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Qualitative analysis of *Clitoria ternatea* Linn. (*Aparajita*) flower of family Fabaceae

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Abstract

The present paper deals with phytochemical studies in *Clitoria ternatea* Linn. Phytochemical analysis was used to test the plant extracts for therapeutic substances. Valuable data has been collected about the presence of various phytochemicals like Tannins, Alkaloids, Phenols Glycosides, Saponins and Steroids and Flavonoids. A large number of persons in the world use medicinal plants and herbs for health purposes. Therefore, scientific scrutiny of their biological properties, therapeutic potential and safety will be helpful in making wise decisions about their use. There are thousands of biologically active compounds and effective drugs developed from traditional medicinal plants. The plant showed a wide range of pharmacological activities, including antioxidant, antimicrobial, hypolipidemic anticancer, cardiovascular, antipyretic central nervous, respiratory, immunological. Therefore, this paper aims to present an overview of pharmacognostical, traditional, phytochemical investigations carried out on the flower of *Clitoria ternatea* Linn.

Clitoria ternatea Linn. is an attractive perennial climber with conspicuous white or blue flowers. It belongs to the family Fabaceae and is commonly known as "*Shankhapushpi. Aparajta*" and "butterfly pea" is traditionally used to treat various ailments[8]. The colour of the flowers, which are a vibrant deep blue and solitary with faint golden lines, is the most striking element of this plant. They are around 3 cm in length and 2 cm in width. Some varieties yield white flowers. The fruits are 6 cm long, flat pods with seven to ten seeds in each pod[6]. They are edible when tender. It is grown as an ornamental plant and revegetation species, requiring little care when cultivated[1]. Being a leguminous plant, its roots form a symbiotic association with soil bacteria known as *Rhizobium*, which fixes atmospheric Nitrogen into a plant-usable form which is called nitrogen-fixing. Therefore, this plant is also used to improve soil quality through the decomposition of nitrogen-rich plant material[3]. Plants could be

a good source of antioxidants. Natural antioxidants are secondary metabolites of plants such as phenolic acids, flavonoids, carotenoids, tannins, flavones glycosides and tocopherol[2].

Medicinal plants have been used from time immemorial in daily life to treat diseases all over the world. In herbal medicines, one or more active ingredients are derived from the non-aerial and aerial parts or resins, juices and oils of the plant either in a crude state or as a pharmaceutical formulation[4]. The Ayurveda medicinal system is an antipyretic, brain tonic, antidiabetic, anti-inflammatory, antiproliferative, antioncogenic effect, and cure infertility[11]. Leaves root, stem and flower of both varieties, blue and white, have been used for medicinal purposes from ancient times. The Ayurvedic pharmaceutical system has antipyretic, brain tonic, antidiabetic, anti-inflammatory, antiproliferative, antinocogenic, and infertility-curing properties. Significant phytoconstituents of pentacyclic triterpenoids as taraxerone and taraxerol can be found in *Clitoria ternatea* L. [7]. In plants, a naturally occurring large group of phytochemicals, namely flavonoids and another group of phenolic compounds, are rich in *Clitoria ternatea* Linn.[10] and also contains very effective antioxidant, antibacterial and pesticide activity[5]. *Clitoria ternatea,* with its vast spectrum of antioxidants and ease of cultivation, can be a valuable source of natural antioxidants or phytochemicals.

Clitoria ternatea Linn. flowers were extracted by using cold maceration method.[9] Here different solvents like petroleum ether, methanol and ethyl acetate were used. Detailed phytochemical testing was performed to identify the presence or absence of different phytoconstituents.

1. Test for Triterpenoids and Steroids:

i. Libermann-Burchard's Test:

The extract was treated with chloroform. To this solution, a few drops of acetic anhydride were added, boiled and cooled. Concentrated sulphuric acid was added through the sides of the test tube-formation of the brown ring at the junction of two layers.
If the upper layer turns green, it shows the presence of steroids.
And the formation of deep red colour shows the presence of triterpenoids.

2. Test for Flavonoids:

i. Shinoda test:

To the extract, 5 ml (95%) of ethanol was added. The mixture was treated with a few fragments of magnesium turning, followed by drop-wise addition of concentrated hydrochloric acid—formation of pink colour shows the presence of flavonoids.

ii. Lead Acetate Test:

The extract was treated with a few drops of lead acetate solution. The formation of yellow precipitate may show the presence of flavonoids.

3. Test for Tannin and Phenolic compounds:

i. Dilute Iodine solution test:

To 2 ml of extract, a few drops of dilute iodine solution were added—formation of transient red colour shows the presence of phenolic compounds.

ii. Ferric Chloride Test:

Some amount of extract was dissolved

in distilled water. To this solution, 3 ml of 5% ferric chloride solution was added. The formation of blue, green, or violet colour shows the presence of phenolic compounds.

4. *Test for Alkaloids :*

To the extract, dilute hydrochloric acid was added, shaken well and filtered. With the filtrate, the following tests were performed.

i. Hager's Test :

To 3 ml of filtrate, a few drops of Hager's reagent were added in a test tube. The formation of a yellow colour precipitate shows the presence of alkaloids.

ii. Wagner's Test :

To 3 ml of filtrate, a few drops of Wagner's reagent were added in a test tube. The formation of a reddish-brown precipitate shows the presence of alkaloids.

5. *Test for Glycosides:*

i. Keller-Killiani Test:

To 4 ml of test solution, 4 ml of glacial acetic acid and one drop of 5% ferric chloride were added in a test tube. One ml of concentrated sulphuric acid was added by the side of the test tube. The formation of blue colour in the acetic acid layer shows the presence of Cardiac glycosides.

ii. Borntrager's Test:

To 1 ml of test solution, dilute sulphuric acid was added, boiled for 10 minutes and filtered. To the cold filtrate, an equal volume of benzene or chloroform was added and shake it was shaken well. The organic solvent layer was separated and ammonia was added to it. The formation of pink to red colour in the ammonical layer shows the presence of anthraquinone glycosides.

6. *Test for Saponins :*

i. Froth Test:

The extract was diluted with distilled water and shaken in a graduated cylinder for 10 minutes. The formation of a layer of foam shows the presence of saponins.

7. *Test for Carbohydrates and Reducing sugar:*

i. Fehling's Test :

3 ml of aqueous extract, 3 ml of Fehling's A and 3 ml of Fehling's B solutions were added to a test tube and heated in the water bath for 15 minutes. The formation of a red precipitate shows the presence of reducing sugar.

ii. Barfoed's Test :

One ml of extract and 1 ml of Barfoed's reagent were mixed in a test tube and heated on a water bath for 2 minutes. Red colour due to the formation of cupric oxide shows the presence of monosaccharides.

8. *Test for Protein and Amino acids:*

i. Million's Test:

3 ml of extract was mixed with 5 ml of Million's reagent. A white precipitate formed, which on heating turned to brick red, shows the presence of proteins.

ii. Ninhydrin Test:

3 ml of the test solution was heated with 3 drops of 5% Ninhydrin solution in a water bath for 15 minutes. The formation of blue colour shows the presence of amino acids.

Table-1. Qualitative phytochemical analysis *Clitoria ternatea* L. flower extract

S.No.	Experiment	Result		
		Pet. Ether Extract	Ethyl Acetate Extract	Methanol Extract
1. Test for Triterpenoids and Steroids				
i.	Libermann-Burchard's Test	-	-	+
2. Test for Flavonoids				
i.	Shinoda Test	-	+	+
ii.	Lead Acetate Test	-	+	+
3. Test for Tannins and Phenolic Compounds				
i.	Dilute Iodine Solution Test	-	-	+
ii.	$FeCl_3$ Test	-	+	+
4. Test for Alkaloids				
i.	Hager's Test	-	-	-
ii.	Wagner's Test	-	-	-
5. Test for Glycosides				
i.	Keller Killani Test	-	-	+
ii.	Borntrager's Test	-	-	+
6. Test for Saponins				
i.	Froth Test	+	-	-
7. Test for Carbohydrates and reduce sugar				
i.	Fehling's Test	-	-	+
ii.	Bareford's Test	-	-	+
8. Test for Protein and Amino acids				
i.	Million's Test	-	-	-
ii.	Ninhydrin Test	-	-	-

+ shows the presence of that phytoconstituent
-shows the absence of that phytoconstituent

Qualitative Phytochemical Analysis of *Clitoria ternatea* Linn. flower extract was carried out in Results are mentioned in table-1. Results show that :

- In petroleum ether extract, only saponin was present.
- In Ethyl acetate extract Flavonoid, Tanin, Phenolic compounds were present.
- In methanol extract, Triterpenoid, Steroid, Flavonoid, Tanin, Phenolic compound, Glycoside, Carbohydrate, Reducing sugar were found present.

The obtained phytochemical constituent results demonstrate that the methanol extract of *Clitoria ternatea* Linn. flowers can therapeutically be used in the treatment of some diseases. Therefore, further work is necessary to isolate and characterize the active constituents.

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