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# Pharmacological aspects of *Clitoria ternatea*

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**Abstract**
The butterfly pea flower, also known as the blue pea, boasts a rich medicinal history deeply related with its vibrant presence in colorful societies. The journey of blue pea is as a healing agent since ancient times, which have been used in traditional Ayurveda and Chinese drugs. Botanical name of this flower is *Clitoria ternatea*. and subfamily Faboideae. It belongs to the family Fabaceae Butterfly pea flowers are a type of condiment factory. This factory is used in the treatment of eye infection, throat infection, skin infection, asthma. Habitat of the plant is warm, sticky conditions and prefers well draining soil. There are colorful uses of butterfly pea flower including, beverages, food dye, medicine, cosmetics etc. benefit of this flower is rich in antioxidant. Butterfly pea plant activity studies, there's fascinating range of research exploring its potential benefits in various fields. It involved cerebral enhancement, neurological protection, overall health benefits including antioxidant activity, anti-inflammatory properties and hair growth. Other activities include antibacterial and antifungal properties, diabetes management. The medicinal properties of these flowers are cancer prevention, cardiovascular health, increased weight loss, better blood sugar control and improvement in skin health. On the flower until the arrival work is done on biochemical evaluation, antioxidant and anti-inflammatory activity etc. The antimicrobial, antidiabetic and phytochemical tests were performed. In the antimicrobial test organisms were used like *Salmonella*, *Bacillus*, *E-coli*, *Pseudomonas*, *Streptococcus*, etc. *Clitoria ternatea* flower is a very useful candidate for functional food applications owing to its wide range of pharmacotherapeutic properties as well as its safety and effectiveness.

**Keywords:** Antimicrobial, extraction, food preservative, *Clitoria ternatea*, phytochemical, antidiabetic property

## Introduction

The butterfly pea flower, *Clitoria ternatea* with its vibrant blue petals and unique properties. (Fantz PR et.al 1991) [30] Explore the flower's origins in Southeast Asia and its migration routes. (Rai KS *et al* 2000) [12]. Discuss its adaptation to diverse environments and potential role in seed dispersal by butterflies. Delve into the intricate structure of the flower, including its distinctive blue sepals, fused petals, and staminal sheath. Analyze its reproductive strategies and compare it to other fabaceae members. (Ssolomon, et.al 2016). Investigate the genetic variations within the species and potential threats to its biodiversity. The butterfly pea flower, also known as blue pea, Aprajita, Cordofan pea, Blue Tea Flowers, or Asian pigeon wings, is a captivating plant native to Southeast Asia. (Muthu C et.al 2006) [3] This vibrant wonder captivates not only with its stunning appearance but also with its surprising versatility and potential health benefits (Mukherjee PK et,. al 2007) [2] The butterfly pea boasts intensively blue, trumpet- shaped flowers about 2- 3 elevation in periphery. These flowers bloom around the time in tropical climates, adorning the factory with splashes of color. The leaves are lustrous green and pinnate, suggesting those of typical pea shops. (Tirkey A et.al 2006) [4] The dried petals or whole flowers are most generally used to brew a caffeine-free herbal tea known as blue tea. This tea has a mild, earthy flavor and a stunning sapphire color that changes to pictorial purple when acidic (like with bomb juice). The vibrant blue color uprooted from the flowers is a natural and safe volition to synthetic colorings. This color is used to color rice dishes, amalgamations. (Nawas Ah et. al 2009) The antioxidants and anti-inflammatory parcels of the flower make it a desirable component in some hair and skin care products. Research suggests implicit benefits for brain health, memory, anti-aging, and blood sugar control, although further studies are demanded for conclusive substantiation. (Raghupathy S et.al 2009) The flower's excerpts may help reduce inflammation and palliate pain associated with conditions like arthritis. (Nawaz AH, *et al*,. 2006) The factory is fairly easy to grow in warm climates with plenty of sun and well- draining soil. While generally safe for most people, consult a croaker.

Before consuming butterfly pea flower if you see bright blue color seems perfect to attract butterflies, they infrequently pollinate it. Rather, notions and other insects are its primary pollinators, attracted by the sweet quencher at the base of the flower. In Thailand, it's used in observances and immolations, emblematize stopgap and good luck. In Ayurveda, it's associated with the third eye chakra, representing suspicion and spiritual enlightenment. (Bhandar MJ et.al 1995) [11] The flower's name" Aprajita" in Sanskrit translates to" unconquered," making it a symbol of strength, adaptability, and palm. Besides coloring rice dishes and goodies, the flower can be used to make bathos, jellies, and indeed ice cream. (Sikdar M, *et al*., 2008) [6] The dried flowers can be used for ornamental purposes, creating wreaths, potpourris, and indeed natural fabric colorings. Their vibrant color adds a unique touch to any craft design. Butterfly pea flower tea can be used to produce astoundingly layered amalgamations, its color changing grounded on the acidity of the other constituents. (Vimalanayhan S, *et al*., 2009) [8]

## Materials and methods

### Sample Collection

Flowers of *Clitoria ternatea* was collected from the botanical garden in K.J. Somaiya College, Kopargaon on 8 January of 2024 and authenticated by the areas of surroundings. At room temperature flowers are dried for 10-20 days. Then dried flowers were pulverized.

### Flower Extract Preparation

The sample materials were extracted using ethanol by soxhlet method. The 20 mg powder in 200 ml of ethanol and the sample material was placed on filter paper and placed in the thimble. Then vapours of a fresh solvent are produced in a thimble containing the material to be extracted and are liquefied in the condenser (Balakrishnan V et.al 2009) [9].

### Test microorganisms and growth media

Gram-positive and Gram-negative bacteria, were used for antimicrobial activities studies: Gram-positive bacteria included *Bacillus*, Gram-negative bacteria included *Escherichia coli, Pseudomonas*, were used in this study. The bacterial strains were grown in Muller–Hinton agar plates at 37 °C. for 24 hours. (Mukherjee PK et.al., 2007) [2].

### Phytochemical analysis- (Hossain Md et.al., 2010) [10]

### Qualitative analysis

It is the strongest match of test for presence of tannins, glycosides, sponins, flavonoids, phenol, carbohydrates, proteins.

### Glycosides Test

About 0.5gm of ethanol extract was taken in a test tube and 1 ml glacial acetic acid containing traces of FeCl3 was added to this solution, 1ml concentrated sulphuric acid was added and reddish brown colour was formed of the two layers and the upper layer turned bluish green in the presence of glycosides. (Parimaladevi B et.al 2004) [19]

### Flavonoid Test

0.5gm of extract was poured into 10 ml of ethyl acetate in a test tube and placed in a hot water bath for 1 min. Then the mixture was shaken for 1 min the mixture was then filtered. 4ml of the filtrate is taken and mixed with 1ml 1 % aluminum chloride solution. It is shaken properly and incubated for 10 min and yellowish colour appears in the presence of 1 ml diluted ammonia solution showing the presence of flavonoids.

### Tannin Test

5 gms of the ground powder was extracted with 10ml ammoniacal chloroform and 5ml chloroform. The filtered and refined mixture was filtered and then shaken with 10 drops of 0.5 M sulphuric acid. Creamish white precipitation was noticed just like tannins.

### Proteins Test

2 ml of filtrate extract with 2-5 drops of ninhydrin solution placed in the boiling water for 2-3 minutes. After 2-3 minutes the formation of purple color shows the presence of protein.

### Phenol Test

Fractions of extract in aqueous 5% of ferric chloride shows the formation of deep blue or black color which shows the presence of phenol.

### Saponins Test

2 ml of extract with the 6 ml of tap water and shake vigorously for 5 minutes. After 5 minutes the persistent formation of foam was observed. It shows the presence of saponin

### Antimicrobial well diffusion Assay

Antimicrobial activities of the flower extract were studied by the well diffusion method. The Muller hinton agar was spread on the solid plate with an L- shaped glass rod. Then wells loaded with 50ml, 100ml, 150ml extract at a concentration of 100.0 mg/ml. Similarly each plate carries a negative control by adding a phosphate buffer in the center antibiotics were considered as positive control. All the plates were incubated at 37 degree celsius for 18 hrs at 28 degree celsius. The zones of growth of inhibition around the wells were measured after 18 hr. The sensitivity of the microorganism to the flower extract was determined by measuring the size of the inhibitory zone on the agar surface around the well. (S Solomon, N Muruganantham and MM Senthamilselvi *et al*., 2016) [1]

### Antidiabetic assay

Salivary-amylase enzyme were added with starch solution and left to react with alpha- amylase solution under alkaline conditions at maltose was quantified by the reduction of 3,5 dinitro salicylic acid to 3- amino- 5- nitrosalicylic acid starch solution was obtained by stirring 0.1 g of potato starch in 100 ml of phosphate buffer. The enzyme solution was prepared by mixing salivary-amylase in 100 ml of distilled water. The colorimetric reagent is prepared by mixing sodium potassium tartrate solution and 3,5 dinitrosalicylic acid solution 96mM both control and plant extracts. (Zheng W et.al 2001) [22]

## Result

### Percentage of yield

**Table 1:** Percent of yield of dry powder

| Flower sample | Flower fresh weight(gm) | Powder weight (gm) | % of yield |
|---|---|---|---|
| *Clitoria ternatea* | 45.49 | 20.43 | 222.66 |

### Result of phytochemicals

**Table 2:** Qualitative analysis is done to screen for the presence of phytochemicals from the *Clitoria ternatea*

| Sr. No | Phytochemicals | Plant part (flower) |
|---|---|---|
| 1 | Carbohydrate | +ve |
| 2 | Glycosidase | +ve |
| 3 | Flavonoides | +ve |
| 4 | Tannis | +ve |
| 5 | Proteins | +ve |
| 6 | Phenols | -ve |
| 7 | Saponin | -ve |

In the phytochemical assay the result shows the presence of carbohydrates, glycosidase, flavonoids, tannins, proteins, and the absence of phenols and saponin.
+ve for Presence of the compound.
-ve for Absence of the compound.

**Result of antimicrobial activity**

**Table 3:** Antimicrobial activity of the compound isolated from the ethanol of the flower of *Clitoria ternatea*

| Sr.no. | organism | Concentration(mg/ml) (extract) | zone of inhibition(mm) |
|---|---|---|---|
| 1 | *E- coli* | 50<br>100<br>150 | 23<br>25<br>28 |
| 2 | *Pseudomonas* | 40<br>80<br>120 | 12<br>13<br>14 |
| 3 | *Bacillus* | 40<br>80<br>120 | 18<br>20<br>22 |
| 4 | *Neisseria* | 40<br>80<br>120 | 14<br>15<br>17 |

In the current study, *Clitoria ternatea* flowers were screened for antimicrobial activity and compared with standard drugs. It is evident from the data presented in Table I that the compound isolated from the ethanol fraction of *Clitoria ternatea* flowers possesses antibacterial activity. The well diffusion method result showed the zone of inhibition for *E.coli* 50 µg /ml as 23mm, 100 µg/ml as 25mm, 15 µg/ml as 28mm and for pseudomonas 40 µg /ml as 12mm, 80 µg /ml as 13mm, 120 µg /ml as 14mm and for *Bacillus* 40 µg /ml as 18mm, 80 /ml as 20mm, 120 µg /ml as 22mm.and for *Neisseria* 40 µg /ml as 30mm, 80 µg /ml as 25mm, 120 µg /ml as 15mm the test sample against *Escherichia coli*, *Bacillus* and for *Neisseria* when compared with standard drug showing 30 mm, 25 mm, 15 mm,20mm zone of inhibition

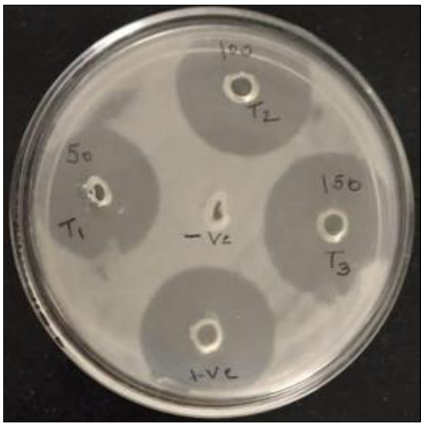
**Result of antidiabetic activity**

**Table 4:** Antidiabetic activity of the isolated compound from the ethanol fraction of the flower of *Clitoria ternatea*

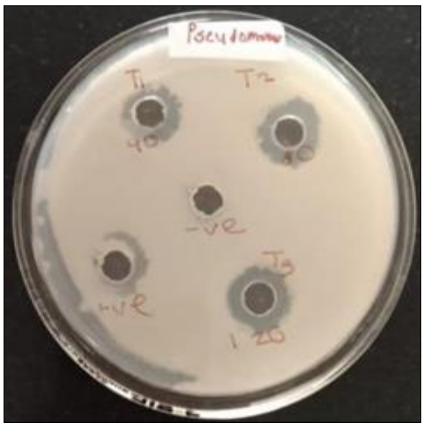
| Conc. Of extract (mg/ml) | % of inhibition(standard) | % of inhibition (ethanol) |
|---|---|---|
| 20 | 65.17 | 36.36 |
| 40 | 72.35 | 27.27 |
| 60 | 79.56 | 13.63 |

In antidiabetic assay results show the zone of inhibition for salivary amylase 20 mg/ml as 14mm, 40mg/ml as 16mm, 60mg/ml as 19mm. The α-Amylase inhibition activity of the extract of *Clitoria ternatea was comparable to report B. N. Joshi et al. who studied the inhibition activity of the flower Clitoria Ternatea flower extract. (Crowder LV et.al 1974)* [37].

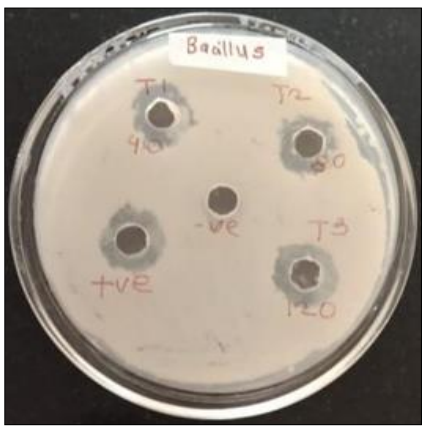
**Antimicrobial activity of the compound isolated from the ethanol fraction of the flower of *Clitoria ternatea***



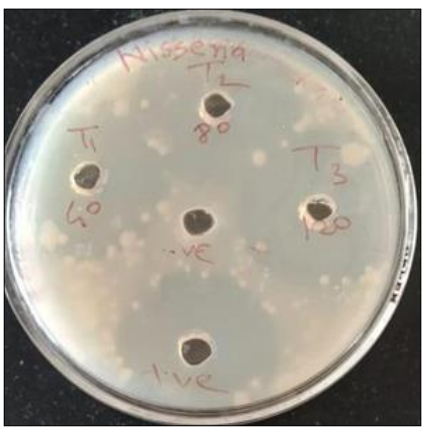

***Escherichia coli***




***Pseudomonas***

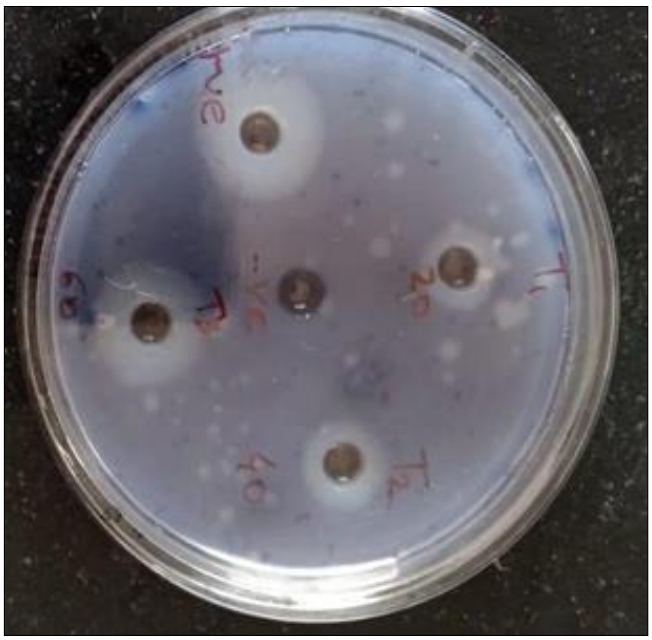



***Bacillus***




***Neisseria***

**Antimicrobial activity**



**Antidiabetic activity of the compound isolated from the ethanol fraction of flower of *Clitoriaternatea***

**Discussion**

In the current study, *Clitoria ternatea* flowers were screened for antimicrobial activity and compared with standard drug. It is evident from the data presented in Table I that the compound isolated from the ethanol fraction of *Clitoria ternatea* flowers has antibacterial activity. The well diffusion method result showed the zone of inhibition for *E.coli* 50 µg /ml as 23mm, 100 µg/ml as 25mm, 15 µg/ml as 28mm and for *Pseudomonas* 40 µg /ml as 12mm, 80 µg /ml as 13mm, 120 µg /ml as 14mm and for *Bacillus* 40 µg /ml as 18mm, 80 /ml as 20mm, 120 µg /ml as 22mm.and for *Neisseria* 40 µg /ml as 30mm, 80 µg /ml as 25mm, 120 µg /ml as 15mm the test sample against *Escherichia coli*, *Bacillus* and for *Neisseria* when compared with standard drug showing 30 mm, 25 mm, 15 mm,20mm zone of inhibition. In the phytochemical assay the result shows the presence of carbohydrates, glycosidase, flavonoids, tannins, protiens, and the absence of phenols and saponin. In antidiabetic assay result shows the zone of inhibition for salivary amylase 20 mg/ml as 14mm, 40mg/ml as 16mm, 60mg/ml as 19mm.

**Conclusion**

Current study shows that the compound isolated from the ethanol fraction of flowers of *Clitoria ternatea* is having good pharmacological action. Antimicrobial activities are aggravated by increasing the quantity of this compound, and hence this compound could be used as another option for antibiotics. The concentration of extract 150mg/ml is suitable for greater inhibition against *E-coli.* And the concentration of extract 120 mg/ml is suitable for greater inhibition against *Pseudomonas*, *Bacillus* and *Neisseria*. The presence of phytochemicals in extract of *Clitoria ternatea* flower was identified. The *Clitoria ternatea* flower extract exhibited good antidiabetic properties and *Clitoria ternatea* can be considered as an herbal plant.

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