IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review Article on "Butterfly Pea (Clitoria ternatea): A Versatile Herb in Pharmaceuticals and Cosmetics."

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ABSRATCT- Clitoria ternatea, commonly known as butterfly pea, is a medicinal plant renowned for its vibrant blue flowers and diverse phytochemical profile. Butterfly Pea has been used for centuries in Ayurvedic and Southeast Asian Medicine and now recent studies have shown that it holds great promise in today's pharmaceutical field. The Plant is rich in bioactive compounds like flavonoids, anthocyanins, triterpenoids and peptides like cyclotides which contributes to its antioxidants, anti-inflammatory, antimicrobial, nootropic, and anticancer properties. This article reviews current findings on the pharmacological properties of butterfly pea, its mechanism of action, and emerging application in drug formulation and diseases treatment.

Key Words- Butterfly Pea, Clitoria ternatea, Ayurveda, anti-oxidant

1. INTRODUCTION

Clitoria ternatea, generally known as butterfly pea or blue pea, is a perennial herbaceous plant from the Fabaceae family. It has a rich source of antioxidants. Butterfly pea flowers are often used to give a natural blue colour to food and drinks. They're commonly added to items like rice, desserts, and even mocktails or cocktails. In traditional systems like Ayurveda, these flowers are also valued for their potential health benefits. The pigments found in butterfly pea flowers can be taken out and used to make a natural blue dye. This dye is often used in fabrics, food colouring, and cosmetics as a natural option instead of chemical-based dyes. Clitoria ternatea is a well-known Ayurvedic plant and herbal treatment used to treat a number of diseases. The butterfly pea bloom has a blue tint.

VARIOUS TYPES OF BUTTERFLY PEA FLOWER

i. **Clitoria ternatea:** The most common species with bright blue flowers, though it can also produce variations with purple or white petals.

Figure 1 Clitoria ternatea

ii. **Clitoria ternatea 'alba':** This variety features white flowers instead of the typical blue or purple.

Figure 2 Clitoria ternatea 'alba'

iii. **Clitoria ternatea 'Double Blue':** Known for its double-layered petals, creating a fuller appearance compared to the single-petaled varieties.

Figure 3 Clitoria ternatea 'Double Blue'

iv. **Clitoria ternatea 'Rosea':** A variation with pink or light purple flowers instead of the typical blue.

Figure 4 Clitoria ternatea 'Rosea'

2. TAXONOMY

The butterfly pea, scientifically known as Clitoria ternatea, belongs to the family Fabaceae (or Leguminosae) family, which is also known as the pea or bean family. It is classified under the genus Clitoria. This plant is a perennial vine found in tropical and subtropical regions. The holotype of the Clitoria subgenus, Clitoria ternatea, is the prototypical Clitoria. Since Linnaeus drew the specific description from specimens found on the Indonesian island of Ternate, it is believed that the specific name originated there. The exact geographic origin of C. ternatea is thus difficult to determine, but we may infer from the center of diversity for subgenus Clitoria, that C. ternatea arose in or around the Indian Ocean and not the Pacific Ocean or South China Sea where it has been in use as a food colouring historically (Fantz, 1977; Staples, 1992). It is also entirely possible that the taxon we know as C. ternatea is an ancient hybrid of one or more members of the subgenus Clitoria that had subsequently been introduced to Southeast Asia.

Kingdom: Plantae
Division: Magnoliphyta
Class: Magnoliopsida
Subclass: Rosidae
Order: Fabales
Family: Fabaceae(also known as Leguminosae or Papilionaceae)
Subfamily: Faboideae
Genus: Clitoria
Species: Clitoria ternatea L.

3. MORPHOLOGY

The pea blossoms are about 4 cm long and 3 cm broad, with five petals. A banner with two wings two keels, and brilliant yellow emblem in the middle. The butterfly pea is a perennial herbaceous plant with distinctive features. Its most striking characteristic is its bright blue, butterfly-shaped flowers, though some varieties produce white flowers.

Figure 5 Morphology of Butterfly pea

The perennial plant Clitoria ternatea reproduces itself by means of black seeds. The colourful pods range in length from 7 to 11 cm. In the culinary industry, the root and leaves are used to manufacture herbal and medicinal drinks. Butterfly peas are the most popular product in the world.

4. CHEMICAL CONSTITUENTS

Butterfly pea flowers contains chemical constituents like Taraxerol and taraxerone, pentacyclic triterpenoids and flavonol glycoside, 3,5,4′-trihydroxy-7- methoxyflavonol-3-O-β-d-xylopyranosyl- (1,3)-O-β-d-galactopyranosyl (1,6)-O-β-d-glucopyranoside are present in the root of CT . Besides protein and fatty acid content, CT seeds also contain p-hydroxycinnamic acid, β-sitosterol, γ-sitosterol adenosine, flavonol-3-glycoside, ethyl-α-d-galactopyranoside, 3,5,7,4′- tetrahydroxyflavone, 3-rhamnoglucoside, hexacosanol, and an anthoxanthin glucoside. Kelemu et al. reported the presence of antimicrobial and insecticidal protein finotin in the seeds of CT. The flowers of CT contain ternatins A1-3, B1-4, C1-5, D1-3 . The flowers of CT also contain kaempferol, kaempferol 3-neohesperidoside, kaempferol 3-2G-rhamnosylrutinoside, kaempferol 3-rutinoside

5. NUTRITIONAL FACTORES

Clitoria ternatea flowers are rich in anthocyanin called ternatins, some of the same types of flowers found in superfoods like berries, cherries and red wine.
This plant also contains several other Antioxidants like,

Kaemphferol:- This compound has been studied extensively for its cancer-fighting properties.
p-Coumaric acid:- Some research suggests that p-coumaric acid could have anti-inflammatory, antimicrobial, and antiviral effects, which may help protect against disease.
Delphinidin-3,5-glucoside:- This antioxidant may help stimulate immune function and cause cell death in colorectal cancer cells.
Flavonoids:- These compounds also have antioxidant and anti-inflammatory effects.
Phenolic Compounds:- Butterfly pea also contains some phenolic compounds, like Kaemphferol, Delphinidin-3,5- glucoside.
Vitamins:- This flower also contains some vitamins like vitamin A,C and E that are important for overall health and, according to a health and wellness blog.

6. MEDICINAL ACTIVITIES

- Nootropic Activity
- Anti- inflammatory
- Analgesic
- Antipyretic Activity
- Antidiabetic Activity
- Antioxidant Activity
- Pesticidal Activity

7. BENEFITS

1. Improve skin and hair health:

If applied topically, butterfly bean flower can prevent early signs of skin aging, such as loss of firmness, fine lines, and uneven skin tone and texture. Due to its anti-inflammatory properties, it helps to treat rashes, swelling, itching, dermatitis or allergies affecting the skin. Butterfly pea flowers can help to prevent the different skin problems. It is known to help provide extra blood to the hair follicles and reduce inflammation that inhibits hair growth.

2. Supports Glowing Skin:

While some flowers and plants contain ingredients that can irritate the skin, everything from the root of the butterfly pea flower to the flower itself can be used in skin care. One study showed soothing effects on skin problems.

3. Enhance Skin Health:

Flavonoids present in green tea boosts collagen production and support skin elasticity. Drinking warm green tea regularly can help to cleanses the stomach, liver and kidneys, flushing out undigested food and toxins from the body.

4. Promote Hair Growth:

Blue pea flowers are also great for hair because they contain anthocyanins, compounds known to increase blood circulation in the head, keeping the scalp healthy. It also helps strengthen hair follicles from the inside out.

5. Protein source:

These flowers also provide minimal protein and a small amount of dietary fibre.

6. Vitamins:

The contain moderate amount of vitamin C, some vitamin A in the form of carotenoids like beta carotene, small amount of iron and calcium.

8. Rich in Antioxidants:

Butterfly pea flower is packed with anthocyanins, the compounds that give it its signature blue colour colour. These antioxidants protect cells from oxidative stress, support the skin health and may slow signs of aging.

9. Supports Brain and Memory function:

These flowers traditionally used to improve the mental clarity. It may help enhance memory, focus and cognitive performance by increasing acetylcholine levels in the brain.

10. Fights reproductive issues:

Green tea infusion has been shown to help treat menstrual problems, such as reducing cramps and relieving pain. In men, it is injected to stimulate normal sperm production. The flower is believed to have strong aphrodisiac properties.

8. CONCLUSION

In this article, Clitoria ternatea, commonly known as butterfly pea, is a valuable medicinal plant known for its safety and wide range of healing benefits. Traditionally used in Southeast Asia, it's often prepared as a tea or herbal extract and is rich in antioxidants like anthocyanins, which give it a vibrant blue color. This plant offers several health benefits, including anti-inflammatory and antibacterial effects. It supports brain, skin, and eye health, helps with digestion, and aids respiratory and metabolic functions. Studies have shown

that it also has nootropic, antistress, antidepressant, anxiolytic, sedative, antipyretic, anti-inflammatory, pain-relieving, and antidiabetic effects.

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