

## PHYTOCHEMICAL PROFILE AND PHARMACOLOGICAL ACTIVITIES WITH COSMETOLOGICAL AND EMERGING APPLICATIONS OF CLITORIA TERNATEA (SANGU POO)

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### ABSTRACT

From the pea family comes *Clitoria ternatea* Linn., often called Sangu Poo, a plant long noted for healing uses due to its mix of natural compounds. Because of brain-supporting, swelling-reducing, and mind-sharpening traits, it has held importance in traditional Indian, Tamil, and Greco-Arab medicine systems. Botanical features aside, this summary covers chemical makeup alongside lab-tested effects and fresh roles in skincare science. While rooted in ancient practice, the study now expands into modern health possibilities tied to this vivid blue-flowered vine. Rich in active plant chemicals like terpenes, flavonoids, and alkaloids, this species holds diverse natural substances. From saponins to tannins, terpenoids to glycosides, its components show broad biological roles. Antioxidant qualities appear alongside antimicrobial strength, often seen in lab tests. Healing properties extend to ulcers, wounds, and even liver

protection, as shown in results. Heart health support links to how it influences cell signals tied to inflammation. Cancer-related activity emerges when metabolic processes are adjusted by key molecules. Immune system balance arises due to shifts in nerve-driven responses. Free radicals tend to drop when extracts enter tissues during trials. Cyclotides play a quiet but steady role across many of these outcomes. Effects unfold mainly through cleaning reactive particles, calming swelling paths, and guiding brain-body loops. These days, *Clitoria ternatea*

is turning heads in skincare and beauty products because it may slow ageing, shield skin from light damage, reduce pigment formation, and encourage hair growth. The vivid hues found in this plant come from natural compounds called anthocyanins, which double as gentle, earth-safe dyes in both cosmetics and food items. Beyond that, early signs suggest it could play a role in health supplements, everyday foods with added benefits, tiny delivery vehicles for medicine, and even green solutions in manufacturing settings. Even so, without proof from human trials, consistent quality remains a problem. Still, plant compounds break down easily, making results unpredictable. Yet regulation lags behind discovery, slowing progress. Because of this, better methods in testing and product design are needed. Only then can real benefits emerge from long-used natural sources.

**KEYWORDS:** Cancer-related activity emerges when metabolic processes are adjusted by key molecules.

## INTRODUCTION

Medicinal plants have been a key part of the traditional healthcare system for centuries. They contain many bioactive compounds with healing potential. One notable plant is *Clitoria Ternatea* Linn, commonly known as butterfly pea, blue pea, Asian pigeon wings, or Sangu poo (in Tamil). This perennial herb belongs to the Fabaceae family. It grows widely in tropical and subtropical areas, especially in South and Southeast Asia, including India, srilanka, Malaysia, Indonesia, Thailand and the Philippines. *C. ternatea* is often cultivated as an ornamental plant, cover crop, and medicinal herb due to its ability to thrive in different climates and its nitrogen-fixing capacity.

*Clitoria ternatea* is a climbing plant with pinnate leaves, solitary deep blue, violet, white, or mauve flowers, and flat pods that contain 6 to 10 seeds. The vibrant blue colour of its flowers comes from a special group of anthocyanins called ternatins. This has drawn significant scientific and industrial interest. Traditionally, various parts of the plant-roots, leaves, seeds, and flowers-are used in Ayurvedic, Siddha, Unani, and folk medicine to treat neurological disorders, inflammation, fever, skin diseases, diabetes, digestive issues, and as a brain tonic to improve memory and cognition.

Phytochemical research on *C. ternatea* has found a wide range of secondary metabolites. These include flavonoids, anthocyanins, phenolic acids, tannins, alkaloids, saponins, terpenoids, glycosides, steroids, proteins, carbohydrates, fatty acids, and phytosterols. The

flowers are particularly rich in polyphenolic compounds like delphinidin-based anthocyanins, kaempferol, quercetin, and myricetin derivatives, which give the plant strong antioxidant properties. Improved extraction methods, such as ultrasound-assisted extraction, have boosted the recovery and bioavailability of these phytochemicals.

Recently, *C. ternatea* has attracted more attention for its uses in cosmetics and other emerging applications. The flower extracts are being studied as natural colourants in food, drinks, and cosmetics because of their bright blue colour and colour-changing properties that depend on pH. In cosmetics, *C. ternatea* is included in herbal skincare and haircare products for its antioxidant, anti-ageing, anti-inflammatory, photoprotective, and anti-microbial qualities. It shows potential for use in anti-wrinkle creams, sunscreens, hair growth products, and natural dyes, reinforcing its role as a versatile cosmetic ingredient. Furthermore, the plant may be beneficial in nutraceuticals, functional foods, eco-friendly dyes, and pharmaceutical products, contributing to sustainable and green product development.

Despite its extensive traditional use and growing scientific evidence, there is still limited clinical validation and standardisation of products based on *Clitoria ternatea*. Therefore, a thorough review of its phytochemical profile, cosmetic relevance, and new applications is crucial. This will help to connect traditional knowledge with modern scientific research.

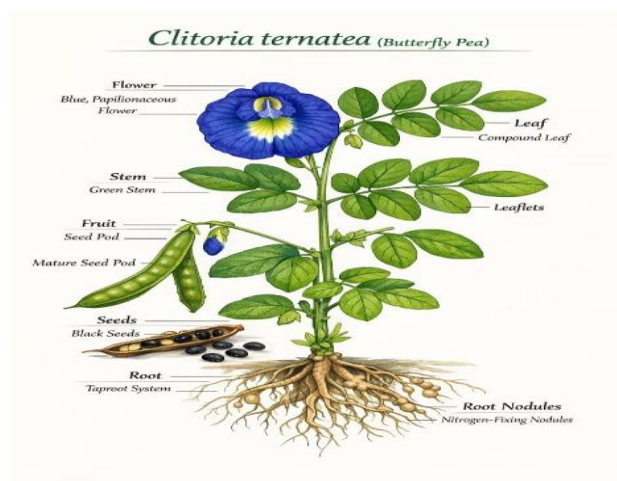
The vibrant blue colour of flowers comes from delphinidin-based anthocyanins called ternatins, which not only give the flowers their striking hue but also provide strong antioxidant benefits. Traditionally, various parts of the plant, including roots, leaves, seeds, and flowers, have been used extensively in Ayurvedic, Siddha, and folk medicine as a brain tonic, memory enhancer, anti-inflammatory agent, and treatment for skin issues and neurological conditions.

This review aims to gather current information on the botanical features, phytochemical components, pharmacological properties, and expanding applications of *Clitoria ternatea* (Sangu poo). It emphasises the plant's therapeutic potential and future possibilities in modern medicine, cosmetics, and related industries and examines current knowledge on the phytochemical characteristics, medical effects, and cosmetic and emerging uses of *Clitoria ternatea* (Sangu poo), highlighting its therapeutic value, cosmetic potential, and future possibilities in pharmaceuticals, cosmeceuticals, and industrial applications.



## BOTANICAL OVERVIEW

Botanical Description of *Clitoria ternatea* *Clitoria ternatea* Linn. is an evergreen, herbaceous, and climbing plant with the family name “Fabaceae” (Leguminosae). It is known as “butterfly pea”, “blue pea”, “Asian pigeon wings”, or “Sangu poo” in Tamil. It finds extensive usage as an ornament, in traditional medicine, as well as in improving soil fertility by acting as a nitrogen-fixing plant, thereby making its usage widespread in the tropical as well as the subtropical regions.



## TAXONOMICAL CLASSIFICATION

Kingdom: Plantae

Division: Angiosperm

Class: Dicotyledonae

Order: Fables

Family: Fabaceae

Species: Swingle

Genus: *Clitoria*

Species: *Clitoria ternatea* Linn.

## **HABIT AND HABITAT**

During this, *Clitoria ternatea* is an annual or perennial, slender, twining vine. It is suited to warm climatic conditions. It can grow well in well-drained soils. It is observed to be growing along fences, hedges, roadsides, gardens, and agricultural fields. It has a fast rate of growth.

## **ROOT**

The root system is characterised by the presence of a strong taproot with laterals. The root is conventionally utilised in the formulation of medicine and is renowned for its biological activity, especially in the neurological and anti-inflammatory fields.

## **STEM**

The stem is herbaceous, cylindrical, green, and pubescent in the young state, and fuzzy when young, becoming slightly woody as it matures. It twines in a clockwise direction and provides support for the plant.

## **LEAVES**

Leaves are alternate, pinnately compound, and made up of 5-7 ovate to elliptical leaflets. The leaflets are smooth, entire, and bright green, with either a blunt or slightly pointed tip. Leaves are important for photosynthesis and contain various secondary compounds that contribute to their medicinal effects.

## **FLOWERS**

The flowers are solitary and large, measuring about 3-5 cm across. They are mostly deep blue, but white, violet, and pale pink varieties also exist. The corolla has a distinct papilionaceous shape typical of the Fabaceae family. The vibrant blue colour of petals comes from ternatins, a group of delphinidin-based anthocyanins that give the plant its antioxidant, coloring, and cosmetic properties.

## **FRUIT**

The fruit is a flat green pod that measures around 5-10 cm long. Each pod contains 6-10 seeds and turns brown when mature.

## **SEEDS**

Seeds are small, hard, and oval to oblong in shape, ranging from yellowish-brown to black. They contain a lot of protein and lipids and are sometimes used in traditional medicine.

## **TRADITIONAL USES AND ETHNOBOTANICAL IMPORTANCE OF CLITORIA TERNATEA (SANGU POO)**

*Clitoria ternatea*, or butterfly pea-Sangu poo If you are in south India-has a long history woven into everyday life across Asia, Africa, and plenty of other tropical places. People have turned to this plant for generations, especially in traditional systems like Ayurveda, Siddha, Unani, and Chinese medicine. They didn't just stumble onto it either; butterfly pea has a real reputation for helping with all kinds of health issues.

Take Ayurveda, for example. Here, butterfly pea sits in a special class of herbs called *Medhya Rasayana*, basically, brain boosters. Folks use the roots too-colouring to sharpen the mind, lift mood, and calm nerves. It's a go-to for stress, anxiety, epilepsy, and mental exhaustion. But that's not all. People also use root decoctions as a gentle laxative or to help with urinary problems.

Over in Siddha and Unani traditions, the plant's a bit of a multitasker. Healers rely on its different parts to fight fever, soothe inflammation, ease asthma and coughs and treat skin troubles. Leaves make handy poultices for swelling, wounds, and infections. The flowers? People steep them to help with itchy or irritated eyes. But it's not just about medicine. In villages and rural communities, especially in Tamil Nadu and Kerala, butterfly pea has a strong cultural presence. The deep blue flowers turn up in religious rituals and ceremonies, symbolising purity. They show up in kitchens too, colouring drinks, rice and sweets with that unmistakable blue. If you travel through Thailand or Malaysia, you'll spot butterfly pea tea everywhere. Locals believe it keeps you young, sharpens eyesight, and boosts energy. Traditional healers even reach for the seeds and roots in emergencies, such as snake bites or scorpion stings.

### **SCOPE AND OBJECTIVES OF REVIEW**

#### **Scope of the review**

This review takes a close look at *Clitoria ternatea* Linn. (also Sangu poo), a plant with a long history in traditional medicine and growing interest for its therapeutic value today. Here, the focus isn't just on what the plant looks like or where it grows; we're digging into everything from its roots in Ayurveda, Siddha, and Unani medicine to what modern science says about its chemical makeup and medical effects. We're especially interested in what gives Sangu poo its punch: the bioactive compounds like anthocyanins, flavonoids, alkaloids, and peptides. These are the key players behind its wide range of benefits.

Along the way, the review connects the old with the new, comparing what the traditional healers knew with what the labs are finding out. There's also a strong spotlight on Sangu poo's rising star in the beauty world, whether it's skin, hair, or just as a natural colorant. Plus, we're looking at its role in nutraceuticals, functional foods, and even the safety questions that come up as it moves from folklore into mainstream products. The goal is simple: gather the latest facts, find where tradition meets science, and map out where research and industry could take this plant next.

### **OBJECTIVES OF THE REVIEW**

Here is what this review sets out to do

Lay out how *Clitoria ternatea* has been used in traditional and folk medicine across different cultures.

Pull together what's known about the plant's chemical profile, especially the standout bioactive compounds.

Go over the proven pharmacological effects—think antioxidant, neuroprotective, anti-inflammatory, antimicrobial, antidiabetic, and anticancer actions.

Shine a light on its uses in beauty and personal care, focusing on how it helps skin, hair, and fight aging.

Explore its growing presence in industry, from natural dyes to herbal supplements and functional foods.

Take a hard look at safety, toxicity, and any downsides, both from traditional and modern use.

Finally, spot the gaps—where research still needs to go, and what questions need better answers to turn tradition into tomorrow's pharmaceuticals and cosmetics.

### **ETHNOPHARMACOLOGICAL SIGNIFICANCE OF CLITORIA TERNATEA (SANGU POO)**

*Clitoria ternatea* Linn. It's not just another plant— it's been a mainstay in traditional medicine for generations across Asia, Africa, and other tropical parts of the world. Look at the way people use it, and you see a close tie between old-school healing and what modern science keeps uncovering.

### **ETHNOMEDICINAL APPLICATIONS**

In Ayurveda, Siddha, and Unani systems, *C. ternatea* stands out for its effects on the nervous system. Healers reach for its roots—usually as a powder or decoction—when someone needs

sharper memory, better focus, or relief from things like epilepsy, insomnia, anxiety, and depression. Because of all this, it's a Medhya Rasayana herb, a category for plants that boost brain function.

But that's not all. Folk healers use the leaves and flowers to bring down fevers, ease pain, calm inflammation, and clear up skin problems. Mix up a paste or poultice, and suddenly you have a traditional remedy for wounds, abscesses, or even insect bites—a testament to its anti-infective and anti-inflammatory powers.

### **NEURO-ETHNOPHARMACOLOGICAL IMPORTANCE**

If you ask around, many folks will tell you the real magic of *C. ternatea* lies in how it helps in the mind. Traditional healers have relied on its flowers and roots to sharpen learning, improve memory, and boost concentration. And now, research backs them up – studies show the plant really does have nootropic, anxiolytic, antidepressant, and neuroprotective effects.

### **ANTI-INFECTIVE AND ANTI-TOXIC USES**

Out in the countryside or among tribal communities, *C. ternatea* is more than just a remedy—it's a first line of defense. When someone faces a snake bite, scorpion sting, or nasty infection, seeds and roots often become antidotes. It's not surprising that lab studies now confirm its antibacterial, antifungal, and antiparasitic powers.

### **ETHNOPHARMACOLOGICAL RELEVANCE IN COSMETOLOGY**

*C. ternatea* isn't just about healing; it's about beauty, too. People mix flower and leaf extracts into oils and pastes to strengthen hair, stop premature greying, improve scalp health, and brighten skin. These traditional tricks have inspired a new wave of modern skin and hair products built around *C. ternatea*.

### **ETHNOPHARMACOLOGICAL IMPORTANCE**

All these traditional uses show why *Clitoria ternatea* matters so much in ethnopharmacology. It's a plant with many talents, one that sits at the crossroads of old wisdom and new research. That's why scientists keep digging deeper, hoping to turn this ancient remedy into modern medicines, supplements, and beauty products. More clinical and safety studies will only add to what we know.

## PHYTOCHEMICAL PROFILE OF CLITORIA TERNATEA (Sangu Poo)

*Clitoria ternatea*, also called sangu poo, packs a serious punch when it comes to phytochemicals. Every part of a plant, flowers, leaves, roots, seeds, and stems, holds a mix of primary and secondary metabolites. You'll find polyphenols, flavonoids, anthocyanins, alkaloids, saponins, tannins, glycosides, terpenoids, and peptides throughout the plant.

Let's start with polyphenols and flavonoids.

These are everywhere in *C. ternatea*, especially the flavonoids. They're the big players behind the plant's antioxidant, anti-inflammatory, and neuroprotective effects. Some of the main flavonoids here are quercetin, kaempferol, myricetin, rutin, and luteolin. They basically hunt down free radicals and help keep oxidative stress in check.

The flowers stand out for their anthocyanins, mainly ternatins –these are delphinidin-based anthocyanins. Ternatins gives the flowers that unmistakable deep blue colour and comes with strong antioxidant, anti-ageing, and photoprotective benefits. Because they hold their colour so well, researchers look at them for natural food colorants and cosmetic pigments.

Alkaloids show up mostly in the roots and seeds. Compounds like clitoris and Aparajita give the plant its reputation for supporting the central nervous system. People have used it traditionally as a nootropic, anxiolytic, and antidepressant – and these alkaloids seem to be why.

Saponins and tannins are all over the plant. Saponins help fight inflammation and infections, and they boost immune function. Tannins bring astringent, wound – healing, and antioxidant properties, which fit with how people have used the plant for skin issues, wounds, and infections.

Terpenoids and sterols, such as  $\beta$ - sitosterol and stigmasterol, add even more value. They show anti-inflammatory, liver – protective, and heart-protective effects, which just broadens the plant's healing potential.

One thing that really sets *Clitoria ternatea* apart is its cyclotides – a special group of cyclic peptides. These little molecules are unusually stable and show off antimicrobial, insecticidal, cytotoxic, and enzyme – blocking activities. They look promising for both medicine and agriculture.

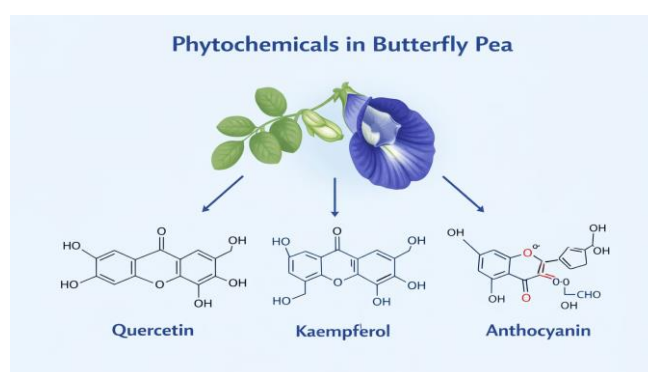
Here's how the main compounds break down across different parts

Flowers: Anthocyanins (ternatins), flavonoids, phenolic acids.

Leaves: Flavonoids, saponins, tannins, terpenoids.

Roots: Alkaloids, flavonoids, glycosides.

Seed: Alkaloids, cyclotides, fatty acids Altogether, this rich mix of phytochemicals explains why *Clitoria ternatea* shows up everywhere from traditional medicine to modern skincare. The compounds work together and seem to boost each other's effects, making this plant a valuable source of natural antioxidants, neuroprotective agents, and cosmeceutical ingredients. There's still a lot to discover – further research and clinical testing will help unlock its full potential.



## PRIMARY AND SECONDARY METABOLITES OF CLITORIA TERNATEA (*Sangu poo*)

*Clitoria ternatea* Linn, or *Sangu poo*, gets its healing power from a huge variety of primary and secondary metabolites. These aren't just important for the plant's own growth and survival-they're the reason people have used this plant in both traditional and modern medicine.

### Primary metabolites

Primary metabolites are the basics: the stuff that keeps the plant alive and growing. In *Clitoria ternatea*, these compounds also make the plant nutritious.

**Carbohydrates** You'll find simple sugars, polysaccharides, and dietary fibres in different parts of the plant. They give energy and structure, which is why *Sangu Poo* shows up in herbal tonics and functional foods.

### Proteins and amino acids

The seeds and leaves are packed with proteins and free amino acids. These help run the plant's cells, giving it those nourishing, restorative qualities people value.

### Lipids and Fatty Acids

These seeds hold fixed oils loaded with fatty acids. These support cell membranes and store energy, and they're the reason the plant is used in traditional hair oils and some cosmetics.

### Vitamins and minerals

*Clitoria ternatea* has plenty of essential vitamins and trace minerals. These boost its antioxidant defenses and help regulate metabolism, so it's a natural fit for nutraceuticals.

### Secondary metabolites

Secondary metabolites aren't about keeping the plant alive day to day, but they do a lot for its defenses and give it most of its medicinal punch. *Clitoria ternatea* packs a whole range of these powerful compounds.

### Flavonoids

You'll find flavonoids like quercetin, kaempferol, myricetin, and rutin especially in the flowers and leaves. They're strong antioxidants, fight inflammation, and help protect the nervous system.

### Anthocyanins

The flowers are loaded with anthocyanins—mainly anthocyanins—which give them that striking blue colour. These pigments work as antioxidants, protect skin from the sun, and have anti-ageing effects. That's why they're popular in food and cosmetics.

### Alkaloids

Roots and seeds supply alkaloids such as clitorin and aparajitin. These nitrogen-based compounds affect the central nervous system, offering benefits like sharper memory and reduced anxiety.

### Saponins

Saponins show up throughout the plant. They're known for fighting inflammation, killing microbes, and balancing immune responses, backing up the plant's traditional use for skin and inflammatory problems.

### Tannins and Phenolic Compounds

Tannins and other phenolics help wounds heal, act as antioxidants, and have astringent qualities, so they're useful for treating infections and helping tissue repair.

### Terpenoids and Steroids

Compounds like  $\beta$ -sitosterol and stigmasterol show up here too, linked with anti-inflammatory and heart-protective effects.

### Cyclotides and Peptides

One thing that sets *Clitoria ternatea* apart is its cyclotides—tough, circular peptides with a whole list of actions: they're antimicrobial, cytotoxic, insecticidal, and inhibit certain enzymes. They've got a lot of potential for medicine.

## PHARMACOLOGICAL ACTIVITIES OF CLITORIA TERNATEA LINN

*Clitoria ternatea* Linn. shows a broad range of pharmacological activities due to its rich mix of phytochemicals, including anthocyanins (ternatins), flavonoids, alkaloids, saponins, tannins, and phenolic compounds. Various *in vitro* and *in vivo* studies have confirmed its traditional medicinal uses.

### 1. Antioxidant Activity

The plant has strong antioxidant potential because of its high levels of anthocyanins and polyphenols. Extracts of *C. ternatea* effectively capture free radicals and reduce oxidative stress by boosting natural antioxidant enzymes. This supports its role in preventing cell damage and age-related disorders.

### 2. Anti-Inflammatory Activity

*Clitoria ternatea* has significant anti-inflammatory effects by blocking inflammatory substances like prostaglandins and cytokines. The flavonoids and phenolic compounds help reduce swelling and inflammation, making the plant useful for managing inflammatory conditions.

### 3. Neuroprotective and Nootropic Activity

Traditionally known as a brain tonic, *C. ternatea* shows neuroprotective and memory-boosting properties. Studies suggest improvements in memory, learning, and acetylcholine levels. These effects are connected to antioxidant activity and changes in neurotransmitters, indicating potential benefits for neurodegenerative disorders.

#### 4. Antimicrobial Activity

Extracts of *C. ternatea* demonstrate antimicrobial activity against various bacterial and fungal strains. The presence of bioactive compounds such as flavonoids, alkaloids, and tannins adds to its ability to inhibit microbial growth, supporting its traditional use in treating infections.

#### 5. Antidiabetic Activity

The plant has antidiabetic potential by lowering blood glucose levels and improving insulin sensitivity. Its bioactive components help control carbohydrate metabolism and block enzymes that absorb glucose, making it useful for managing diabetes.

#### 6. Hepatoprotective Activity

*C. ternatea* shows hepatoprotective effects by protecting against toxin-induced liver damage. Its antioxidant and anti-inflammatory properties help maintain liver enzyme levels and cell health.

#### 7. Anticancer Activity

Early studies suggest that *C. ternatea* may have anticancer potential by triggering cell death and slowing growth in various cancer cells. Polyphenolic compounds play an important role in managing oxidative stress and the signalling pathways involved in cancer development.



### COSMETOLOGICAL APPLICATION OF CLITORIA TERNATE

*Clitoria ternatea* has attracted significant interest in the cosmetic and personal care industry. Its high levels of anthocyanins (ternatins), flavonoids, phenolic acids, and antioxidants provide various benefits for skin and hair care.

#### 1. Natural colourant in cosmetic formulations

The deep blue pigment in *C. ternatea* flowers mainly comes from anthocyanins. This pigment is widely used as a natural colourant in creams, gels, shampoos, soaps, lip products, and

decorative cosmetics. These pigments are biodegradable, non-toxic, and pH-sensitive, making them ideal for clean-label cosmetic products.

## 2. Anti-ageing and skin protective effects

The strong antioxidant properties help neutralise free radicals that cause premature skin ageing. Regular use in topical formulations may reduce fine lines, wrinkles, and loss of skin elasticity by protecting collagen and elastin fibres.

## 3. Skin brightening and complexion enhancement

Flavonoids and phenolic compounds reduce oxidative stress and improve skin tone. Extracts of *C. ternatea* are included in face creams, serums, and masks to promote a healthy, radiant complexion.

## 4. Wound healing and skin repair

*C. ternatea* has wound healing and anti-inflammatory properties. It is used in healing creams, gels, and after-sun products to soothe irritated skin, minor cuts, and burns.

## 5. Anti-inflammatory and soothing agent

The plant extracts help decrease skin inflammation, redness, and irritation. This makes them suitable for sensitive skin formulations, including lotions and baby care products.

## 6. Hair growth promotion and scalp health

Traditionally, *C. ternatea* has been used to support hair growth and prevent hair loss. Its antioxidant and antimicrobial properties help maintain scalp health, strengthen hair follicles, and improve hair texture when included in hair oils, shampoos, and conditioners.

## 7. Anti-dandruff and antimicrobial effects

The antimicrobial activity helps control microorganisms that cause dandruff, supporting its use in anti-dandruff shampoos and scalp treatments.

## **COSMETIC USE OF CLITORIA TERNATEA**

Creams made from plant extracts. Serums that soak deep into the skin. Shampoos using natural ingredients instead of lab-made ones. Conditioners designed to nourish hair gently. Masks are applied once a week for extra care. Toners that refresh without harsh alcohol. Articles already written reviewing each type. From butterfly pea plants, *clitoria ternatea* extracts bring anthocyanins - called ternatins - to skincare products. These compounds team

up with flavonoids, adding strength through natural phenolics. Antioxidants join in, working quietly across formulas meant for skin and hair. Benefits emerge slowly, built on plant chemistry rather than claims. Each ingredient plays more than one role behind the scenes.

### 1. Extract-Based Creams

Fat bits float in watery goo - sometimes it flips, water hangs in fat instead. Texture shifts depending on which liquid leads the mix

#### Applications

Anti-ageing and skin protective creams

Moisturising and nourishing creams

Healing and soothing creams .

#### Functional benefits:

Antioxidant protection against oxidative stress

Improvement of skin elasticity and hydration

Reduction of inflammation and irritation

Healing cuts get a boost here. Skin fixes itself better when helped along. Recovery shows up faster with aid. Tissue rebuilds more smoothly given support. Repair processes run more strongly if backed properly.

### C. Ternatea Extract Function

A single plant-based compound steps into the role, delivering a slowdown in ageing signs while calming irritation. Brighter-looking skin emerges through its influence, working quietly beneath the surface. Instead of harsh agents, this natural element brings balance, shifting texture over time. Results appear not by force but through steady presence, revealing clarity where dullness once sat.

### 2. Extract-Based Serums

Formulation type: Aqueous or hydro-alcoholic lightweight systems

#### Applications

Anti-aging serums

Brightening and antioxidant serums

Repair and night serums

#### Functional benefits:

High bioavailability of anthocyanins and flavonoids

Reduction of fine lines and oxidative damage

Enhancement of skin radiance and texture

### 3. Shampoos

Formulation type: Herbal or mild surfactant-based shampoos

Applications:

Hair growth-promoting shampoos

Anti-dandruff shampoos

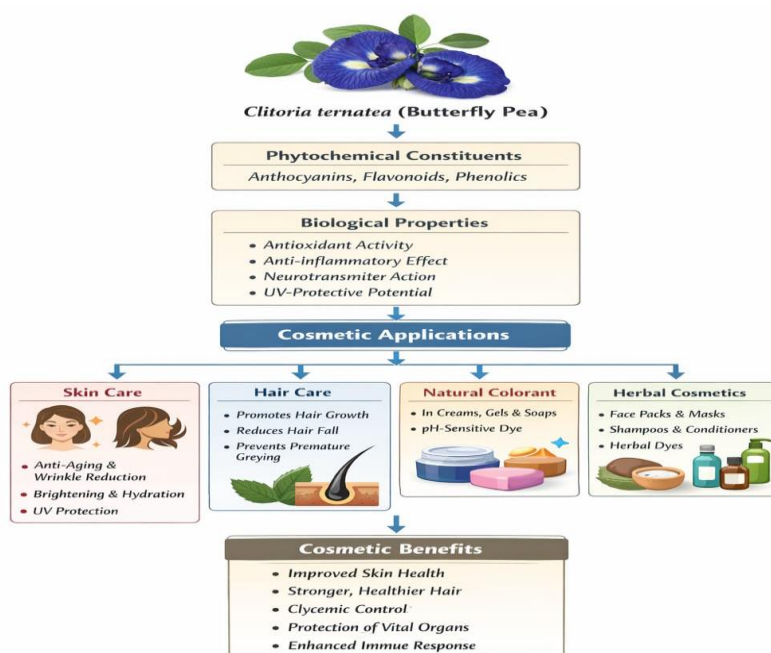
Scalp-nourishing cleansers

Functional benefits:

Strengthening of hair roots

Reduction of dandruff and scalp irritation

Improvement of hair texture and shines



## USES OF CLITORIA TERNATEA TODAY

Fresh attention from researchers now pushes past old roles of *Clitoria ternatea* in folk medicine and skincare, pointing instead toward high-end drug development, beauty-health hybrids, dietary supplements, and even manufacturing uses. Though long rooted in tradition, the plant's journey has taken a sharp turn into labs exploring deeper functions. Not just another herbal remedy anymore, it slips into spaces like targeted therapies, functional ingredients, and material science. Each step forward reveals layers not previously mapped.

What once stayed in gardens now shifts into vials, capsules, formulas built for precision. Curiosity drives this shift - quietly, steadily - without fanfare or promises.

### 1. Cosmeceutical And Advanced Skincare Uses

Development of anti-ageing, antioxidant-rich serums and creams

A soft blue tint appears when this ingredient meets gentle skincare formulas. Where acidity shifts, colour follows along. Beauty items gain hue without synthetic dyes. Nature gives the shade, not lab-made chemicals. With every formula change, the tone adapts quietly. Clean-focused lines find depth through it. Not all pigments need artificial origins - this one grows from balance.

Incorporated Into UV Protection And After Sun Products

Application in dermatological wound healing and skin repair products

### 2. Nanotechnology-Based Formulations

Encapsulation of *C. ternatea* extracts in nanoparticles, nanoemulsions, and liposomes

Improved stability, bioavailability, and skin penetration of anthocyanins

Targeted delivery for anti-ageing, anti-inflammatory, and antioxidant effects

### 3. Nutraceutical and Functional Food Uses

Found in drinks that boost energy, blends of herbs steeped in hot water, and pills meant for daily health support

Natural antioxidant and cognitive health enhancer

Replacement of synthetic food colourants with plant-based pigments

### 4. Medicine and Treatment Uses

Development of cardioprotective and neuroprotective formulations

Exploration as an immunomodulatory and adaptogenic agent

Potential role in anti-diabetic and anti-obesity products

### 5. smart and pH-sensitive products

Use of anthocyanins as natural pH indicators

Application in smart cosmetics and packaging systems that change colour with pH

Innovative skincare products responding to skin pH variations.

## SAFETY AND TOXICITY OF CLITORIA TERNATEA

### 1. Studies on short-term and long-term toxicity

Despite high amounts being tested, no major harmful reactions showed up when scientists looked closely at how animals responded. Extracts made with water or alcohol didn't trigger serious issues, even when used heavily in trials. It took more than 2000 mg per kilogram of body weight in rats before any fatal results appeared, pointing toward minimal immediate risk. Odd shifts in behaviour never emerged, nor did deaths pile up after brief contact with the substance.

Week after week, giving *Clitoria ternatea* extract to lab animals brought almost no harmful reactions. Instead of damage, organ tissues looked largely unchanged under the microscope. Blood counts stayed stable throughout the trial period. Liver and kidney values held steady, showing no red flags. With time, the body seemed to accept the substance without struggle. Even at higher doses over months, disruption remained rare. This pattern points to a quiet safety profile overall.

### 2. Safe Dosage Limits

Even though clear medical rules don't yet exist, scattered trials and old practices suggest a general safety zone. From lab tests on animals, helpful amounts often fall between 100 and 500 milligrams per kilogram of extract, based on what effect researchers watch. Because healing customs differ by region, petals, green parts, and underground stems go into remedies like boiled extracts, infusions, or dried forms - taken in small portions.

Even so, lab-made extracts and medical versions need to stick to approved amounts because too much might lead to side issues. Clear safety levels for people still wait for more hospital-based research to confirm the exact boundaries.

### 3. Drug-Herb Interactions

Little is known about how *Clitoria ternatea* might interact with medicines. Because it can act as an antioxidant, help control blood sugar, or affect brain function, using it while on medication needs care. Blood sugar could drop too low if it's used at the same time as diabetes drugs. While calming effects have been noted, combining it with sedatives might increase drowsiness. Its influence on mental performance also suggests possible overlaps with mind-active substances.

So talking to a doctor first makes sense if you are on medication and thinking about trying *Clitoria ternatea* products. Because mixing them could lead to issues someone might not expect right away. Safety tends to come down to knowing how things interact inside the body. That is why getting advice ahead of time matters most.

## **FUTURE PERSPECTIVES**

### **1. Clinical Study Opportunities**

Even if lab tests show *Clitoria ternatea* has active compounds, solid human trials remain scarce. Because of that, real-world proof about its healing effects remains uncertain. Instead of stopping at animal models, scientists might move toward structured patient-based work. While early signs point to benefits, only careful monitoring in people can confirm them. One path forward includes testing how it affects brain-related conditions, followed by blood sugar control. Another angle looks at how it fights cellular damage, yet details on concentration matter too. Since skincare claims pop up often, checking those claims under strict rules makes sense. When tradition meets modern methods, results must stand on measurable outcomes, not assumptions. Though interest grows steadily, clarity comes only through repetition and peer review. Without skipping steps, progress depends on disciplined follow-up across diverse groups.

### **2. New Ways to Deliver Medicines**

From tiny particles to fluid blends, new ways of carrying medicine might help unlock more power in *Clitoria ternatea* natural chemicals. Though rich in helpful elements like flavonoids and anthocyanins, these substances tend to break down fast, resist absorption, or lose strength too soon. By wrapping them into tools like liposomes or microscopic droplets, protection improves, along with how well they enter the body. Delivery methods, once rare, now open paths to better performance, letting plant-based ingredients work longer, steadier, stronger. Such shifts don't just upgrade function - they reshape what natural compounds can actually do.

### **3. Cosmeceutical Product Development**

As more people look for plant-powered skincare, *Clitoria ternatea* stands out in beauty product development. Thanks to antioxidants and substances that calm irritation, it fits well into lotions and treatments for skin and hair. Work ahead might explore making items like facial creams, rinses, cleansers, moisturisers, packs for the face, along with colouring agents

from its blooms. Because it contains anthocyanins, this flower could also replace artificial dyes in makeup and care lines - offering a gentler touch and less harm to nature.

#### 4. Industrial and commercial possibilities

This blue-flowered vine brings real worth to farms and markets because it does more than one thing well. Already, people across Asia put it into teas, health-focused snacks, dyes you can eat, and age-old remedies. As curiosity grows worldwide about plant-based wellness items, growing this crop on large plots could make sense. Drug makers, skincare brands, eateries, and supplement producers might gain if they work with consistent plant concentrates and fresh product ideas. Pouring resources ahead into farming methods, ways to process it, and systems that check purity should lift both profit margins and reach around the globe.

### CONCLUSION

*Clitoria ternatea*, known as Sangu Poo, earns attention through dense layers of natural chemicals that shape its role in healing traditions. Because it holds substances like anthocyanins - especially ternatins - alongside flavonoids, alkaloids, and phenolics, its inner workings touch many body processes. From fighting oxidative stress to calming inflammation, shielding nerve cells, balancing blood sugar, blocking microbes, and aiding heart function - it moves across systems quietly but widely. Science now backs what ancient practices long relied on: Ayurvedic, Siddha, and Unani healers used it wisely, guided by time instead of labs. Its strength lies not in one single part, but in how these elements work when they stay together.

From roots to petals, *Clitoria ternatea* shows up in skincare for slowing ageing signs while shielding skin from sunlight. Not only does it help brighten the complexion, but it also supports healthier hair growth over time. The plant's deep blue hue works without artificial dyes, replacing lab-made additives quietly. Instead of relying on harsh ingredients, formulators turn to its active compounds as gentler options. In drinks or capsules, it appears where wellness meets daily nutrition. Even packaging and biodegradable goods now include parts that were once thrown away. Sustainability gains ground when such uses replace wasteful norms, one application at a time.

Still, even with promising lab results, solid human trials are missing, as are consistent extract formulas and proof of long-term safety. Different plant chemicals change from batch to batch, making outcomes unpredictable. Active ingredients can break down easily, losing their

effect over time. Rules around approval add more hurdles, slowing wider medical or commercial use.

A closer look at how it works in real patients could reveal more about *Clitoria ternatea*'s true value. Instead of just lab tests, actual medical trials might unlock better results. Through smarter ways to deliver its compounds, effectiveness may rise sharply. Formulas that last longer on shelves would help, too. Because some parts break down fast, keeping them stable matters quite a bit. When tested properly and made consistently, its uses grow wider than expected. Traditional remedies meet today's science in surprising ways here. Skincare products might benefit, along with larger-scale manufacturing needs. Not every plant adapts so well across fields. This one stands out quietly, without needing loud claims.

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