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Phytochemical Analysis of Medicinal Plant of Korba District: *Clitoria Ternatea*

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ABSTRACT –

Clitoria ternatea, commonly known as butterfly pea, is a traditional medicinal plant widely recognized for its diverse therapeutic properties. This plant has shown promising potential in regulating blood sugar levels, making it beneficial for diabetic individuals. It also plays a role in weight management by inhibiting lipid metabolism and enhancing energy expenditure. Traditionally used in Ayurvedic medicine, *Clitoria ternatea* aids in digestive health, alleviating issues such as indigestion and constipation. The anthocyanins present in its flowers support eye health by improving blood circulation and may enhance night vision. Furthermore, the plant is known for its nootropic effects, enhancing memory, cognitive function, and potentially preventing cognitive decline. Its adaptogenic nature helps the body manage stress, while its antioxidant and anti-inflammatory compounds contribute to improved skin and hair health by protecting against oxidative damage. These multifaceted benefits make *Clitoria ternatea* a valuable resource in both traditional and modern herbal medicine.

Keywords - *Clitoria ternatea*, butterfly pea, blood sugar regulation, weight loss, digestive health

Introduction –

Phytochemicals are naturally occurring compounds found in plants, and they have gained significant attention in recent times due to their diverse medicinal properties. These compounds play a crucial role in combating various ailments such as asthma and snake bites. *Clitoria ternatea*, commonly known as "Shankpushpi" in Sanskrit, is traditionally recognized as a powerful "Medhya" or brain tonic. The plant has been used in the treatment of insect bites, skin disorders, asthma, burning sensations, ascites, inflammation, leucoderma, leprosy, hemicrania, amentia, and pulmonary tuberculosis. It is rich in bioactive constituents, including pentacyclic triterpenoids like taraxerol and taraxerone, along with ternatins, alkaloids, flavonoids, saponins, tannins, carbohydrates, proteins, resins, and starch. Studies have demonstrated its potential antioxidant, antidiabetic, and hepatoprotective effects.*Clitoria ternatea*, commonly known as butterfly pea, has been used since ancient times with its roots, seeds, and leaves being the primary parts utilized. The plant is rich in phytoconstituents notably pentacyclic triterpenoids such as taraxerol and taraxerone. Phytochemical screening of the roots reveals the presence of compounds like ternatins, alkaloids, flavonoids, saponins, tannins, carbohydrates, proteins, resins, starch, and various secondary metabolites including triterpenoids, glycosides, anthocyanins, and steroids. A simple, sensitive, and precise HPTLC method has been developed for taraxerol detection in the plant. Additionally, four kaempferol glycosides have been isolated from the leaves, with kaempferol-3-glucoside, kaempferol-3-rutinoside, and kaempferol-3-neohesperidoside identified through UV, NMR, and MS analyses. The fourth, characterized as kaempferol-3-O-rhamnosyl glucoside ($C_{33}H_{40}O_{19}$, MP: 198°C), was named *Clitoris*.

It is believed to help regulate blood sugar levels, making it potentially beneficial for individuals with diabetes. Some studies suggest it may aid in weight management by inhibiting lipid metabolism and promoting calorie burning. Traditionally used in Ayurveda, it supports digestive health by relieving issues such as indigestion and constipation. The anthocyanins present in its flowers are thought to improve blood circulation to the eyes and may enhance night vision. Known as a natural brain tonic, *Clitoria ternatea* is believed to improve memory, cognitive function, and may even help prevent or treat cognitive deficits. Additionally, it is regarded as an adaptogen, helping the body cope with stress while also reducing anxiety and symptoms of depression. Its nootropic properties support mental clarity and overall brain health. Furthermore, its high antioxidant and anti-inflammatory content may protect the skin from free radical damage, potentially improving skin elasticity and reducing the appearance of wrinkles, contributing to overall skin and hair health.

Figure no.01 *Clitoria ternatea* Flowers and leaves

Methodology

First, *Clitoria ternatea* (Berk) samples were collected, thoroughly washed, air-dried, and then ground into a coarse powder. This powder was macerated in 70% ethanol for seven days. After maceration, the mixture was filtered, and the filtrate was concentrated using a rotary evaporator at 50°C to obtain a viscous extract. This extract was then subjected to phytochemical screening to detect the presence of various compounds.

Phytochemical screening

Test for Steroids: 2 mL of concentrated sulphuric acid was carefully added along the test tube's side after 1 mL of the extract had been dissolved in 3 mL of chloroform. The presence of steroids was revealed by the emergence of a red colour.

Test for Glycosides - To check for glycosides, add 1 millilitre of water and a few drops of sodium hydroxide (NaOH) to 1 millilitre of the extract. The presence of glycosides was verified by the development of a yellow tint.

Test for Terpenoids - Terpenoids were tested by mixing 0.5 mL of the extract with 2 mL of chloroform and then adding 3 mL of sulphuric acid concentration. Terpenoids were present because a reddish-brown contact formed.

Test for Alkaloids - To test for alkaloids, 0.2 mL of diluted hydrochloric acid, 1 mL of Mayer's reagent, and 2 mL of the extract were combined. The presence of alkaloids was indicated by a yellowish precipitate or colouration.

Test for Flavonoids - To check for flavonoids, the extract was mixed with a few drops (1–5) of strong hydrochloric acid. Flavonoids were proven to be present when a red colour developed.

Test for Tannin - 5 mL of the extract was mixed with 2 mL of 5% ferric chloride ($FeCl_3$) solution. The formation of a greenish-black precipitate indicated the presence of tannins.

Test for Phenols - To the extract, 1 mL of water and 1–2 drops of $FeCl_3$ were added. The appearance of blue, green, red, or purple coloration confirmed the presence of phenolic compounds.

Test for Anthocyanins- 2 mL of the plant extract was mixed with 2 mL of hydrochloric acid and ammonium solution. A color change from green to blue-violet indicated the presence of anthocyanins.

Test for Saponins - 1 mL of the extract was diluted with 20 mL of distilled water and shaken vigorously for 15 minutes. The formation of a stable 1 cm froth layer confirmed the presence of saponins.

Test for Phenolics - 2 mL of the extract was treated with neutral ferric chloride solution. The development of a black color indicated the presence of phenolic compounds.

Test for Phytosteroids - 5 mL of the extract was mixed with 2 mL of chloroform and 2 mL of concentrated sulfuric acid. The appearance of a pink or red color indicated the presence of phytosteroids.

Result and discussion

Several common tests were used for phytochemical screening of the Clitoria ternatea extract in order to detect the presence of bioactive chemicals. The following table provides a summary of the observations and conclusions. Test results for steroids, glycosides, alkaloids, tannins, phenols, and phenolic compounds showed that the extract contained these substances. The absence of terpenoids, flavonoids, anthocyanins, saponins, and phytosteroids in the analysed sample was shown by their negative test results. Clitoria ternatea's phytochemical investigation showed a wide range of secondary metabolites with possible therapeutic uses. The red colouring, which indicates a significant positive result for steroids, points to the existence of physiologically active substances that could support hormonal or anti-inflammatory effects.

There were also tannins, alkaloids, and glycosides. While tannins are linked to astringent and antioxidant qualities, alkaloids are well-known for their pharmacological effects, which include analgesic and antibacterial actions. The plant's antioxidant activity is further supported by the presence of phenols and validation by the neutral ferric chloride test. It's interesting to note that the extract lacked terpenoids, flavonoids, anthocyanins, saponins, and phytosteroids. This could change based on the solvent employed, the extraction period, the plant component, or environmental factors that alter the phytochemical makeup.

Conclusion - The study supports the traditional use of Clitoria ternatea in herbal medicine by confirming that its extract includes important phytochemicals, namely steroids, glycosides, alkaloids, tannins, and phenolic compounds. The lack of other substances, such as terpenoids and flavonoids, in this particular extract, however, points to the necessity of more research employing various extraction techniques or solvents. These results support Clitoria ternatea's therapeutic value and pharmacological application potential.

Table no. 01 Results for secondary metabolites of plant

S. No.	Phytochemical Test	Reagents Used	Observation	Inference
1	**Steroids**	1 mL extract + 3 mL $CHCl_3$ + 2 mL conc. H_2SO_4	Red coloration	Presence of steroids
2	**Glycosides**	1 mL extract + 1 mL water + few drops NaOH	Yellow coloration	Presence of glycosides
3	**Terpenoids**	0.5 mL extract + 2 mL $CHCl_3$ + 3 mL conc. H_2SO_4	Reddish-brown interface	Absence of terpenoids
4	**Alkaloids**	2 mL extract + 0.2 mL dil. HCl + 1 mL Mayer's reagent	Yellow precipitate	Presence of alkaloids
5	**Flavonoids**	Extract + 1–5 drops conc. HCl	Red coloration	Absence of flavonoids
6	**Tannins**	5 mL extract + 2 mL 5% $FeCl_3$	Greenish-black precipitate	Presence of tannins
7	**Phenols**	Extract + 1 mL water + 1–2 drops $FeCl_3$	Blue, green, red, or purple coloration	Presence of phenols
8	**Anthocyanins**	2 mL extract + 2 mL HCl + ammonium solution	Green to blue-violet color change	Absence of anthocyanins
9	**Saponins**	1 mL extract + 20 mL distilled water (shaken 15 min)	1 cm stable froth layer	Absence of saponins
10	**Phenolics (Confirmatory)**	2 mL extract + neutral $FeCl_3$	Black coloration	Presence of phenolic compounds
11	**Phytosteroids**	5 mL extract + 2 mL $CHCl_3$ + 2 mL conc. H_2SO_4	Pink or red coloration	Absence of phytosteroids

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