitoria ternatea* tolerates average daily temperatures down to 15°C but not suited to districts with severe or frequent frosts. Normally it grown in full sunlight but moderately shade-tolerant. Flowers of *Clitoria ternatea* can develop in 4-6 weeks after sowing and continue to flower while temperature and moisture are adequate. Flowering can occur throughout the year given sufficient soil moisture and frost-free conditions. Predominantly self-fertile but with some out-crossing. *Clitoria ternatea* normally grown in full sunlight but moderately shade-tolerant. Flowers can develop in 4-6 weeks after sowing and continue to flower while temperature and moisture is adequate. Flowering can occur throughout the year given sufficient soil moisture and frost-free conditions. *Clitoria ternatea* predominantly self-fertile but with some out-crossing. Best results are achieved by planting into soil moisture (2-6 cm), in narrow rows (15-50 cm apart) at about 2-4 kg/ha for long-term pastures and about 6 kg/ha for short-term pastures to achieve plant densities of 5-10 plants/m². Excellent results can be achieved when sown as a crop using conventional planters and press wheels to achieve good soil/seed contact. For optimum yield as a green manure crop, use a seeding rate of 12 kg/ha. Soil temperatures between 16 and 36°C are required for good establishment. Mechanically scarify seed with a high hard seed content (>30%) when soil conditions favour immediate germination, or use unscarified seed with a high hard seed percentage when staggered germination is desired. For *Clitoria ternatea*, fertilizer is not normally used when sown on suitable soils^{4,5,6}.



Botanical Name- *Clitoria ternatea* L.

Family- Fabaceae

Synonyms:

Hindi-Koyala; **Telugu-** Dintena , **Malayalam** – sangu pushpam, **English:** Butterfly pea, blue pea vine, mussel-shell climber, pigeon wings, **Bengali:** Aparajita, **Kannada:** Nagar hedi, **Marathi:** गोकर्ण (Gokarna), **Portuguese:** Fula criqua, **Sanskrit:** Sankhapushpi, aparajita , saukarnika , ardrakarni, girikarnika , supuspi , mohanasini , vishadoshaghni , shwetanama , Vishnukranta , ashwakhura ¹.

Morphology

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 long, flat with 6 to 10 seed, in each pod. Seeds are 6-10 and black in colour. Plant flowers in rainy season and fruits in winter. *C.purpurea* has dark blue coloured papilionaceous flowers and *C.ternatea* has creamy white coloured flowers which are solitary and very attractive.

Microscopy

Rachis- It shows single layered epidermis externally covered with thick, smooth cuticle; unicellular to tricellular, hooked hair with warty cuticle, found on epidermis of either side; vascular bundle crescent shaped consisting of xylem and phloem; pericycle present in the form of broken ring; rest of the tissues between epidermis and pericycle composed of oval to polygonal, thin-walled, 3 to 5 layered, parenchymatous cells ⁶.

Leaflet - Leaflet shows dorsiventral structure; both upper and lower epidermis of leaf consists of single layered cells, covered externally with thick cuticle; some epidermal cells of both surfaces elongate outwards forming unicellular to tri-cellular warty hairs or trichomes, basal cells smaller and apical cells longer; palisade single layered; palisade ratio 3 or 4; spongy parenchyma 4 or 5 layered with intercellular spaces and containing a few prismatic crystals of calcium oxalate; paracytic stomata, present on both surfaces; stomatal index 58 to 64 on lower surface, 31 to 42 on upper surface; vein islet number 22 to 24; veinlet terminal number 34 to 37 per sq. mm

Powder - Powder is yellowish-green in colour; shows groups of spongy parenchyma, palisade cells, fibres, xylem vessels with spiral thickenings, fragments of hairs with or without warty cuticle, wavy thin-walled, epidermal cells with paracytic stomata in surface view.

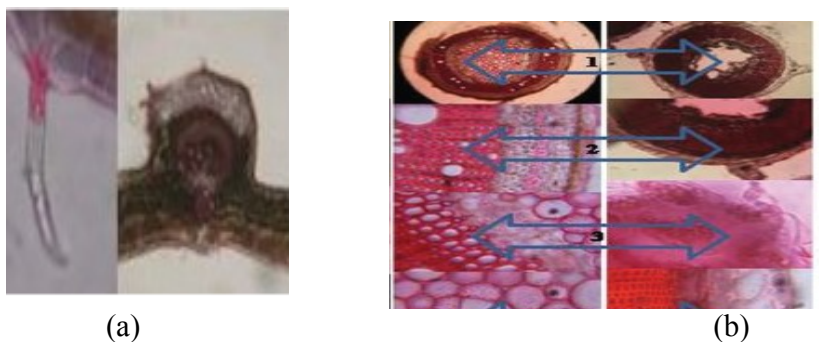
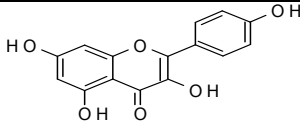
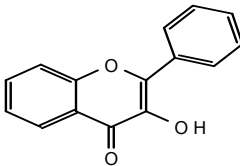
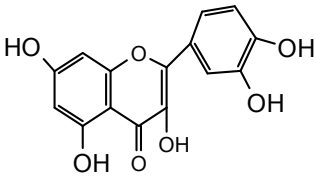
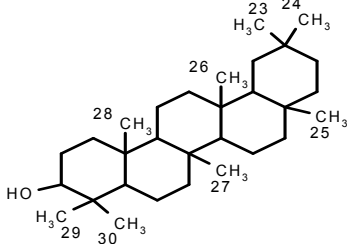
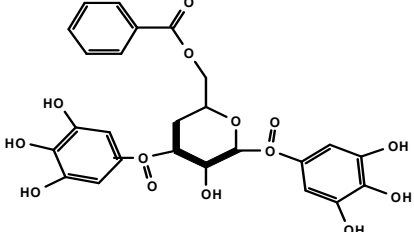
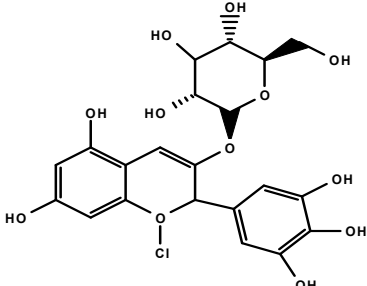
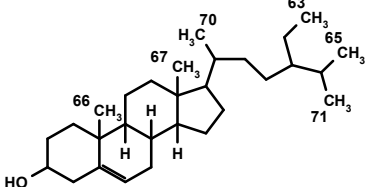
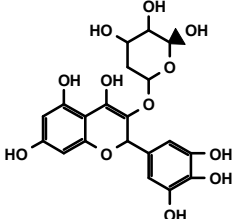
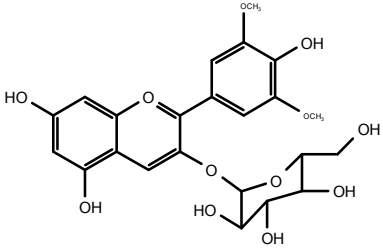
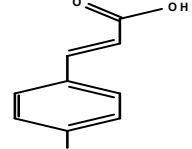
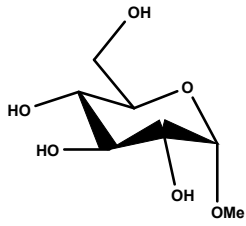
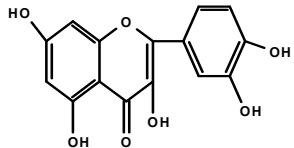
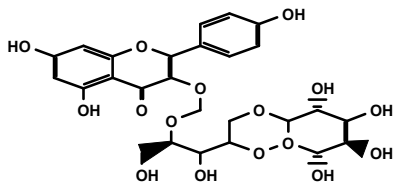
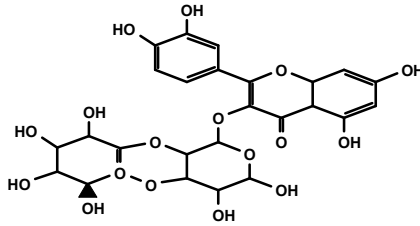
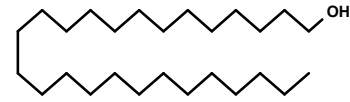
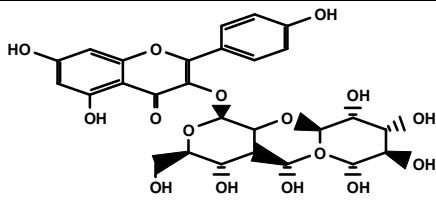
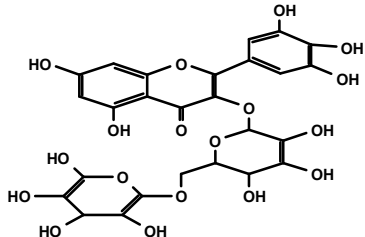
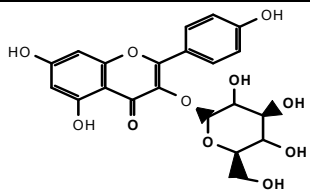


Fig a: Transverse section of leaf of *Clitoria ternatea*,
Fig. b.: Transverse section of root of *Clitoria ternatea*,

Phytochemical constituents

Sr.No	Chemical constituents	Structure
1.	Kaempferol	
2.	Quercetin	
3.	Myriceti	
4.	Taxaxerol	

5.	Tannic acid	
6.	3-monoglucoside	
7.	β -Sitosterol	
8.	Delphinidin-3,5-diglucoside	
9.	Malvidin-3 β -glucoside	
10.	p-hydroxycinnamic acid	

12.	Ethyl- α -D-galactopyranoside	
13.	Anthoxanthin glucoside.	
14.	Kaempferol 3-neohesperidoside	
15.	Quercetin 3-neohesperidoside	
16.	Hexacosanol	
17.	Myricetin,3-neohesperidoside	
18.	Myricetin 3-rutinoside	
19.	Kaempferol 3-glucoside	

Along with above mentioned chemicals it also contains glycosides, flavonal glycosides and resin glycosides. Three flavonol glycosides are 3-O-(2''-O- α -rhamnosyl-6''-O-malonyl)- β -glucoside, 3-O-(2''-O- α -rhamnosyl-6''-O-malonyl)- β -glucoside, and n 3-O-(2'',6''-di-O- α -rhamnosyl)- β -glucoside together with eleven known flavonol glycosides were present in the petals of *Clitoria ternatea*. Crude protein and crude fibre in the leaves were 21.5% & 21.5-29% respectively. Total plant protein ranges from 14-20%. , sigmat-4-ene-3, 6, diene, roots contains taxaxerol and taxaxerone. The leaves contains 3-o-rhamnosylgalactosideof kaemferol,delphinidin-3,5-diglucoside, delphinidin- β -glucoside, and its 3 methyl derivative, , kaemferol and cynodin chloride seeds contains myricetin 3-2G-rhamnosylrutinoside;kaempferol 3-2G-hamnosylrutinoside;8,quercetin3-rutinoside;quercetin 3- glucoside; myricetin 3-glucoside.The root bark contains starch, tannin and resin. The seeds contain a fixed oil, a bitter acid resin (the active principle), tannic acid, glucose (a light brown resin) and ash.

PHARMACOLOGICAL ACTIVITIES-

1) Antihyperglycemic

Clitoria ternatea showed antihyperglycemic activity reported by *Clitoria ternatea* Linn. An Overview Patil et al, *Clitoria ternatea* Linn.: An Overview, International Journal of Pharmaceutical Research,2011, Volume 3, Issue 1, 20-23.^{8,9}

2) Digestive system:

It is an antiemetic. Antidypsetic Mild-laxative and cholagogue Therefore it is used in emesis, dyspepsia, constipation jaundice and piles. Kapha and pitta work together in the lower part of the stomach. It is used in healing ulcers of pylorus duodenum etc¹².

3) Anti-inflammatory, Antipyretic, Analgesic—

The methanol extract of *Clitoria ternatea* L. showed a significant antipyretic activity. *Clitoria ternatea* roots methanol extract when given by oral route to rats was found to inhibit both the rat paw oedema caused by carrageenin and vascular permeability induced by acetic acid in rats¹⁶.

4) Antioxidant-

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. In this study the potential antioxidant activity of *C. ternatea* extracts and an extract containing eye gel formulation was investigated aqueous extracts were shown to have stronger antioxidant activity than ethanol extracts¹⁷.

5) Circulatory system :

Being haemostatic and blood purifier, it is useful in haemorrhagic disorders and vatarakta. Hot infusion of dhamasa is given to prevent small pox¹⁷

6) Goiter-

It has also been reported that the extract from the white-flowered plant can cure goiter¹⁷.

7) 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^{17,18}.

8) Anthelmintic

Methanol extract of the *Clitoria ternatea* root shows anthelmintic activity is might be because of active principles present in methanol extract of the root.

9) Antimicrobial-

The crude extract from seeds of *C. ternatea* showed strong antimicrobial activity. This plant's root is specially used for leucoderma.

10) Hemicrania-

The juice of the root of white flowered variety is blown up the nostrils as a remedy for hemicrania.

11) Larvicidal-

C. ternatea was showing the most promising mosquito larvicidal activity.

12) Urinary system:

It increases urination. Decoction is used in dysuria. And urinary troubles even in cattle, ulcer and antidotal properties¹⁸.

13) Effects on nervous system-

It has reported that *Clitoria ternatea* has tranquillizing effect on the brain hence it is used in symptoms like syncope, vertigo and brain weakness. The *Clitoria ternatea* was studied for its effect on cognitive behavior, anxiety, depression, stress and convulsions. By using Pentylentetrazol (PTZ) and maximum electroshock (MES), the methanolic extract of *Clitoria ternatea* was found to possess nootropic, anxiolytic, antidepressant, anticonvulsant and antistress activity.^{18, 19, 20}.

14) Nephroprotective-

The present study shows that the administration of ethanol extract of CT has Nephroprotective potential against APAP-induced Nephrotoxicity. It provides experimental evidence that CT augmented the myocardial antioxidant enzymes level, preserved histoarchitecture and improved cardiac performance following APAP administration reported in Evaluation of phytoconstituents, nephro-protective and antioxidant activities of *Clitoria ternatea* by K.Sarumathy, M.S.Dhana Rajan, T.Vijay, and J.Jayakanthi²¹.

15) Antihistaminic

It has also reported by Dnyaneshwar J Taur and Ravindra Y Patil Journal of Basic and Clinical Pharmacy that *Clitoria ternatea L.* showed antihistaminic activity using using clonidine and haloperidol induced catalepsy in mice²³.

Besides this *Clitoria ternatea* is also used in the treatment of filariasis²⁸, eye infections habitual abortion, to control menstrual discharge, the roots of white variety, mashed in milk are given orally to avert the abortion and stabilize the foetus. The plant is considered as a good brain tonic and 'Sankhapushpi' one of the formulations in Ayurveda consists of the roots and seeds of CT and is used as a 'tonic of the nerves', alterative and laxative. It is also used to cure sexual ailments. Extracts of *Clitoria ternatea L.* have been used as an ingredient in 'Medhya Rasayana' a rejuvenating recipe used for treatment of neurological disorders and considered as wholesome for intellect. The juice of its leaves mitigates the toxins. The fresh leaves juice, combined with ginger juice, effectively controls the excessive sweating²⁸

Conclusion

The concept of research is directed towards the development of newer strategies for the treatment of various life threatening diseases and disorders. The author wants to highlight a brief spectrum of biological activities of *Clitoria ternatea L* in medicines. In view of above fact the attempt has been made to direct the attention of researcher towards the *Clitoria ternatea L* (*aparajita*) an herb having graceful importance in ayurveda with possible pharmacological activities.

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