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Review Article

Pharmacognostic Standardization of *Clitoria ternatea*

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ABSTRACT

Clitoria ternatea, commonly known as butterfly pea, is a medicinal plant predominantly found in Asian countries and other tropical regions. It is rich in phytoconstituents, making it a valuable component in various traditional medicinal systems. Clitoria ternatea contains numerous bioactive compounds, including tannins, phlobatannins, saponins, triterpenoids, phenols, flavonoids, flavonol glycosides, proteins, alkaloids, anthraquinones, anthocyanins, cardiac glycosides, volatile oils, and steroids. This review article discusses the wide range of pharmacological activities exhibited by Clitoria ternatea, such as antioxidant, antimicrobial, anticancer, antianxiety, anticonvulsant, antidepressant, antipyretic, local anesthetic, anti-inflammatory, and nootropic effects, among others. It also highlights the physicochemical characteristics of the plant and its various physiological applications.

INTRODUCTION

A growing number of individuals worldwide are turning to medicinal plants and herbal therapies for health and well-being. This underscores the importance of rigorous scientific evaluation of these traditional remedies in terms of therapeutic efficacy, biological mechanisms, and safety profiles to guide their appropriate use ScienceDirect. Historically, numerous significant drugs and bioactive compounds have been derived from medicinal plants, offering a broad spectrum of pharmacological actions—including antimicrobial, antioxidant, anticancer, hypolipidemic, cardioprotective, neuroprotective, respiratory, immunomodulatory, anti-inflammatory, analgesic, antipyretic, and more IJamJournal of Medula.

Figure 1: Flower

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Clitoria ternatea L., also known as butterfly pea, Aparajita, or Shankhpushpi, is a climber in the Fabaceae family with traditional applications across various medicinal systems European Journal of Medicinal PlantsCardiovascular Disease Research Journal. Preliminary phytochemical screenings reveal that C. ternatea contains a rich array of bioactive compounds such as tannins, phlobatannins, carbohydrates, saponins, triterpenoids, phenols, flavonoids, flavonol glycosides, proteins, alkaloids, anthraquinones, anthocyanins, cardiac glycosides, volatile oils, steroids, and specific molecules like Stigmast-4-ene-3,6-dione CiteFactorJournal of MedulaEuropean Journal of Medicinal PlantsIJPSR.

Figure 2 – Stems and Roots

Extensive pharmacological investigations have demonstrated that C. ternatea exhibits a wide spectrum of beneficial effects—among them antioxidant, hypolipidemic, anticancer, anti-inflammatory, analgesic, antipyretic, antidiabetic, central nervous system (CNS) modulatory, antimicrobial, gastrointestinal antiparasitic, and insecticidal activities Journal of Medula Cite Factor IJPSR European Journal of Medicinal Plants.

This review aims to comprehensively highlight the chemical constituents and pharmacological potentials of *Clitoria ternatea* through systematic analysis of recent scientific literature.

Key Highlights & Citations

Global relevance of medicinal plants: Approximately 80% of the world's population relies on plant-based products for health, emphasizing the need for safety assessments as nearly 150,000 plant species contain potentially toxic compounds.

Diversity of pharmacological activities: Traditional medicinal plants have yielded a wide array of drugs; the diverse activities attributed to C. ternatea echo this potential.

Rich phytochemical profile: Detailed compound classes such as triterpenoids, flavonol glycosides, anthocyanins (like ternatins), cyclotides, alkaloids, and steroids are well- Documented in multiple recent reviews.

Demonstrated pharmacological effects: Scientific literature consistently supports a multitude of therapeutic actions—ranging from antioxidant to insecticidal activities.

Clitoria ternatea

Clitoria ternatea L. is a perennial climber in the Fabaceae family, commonly referred to as butterfly pea, blue pea, Asian pigeonwings, or bluebell vine . Its name "Clitoria" is derived from the flower's resemblance to the human anatomy, while "ternatea" refers to Ternate Island in Indonesia, where Linnaeus first described it .

Synonyms

Synonyms include Clitoria albiflora, Clitoria bracteata, Clitoria mearnsii, Clitoria tanganicensis, and Clitoria zanzibarensis

Vernacular Names

- Sanskrit: Aparajita, Girikarnika, Shankapushpi, Vishnukranta, and others
- English: butterfly pea, blue pea vine
- Other regional names : Tamil, Hindi, Gujarati, Marathi Vernacular names Vary
- Commonly " Gokurna" in Marathi.

Morphological Features

- **Growth Form:** A twining, slender vine/climber reaching 0.5–3 m long.
- **Leaves:** Pinnate with typically 5–7 elliptic to lanceolate leaflets, 2.5–5 cm long.
- **Flowers:** Solitary and large—approximately 4–5 cm long—usually blue, sometimes white or pink, with a papilionaceous structure.
- **Pods & Seeds:** Linear-oblong, somewhat pubescent pods measuring 6–12 cm containing 6– 10 seeds; seeds are 4.5–7 mm long, often mottled, olive to dark brown or black.
- **Roots:** Possess deep root systems and nodules for nitrogen fixation, aiding in soil Enhancement.

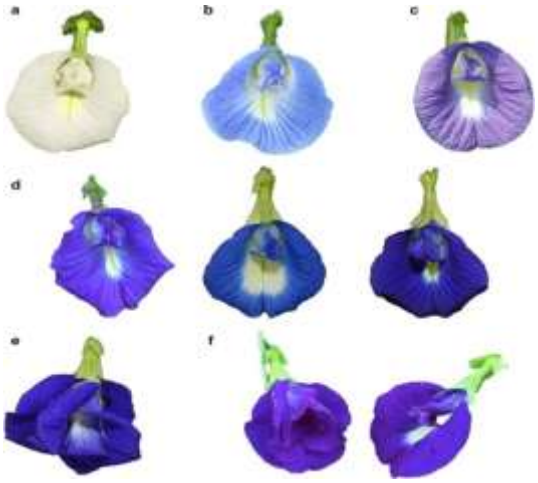

Figure 3 – Different Petal colors of flower

Table 1: MOA of Pharmacological Action

Sr. No.	Property	MOA (Mechanism of Action)
1a	**CNS Effect (Neurological Disorders)**	CT extract increases acetylcholine (ACh) levels in the brain (particularly midbrain and cerebral cortex), but decreases activity in the medulla oblongata. Root extract increases acetylcholinesterase (AChE) activity in the cerebral cortex, suggesting cholinergic modulation of neuronal signaling.
1b	**Seizures**	Methanolic extract of leaves and flowers shows anticonvulsant activity, reducing seizure-induced limb extension. Likely due to GABAergic enhancement or suppression of excitatory neurotransmission.
1c	**Depression**	Ethanolic root extract contains 23-9,1.7- octadecadienal and n-hexadecanoic acid, which act as MAO-A inhibitors → leading to increased serotonin, dopamine, and norepinephrine levels → antidepressant effect.
1d	**Anxiety**	Methanolic extract increases exploratory behavior (dark/light box test), suggesting anxiolytic activity possibly via GABAergic potentiation or serotonergic modulation.
2	**Anti-Ulcer**	Methanolic extract decreases ulcer index in rats. Anti-stress property likely through reduction of gastric acid secretion and oxidative stress, providing mucosal protection.
3	**Anti-Diabetic**	Ethanolic leaf extract reduces blood glucose levels after 28 days of oral administration. Possible mechanisms: ↑ insulin secretion, ↑ glucose utilization, or inhibition of carbohydrate-digesting enzymes

Phytoconstituents of *Clitoria ternatea* (Butterfly Pea)

- **Biomass Yield**

Produces up to 30 tons of dry matter per hectare per year under favorable conditions.

- **Mineral Content**

Rich source of calcium, making it suitable for formulation of herbal calcium- rich drinks.

- **Proteins**
  Contains antifungal proteins, which contribute to its antimicrobial activity

Other Reported Constituents (from literature)

- **Flavonoids** (e.g., quercetin, kaempferol, rutin) → antioxidant, anti- inflammatory
- **Anthocyanins** (ternatins – responsible for the blue color) → antioxidant, neuroprotective.
- **Triterpenoids & Saponins** → adaptogenic, anti-diabetic.
- **Alkaloids & Tannins** → antimicrobial, anti-stress.

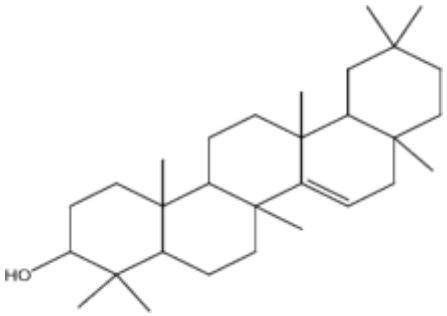

Figure 4: Structure of Taraxerol

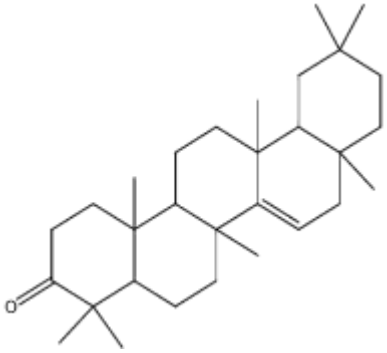

Figure 5 : Structure of Taraxerone

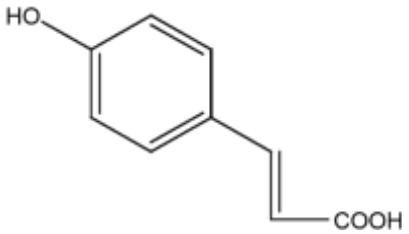

Figure 6 : Structure of p-Hydroxycinnamic acid.

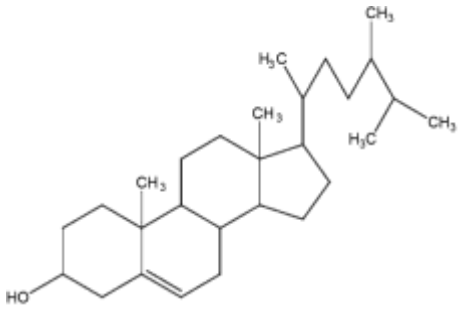

Figure 7 : Structure of β- sitosterol

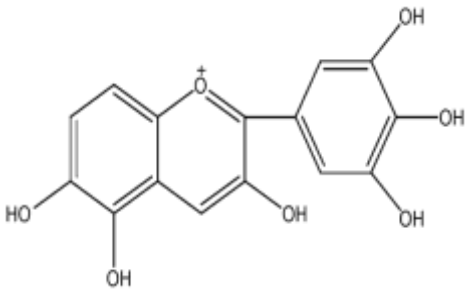

Figure 8 : Structure of Delphinidin

Pharmacological properties

Anthelmintic Activity:

Anthelmintic activity was found in ethanolic and aqueous extract of C. ternatea leaves at the dose of 100 mg/ml. This was performed at three different concentrations (100, 50, 25 mg/ml) of ethanolic and aqueous extracts respectively by using Eisenia foetida. The study was focused at the in-vitro comparative study of aqueous and ethanolic extracts of leaves of C. ternatea for anthelmintic activity. Thus, the study involved in the determination of time of paralysis (P) and time of death (D) of the worms. While determination for both extracts, the time of paralysis and death time of aqueous extract was observed as 18 ± 1.57 and 53.33 ± 0.33 and in case of ethanolic extracts 12.33 ± 0.80 and 32.33 ± 0.71 respectively. At last, the anthelmintic activity of ethanolic extract of C. ternatea was found more potent than aqueous extract of C.

Antihistaminic Activity:

Antihistaminic activity was found in the ethanolic extract of C. ternatea roots in dose dependent manner. Evaluation for antihistaminic activity was done using clonidine and haloperidol induced catalepsy in mice for Ethanol Extract of C. ternatea Root (ECTR) at doses 100, 125 and 150 mg/kg IP. Dose dependent catalepsy was induced in mice by Clonidine, a α2 adrenoreceptor agonist which was inhibited by histamine H1 receptor antagonists but not by H2 receptor antagonist. Clonidine, which is responsible for the release of histamine from mast cells, is responsible for different asthmatic conditions.

A non-selective D2 dopamine antagonist (Haloperidol) induces catalepsy is primarily due to blockade of dopamine receptors in the straiatum. The agents responsible for increase in dopamine transmission inhibit haloperidol-induced catalepsy. Findings showed that ethanol Extract of C. ternatea Root (ECTR) and Chlorpheniramine Maleate (CPM) inhibit clonidine induced catalepsy significantly $P < 0.001$ when compare to control group, while 12 ECTR and CPM fail to inhibit haloperidol induced catalepsy. So it is concluded that the agents increasing dopamine transmission inhibits haloperidol-induced catalepsy and the present study shows ECTR possesses antihistaminic activity.

Antimicrobial Activity:

The antimicrobial screening was evaluated against Extended Spectrum Beta Lactamase (ESBL) producing Salmonella enteritidis, Salmonella typhimurium, Klesiella pneumonia, Enteropathogenic E.coli, Uro-pathogenic E.coli, and Pseudomonas aureginosa isolated from patients with urinary tract infection and acute gastroenteritis.

Disc diffusion method was used to test the above-mentioned extracts for their activity. Water, methanol and chloroform extracts of C. ternatea owers was exhibited activity against uropathogenic E.coli, Enteropathogenic E.coli, Enterotoxigenic E.coli, Salmonella typhimurium, Klesiella pneumoniae and Pseudomonas aureginosa. Methanol extract of C. ternatea exhibits comparatively high activity as compared with chloroform and aqueous extracts. The inhibitory zone produced by water, methanol and chloroform extracts at a concentration of 4 mg/disc was found 12 mm, 16 to 26 mm and 14 mm to 18 mm respectively while petroleum ether and hexane extracts did not exhibit any activity .

Cytotoxic Activity:

The crude methanol extract of stem-bark, leaves and seeds of C. ternatea demonstrated a significant cytotoxic activity in a brine shrimp lethality bioassay test. The LC50 values of the crude methanol extract of stem-bark, leaves and seeds were found to be 179.89, 25.82, 110.92 µgm/ml) respectively. Among them crude methanol extract of leaves (25.82 µgm/ml) and methanol fraction of leaves (22.28 µgm/ml) showed a very promising cytotoxic activity.

Central cholinergic activity in rats:

Researcher has reported the alcoholic extract of roots of C. ternatea on spatial memory retention and associated changes in Acetylcholine (ACh) and Acetylcholinesterase (AChE) activity in the brain after electroshock or scopolamine induced amnesia. The preselected trained rats were administered with either alcoholic extract of C. ternatea or standard Shankhapushpi syrup for 10 days once a day.

The animals of respective groups were subjected to electroshock or scopolamine treatment followed by radial arm maze task performance1 h after the last dose. Thereafter, the brain was immediately

isolated and ACh as well as AChE levels were estimated. Study shows significant memory retention against scopolamine and electroshock induced amnesia in root extract treated rats. The extract was found to be more effective in scopolamine induced amnesia model. This action was found to be associated with significant decrease in AChE activity and increase in ACh content of whole brain in different regions of the brain compared to respective controls qualitatively.

Hypoglycemic Effect:

The effect of orally administered aqueous extracts (400 mg/kg body weight) of C. ternatea leaves and owers were examined in control and test group of rats on insulin, glycosylated hemoglobin and serum glucose. The aqueous extracts of C. ternatea leaves and owers significantly (P<0.05) increased the liver and skeletal muscle glycogen, the activity of the glycolytic enzyme and glucokinase serum insulin but able to reduce the serum glucose, glycosylated hemoglobin and the activities of gluconeogenic enzyme, glucose-6- phosphatase. After all the biochemical tests, the group of leaf extract- treated rats indicated essentially the same pro le as those treated with the group of ower extract. Previously, the leaves and owers of C. ternatea have been reported for antidiabetic property; hence current study is an attempt to evaluate the antidiabetic potential in seeds of C. ternatea. Methods: Preliminary phytochemical investigations of Ethanol extract of seeds of C. ternatea Linn. was done. The seed extracts were screened for hypoglycaemic activity in Streptozotocin induced diabetic rats (60 mg/kg, i.p.) at two dose levels like 200 mg and 400 mg/kg body weight. Results: Presence of various phytoconstituents in ethanolic extract viz. alkaloids, glycosides, saponins, tannins, phenolic compounds, carbohydrates, proteins, sterols, and avonoids. The ethanol extract at 400 mg/kg.b.wt dose showed significant decreased blood glucose ($p < 0.001$), cholesterol ($p < 0.05$), alkaline phosphatase ($p < 0.001$), aspartate amino transferase ($p < 0.001$) and alanine amino transferase ($p < 0.001$), when compared to diabetic control. Further study is required to isolate active phytoconstituents from ethanolic extract of seeds of C. ternatea Linn.

Neurogenic Potential:

In Indian Ayurvedic system of medicine, extracts derived from C ternatea Linn have been used as an ingredient of “Medhya rasayana”, intentionally used for improving memory and longevity in humans and also in treatment of various neurological conditions. Our earlier experimental studies with oral intubation of C. ternatea aqueous root extract had shown significant increase in learning and memory of postnatal and young adult Wistar rats. In the present study we were designed to elucidate the in vitro effects of 200 mg/ml of C. ternatea aqueous root extract on proliferation, differentiation and growth of anterior sub ventricular zone neural stem cells derived from prenatal and postnatal rat pups.

Results shown significant increase in proliferation and increase in the yield of differentiated neurons of a SVZ neural precursor cells at 7 days in vitro and growth of neurospheres when treated with 200 ng/ml of C. ternatea aqueous root extract as compared to age matched control. Results indicate that CTR has growth promoting neurogenic effect on a SVZ neural stem cells and their survival similar to neurotrophic factors like Survivin, Neuregulin 1, FGF-2, BDNF possibly the basis for enhanced learning and memory.

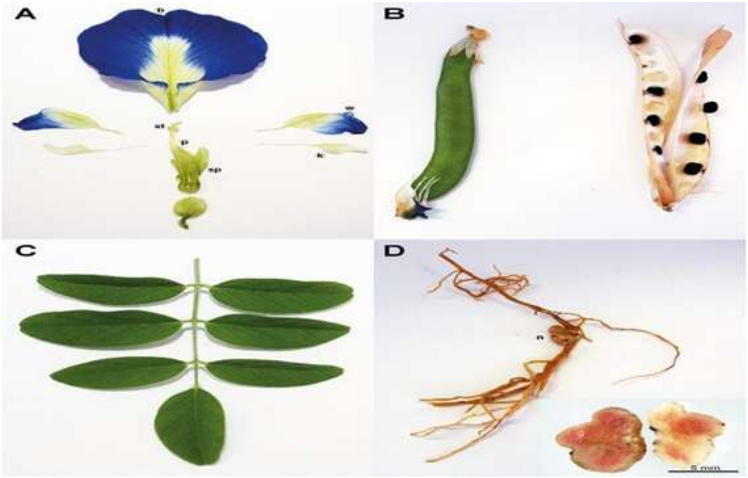

Figure 8: All Parts of *Clitoria ternatea*

Proteolytic activities:

The activities of endopeptidases (pH of hemoglobin is 3.5 and pH of azocasein is 6.0), carboxypeptidase (pH of CBZ-Phe-Ala is 5.2), and arylamidases (pH of LPA is 7.0 and pH of BAPA is 7.6) were assayed in extracts of cotyledons and axis of resting and germinating seeds of C. ternatea L. All the activities were low in resting seeds but the endopeptidases at pH 3.5 and the arylamidase at 7.0 were high in cotyledons. The activities of endopeptidases showed an increase at the day 3 followed by a decrease, while the carboxypeptidase and the arylamidases increased in cotyledons reaching a maximum at the day 9. In the axial tissue the endopeptidases and carboxypeptidase activities showed an increase until the day 9 followed by a decrease and the arylamidases were low. The increase of acidic endopeptidase and carboxypeptidase activities in germinating cotyledons has been suggested as an indication of their participation in the degradation of the storage proteins.

Wound Healing Activity:

The effects on wound healing were investigated using excision, incision and dead-space models in rats. Seed and root extracts significantly improved wound healing property when administered orally by gavages as well applied topically as ointment which are comparable to that of cotrimoxazole ointment. The finding of this study suggested that plant possesses effects on all three phases of wound healing: inflammatory, proliferative and remodeling phase.

Larvicidal activity:

Screening of natural products for mosquito larvicidal activity against three major mosquito vectors Aedes aegypti, Anopheles stephensi, and Culex quinquefasciatus resulted in the identification of three potential plants extracts viz., Saraca indica/ asoca, Nyctanthes arbortristis, and C. ternatea for mosquito larval control. In the case of S. indica/asoca, the chloroform extract of the bark and the petroleum ether extract of the leaves were effective against the larvae of C. quinque fasciatus with respective LC50 values 227.9 and 290.5 ppm. The LC50 values of chloroform extract of C. ternatea leaves were 302.2, 517.2, and 422.2 ppm against A. aegypti, A. stephensi, and C. quinquefasciatus, respectively. The methanol and chloroform extracts of owers of C. ternatea showed larvicidal activity against larvae of A. stephensi with the respective LC50 values of 245.4 and 748.7 ppm. Among the methanol extracts of C. ternatea leaves, roots, owers, and seeds, the seed extract was effective against the larvae of all

the three species with LC50 values 66.2, 155.5, and 55.4 ppm, respectively, for A. stephensi, A. aegypti, and C. quinquefasciatus. Among the three plant species studied for mosquito larvicidal activity, C. ternatea was showing the most promising mosquito larvicidal activity .Enhancementof acetylcholine content in rat hippocampus: Significant increase in Acetylcholine (ACh) content in hippocampi as compared to age matched controls after the treatment with 100 mg/kg of C. ternatea aqueous root extract (CTR), for 30 days in neonatal and young adult age groups of rat. Increase in ACh content in their hippocampus may be the neurochemical basis for their improved learning and memory .

Antipyretic activity:

Evaluation of anti-pyretic potential Of Methanolic Extract of C. ternatea L. Root (MECTR) of blue owered variety (Family: Fabaceae) on normal body temperature and yeast-induced pyrexia in albino rats. Increase in rectal temperature was observed after 19 hours of Yeast suspension (10 ml/kg body wt.) subcutaneous injection. The extract produced significant reduction in normal body temperature at doses of 200, 300 and 400 mg/kg body wt., p.o., and yeast-provoked elevated temperature in a dose- dependent manner. The effect extended up to 5 hours after the drug administration. The anti-pyretic effect of the extract was comparable to that of paracetamol (150 mg/kg body wt., p.o.), a standard anti-pyretic agent Effects on growth and morphogenesis of Aspergillus niger: The extract showed a favorable antifungal activity against A. niger with a minimum inhibition concentration 0.9 mg/mL and minimum fungicidal concentration 1.7 mg/mL, respectively. The leaf extract exhibited considerable antifungal activity against lamentous fungi in a dose-dependent manner with 0.5 mg/mL IC50 value on hyphal growth of A. niger. The main changes observed under scanning electron microscopy after C. ternatea extract treatment were loss of cytoplasm in fungal hyphae and the hyphal wall and its diameter became markedly thinner, distorted, and resulted in cell wall disruption. In addition, conidiophore alterations were also observed when A. niger was treated with C. ternatea leaf extract the effect of leaves extracts against the sh pathogens: The extracts of C. ternatea was tested against P. aeruginosa, E. coli, K. pneumonia, B. subtilis, A. formicans, A. hydrophila and S. agalactiae by the agar well diffusion method. Different extracts of C. ternatea showed inhibitory effects against P. aeruginosa, E. coli, K. pneumonia, B. subtilis, A. formicans, A. hydrophila and S. agalactiae. Ethyl acetate extracts of C. ternatea showed maximum of zone of inhibition against A. formicans (19 mm), A. hydrophilia (20 mm), B. subtilis (20 mm) and P. aeruginosa (22 mm) next to that ethanol extract of C. ternatea showed A. formicans (19 mm) and E. coli (15 mm) followed by Acetone extract showed maximum zone of inhibition S. agalactiae (20 mm) and K. pneumonia (19 mm).

Hepatoprotective activity:

The methanol, chloroform, and petrolium ether extracts of roots of blue and white owered varieties of C. ternatea (CT) were found to have hepatoprotective property. This was assessed by evaluating their hepatoprotective potential against Carbon Tetrachloride (CCl4) induced hepatotoxicity in rats. Methanolic extracts ofroots of blue and white owered varieties at dose 250 and 500 mg/kg b. w. were showed significant ($P<0.001$) reduction in the serum TB level. The white flowered variety of CT showed much more reduction in TB level as compared to blue flowered variety of CT [10]. Hepatoprotective activity of C. ternatea seed and root and Vigna

mungo seed against acetaminophen- and carbon tetrachloride-intoxicated rats was investigated. C. ternatea and V. mungo seed extracts significantly ($p<0.05$) decreased SGOT, SGPT, ALP and Total Bilirubin (TB) in both acetaminophen and CCl4 - intoxicated rats. The C. ternatea root extract, showed similar results only in CCl4 - intoxicated rats. These ndings were further supplemented by histopathological studies of liver tissues. Hepatic collagen content as evident from decreased ($p<0.05$) hydroxyproline levels and hepatic mast cell in filtration were significantly decreased in extracts pre-treated animals. In addition, C. ternatea and V. mungo seed extracts significantly ($p<0.05$) reduced hepatic lipid peroxidation as evident from the decreased MDA, increased antioxidant enzymes activities and GSH levels in the liver tissues. The findings of study suggested that C. ternatea and V. mungo possess potent hepatoprotective activity. The hepatoprotective activity of C. ternatea could be attributed to antioxidant properties and prevention of pre-inflammatory changes

Antioxidant activity:

The chemical composition of the flowers of C. ternatea suggest that they may have antioxidant activity, ethanopharmacological evidences shows that the extracts of C. ternatea (butterfly pea) owers are used in Thailand as a component of cosmetics. The aqueous and ethanolic extract of C. ternatea was found to have antioxidant potential. Aqueous extracts were shown to have stronger antioxidant activity than ethanol extracts (IC50 values were 2 mg/mL and 5 mg/mL, respectively). This was assessed by performing DPPH scavenging activity test. The total phenolic content was 2.0 mg/g extract. as gallic acid equivalents. The data from this study support the use of C. ternatea extracts as antioxidant inclusions in cosmetic products.

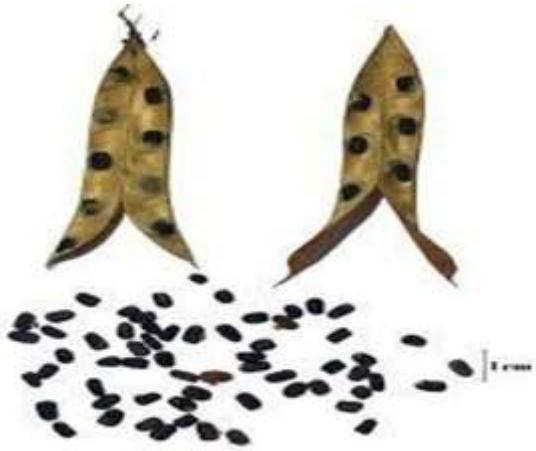

Figure 9: Seeds

In-vitro cytotoxic activity:

This study evaluates the in-vitro cytotoxic effect of petroleum ether and ethanolic flower extracts of C. ternatea Linn by using trypan blue dye exclusion method. Both extracts exhibit significant cell cytotoxic activity. For both the extracts decrease in cell count was observed with increase in concentration of the extract. There was a dose dependent increase in cytotoxic activity for all the concentrations tested [36].

Anti-Inflammatory, Analgesic and Antipyretic Properties:

C. 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 rats. Moreover, the extract exhibited a significant inhibition in yeast-induced pyrexia in rats. In the acetic acid-induced writhing response, the extract markedly reduced the number of writhings at doses of 200 and 400 mg/kg (p.o.) in mice

CONCLUSION AND FUTURE PERSPECTIVES

Nature has been a source of medicinal agents since time immemorial. The plant kingdom harbors an in exhaustible source of active ingredients

invaluable in the management of many intractable diseases. They are well known in traditional herbal medicine for their diseases curing property. Aparajita is one of the herbs mentioned in all ancient scriptures of Ayurveda. C. ternatea belongs to family 'Fabaceae'; is cultivated throughout India. It is a perennial twing herb; steams are terete, more or less pubescent and persistent legume found in India, China, Philippines and Madagascar etc. It is native to tropical Asia and widely distributed thought the world mainly in tropical countries. It is a very common garden ower plant found all over India especially in southern India. Butterfly pea is recognized as being adapted to clay soils. It is reported to be a good "Medhya" (brain tonic) drug and, therefore, mainly used in the treatment of "Masasika" roga (mental illness). In Ayurveda, the roots, seeds and leaves of C. ternatea have long been widely used as a brain tonic and is believed to promote memory and intelligence. C. ternatea has been widely screened for its various pharmacological activities especially well documented for neuropharmacological action. The root and root barks are used in ascathartic, diuretics and has laxative effects.

Juice of roots is used in the treatment of chronic bronchitis. The leaves are useful in otalgia and hepatopathy, whereas seeds are cathartic. The owers and leaves are used to make collyrium, leaves are also used to relieve joint pain in arthritis, and hepatic disorder, the seeds have laxative effects, and are cathartic, and it contains antifungal proteins. C. ternatea plant has the most promising mosquito larvicidal activity. C. ternatea have number of pharmacological activities such as possessing nootropic, anxiolytic, antidepressant, anticonvulsant, sedative, antipyretic, anti-in ammatory and analgesic activities, memory enhancing, acetylcholine content increasing and acetylcholinesterase activity.

Future scope of present investigation is isolate active phytoconstituents which is responsible for various pharmacological activities. The detailed chemical natures and structure of the active principles responsible for its activity are not known. Hence, further studies should be carried out to elucidate the active principles of C. ternatea.

CONCLUSION

Scientific research on *Clitoria ternatea* highlights its significant antioxidant, antidiabetic, and hepatoprotective potential. The plant is a rich source of phytochemicals, particularly phenolic compounds, which contribute to its strong free radical–scavenging and antioxidant activities. Both leaf and flower extracts have demonstrated hypoglycaemic effects by regulating biochemical indices associated with diabetes mellitus.

The hepatoprotective activity of *Clitoria ternatea* is likely attributed to its antioxidant properties, stemming from the presence of bioactive phenolic constituents. These findings support its potential use in managing oxidative stress–related disorders, including liver dysfunction and diabetes.

Future research should focus on elucidating the detailed mechanisms of action, isolating the specific phytochemicals responsible for these activities, and exploring the anti-proliferative and pharmacological applications of *Clitoria ternatea*. The organic and aqueous extracts hold promise as a natural source of therapeutic agents for the pharmaceutical and nutraceutical industries.

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