Preliminary phytochemical screening to detect various Secondary Metabolites from *Clitoria ternatea* Linn

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Abstract
Clitoria ternatea is a plant with a variety of ethnic medicinal uses. The qualitative analysis of Clitoria ternatea shows the presence of bioactive compounds such as Alkaloids, Tannins, Glycosides, Resins, Steroids, Saponins, Flavonoids and Phenols. The quantitative estimation of total Saponins, Flavonoids and Phenols in roots and of Flavonoids in shoots, flowers and seeds is also reported which is very important for the pharmaceutical industry. This is valuable information for preparation of drugs in pharmaceutical industry and stress the need for more intensive research in this medicinal plant since the compounds play a great role in healthcare.
Keywords: *Clitoria ternatea* , phytochemicals, Metabolites, Morphological Description and uses etc.

Introduction

Clitoria ternatea, commonly known as Asian pigeonwings, bluebellvine, blue pea, butterfly pea, cordofan pea and Darwin pea, is a plant species belonging to the family Fabaceae. In India: Sanskrit: Ashphota, Aparajita Saukarnika, Ardrakarni, Girikarnika, Supuspi, Mohanasini Vishadoshaghni, Shwetanama , Vishnu-Kranta, Ashwakhura.

In India, it is revered as a holy flower, used in daily puja rituals. The flowers of this vine were imagined to have the shape of human female genitals, hence the Latin name of the genus *"Clitoria"*, from "clitoris". The species name is thought to derive from the city of Ternate in the Indonesian archipelago, from where Linnaeus's specimens originated.

- Domain: Eukaryota
- Kingdom: Plantae
- Phylum: Spermatophyta
- Subphylum: Angiospermae
- Class: Dicotyledonae
- Order: Fabales
- Family: Fabaceae or Papilionaceae
- Subfamily: Faboideae
- Genus: Clitoria
- Species: Clitoria ternatea

Clitoria genus is inconsequential, indigenous climber and a common garden flower found throughout the tropical and subtropical regions of the world. Now the genus becomes rare in humid and sub-humid lands of Asia, America, and Africa and also in semi-arid tropical Australia. It grows from sea level to 1800 and also grown as an ornamental in the warmer parts of the world and outspread from about 20°North latitude to the Salta district in Argentina at about 24°South latitude.

In traditional Ayurvedic medicine, it is ascribed various qualities including memory enhancing, nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing, and sedative properties. In traditional Chinese medicine, the plant has been ascribed properties affecting female libido due to its similar appearance to the female reproductive organ. Using its extract have also shown its ability to reduce intensity of behavior caused by serotonin and acetylcholine.

Ayurveda medicine system was based on the three humours namely wind (vata), Bile (pitta) and phlegm (kapha). This system of medicines mostly is polyherbal formulations. Some important herbs in Ayurveda *are Rauwolfi serpentina, Asparagus racemosus, Cassia atrgustifbla, Sesamum indicum, Holarrhena antidysenterica, Withania somnifera, Aconitum*

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napellus, etc (Kokate, 2001). Some leguminous species like *Mucuma pruriens* (Cowhage), it is called Krauncha in sanskrit. 3-6gms of seed powder is used for treating Parkinsonism. 50-100 ml of root decoction is used to treat male infertility and impotency in female infertility. The aqueous extract of *Sesbunia grandlfora* flowers, has been found to produce haemolysis of erythrocytes even at low concentration. The active principle responsible for the haemolytic effect is characterized the methyl ether of Oleanolic acid (Kalyanagurunatham *et al.*, 1985). The capsule alfa-alfa, a. multivitamin medicine in ancient Ayurvedic medicine extracted from Medicago sativa used to treat ulcers, arthritis, cancer, scurvey, earache and cholesterol control. The drug contains phytochemicals such as saponins, sterols, flavonoids, coumarins, alkaloids, acids, vitamin A, BI, BIZ, C, D, E, % K. This drug is used in the form of powder (5-1Ogrns) and decoction (Nadkami, 2004).

According to World Health Organisation 3.5 billion people in developing countries are using plant-based medicines for their primary health and healthcare. WHO further indicates that over 30% of world's plant species have at one time or other used for medicinal purposes? Ova 35,000 plants are used in various cultures around the world, about 20,000 plants are marketed for medicines and cosmetics. Almost 90% of the marketed plant drugs are from wild resources and over 120 important drugs are of plant origin (phytochemicals). Another important discovery of Catharanthine from Stephemia cepharantha and S. sasaki is used for the treatment and prophylaxis of tuberculosis. Rutin from Ruta graveolens was found to be very effective antimalarial drug. It was used in China during 2"d world war. A more recent discovery is an Indian herbal drug from TBGRI (Kerala) is, TBR-20 from *Trichopus uylanicus* is an effective drug for evergreen health, vitality and vigour (Pushpangadhan et *a1*.,1995). Its immuno stimulant properties are said to be potential against the dreadhl disease AIDS. Hence phytochemlcal and antimicrobial investigations of medicinal plants will contribute to the advancement of world health. According to WHO nearly 70-80% of the global population depends on herbal drugs. Majority of the herbal drugs are extracted from the secondary metabolites and they are used as analgesic, antifertility agents, antimicrobial, cardiovascular and antimicrobial drugs (Narayana Swamy, 2005). Secondary metabolites comprise different classes namely, 1) Alkaloids 2) Phenolic compounds 3) Glycosylates 4)

Non-protein arnino acids 5) Terpenoids 6) Volatile oils 7) Tannins and 8) Mucilage's (Vickery and Vickery, 1901).

Alkaloids

These are organic nitrogen contain bases with a heterocyclic ring. Alkaloids exhibit diversity of structures and also shows an extra ordinary spectrum of Pharmacological activities, because of their characters, they are important for clinical, physiological, taxonomic and biogenic nature. Vincristine, Vinblastine are the alkaloids derived from Madagascar periwinkle Catharanthus roseus are used to treat some types of cancer.

Phenolic compounds

Phenolic compounds with a single aromatic ring which differ in position of OH group substituents. They are widely distributed among plant kingdom and present as Phenolic acids, Phenols, Flavonoids, Phenyl proponoids, Phenolic quinines, can acts as antiseptic and anti-inflammatory.

Terpenoids

Terpenoids include a large group of compounds derived from mevalonic acid precursor and are mostly polymerized isoprene derivatives. Terpenoids are abundantly found in volatile oils, consisting complex mixture of terpenes, alcohols, ketones, aldehydes and esters.

Saponins:

Saponins are the glycosides of both steroids and triterpenes. They are mostly non-nitrogenous water-soluble glycosides which reduce surface tension and produce lather on shaking. They are hydrolysed by acid to yield genins on one hand and sugars on the other.

Tannins

Tannins are the flavouring agents and antiseptic secondary metabolites which are present in liquid form in the cell sap and also in distinct vacuoles. They have been known since long time as the astringent's substances having the capacity to combine with tissue proteins and

precipitate them.

Phenolic Compounds

The term phenolic compounds embrace a wide range of plant substances which possess aromatic ring bearing one or more hydroxyl substituents. Some phenolic compounds are usually located in the vacuoles and some are combined with sugar as glycosides.

Flavonoids

Flavonoids are the largest group of water-soluble phenolic compounds (Wollen Weber and Dietz. 198l). The word flavonoid was first coined by Giessman and Hinreiner, as their structures possess flavone 2-Phenyl chromone (Geissman and Hinreiner, 1952). Flavonoids occur in all the parts of the plant (root, heartwood, sap wood, bark, leaf, fruit and in flower). So, present studies on plant belonging to *papilonaceae*

Papilionaceae

The *papilionaceae* is the largest of the three families consisting of about 482 genera and 1200 species. They are cosmopolitan in distribution, abundant in tropics, subtropics and some in temperate zones. Majority of the species are herbaceous (Laburnum & Ulex). Few are shrubs (Sesbania), trees (*Pongamia, Suphora*) woody climbers (Abrus) ; xerophytes and hydrophytes (Aeschynomene). The indigenous genera represent *Astragalus* (1 500-250), Lupinus (225- 120), *Trifoium* (275-65),
Crololaria (250-15), *Hosackia* (50-45), Desmodium (175-35), T*ephrosia* (160-35),
Dalea (150-50), *Lespedeza* (60-25), and *Baplisia* (20). (George Lawrence, 1951). This family is recogrused by their characteristic papilionaceous flowers consisting with a 'banner' petal, two wing petals and two petals partially bed together to form a boat shaped keel. They keep encloses the stamens, which are not visible externally. Stamens 10, diadelphous, (usually 9 and 1, the one opposite the standard) monoadelphous or flee. This family contain most of the important crop species such as Soya bean (Glycine mar), French bean (Phaseolus *vulgaris*), Lentil (*Lens culinaris*) and peanut (*Arachis hypogaea*).

Some of the important medicinal plants of sub family *Papilionaceae* include Abrus *precatorius Linn., Alhagi camelorum Linn., Alhagi murorum, A. pseudalhagi Linn., Arachis hypogaea Linn., Alysicarpus lyagfolius Wight And Arn., Alysicarpus nummularifolius DC., A. rugosus DC., A.vaginalis DC., Astragalus hamosus Linn., A. multiceps Wall., A. strobiliferus Royle., A. tribuloides Del., Atylosia scarabaeoides Benth., Butea monosperma O. Kuntze., Butea superba Roxb., Cajanus indicus Spreng., Canavalia ensiformis DC., Cicer arintinum Linn., Clitoria ternatea Linn., Colutea nepalensis Sims., Crotolaria alata Ham., C. albida Heyne, C. burhia Ham.,*
C. fulva Roxb., C. junea Linn., C. prostrata Rottl., C. retusa Linn., C,sericea Retz., C. striata DC., C. trifoliastrum Wills., C. versucosa, Cyamopsis tetragonoloba Taub., Cylista scariosa Roxb., Dalbergia lancelaria Linn., D. latifolia Roxb., D. multiflora Heyne, D. sissi Roxb., D. spinosa Roxb., D. tamarindifolia Roxb., D.volubilis Roxb., Derris indica Benth., Derris scandens Benth, D. uliginosa Benth, Desmodium gangeticum DC., D. heterophyllum DC., D.lasiocarpum DC., D. polycarpum DC., D. pulchellum Benth., D. retroflexum DC., D. scalpe DC., D. tiliafolium G. Don, D. triflorum DC., Dolichos biflorus Linn., D. falcatus Klein., D. lablab Linn., Erythrina indica Lam., E. ovalifolia Roxb., E. stricta Roxb., E. suberosa Roxb., Fleminga chappar Ham., F.congesta Roxb., F. nana Roxb., F. strobilifera R.Br, F. tuberosa Dalz., Glycyrrhiza glabra Linn., Glycine soja Sieb.&Zucc., Indigofera argentea Linn., I.aspalathoides Vahl ., I . gerardiana R. Grah., I . glabra Linn.,

Materials and Methods

Clitoria ternatea Linn. plants were collected from Manora area district Washim. The plant parts namely leave, roots, shoots, flowers and seeds were shade dried and powdered in a mechanical grinder for preparation of extract. Preparation of plant extracts

The powdered plant parts were Soxhlet extracted with methanol. The extract, on removal of solvent in vacuum, gave a dark greenish brown semisolid residue. The powdered material or the extracts of the plant parts mentioned above were used for the study.

Qualitative analysis it comprised of tests for the presence of Alkaloids, Tannins, Glycosides, Resins, Steroids, Saponins, Flavonoids and Phenols.

Test for Alkaloids

About 0.5 gm of methanol extract was taken in a test tube and was diluted and homogenized with 10 ml distilled water, dissolved in 20 ml dilute HCl solution and clarified by filtration. The filtrate was tested with Drangendroff's and Mayer's reagent. The treated solution was observed for precipitation of white or creamy colour.

Test for Tannins:

Five grams of the ground powder was extracted with 10 ml ammoniacal chloroform and 5 ml chloroform. The mixture was filtered and the filtrate was shaken with 10 drops of 0.5 M sulphuric acid. Creamish white precipitate was observed for the presence of tannins.

Test for Glycosides:

About 0.5 gm of methanol extract was taken in a test tube and 1 ml glacial acetic acid containing traces of ferric chloride was added to it. To this solution, 1 ml concentrated sulphuric acid was added and observed for the formation of reddish-brown colour at the junction of the two layers and the upper layer turned bluish green in the presence of glycosides.

Test for Resins:

For the tests concerning the presence of Resins, 0.5 gm of methanol extract was taken in a test tube and 5 ml of distilled water was added to it and observed for turbidity which indicates the presence of Resins.

Test for Steroids:

About 0.5 gm of methanol extract was taken in a test tube and 2 ml of acetic anhydride was added to it and 2 ml of sulphuric acid was added by the sides of the test tube and observed for the colour change to violet or blue green.

Test for Saponins:

About 0.5 gm of methanol extract was taken in a test tube and 5 ml distilled water was added to it. The solution was shaken vigorously and observed for persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Test for Flavonoids:

About 0.5 gm of extract was introduced into 10 ml of ethyl acetate in a test tube and heated in boiling water for 1 min. The mixture was then filtered. About 4 ml of the filtrate was shaken with 1 ml 1% aluminium chloride solution and incubated for 10 min. Formation of yellow colour in the presence of 1 ml dilute ammonia solution indicated the presence of flavonoids.

Test for Phenols:

About 0.5 gm of extract was taken in a test tube, mixed with 100ml distilled water and heated gently. To this, 2 ml of ferric chloride solution was added and observed for the formation of green or blue colour.





Roots



Plant



Pods with seeds

Results And Discussion

Morphological Description of *Clitoria ternatae*

Leaves 2.5–5 cm, pinnately 5- to 7-foliolate, usually 5-foliolate; stipules small, linear, 2–5 mm; petiole 1.5–3 cm; stipels small, bristlelike; petiolules 1–2 mm; leaflets broadly elliptic or almost ovate, 2.5–5 x 1.5–3.5 cm, thinly papery or almost membranous, adpressed shortly villous or sometimes glabrous on both surfaces, lateral veins 4 or 5 pairs, base obtuse, apex obtuse, slightly emarginate, usually with mucro. Flowers large, solitary in axil; bracteoles green, small, suborbicular or obovate, membranous, with obvious reticulate veins. Calyx membranous, 1.5–2 cm, 5-lobed; lobes lanceolate, less than 1/2 of tube, apex acuminate. Corolla sky blue, pink, or white, to 5.5 cm; standard faintly white or orange in middle, broadly obovate, ca. 3 cm, base shortly clawed; wings and keels much shorter than standard, both clawed; wings obovate-oblong; keels elliptic. Ovary villous. Legume brown, linear-oblong, 5–11 x 0.7–1 cm, compressed, with long beak. Seeds 6–10, black, oblong, ca. 0.6 x 0.4 cm, with obvious strophiole.

Qualitative analysis of the plant extracts of *Clitoria ternatea* for the presence of phytochemicals.

		Plant Part used				
Sr.No.	**Phytochemicals**	**Leaf**	**Root**	**shoot**	**flowers**	**Seeds**
1	**Alkaloids**	-	-	+	+	+
2	**Tannins**	+	-	+	+	+
3	**Glycosides**	+	-	+	+	+
4	**Resins**	+	-	+	+	+
5	**Steroids**	+	-	-	-	-
6	**Saponins**	-	+	-	-	-
7	**Flavonoids**	-	+	+	+	+
8	**Phenols**	-	+	-	-	-

Phytochemical screening of medicinal plants is very important in identifying new sources of therapeutical and industrial importance (Salhan *et al*. 2011). The present study contributes valuable information of bioactive compounds present in Clitoria ternatea. Qualitative analysis of plant extract was carried out for Alkaloids, Tannins, Glycosides, Resins, Steroids, Saponins, Flavonoids and Phenols. Furthe r, some pl ant extracts we r e quantitatively analyzed for Saponins, Flavonoids and Phenols. Alkaloids are produced by large variety of organisms including bacteria, fungi, plants and animals and some alkaloids have a bitter taste while many are toxic to other organisms (Gupta *et al*. 2010). In the present study, alkaloids are present in shoot, flower and seed extracts, which agrees with Uma (2009) and Chauhan *et al*. (2012) and absent in leaves and shoot extracts (Rao and Savitramma 2011). Tannins and Resins reported in the present study in shoots, leaves, flowers and seeds agrees with the findings of Rao and Savitramma (2011), Uma (2009), Manalisha and Chandra (2011).

Presently, Steroids were present in leaf which confirms the report of Kamilla *et al*. (2009)

and absent in shoot, flower and seed extracts which also confirms the report of Kamilla *et al*. (2009). Saponins were reported in the root of C. ternatea presently which agrees with Manalisha and Chandra (2011). Saponins were presently absent in shoot and seed extracts which agrees with Kamilla *et al* (2009).

Conclusion

It is concluded that *Clitoria ternatea* is a plant with a variety of ethnic medicinal uses. The qualitative analysis of *Clitoria ternatea* shows the presence of bioactive compounds such as Alkaloids, Tannins, Glycosides, Resins, Steroids, Saponins, Flavonoids and Phenols. The quantitative estimation of total Saponins, Flavonoids and Phenols in roots and of Flavonoids in shoots, flowers and seeds is also reported which is very important for the pharmaceutical industry. This is valuable information for preparation of drugs in pharmaceutical industry and stress the need for more intensive research in this medicinal plant since the compounds play a great role in healthcare.

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