PHARMACOLOGICAL IMPORTANCE OF *CLITORIA TERNATEA* – A REVIEW

Dr. N.V.B.L.A.Baby. Kambampati*1, Dr. P. Kishore Kumar, Dr. B. Chandrashekar Rao2, D. Santhosha

1Department of Pharmacology, Chilkur Balaji College of Pharmacy, Aziz Nagar village, Moinabad, Rangareddy-501504.

2Department of Pharmaceutics, Chilkur Balaji College of Pharmacy, Aziz Nagar village, Moinabad, Rangareddy-501504.

ABSTRACT

Medicinal and aromatic plants have been used over the ages for its potency and minimal side effects. Due to this, the exploration is at its highest peak. Seeing this phenomenon the climbing plant Clitoria ternatea (CT) belonging to the Fabaceae family and commonly known as 'Butterfly pea' and Shankpushpi. Traditional name is Aparajitha pushpam, has been taken up which is used in Traditional Ayurvedic Medicine, because of its varied uses over centuries as a memory enhancer, nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing and sedative agent. A wide range of secondary metabolites including triterpenoids, flavonol glycosides, anthocyanins and steroids has been isolated from Clitoria ternatea Linn. Its extracts possess a wide range of pharmacological activities including antimicrobial, antipyretic, anti-inflammatory, analgesic, diuretic, local anaesthetic, antidiabetic, insecticidal, blood platelet aggregation-inhibiting and for use as a vascular smooth muscle relaxing properties. This plant has a long use in traditional Ayurvedic medicine for several diseases and the scientific studies has reconfirmed those with modern relevance. The plant contains many active constituents like alkaloids, glucosides, flavonoids, saponins, tannins, carbohydrates etc. This review is an effort to explore the phytochemical constituents and pharmacological studies of CT, which have been in clinical use in the Ayurvedic system of medicine along with a critical appraisal of its future.
ethno pharmacological potential in view of many recent findings of importance on this well-known plant species.

INTRODUCTION
A large and increasing number of patients in the world use medicinal plants and herbs for health purpose. Therefore, scientific scrutiny of their therapeutic potential, biological properties, and safety will be useful in making wise decisions about their use. There are hundreds of significant drugs and biologically active compounds developed from the traditional medicinal plants. Traditional name is Aparajitha pushpam. Plant showed wide range of pharmacological activities including antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic antipyretic and many other pharmacological effects. The preliminary phytochemical screening showed that Clitoria ternatea contained tannins, phlobatannin, carbohydrates, saponins, triterpenoids, phenols, flavonoids, flavonol glycosides, proteins, alkaloids, anthraquinone, anthocyanins, cardiac glycosides, Stigmast-4-ene-3,6-dione, volatile oils and steroids. The plant showed 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 will highlight the chemical constituents and pharmacological effects of Clitoria ternatea. Clitoria albiflora Mattei, Clitoria bracteata Poir., Clitoria mearnsii De Wild., Clitoria tanganicensis Micheli, Clitoria zanzibarensis Vatke.

PHARMACOLOGICAL PROFILE
Pharmacological studies have confirmed that Clitoria ternatea exhibit a broad range of biological effects, some of which are very interesting for promising future development.

Fig: Clitoria ternatea.
MEMORY ENHANCEMENT ACTIVITY STUDIES
The oral treatment of Clitoria ternatea roots extract at doses significantly increased memory in rats. The alcoholic extracts of aerial parts and roots of CT was reported to attenuate electroshock induced amnesia. The acetylcholine (AcH) content of the whole brain and acetyl cholinesterase activity at different regions of the rat brain viz cerebral cortex, mid-brain, medulla oblongata and cerebellum was evaluated. It was suggested that an increase in (AcH) in rat hippocampus may be the neurochemical basis for improved learning and memory. Rai et al by using passive avoidance test and spatial learning T-maze have also shown that the aqueous root extract of Clitoria ternatea enhances memory in rats. In another reported study the effect of aqueous root extract on the dendritic cytoarchitecture of neurons of the amygdae was studied. This improved dendritic arborisation of amygdaloidal neurons correlates with the increase passive avoidance learning and memory in the Clitoria ternatea treated rats.

ANTI-INFLAMMATORY, ANALGESIC AND ANTI-PYRETIC ACTIVITY STUDIES
The study was obtaining the anti-inflammatory activity of the methanolic extract from the roots of Clitoria ternatea Linn. Using rat models. In the same study the ethanolic extract was also evaluated for analgesic activity in mice with the acetic acid-induced writhing response and mechanical stimulus by tail clip method. In another study, the methanol extract of CT was evaluated for its anti-pyretic potential in albino rats and the anti-pyretic effect of the extract was comparable to that of paracetamol (PCM) (150 mg/kg b.w. p.o) a standard anti-pyretic agent.

ANTI-EPILEPTIC ACTIVITY STUDIES
Methanol extract from the aerial parts of Clitoria ternatea was screened by using pentylenetetrazol (PTZ) and maximum electroshock (MES) – induced seizures in mice at the dose of 100 mg/kg p.o. CT significantly delayed the onset of convulsions and also delayed the duration of tonic hind limb extension in MES-induced convulsions.

ANTI-OXIDATIVE STUDIES
It has been established that oxidative stress is among the major causative factors of many chronic and degenerative diseases. CT petals have been recognised to possess anti-oxidant activity. Extracts of Clitoria ternatea flowers are used in Thailand as a component of cosmetics and the chemical composition of the flowers suggest that they may have anti-oxidant activity. Aqueous extracts were shown to have stronger anti-oxidant activity than
ethanol extracts. The antioxidant potential of aqueous leaf extracts of Clitoria ternatea were evaluated by determining the levels of enzymatic and non-enzymatic antioxidants. In vitro antioxidant capacity was also determined using different assays such as Ferric reducing power assay (FRAP), Reducing activity assay, diphenypicrylhydrazyl (DPPH) assay and Hydroxyl radical scavenging activity and the results were comparable with standard antioxidants such as butylated hydroxyl toluene (BHT), ascorbic acid and rutin.

**BLOOD PLATELET AGGREGATION INHIBITION STUDIES**

An anthocyanin ternatins D1 isolated from petals of Clitoria ternatea was evaluated for in vitro platelet aggregation inhibitory activity in rabbits and the results of various reported studies showed significant inhibition of collagen and adenosine diphosphate (ADP) induced aggregation of platelets.

Anti-diabetic studies Oral administration of aqueous extract of CT leaves (400mg/kg body weight) and flowers (400mg/kg body weight) for 84 days showed significantly reduced serum glucose, glycosylated hemoglobin, total cholesterol, triglycerides, urea, creatinine and the activity of gluconeogenic enzyme glucose-6-phosphatase, but increased serum insulin, HDL-cholesterol, protein, liver and skeletal muscle glycogen content and the activity of glycolytic enzyme glucokinase. For all the above biochemical parameters investigated, Clitoria ternatea leaves treated rat showed a little better activity than Clitoria ternatea flowers treated diabetic rats.

**LOCAL ANAESTHETIC ACTIVITY STUDIES**

The local anaesthetic effect of an alcoholic extract of Clitoria ternatea aerial part was studied by Kulkarni et al using corneal anesthesia in rabbits and plexus anesthesia in frogs. The results were almost as effective as xylocaine in inducing local anesthesia.

**ANXIOLYTIC ACTIVITIES**

The oral administration of CT (100-400mg/kg) dose dependently increased the time spent in the open arm, the time spent in the lit box and decreased the duration of time spent in the dark box. The oral administration of CT (30mg/kg) failed to show any significant effect in both animal models of anxiety. The animals treated with CT (100mg/kg) showed a significant increase in the inflexion ratio and discrimination index which provides evidence for the species nootropic activity.
CNS DEPRESSANT ACTIVITY STUDIES
The extract decreased time required to occupy the central platform (transfer latency, TL) in the elevated plus maze (EPM) and increased discrimination index in the object recognition test, indicating nootropic activity. It decreased the duration of immobility in tail suspension test, reduced stress induced ulcers and reduced the convulsing action of PTZ and MES. The extract exhibited tendency to reduce the intensity of behavior mediated via serotonin and AcH.

ANTI-STRESS ACTIVITIES OF CLITORIA TERNATEA
The anti-stress activity of aerial parts was assessed using cold restraint stress (CRS) induced ulcers, lithium-induced head twitches, clonidine-induced hypothermia, sodium nitrite-induced respiratory arrest and haloperidol-induced catalepsy in rat and mice.

LARVICIDAL ACTIVITIES
The methanol extracts of Clitoria ternatea seed extract was effective against the larvae of all the three species with LC50 values 65.2, 154.5 and 54.4 ppm, respectively for A. stephensi, A. aegypti and C. quinquefascitus. CT was showing the most promising mosquito larvicidal activity.

PROTEOLYTIC ACTIVITIES
The activities of endopeptidases (hemoglobin pH 3.5 and azocasein pH 6.0), carboxypeptidase benzyloxy carbonyl (CBZ-Phe-Ala Ph 5.2), and arylamidases lysophosphatidic acid and a-N-benzoyle-L-arginine P-nitro-analide (LPA 7.0 and BAPA 7.6) were assayed in extracts of cotyledons and axis of resting and germinating seeds of Clitoria ternatea but the endopeptidases at pH 3.5 and the arylamidase at 7.0 were high in cotyledons.

ANTIHELMINTIC ACTIVITIES
It was indicated that crude alcoholic extract of CT and its ethyl acetate and methanol fractions significantly demonstrated paralysis and also caused death of worms especially at higher concentration of 50 mg/ml, as compared to standard reference piperazine citrate. In another study, flowers, leaves, stems and roots of CT were evaluated for anti-helmintic activity on adult Indian earthworms Pheretima posthuma. Methanol extract of root is most potent and required very less time to paralysis and death of worms as compared to other extracts. The potency increases from flowers, leaves, stems to roots.
DIURETIC ACTIVITY
The powdered form of dried whole root and ethanol extract were evaluated for diuretic activity and only single I.V. dose of extract produce moderate increase in urinary excretion of Na, K and decrease in Cl but no change in urine volume. Also so appreciable effect seen on oral dosing.

ANTI-MICROBIAL ACTIVITIES
Antibacterial activity was shown against Salmonella spp. and Shigella dysenteriae; organisms causing enteric fever. In addition, the methanol crude extracts showed anti-bacterial activity against K. pneumonia and P. aeruginosa.

The crude extract from seeds of CT showed strong antifungal activity on the test fungus A. niger and A. ochraceous followed by other organisms. The presence of small molecular weight, cystein rich protein, finotin obtained from seeds of the plant CT has been demonstrated for its antifungal property.

HEPATOPROTECTIVE ACTIVITY
The results of the paracetamol-induced liver toxicity experiments showed that mice treated with the ME of C. Ternatea leaf (200 mg/kg) showed a significant decrease in ALT, AST, and bilirubin levels, which were all elevated in the paracetamol group (p < 0.01). C ternatea leaf extract therapy also protective effects against histopathological alterations.

ANTI ASTHMATIC ACTIVITY
Anti asthmatic activity of Clitoria ternatea root’s ethanol extract (ECTR) was evaluated for preliminary phytochemical screening, acute toxicity studies and antiasthmatic activity using milk induced leucocytosis and eosinophilia in mice, egg albumin induced mast cell degranulation in rats and passive cutaneous anaphylaxis in rats result showed that the LD50 of ECTR is more than 1300 mg/kg.

ANTICONVULSANT AND ANTISTRESS ACTIVITY OF CT
It was estimated that the C. ternatea root extract enhanced ACh content significantly in the hippocampi when analyzed by fluorimetric method in neonatal rats from 52.79±12.36 to 68.83±9.87 nmol/g tissue, young adults rats from 33.9±6.92 to 88.89±18.29 nmol/g tissue. Hippocampal ACh content was found to be significantly less in 90-day-old control rats as compared to 37-day-old control rats: (33.9±6.92 vs. 52.79°12.36 nmol/g tissue). On the
contrary, hippocampal ACh content was found to be higher in 90-day-old CTR treated rats than in 37-day-old CTR treated rats 88.89+18.29 tissuevs.68. 83+9.87 nmol/g tissue and result were expressed as mean+S.D., were statistically compared by Student’s t-test. Values of P<0.05 were considered statistically significant.

ANTIOXIDANT AND CYTOTOXIC ACTIVITY
The IC50 values were 1 mg/mL and 4 mg/mL, respectively. As antioxidant activity is often attributed to phenolic compounds within plants the total phenolic content within the aqueous extract and gel were measured.

A study of ethanolic extract of Clitoria ternatea proved that the plant posses cytotoxic and antioxidant activities. The extract showed potent cytotoxic activity in trypan blue dye exclusion method using DLA cell lines with EC50 value of 305μg/ml and exhibited a dose-dependent decrease in cell count for all the concentrations tested. The antioxidant activity was evaluated by DPPH free radical method. The extract exhibited potent antioxidant activity with an EC50 of 36.5μg/ml. There was a dosedependent increase in the percentage of antioxidant activity for all concentrations tested.

PHARMACOLOGICAL EFFECTS

ANTI MICROBIAL EFFECT
The antimicrobial properties of clitoria ternatea was investigated by agar disk and were diffusion methods. The seeds extract of clitoria ternatea showed strong antifungal activity on all the tested fungi but the cells extract exhibited marginal antifungal activity.

ANTI CANCER EFFECT: The cyto toxicity of the aquous and methanol extractsof the flower of clitoria ternatea was evaluated on six type of normal and cancer origin celltiner. This included the hormone-dependent breast cancer celltine.

CENTRAL NERVOUS EFFECT
Seeds and leaves of clitoria ternatea have been widely used as brain tonic and belived to promote memory and intelligence. The isolated compounds may act as a lead compounds for identifying new derivatives which could use for improving memory is extensively used for different central nervous system effects especially memory enhancement.
GASTROINTESTINAL EFFECT
The anti-hyper lipemic effect of clitoria ternotea L was as studied in experimentally induced gastrointestinal in rats. Clitoria ternatea was evaluated in different experimentally included ulcer model in rats.

ANTIINFLAMMATORY ANTIPYRETIC AND ANALGESIC EFFECTS
The extract, at doses of (200, 300 and 400 mg/kg bw, po), produced significant reduction in normal body temperature 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 bw, po). Clitoria ternatea roots methanol extract, 200-400 mg/kg orally, 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 po in mice. The analgesic and anti-inflammatory activity of Clitoria ternatea flower extract were carried out in rats (carrageenan paw edema) and mice (hot plate). The petroleum ether (60-80°C) extract possessed significant anti inflammatory and analgesic properties.

ANTIOXIDANT EFFECTS
Methanol extracts of CT also showed significant reductive ability as well as hydroxyl radical scavenging activity. Methanol extract of white flowered variety of CT showed more significant antioxidant activity as compared to blue flowered variety of CT. All the concentrations of methanol extract of CT (MECT) showed antioxidant activity when compared to control (p<0.001). The antioxidant activity of the leaves as well as blue and white flowers of Clitoria ternatea was investigated. They exhibited significant antioxidant activity and the sample from the blue flower bearing plant showed better scavenging activity.

ANTIDIABETIC EFFECT
The hypoglycemic effects of methanol, water, petroleum ether and chloroform extract of Clitoria ternatea leaves were evaluated in Streptozotocin induced diabetic rats for acute and subacute effects. The extract of Clitoria ternatea (200 and 400 mg/kg) significantly reduced blood glucose level in Streptozotocin induced diabetic rats. 400mg/kg possessed significant hypoglycemic effect, 200 mg/kg also decreased glucose level but not as 400mg/kg. The result of acute effect of the methanol extract, showed that 200 and 400 mg/kg exerted a very similar
effect, but at the initial stage at the 30 min, 200mg/kg showed a fine decrease in blood glucose level. Subacute activity showed that on the long term use of extract the dose 200 mg/kg is much better to control the blood glucose level than the 400 mg/kg dose(103).

CENTRAL NERVOUS EFFECT
Plants commonly used under the name shankpushpi are: Convolvulus pluricaulis Chois., Evolvulus alsinoides Linn., both from Convolvulaceae, and Clitoria ternatea Linn. (Leguminosae). The memory-enhancing activity of these three plants was investigated. Anxiolytic, antidepressant and CNS-depressant activities of these three plants were also evaluated and compared. The nootropic activity of the aqueous methanol extract of each plant was tested using elevated plus- maze (EPM) and step-down models. Anxiolytic, antidepressant and CNS-depressant studies were evaluated using EPM, Porsolts swim despair and actophotometer models. Clitoria ternatea extract (CTE) showed maximum memory-enhancing and anxiolytic activity (p<0.001) at 200 and 100 mg/kg, respectively. Amongst the three plants, Clitoria ternatea extract (CTE) showed significant (p<0.05) antidepressant activity. All the three plants showed CNS-depressant action at higher dose levels.

HYPOLIPIDEMIC EFFECT
The anti-hyperlipidemic effect of Clitoria ternatea L. was studied in experimentally induced hyperlipidemia in rats. The poloxamer 407-induced acute hyperlipidemia and diet-induced hyperlipidemia models were used in this investigation. Oral administration of the hydroalcoholic extract of the roots and seeds of Clitoria ternatea resulted in a significant (p<0.05) reduction of serum total cholesterol, triglycerides, very low-density lipoprotein cholesterol, and low-density lipoprotein cholesterol levels. The atherogenic index and the HDL/LDL ratio were also normalized after treatment in diet-induced hyperlipidemic rats. The effects were compared with atorvastatin.

ANTIHISTAMINIC AND ANTIASTHMATIC EFFECT
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. mg/kg, po) and gemfibrozil (50 mg/kg, po).

**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 mediated immunity were studied by measuring delayed type hypersensitivity (DTH) response in SRBC-sensitized rats. 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.

**DIURETIC AND ANTI UROLITHIASIS EFFECT**

Clitoria ternatea roots or their extract in 95% alcohol showed no significant diuretic or natriuretic effect in dogs when administered orally in non-toxic dose. Intravenous doses of the extract led to a moderate increase in the excretion of sodium and potassium in the urine, but at the same time, it showed signs of kidney damage.

**EFFECT OF CLITORIA TERNATEA ON GENERAL BEHAVIOR**

Ethanol extract of the root of Clitoria ternatea was evaluated for different neuropharmacological actions in rats and mice, such as general behavior, exploratory behavior, muscle relaxant activity and phenobarbitone induced sleeping time. The ethanol extract at doses of 100 and 150 mg/kg caused reduction in spontaneous activity, decrease in exploratory behavioral pattern by the head dip and Y-maze test, reduction in the muscle relaxant activity by rotarod, 300C inclined screen and traction tests indicating significant neuropharmacological activity.

**IMMUNOMODULATORY EFFECTS**

This study evaluated the immunostimulatory activities of aqueous extracts of Clitoria ternatea leaf and flower. The studies were conducted on oral administration of aqueous extract of CT to alloxan-induced diabetic rats for a duration of 60 days which significantly decreased the in serum glucose and cholesterol levels. The total white blood cells, red blood cells, T-lymphocytes and Blymphocytes were significantly increased in treated animals, while
monocytes and eosinophils showed an opposite trend. These results further indicate that these plant extracts have immunomodulatory effects that strengthen the immune system.

WOUND HEALING EFFECT
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.

EFFECT ON LEARNING AND MEMORY
The effects of Clitoria ternatea (CT) aqueous root extract on learning and memory in rat pups (7 days old) using open field behaviour test, spontaneous alternation test, rewarded alternation test and passive avoidance test were observed. The results of this study showed that the oral treatment of CT roots extracts at different doses significantly enhanced memory in rats. CT aqueous root extract for learning and memory improvement using open field behaviour test, passive avoidance test and, spatial learning test (T-maze test) in neonatal rat pups (7days old). Neonatal rat pups were incubated during growth spurt period at the dose of 50 and 100mg/kg of aqueous root extract for 30 days. CT root extract had memory enhancing properties which had little or no effect on the general motor activity but showed improved retention and spatial learning performance at both time points of behavioural tests. This memory enhancing property was marked in neonatal rats (which were in their growth spurt period) treated with CT 100mg/kg bodyweight for 30 days. Thus it appears that treatment with CT extract results in permanent change in the brain which was responsible for the improved learning and memory.

PROTECTIVE EFFECTS
Petroleum ether, chloroform, and methanol extracts of roots of blue and white flowered varieties of Clitoria ternatea (CT) were studied for their hepatoprotective potential against carbon tetrachloride (CCl4) induced hepatotoxicity in rats. The hepatoprotective activity was assessed using various biochemical parameters like serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, serum alkaline phosphatase and total bilirubin along with histopathological studies of liver tissues. The substantially elevated
serum enzymatic levels of serum transaminases, alkaline phosphatase and total bilirubin were significantly restored towards normalization with the treatment of CT. The biochemical improvement were confirmed by histopathological examination of liver sections.

SIDE EFFECTS AND TOXICITY
LD50 of ethanol extract of Clitoria ternatea root was more than 1,300 mg/kg in mice(81). Acute oral toxicity study showed that there was no mortality up to 3000mg/kg in mice. After single dose 1000 mg/kg in rats, no death or any other disorders up to 72 h(86). The extract was found safe even at the dose of 2000 mg/kg body weight in rats. There was no mortality observed at doses up to 2 g/kg (po) of the ethanol extract of the aerial parts of Clitoria ternatea in rats. During observation, the animals exhibited decreased mobility but no signs of convulsions or loss of writhing reflex. This result indicates that Clitoria ternatea has a low toxicity profile. The mutagenic effect of the aqueous extract of Clitoria ternatea Linn was assessed by three test methods, Bacillus subtilis rec assay, Salmonella typhimurium Ames’ test and micronucleus test. The aqueous extract gave negative results, no mutagenic activities in both bacterial and mammalian cells.

MISCELLANEOUS
The plant of interest was found to be active as nitrogen supplements to Napies grass basal diet in relation to the performance of lactating Jersey crows.[11,90,91] Polar (ethanol) and non polar (benzene) extracts of Clitoria ternatea seeds at dose of 75 and 100 mg/kg, i.p. was evaluated on milk induced leucocytosis and milk induced eosinophilia in mice and found significant inhibition. The ethanol and benzene extracts showed milk induced leucocytosis in dose dependent manner. But in milk induced eosinophilia ethanol extracts showed inhibition eosinophilia in dose dependent manner while benzene extract does not showed dose dependent inhibition. This inhibition of leucocytosis and eosinophilia indicates the anti-allergic potential of Clitoria ternatea.

CONCLUSION
Major thrust by whole of the pharmaceutical industry is focused towards design and development of new plant based drugs through investigation of leads from traditional system of medicines. In the study of Clitoria ternatea alcoholic extracts of roots, leaves and flowers gives different pharmacological activities like antileprosy, anti-inflammatory, antihelmintic, immunomodulatory, antiasthamatic, antidepressant, anticonvulsant, analgesic, antipyretic, antifungal, proteolytic and antihyperlipidemic. Many important phytoconstituents responsible
for the activity were isolated. The scientific research on Clitoria ternatea suggests a huge biological potential of this plant. Though the reported evidences supports the safety and efficacy of CT, but the quality of the evidence is limited in respect to its bioactive secondary metabolites, bioavailability, pharmacokinetics and therapeutic importance including clinical trials, which are not known with sufficient details. It is strongly believed that detailed information as presented in this review might provide detailed evidence for the use of this plant in different medicines. At the same time, the organic and aqueous extracts of Clitoria ternatea could be further exploited in the future as a source of useful phytochemicals compounds for the pharmaceutical industry.

REFERENCES
2. Prof Dr Ali Esmail Al-Snafi Department of Pharmacology, College of Medicine, Thi qar University, Nasiriyah, Iraq.
3. Chakraborty GS1, Kumar V1, Gupta S1, Kumar A1, Gautam N1, Kumari L11 Pharmacy Institute, Noida Institute of Engineering & Technology, 19, Knowledge Park–II, Greater Noida – 201306, Uttar Pradesh, India.