INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Review On "Clitoria Ternatea'' Of White Veriety

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ARTICLE INFO

Published: 13 Dec. 2024
Keywords:
Clitoria ternatea , Pharmacological Activity, Aparajita, blue ternate, Powder.
DOI:
10.5281/zenodo.14439893

ABSTRACT

Clitoria ternatea L., also known as the butterfly pea, is a plant with a wide range of medicinal properties, particularly in traditional Indian practices. It is known for treating various ailments, including scorpion stings, chronic bronchitis, skin diseases, and ear and eye disorders. The plant's therapeutic potential has led to its use in herbal medicine as a natural remedy for both acute and chronic conditions.A preliminary phytochemical screening of Clitoria ternatea has identified numerous bioactive compounds, including tannins, phlobatannins, carbohydrates, saponins, triterpenoids, phenols, flavonoids, flavonol glycosides, proteins, alkaloids, anthraquinones, anthocyanins, cardiac glycosides, Stigmast-4-ene-3,6-dione, volatile oils, and steroids. These compounds contribute to the plant's diverse pharmacological activities, including anti-inflammatory and antioxidant effects, neuroprotective capabilities, and cognitive function enhancement. In traditional Ayurvedic texts, Clitoria ternatea is considered a medhya drug, promoting intellect and mental clarity. It has been used for treating chronic bronchitis, dropsy, goitre, leprosy, mucous disorders, visual impairments, skin diseases, sore throats, and tumors.Pharmacologically, Clitoria ternatea is known for its central nervous system activity, which can manage conditions related to cognitive decline and mood disorders. Its antipyretic activity has made it a valuable asset in folk medicine for reducing fevers. As interest in natural and holistic health solutions grows, Clitoria ternatea stands out as a symbol of nature's bounty and the enduring relevance of herbal medicine in today's world.

INTRODUCTION

Clitoria ternatea L. is an ornamental perennial climber with conspicuous blue or white flowers, and it is commonly called 'blue ternate' and 'butterfly pea'. The flowers of this crop have almost similar shape of the human female genitals; hence, its Genus name Clitoria is derived from clitoris. As a highly palatable forage legume, the crop is generally preferred by livestock over other legumes. As cited in various published articles, Clitoria is known as a medicinal plant and is known to treat various diseases.[1] The leaf

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

mucilage contains anhydro-galacatan, anhydro pentosan and methyl pentosan and an alkaloid [2]. Traditionally it is recommended for the treatment of snakebite, scorpion sting, chronic bronchitis, indigestion, constipation, fever, arthritis, eye ailments, sore throat, skin diseases, rheumatism, syphilis, eye and ear-diseases in India [3-7]; Large and ever-increasing number of patients use medicinal plants and herbs for better health. Therefore, making it necessary to evaluate of their therapeutic potential, biological properties, and safety. This will be very useful in making informed decisions about their use. Traditional medicinal plants have been useful in development of hundreds of remarkable drugs and biologically active compounds. The plans also exhibited many pharmacological effects including antioxidant, hypolipidemic, anticancer, anti- inflammatory, analgesic, antipyretic, antidiabetic, CNS, antimicrobial, gastro-intestinal antiparasitic, insecticidal and many other pharmacological effects. This review is about highlighting the chemical and pharmacological properties of Clitoria ternatea[8-9]. Diferent parts of this plant have been used in Sri Lankan traditional system of medicine and in folklore to treat variety of disorders such as anasarca, ascites, liver problems, hemicrania, irritation of urethra and bladder, and enlargement of abdominal viscera[10]. Plants with medicinal properties are good alternative sources to fnd remedies for existing noncommunicable diseases worldwide [11]. 'Shankhpushpi' consists of conch or 'Shankha' shaped flowers, categorized under Ayurvedic Medhya Rasayana drugs that claim as brain tonic and have memory and intelligence enhancing properties. The blue-flowered variety is generally mixed with white-flowered one. Various groups of phytochemicals have been reported from white variety of C. ternatea like phenolics- kaempferol, quercetin, myricetin and their glycosides [12-13]. Ethno botanically it is used in various urinary troubles like infection, burning sensation in urinary tract, lack of urination, frequent urination [14] and also reported for purification after surgical removal of tumor [15]. C. ternatea has two varieties, i.e., white flowered and blue flowered. The white-flowered one is found to be therapeutically more active and has been accepted as 'Shankhpushpi' by most of the south Indian vaidyas.[16]

Plant Profile:

Fig No:(01) Clitoria ternatea of white flower

Fig No:(02) Clitoria ternatea of Plants

Morphology

The taxonomical classification of Clitoria ternatea species

Kingdom: plantae
Division: Magnoliophyta
Class: Magnoliopsidas
Rosids Order: Fabales
Family: Fabaceae [17]

Phytoconstituent:

The major phytoconstituents found in Clitoria ternatea are the pentacyclic triterpenoids such as taraxerol and taraxerone.[18] Phytochemical screening of the roots shows the presence of ternatins, alkaloids, flavonoids, saponins, tannins, carbohydrates, proteins, resins, starch, taraxerol and taraxerone.[19] A new simple, sensitive, selective and precise High Performance Thin Layer Chromatography method has been

developed for the determination of taraxerol in Clitoria ternatea Linn. which was being performed on Thin Layer Chromatography aluminium plates. [20] A wide range of secondary metabolites including triterpenoids, flavonol glycosides, anthocyanins and steroids has been isolated from Clitoria ternatea Linn.[21] Four kaempferol glycosides I II, III and IV were isolated from the leaves of Clitoria ternatea L. Kaempferol-3-glucoside (I), kaempferol-3 -rutinoside (II) and kaempferol-3-neohesperidoside (III) were identified by Ultra Violet, Protein Magnetic Resonance and Mass Spectrometry. (IV), C33H40O19, mp: 198, was characterized as Kaempferol-3-orhamnosyl glucoside from spectral data and was named clitorin.[22]

MATERIALS AND METHODS:

Plant material:

The roots of blue and white variety of C. ternatea were collected during the month of June 2010 from the cultivated plants at Herbal Garden and Medicinal Plants Garden, Panjab University, Chandigarh. The identity of plants was confirmed on the basis of detailed study of taxonomic characters and by comparison with authentic samples available at Museum-cum-Herbarium of University Institute of Pharmaceutical Sciences, Centre of Advanced Study, Panjab University, Chandigarh. The samples were further confirmed by Forest Research Institute, Dehradun vide certificate number 765/2006-Bot/15-1. The plant specimens of blue and white variety have been deposited in Museum-cum-Herbarium of University Institute of Pharmaceutical Sciences, Centre of Advanced Study, Panjab University, Chandigarh, India, under the voucher number 1474 and 1475, respectively.[23]

Solvents, chemicals and reagents:

The solvents, chemicals and reagents of laboratory grade were obtained from E.Merck (India) Ltd., Sigma-Aldrich Chemicals Pvt. Ltd. and S.D. Fine Chem. Ltd. Distilled water was used wherever water is mentioned.[24]

Preparation of extracts:

The plant material was dried under shade. Moderately coarse powdered drug (100 g) of root two varieties of C. ternatea was extracted separately with methanol three times (200, 200 and 100 ml) for 48 h. The extracts were filtered and concentrated under reduced pressure to obtain 11.5 and 9.6 g of blue and white variety root extract respectively. A portion of these extracts was used for the preparation of doses for pharmacological investigation. A small portion of dried methanol extract was subjected to phytochemical screening. All doses were prepared by suspending the extract in aqueous solution of Tween 80 and the concentration of the test solution was so adjusted that each animal received a uniform volume of 10 ml/kg. All doses were administered orally and the dose schedule was so adjusted that a uniform time interval elapsed between the administration of dose and a time when the animal was subjected to test.[25]

Evaluation Parameters for Powder:

1. Determination of Particle size & Shape

Bond and hold are fascinations which occur at surfaces, particle size will impact the flow ability. Particles with more surfaces to mass proportions are stronger than coarser particles that are affected by gravitational powers. Molecular size bigger than 250 µm are typically moderately freeflowing, wherein the molecules with size lower than 100 µm are firm and have flow issues. Those having a molecule size under 10 µm are generally firm and oppose flow below gravity, aside from potentially as bigger aggregates.[26]

2. Density

Powders typically flow beyond the influence of gravity. A few powders become electro statically charged because of dealing with and handling, bringing about an adjustment in their conduct of the powder. [27]

3.Bulk density

The bulk density of powder is the proportion of the mass of an untapped powder sample and its mass including the contribution of the inter particulate non-viable mass. Therefore, it depends on both the density of powder particles and the non-linear positioning of particles in the powder bed. The bulk density is shown in grams per milliliter (g/ml) however the international unit is kilogram per cubic centi-meter (kg/cm3). The bulking characteristics of powder are dependent on the construction, handling and storage of the sample. The granules can be filled to select the bulk density. In addition, the small distraction in the powder bed may affect the change of the bulk density.[28]

4.Angle of repose

The angle of repose is a permanent3D angle (compared to a straight bottom), inferred from the formed cone. If the material is placed on the pile, it will slip down until the particles that usually form the surface at an angle Ɵ wear out and balance with gravity. The tangent of an angle of repose is equivalent to the coefficient of abrasion μ in the middle of particles. The angle of repose less than 40°C, shows satisfactory fluidity and greater than 40°C shows continuity.[29]

4.Moisture content:

Moisture content Absorbed moisture in solids can exist either in the unbound state or as part of crystal structure. It directly changes the surface properties of the particles. It can also affect flow properties indirectly and permanently through the granules formulation, which are held together by solid bridges generated by hydration and dehydration. At higher moisture content and higher packing densities liquid bridges may progress. [31]

Pharmacological Activety:

Medicinal researches have validated that Clitoria ternatea display a wide range of biological effects, a few of which are really intriguing for future**.**

Wound healing

The wound healing activity of Clitoria ternatea seed and root extracts was investigated using excision, incision and dead-space models in rats. Clitoria ternatea seed and root extracts significantly improved wound healing in excision, incision and dead-space models when administered orally by gavage as well as applied topically as ointment. These effects were comparable to that of cotrimoxazole ointment. The finding of the study also showed that Clitoria ternatea affected all three phases: inflammatory, proliferative and remodeling phases of wound healing.[32]

Immunomodulatory activity:

The immunomodulatory activity of Clitoria ternatea seed and root extracts was investigated, the effects on humoral immune response were investigated in SRBCs-sensitized rats, while, the effects on cell medicated immunity were studied by measuring delayed type hypersensitivity (DTH) response in SRBC-sensitized rats. Neutrophil recruiting and phagocytosis were measured by studying neutrophil adhesion and carbon clearance method respectively. Furthermore the effects on hematological parameters were also studied. Clitoria ternatea seed and root extracts showed significant immunosupressive effects as evident from significant decrease in primary and secondary antibody titers in SRBCs-sensitized rats, paw thickness in DTH response, and neutrophil adhesion and in vitro phagocytosis. The immunomodulatory effects of Clitoria ternatea on humoral, cell mediated and non-specific immune response could be attributed to decreased immune cell sensitization, immune cell presentation and phagocytosis. The authors concluded that the anti-inflammatory and antioxidant properties of plant might be playing major role in immunomodulatory activity.[33]

Central Nervous System Depressant Activity :

The extract lowered time needed for occupying the central platform, exhibiting transfer latency, in the elevated plus puzzle (EPM) and raised discrimination index in the object identification/recognition test, showing nootropic activity. It decreased the duration of immobility in tail suspension test, minimized stress and anxiety induced ulcers and reduced the convulsing action of PTZ and MES.[34]

Anti-inflammatory and Anti-analgesic Activity

The research study was aimed at obtaining the anti-inflammatory activity of the methanolic extract from the roots of Clitoria ternatea, making use of rat models. In the same research study, the ethanolic extract too was reviewed for analgesic activity in mice with the acetic acid-induced twisting response and mechanical stimuli by tail clip method. [35]

Anti-Pyretic Activity: In another research, the methanol extract of Clitoria ternatea was evaluated for its anti-pyretic capacity in albino rats. The anti-pyretic effect of the extract was comparable to that of paracetamol (PCM) (150 mg/kg b.w. p.o) a common antipyretic agent. [36]

Anti-Epileptic Activity :

Methanol extract from the aerial parts of Clitoria ternatea was examined by making use of pentylenetetrazol (PTZ) and Maximum Electro-shock (MES)- induced seizures in mice at the dosage of 100 mg/kg p.o. Clitoria ternatea considerably delayed the beginning of convulsions and also shortened the time period of tonic hind limb extension in MES-induced convulsions.[37]

Antioxidative Activity:

It has been clearly stated that oxidative stress is amongst the major causative factors of several degenerative and chronic diseases. Clitoria ternatea petals have been recognized to have anti-oxidant activity. Extract of Clitoria ternatea flowers are used in Thailand as a part of cosmetics and the chemical composition of the flower recommend that they might have antioxidant activity. Aqueous extracts of Clitoria ternatea revealed to have stronger anti-oxidant activity as compared to ethanol extracts. The antioxidant potential of Clitoria ternatea extract in aqueous form was reviewed by determining the level of enzymatic and non-enzymatic anti-oxidants. In-vitro antioxidant capability was likewise established by making use of various assays such as Ferric reducing power assay (FRAP), Reducing Activity assay, diphenypicrylhydrazyl (DPPH) assay and Hydroxyl radical scavenging activity and the results were similar with standard anti-oxidants such as butylated hydroxyl toluene (BHT), ascorbic acid and also rutin.[38]

Anti-Diabetic Activity:

Anti-diabetic researches by oral administration of aqueous extract obtained from Clitoria ternatea leaves (400mg/kg body weight) and flowers (400mg/kg body weight) for 84 days revealed significant decrease in serum glucose, glycosylated hemoglobin, total cholesterol, triglycerides, urea, creatinine as well as the activity of gluconeogenic enzyme glucose-6-phosphatase, but raised levels of serum insulin, HDL cholesterol, protein, liver and skeletal muscle glycogen content and the activity of glycolytic enzyme glucokinase. [39]

Anti-Microbial Activity :

The presence of small molecular weight, cystein rich protein, finotin acquired from seeds of the plant Clitoris ternatea has been identified for its antifungal property. The crude extract obtained from seeds of Clitoria ternatea exhibited a robust antifungal activity against the test fungi A. niger as well as A. ochraceous followed by various other microscopic organisms. Anti-bacterial activity was carried out against r all the above biochemical parameters checked out, Clitoria ternatea leaves cured rat revealed to have a little better activity, in comparison to the rats treated by flowers of Clitoria ternatea. [40]

Anticancer Activity:

The in vitro cytotoxic effect of petroleum ether and ethanolic flower extracts (10, 50, 100, 200, 500 µg/ml) of Clitoria ternatea was studied using trypan blue dye exclusion method. Both extracts exhibited significant dose dependent cell cytotoxic activity. For petroleum ether extract the concentration 10 µg/ml showed 8% reduction in cell count, however, 100% reduction was observed at 500µg/ml. In case of ethanolic extract, 10 µg/ml concentration possessed 1.33 % reduction in cell count, while, at 500µg/ml 80 % reduction in cell count was observed . The cytotoxicity of the aqueous and methanol extracts of the flowers of Clitoria ternatea was evaluated on six types of normal and cancer-origin cell lines. These included the hormone-dependent breast cancer cell line (MCF-7), non-hormone-dependent breast cancer cell line (MDA-MB-231), human ovary cancer cell line (Caov3), human cervical cancer cell line (Hela), human liver cancer cell line (HepG2) and human foreskin fibroblast cell line (Hs27). [41]

Gastrointestinal effect:

The antiulcer potential of aqueous and ethanolic extracts of Clitoria ternatea was evaluated in different experimentally induced ulcer models in rats. Ethanolic extract (200 and 400 mg/kg) and aqueous extract (200 and 400 mg/kg) of whole plant were examined in pylorus ligation and indomethacin induced gastric ulcer in rats. Various parameters like volume of gastric acid secretion, pH, total acidity, ulcer index and antioxidant parameters were determined and compared between extracts, standard and vehicle control group following ulcer induction. Among different dose of alcoholic extract, high dose showed significant antiulcer activity in pylorus ligation and indomethacin induced ulceration.[42]

Antihistaminic and antiasthmatic Activity:

Ethanol extract of Clitoria ternatea root (ECTR) was evaluated for antiasthmatic activity using milk induced leucocytosis and eosinophilia in mice, egg albumin induced mast cell degranulations in rats and passive cutaneous anaphylaxis in rats at doses (100-150 mg/kg ip). The results showed that ECTR significantly decreases milk induced leucocytosis and eosinophilia, protected against egg albumin induced degranulations of mast cells in mice and inhibited area of blue dye leakage in passive cutaneous anaphylaxis in rats . The antiasthmatic activity of ethanol extract of Clitoria ternatea roots was evaluated in histamine aerosol induced bronchospasm in Wister rats. The ethanolic extract of Clitoria ternatea (400 mg/kg, po) showed 47.45 % protection against histamine induced bronchoconstriction in rats. The results showed that aqueous extract of C. tenatea has not only bronchodilating activity but also decreases bronchial hyperreactivity by decreasing the infiltration of inflammatory cells in the airway and inhibition of release of histamine like mediators from the mast cell by stabilizing it.[43]

Traditional uses:

Root was used for the treatment of ascetics, enlargement of the abdominal viscera, sore throat and skin diseases. They were also used as purgative, but because, they cause griping and tenderness, they were not recommended. Root was administered with honey and ghee as a general tonic to children for improving mental faculties, muscular strength and complexion tonics. Seeds and leaves were widely used as a brain tonic and to promote memory and intelligence. Juice and flowers were used as an antidote for snake bite. Seeds were used in swollen joints; crushed seeds are taken with cold or boiled water for urinary problems. (Morris et al.,1999), (Ragupathy et al., 2009), (Nadkarni, 1976), (Mukherjee et al., 2007). [44]

Medicinal Uses:

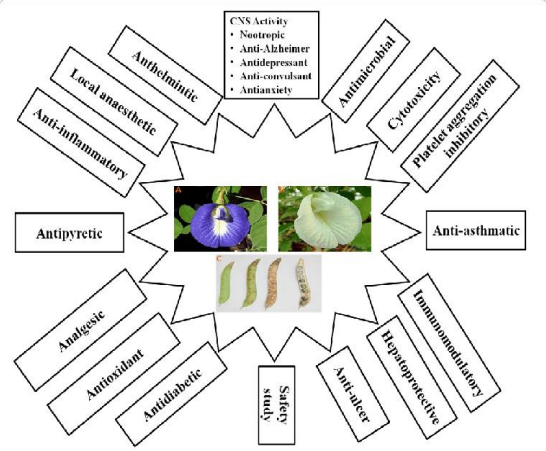

Fig No: (03) Medicinal Uses

CONCLUSION:

phytochemical composition, to extract the natural colourant from flower and to evaluate the antimicrobial property of Clitoria ternatea L. which is an underutilized plant species found in North East India. The natural colour from the flower was extracted and the antimicrobial activity of the methanolic plant extract was determined. Traditional medicinal plants have been useful in development of hundreds of remarkable drugs and biologically active compounds. The plans also exhibited many pharmacological effects including antioxidant, hypolipidemic, anticancer, anti-inflammatory, analgesic, antipyretic, antidiabetic, CNS, antimicrobial, gastro-intestinal antiparasitic, insecticidal and many other pharmacological effects.

ACKNOWLEDGEMENT:

The authors are thankful to the Principal, Guide, and Coordinator for Review Study and highly acknowledge by the Chhatrapati Shivaji College of pharmacy, Deori for providing facilities, needed support and Guidance.

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HOW TO CITE: Nitin Kapgate*, Puja Yelle, Chandrashekar Badwaik, Updesh Lade, Review On "Clitoria Ternatea'' Of White Veriety, Int. J. of Pharm. Sci., 2024, Vol 2, Issue 12, 1755-1763. https://doi.org/10.5281/zenodo.14439893