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A Review: Phytochemical Constituents and Pharmacological Study of Ipomoea carnea

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Abstract: *Ipomea carnea, a plant species in the Convolvulaceae family, has been traditionally used in medicine for its health benefits. The genus Ipomoea includes a diverse range of species commonly found growing in roadside wastelands and along canals. It has a straight, woody, bushy, and slightly cylindrical structure with a greenish hue. Commonly known as Besharm or bush morning glory. Ipomoea carnea features a stem with varied leaf types. This plant is used as a traditional remedy in Ayurveda, Siddha, and Unani medicine systems. Phytomedicines are gaining recognition in modern medicine, and the shrub Ipomoea carnea has been used in traditional medicine for thousands of years. Despite its long history of use, scientific research on this plant is limited and scattered.*

In this review, we have summarized the biochemical efficiency of phytocompounds of I. carnea. Anti-bacterial,anti-fungal,anti-oxidant,anti-cancer,anticonvulsant,immunomodulatory,anti-diabetic, hepatoprotective, anti-inflammatory, anxiolytic, sedativeand wound healing activities are shows by different phtyoextracts of plant and their different parts. However, some toxic effects have been also reported. Some of the major phytocompounds associated with the bioactivity of I. carnea have been reported. This review article might be valuable for phytotherapy researchers, as I. carnea can be a good source for drug development for pharmaceuticals and ayurvedic practitioners.

Keywords: Phytocompounds, Convolvulaceae, review, cultural uses, *Ipomoea carnea*, Chemical constituents, Phytomedicines, Antimicrobial, Anti-cancer

I. INTRODUCTION

Ipomoea carnea, also known as Besharm or morning glory, is a large shrub native to India that has spread worldwide, including to Java and Indonesia. It grows in lowland areas near water and is used as an ornamental and hedge plant. It reproduces quickly by rooting its stems. The plant contains various bioactive compounds such as phenolic acids, alkaloids, flavonoids, coumarins, and sterols. *Ipomoea carnea* is a plant that grows up to 6 meters tall and can be shorter in aquatic habitats. Its stem is thick and
has several thick branches. The plant has simple, petiolate leaves, which are light green and heart-shaped. It blooms in clusters of 4 inch pink flowers in spring and summer, with a glabrous capsule.(2)

Benefits of *Ipomoea carnea* Plant:-

- Anti-Bacterial activity
- Anti-Fungal activity
- Anti-inflammatory properties
- Antioxidant activity
- Antimicrobial activity
- Anti-cancer properties
- Anti-convulsant activity

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- Immunomodulatory
- Anxiolytic activity
- Analgesic (Pain-Relieving) Effects
- Diuretic Properties
- Antidiabetic Potential
- Wound Healing and Skin Health
- CNS (Central Nervous System) Effects
- Hepatoprotective Effects (5)

Geographical Description:-

This plant is found all over the world including American tropics, Argentina, Brazil and Balvia, Pakistan, and Sri Lanka, India in Chhattisgarh and Madya Pradesh.(4)

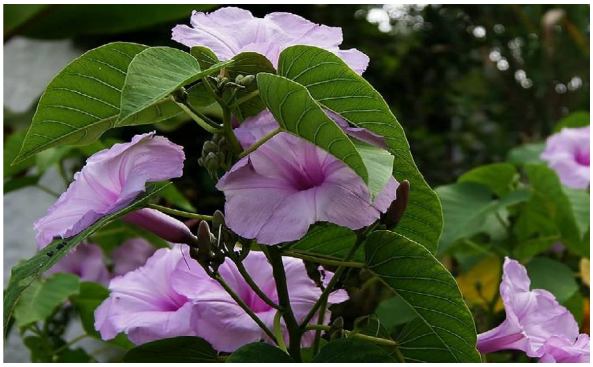

Figure 1:- *Ipomoea Carnea*

Plant Description:-

Type:- Perennial flowering plant.
Growth Habit:- Climbing vine or sprawling shrub.
Height:- 5 to 6 meters.
Stem:- Flexible, woody base in mature plants.
Leaves:-Heart-shaped or lanceolate, 10-20 cm in length, green, smooth.
Flowers:- Trumpet-shaped or funnel-shaped, 5-10 cm in diameter, pink, white, or lavender.
Blooming Season:- Type Spring to autumn.
Fruit Type:-Capsule.
Seed Characteristics:-Small, roundish, brown to reddish-brown.
Native Range:-Tropical and subtropical Americas.
Preferred Environment :-Wetlands, riverbanks, moist, disturbed areas.
Soil Requirements:- Well-drained soils, tolerant of waterlogged conditions.(2)
Synonyms:-
Marathi:- Besharm
English:- Bush Morning glory
Oriya:- Bahay
Bengali:- Besharm
Hindi:- Besharm, Bahay
Others:- Pink Morning Glory, Borrachero, Bush Morning Glory, Badoh Negro, Matacabra, Morning Glory Tree (4)

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Taxonomic classification:-

Kingdom:- Plantae
Sub Kingdom:- Tracheobionta
Division:- Spermatophyta
Subdivision:- Magnoliophyta
Class:- Magnoliopsida – Dicotyledons
Subclass:- Asteridae
Order:- Solanales
Family:- Convolvulaceae
Genus:- Ipomoea
Species:- *Ipomoea carnea Jacq*.(10)

Chemical Analysis:-

Root:-

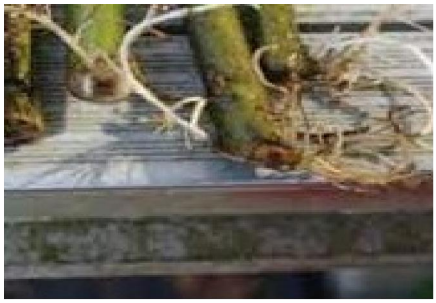

Figure 2:- *Ipomoea Carnea* Roots

It contains 2-Ethyl-1,3 dimethylbenzene, 2-(12-pentadecynyloxy) tetrahydro2H-pyran, 3- furanyl [2-hydroxy 4-methyl-2-(2-methylpropyl) cyclopentyl]- methanone, 2,2- Dideuterooctadecanal Hexadecanoic acid and Linoleic acid (10).

Stem:-

Figure 3:- *Ipomoea Carnea* Stem

It contains 2-(12-Pentadecynyloxy) tetrahydro-2H-pyran, 1-Octadecanol, Hexadecanoic acid, Epiglobulol, Squalene, 1-Octadecanol (10).

Leaves:-

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Figure 4 :- *Ipomoea carnea* Leaves

It contains a number of pharmacological constituents like hexadecanoic acid, stearic acid, 2 diethyl phthalate, n-octadecanol, octacosane, hexatriacontane, tetracontane, 3- diethylamino-1- propanol. Leaves also contains swainsonine and calystegines B1, B2, B3 and C1 (11).

Flowers:-

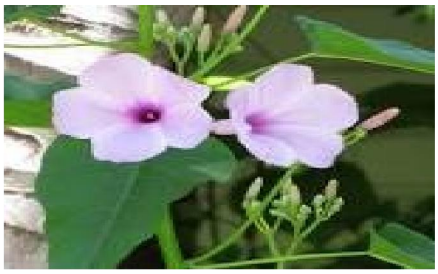

Figure 5 :- *Ipomoea carnea* Flowers

It contains flavonoids, tannins, glycosides, alkaloids, carbohydrates and phenolic compound (12).

Seeds:-

Figure 6:- *Ipomoea Carnea* Seeds

It contains swainsonine and calystegines B1, B2, B3 and C1.(11).

Phytochemical constituents of plant:-

Cardiac glycosides:- *Ipomoea carnea* holds cardiac glycosides such as digitoxigenin and gitoxigenin. These compounds have their potential on cardiovascular effects. Cardiac glycosides have been efficient in medicine to treat heart conditions like congestive heart failure and arrhythmias. They used to increasing the strength of heart contractions and regulating heart beats.

Alkaloids:- Alkaloids, the nitrogenous compounds found in this plants include lysergic acid and its derivatives. These compounds are psychoactive effects and have been studied for their potential in treating neurological disorders as recreational drugs.

Flavonoids:- Flavonoids are assorted groups of plant metabolites with various biological and pharmacological properties like antioxidant properties, potential health benefits, anti-inflammatory and anti-cancer effects.

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Tannins:- Tannins are polyphenolic compounds found in *I. carnea*. They have astringent properties which binds precipitate proteins. Tannins may have antimicrobial and anti-inflammatory effects which posses plant's medicinal properties.

Saponins:- Saponins are other glycosides with foaming properties. They have potential to lower cholesterol effects and have ability to boost the immune system. Saponins credit medicinal properties of *I. Carnea*.(6)

Plant partof *Ipomoea carnea* jarq	Pharmacological activity	Therapeutic uses
Leaves	Purgative, Aphrodisiac, Cathartic, Anti-diabetic,Anti microbial, Antifungal, Anticancer, Cardiovascular Activity, Anti-inflammatory, Hepatoprotective, Anxiolytic,Wound healing, Phytotoxic, Embryo toxic, Neurotoxic	Fungal infection, skin disease, Purgative, scorpion sting, high blood pressure, swelling, Sore, boils, snake bite, Sprains plant. Leaf hot water extract reduces the teratogenic effects of cyclophosphamide and possesses anti-rheumatic qualities.(6)
Flowers		It is well known that tannins found in flowers have anti-inflammatory, anti-fungal,anti-bacterial, anti-oxidant Properties.(7)
Roots	Laxative	Scorpion sting , Laxative, Menstruation, skin diseases. Boiled roots are used as a menstrual stimulant and laxative.(6)
Bark	Antiseptic,Wound healing activity	Leucoderma, boils and pimples stomach ache, nodules in breast, muscular pain and swelling, cuts and injuries, scorpion sting, Leucoderma and other associated skin conditions have long been treated using latex, or milky sap, which is extracted from the bark.(7)
Seed	Analgesicand antiseptic	Rheumatic disease, Dermatoses.(7)

Table 1:- Pharmacological and therapeutic properties of different parts of *Ipomoea carnea*

Pharmacological studies:-

Wound Healing Activity:-

The wound-healing properties of Ipomoea carnea were assessed by extracting fresh flowers with 95% ethanol, concentrating the extract, and fractionating it using diethyl ether, chloroform, and ethyl acetate. The presence of kaempferol and its 3-O-β-D glucoside in the flowers has been linked to significant wound-healing potential. The healing process involves stages like inflammation, fibroblast proliferation, collagen synthesis, and scar maturation, with the efficacy of Ipomoea carnea surpassing untreated wounds and comparable to Sulphathiazole (16).

Anti-oxidant activity:-

Antioxidants are a class of chemicals that can stop other molecules from oxidising by quenching reactive free radicals, and so may have health benefits in the prevention of degenerative illnesses. antioxidants such as polyphenols and flavonoids are abundant in the leaves, stems, and flowers of Ipomoea carnea. Polyphenol and flavonoids found in Ipomoea carnea have been shown to have high DPPH radical scavenging action. Scavenging is critical for preventing the harmful effects of free radicals in disorders like cancer. The floral section of this plant, in particular, is higher in anti-oxidant phytoconstituents. Phenols and flavonoids are abundant in the leaves, stems, and flowers of Ipomoea carnea (15).

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Immuno-modulatory effect:-

In female rats, the nor tropane alkaloids calystegines B1, B2, B3, and C1 and the indolizidine alkaloid swainsonine of Ipomoea carnea demonstrate an influence on spleen/body weight ratio, thymus/body weight ratio, and histological alterations (14).

Anti-Inflammatory Activity:-

Anti-inflammatory efficacy was tested using aqueous extracts of mature green leaves of Ipomoea carnea. The extracts were given at doses of 250 mg per kilogramme and 500 mg per kilogramme of body weight. The study found that Ipomoea carnea leaves had a substantial anti-inflammatory effect at a level of 500 mg/kg, and that it outperforms Etoricoxib 6 mg/kg (17).

Antifungal Activity:-

Ipomoea carnea has been found to have antifungal effect against Alternaria alternative and Curvularia lunata. Ipomoea carnea extracts in chloroform and methanol have antifungal efficacy against eleven pathogenic and non-pathogenic fungi. Colletotrichum gloeosporioides and Cladosporium coumarone were used as test organisms to obtain antifungal fractions of Ipomoea carnea leaves. The purified fraction's efficacy was further validated by the dose-dependent suppression of Alternaria alternative and A. porri spore germination. A combination of (E)-octadecyl p-coumarate and (Z)-octadecyl p-coumarate was found as the active fraction (18).

Cardiovascular Activity:-

When an aqueous extract of Ipomoea carnea was injected into an isolated frog heart, the heart was temporarily blocked for 5 to 10 seconds. The time increased up to 2 minutes when the dosage was increased. It's possible that sodium extrusion or intracellular calcium release causes Ipomoea carnea to have a favourable inotropic impact on isolated frog hearts (26). When 1 g/ml atropine was added to the extract, the early different phase was inhibited, and the stimulant action became grate (19).

Nervous System Activity:-

Ipomoea carnea is recognized for its neurotoxic effects. In goats consuming fresh leaves, flowers, and stems over 45 to 60 days, symptoms included hirsutism, depression, ataxia, hypermetria, wide based stance, muscular incoordination, tremors, spastic paresis, abnormal postural reactions, nystagmus, hyperreflexia, sound hypersensitivity, head tilting, and equilibrium loss. The cerebellum, crucial for coordinating muscle movements, is notably affected by the plant's toxicity (20).

Anti-hypoglycemic Activity:-

In a study on rats, alloxan was used to induce hyperglycemia. Blood glucose levels were measured 48 hours post-injection. Hyperglycemic rats were categorized into groups receiving various treatments, including extracts of Ipomoea carnea leaves and flowers, rutin, and Metformin. The aqueous extract of Ipomoea carnea was found to significantly reduce blood glucose levels and improve glucose tolerance in normal rats (21).

Antimicrobial Activity:-

Crude extracts of the leaves, including those in n hexane, ethyl acetate, acetone, and ethanol, have demonstrated antibacterial activity. Specifically, the acetone extract was effective against Proteus vulgaris and Salmonella typhimurium, while the ethanol extract was effective against Pseudomonas aeruginosa (22).

Anxiolytic activity:-

The central depressive action of Ipomoea carnea appears to be sedative hypnotic. The anxiolytic effects of the aqueous and methanolic extracts of Ipomoea carnea leaves (32.50 and 16.25 mg/kg intraperitonial.) in mice were examined utilising elevated plus maze, open field test, and hole board test paradigms, using diazepam as a positive control. In mice, the lethal dose 50 of Ipomoea carnea leaf aqueous extract (ICLAE) and Ipomoea carnea methanolic extract (ICLME) was 325 mg/kg i.p. body weight. When compared to ICLAE (32.5mg/kg and 16.2mg/kg) and diazepam, ICLME had a stronger anxiolytic effect. When compared to control and diazepam 1mg/kg, 2mg/kg as a benchmark, the effect of the ICLAE and ICLME demonstrated a dosage dependant significant increase in the number of head dipping behaviours in full board tests at doses 32.5 and 16.2 mg/kg. These findings suggest that ICLAE and ICLME have

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anxiolytic properties (24).In experiments using mature goats, all of the animals displayed anomalous behaviour and consciousness, as well as atypical goat behaviour (ability to stand and posture), and one goat died (28).

Hepatoprotective Activity:-

In a study involving rats, liver damage was induced by administering carbon tetrachloride. Rats were then treated with saline, ethanol extracts of Ipomoea carnea leaves and flowers, or silymarin as a standard reference. The hepatoprotective effects were evaluated by measuring serum levels of liver enzymes such as ALT, AST, and ALP at various intervals. Both leaf and flower extracts showed significant hepatoprotective effects. (26)

Anti-diabetic Activity:-

The anti-diabetic effects of Ipomoea carnea leaves were tested on both normal and streptozotocin induced diabetic rats. The aqueous extract of the plant was found to effectively lower blood glucose levels and improve glucose tolerance in normal rats. (25)

Anti-cancer Activity:-

The hydroalcoholic extract of Ipomoea carnea leaves exhibited significant anticancer properties in both in-vitro and in-vivo studies, likely due to the presence of alkaloids, phenols, and flavonoids, which contribute to its dose-dependent anticancer effects.(23)

Glycosidase inhibitory activities:-

Analysis of Ipomoea carnea plant material was carried out by gas chromatography–mass spectrometry recognized the presence of the mannosidase inhibitor swainsonine and 2 glycosidase inhibitors, calystegine B2 and calystegine C1, consistent with a plant-induced a-mannosidosis in the goats. The described storage disorder is analogous to the lysosomal storage diseases induced by ingestion of locoweeds (Astragalus and Oxytropis) and poison peas (Swainsona). Ipomoea carnea makes guinea pigs a valuable animal model for the reproduction of induced alpha mannosidosis.(26)

II. CONCLUSION

The *Ipomoea carnea* herb is exceedingly useful and safe for medical purposes, according to medicinal literature. Its applications in traditional medicine systems, such as Ayurveda, Siddha, and Unani, underscore its long-standing historical significance. Scientific research on I. carnea, though limited, reveals promising pharmacological activities. *Ipomea carnea* would be extremely beneficial to phytochemistry and pharmacology. *I. carnea* is a plant has its therapeutic significance. The plant's taxonomy, morphology, chemical constituents, ecological roles, therapeutic properties, toxicological features explores in this review. Several mechanisms are likely to account for the observed pharmacological effects, the most important being the antimicrobial, antidiabetic, anti-inflammatory, antioxidant, antifungal, wound healing, cardiovascular, glycosidase inhibitory, anticancer, anxiolytic, Mosquitocidal, immuno modulatory, hepatoprotective activity. The plant contains bioactive compounds like alkaloids, flavonoids, cardiac glycosides, saponins, tannins, and terpenoids.

Despite its promising medicinal properties, further research is needed to fully elucidate its safety profile and optimize its therapeutic applications.In conclusion, *Ipomea carnea's* pharmacological properties make it a promising plant species for the development of natural remedies and therapies.

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