



## Research Article

# Studies on morpho - taxonomy anatomy and palynology of *Ipomoea carnea* Jacq growing in Jharkhand, India.

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**Abstract:** *Ipomoea carnea* is a well-known alien invasive species in the Indian subcontinent. It spreads very fast and vast area soon, it clogs the water channels. It has a unique potential to survive in terrestrial as well as aquatic surfaces. In the current communication an endeavor is made to study morpho taxonomy, anatomy and palynology of *Ipomoea carnea*. Owing to its invasive property of survival and spread the current study has been undertaken.

**Keywords:** *Ipomoea carnea*, Taxonomy, Anatomy, Aquatic, Terrestrial.

## Introduction

*Ipomoea carnea* the pink morning glory is a species of morning glory family also called bush morning glory [1]. This belongs to family Convolvulaceae and is a unique plant which was introduced in India as an invasive plant from tropical America [2]. The main character of the plant is that it can regenerate very fast from its part in dry as well as the moist surfaces. Due to this unique character this plant is locally termed as *thetbar* or *besbaram*. The unique property of the plant is that this can survive well in terrestrial surface as well as can withstand in waterlogged region or even water bodies [3-4].

Floristic studies of aquatic and semi-aquatic plant species in Jharkhand since 1994 reflects that this plant is changing its habit once this plant was growing and propagating in the terrestrial areas but now, it has been observed that this plant is not very often in the dry surfaces [5-8]. It has also been observed that this plant is completely changing its habit and shifting its habit and growing in the moist, waterlogged areas or water surfaces especially in the water flowing zones and even ponds. It has been observed that in crop fields, it is becoming an indicator of water flowing, lowland areas, as the plant spreads across the said areas and can be observed from a far distance.

In the present communication an endeavor is made to study the morphotaxonomy, anatomy, phenology and ecology etc. The form and shape of the stomata and their associated epidermal cells, stomatal frequency, type of epidermal hairs (indumentum) and their pattern are important sources of taxonomical characters. The hairs or trichomes are found to be very prominent. Which is one of the important characters of the family, Convolvulaceae<sup>2</sup>.

The study of morphology of pollen grains is necessary of palynology because of its fundamental value in the recognition and identification of grains found in various conditions [8-12]. The Microscope offers a rapid means of observing pollen wall surfaces, as well as providing greater resolution.

Botanical Classification of *Ipomoea carnea* Jacq.

Kingdom: Plantae

Sub kingdom: Tracheobionta

Division: Spermatophyta

Subdivision: Magnoliophyta

Class: Magnoliopsida – Dicotyledons

Subclass: Asteridae

Order: Solanales

Family: Convolvulaceae

Genus: *Ipomoea*.

Species: *Ipomoea carnea* L.

Hindi name : Beshram, Behaya:

## Taxonomy and nomenclature

*Ipomoea* L. is a member of Convolvulaceae which includes about 500 tropical and warm temperate species<sup>17</sup>. The name of *Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) has been an object of extended discussion [13]. Ten names have been frequently and widely applied synonymously [14]: *Ipomoea carnea* Jacquin, *I. batatilla* (Kunth) G. Don, *I. crassicaulis* (Benth.) Robinson, *I. fistulosa* Mart. ex Choisy, *I. fistulosa* var. *nicaraguensis* Donn. Sm., *I. albiflora* Chodat and Hassl, *I. fruticosa* Kuntze, *I. gossypoides* D. Parodi, *I. nicaraguensis* (Donn. Sm.) House, *I. texana* Coult. The names *Argyreia superbiens* and *A. splendens* are also referring to *Ipomoea carnea* [15-17].

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## Materials and Methods

The materials for the present study were observed and reported from different parts of Jharkhand and was locally collected for the study. The plants were collected from aquatic as well as terrestrial conditions. For the morphological study of *Ipomoea carnea*, morphological observation was made, examined and data were recorded. The various qualitative characters considered were of root, stem, leaf, flower, capsule and seed. For anatomical studies the sections of the root, stem and leaves were cut and studied under light electric microscope (OLYMPUS CH20i). The pollen grains were studied under light microscopy by the standard method. Staining of pollen grain was done by using safranin and observations were made under light electric microscope (OLYMPUS CH20i).

## Result and Discussion

### Morphological of features of *Ipomoea carnea*

Large shrubby erect up to 3 m in height, fistular stems, glaucous having latex. Leaves broad ovate, 14-22 x 10-13 cm, base truncate, entire margin, acuminate. Flowers pink, funnel form in dichotomous, axillary and terminal cymes. Calyx lobes 5, unequal broadly ovate. Corolla unnel form, lobes 5. Stamens 5, hairy below. Bicarpellary Ovary, tetralocular, 1 ovule per locule, placentation, axile. Capsules globose or ovoid, seeds hairy. (Fig. 1)



Figure 1. Habit of *Ipomoea carnea*

### Macroscopical Features of leaf of *Ipomoea carnea*

The Size of the leaf is 10- 24cm Length and 4.0-9.0 cm in Width, Heart Shaped, green in colour Apex Cordate, Margin Entire, Base Symmetric, Venation Reticulate pinnate, Surface are Hairy on both side, Prominent Midrib on lower surface. (Fig.2.)

### Macroscopic Features of Flower *Ipomoea carnea*

The flowers are axial, solitary or arranged in monochasium scropioid cymose inflorescence. The pedicel is green in colour, erect, cylindrical, solitary slightly pubescent, measures 1.5-2.2 cm long and 0.14-0.20 cm diameter. The calyx is persistent, consisting of 5 free quincunial sepals, ovate in

shape, with entire margin, symmetric base and acute apex, green in colour, nearly glabrous, measure 0.4-0.7 cm long and 0.6-0.7 cm width. The corolla is formed of 5 united petals (sympetalous), delicate, pinkish white in colour, with 5 pink to violet coloured strands in the regions of cohesion with each other. The mouth of the corolla has an entire margin, with slight conspicuous depressions at the points of the cohesion of the petals, measure 4.7-6.0 cm long and 1.6-1.8 cm width at its mouth.



Figure 2. Morphometric of *Ipomoea carnea*,

The androecium is 5 free epipetalous stamens, which are unequal in length; two of them being longer than the others. They are united to the base of the petals for a distance of 4 mm. The basal part of the filament is hairy, pinkish red and swollen, while the upper part is filiform in shape and white in colour. The filament measures 1.6-2.1 cm long and 0.20-0.25 cm width at its swollen base. The anthers are whitish yellow, oblong, basifixed and bilobed opened laterally, and contain yellow pollen grains. The anther attains 0.5-0.7 cm long and 0.20-0.25 cm width. The gynoecium, shows a superior ovary which is bicarpellary, and bilocular. Each locule contains one or two small anatropous basally placentated ovules. The ovary is conical in shape, whitish yellow in color and carried on yellowish green hypogenous disc. The ovary measures 0.3-0.4 cm long and 0.15-0.20 cm width. The style is cylindrical, yellowish white in color, measures 1.4 – 1.6 cm long and 1-2 mm width and ending with a bilobed stigma, each attains 0.7-1.0 mm long, and 0.3-0.6 mm width. (Fig. 3)

### The fruit of *Ipomoea carnea*

The fruit is a simple dry dehiscent capsule, which opens septifragally and is derived from a superior gynoecium. It is pedicellate, subglobular in shape, with pointed apex and spherical base, greyish green in color when unripe, turning greyish brown on ripening. The fruit shows five persistent sepals and remains of the style at the apex. It measures 1.0-1.5 cm in height, 0.8-1.3 cm in width and usually contains four dark brown colored seeds densely covered with hairs. The pericarp is thin, measuring about 0.1 cm thick, smooth and glabrous with yellowish grey inner surface. (Fig. 2)



**Figure 3.** Morphometric of Reproductive parts of *Ipomoea carnea*,

#### The seed of *Ipomoea carnea*

The seed measures 0.4-0.6 cm in length and 0.2-0.3 cm in diameter, dark brown to black and derived from an anatropous ovule. It is covered with an easy removable dense pale brown to greyish brown trichomes, which attain 0.7-1.0 cm in length. The seed is three-sided, with two flat ventral surfaces that may have a central depression and one convex dorsal surface. The micropyle is represented by a paler scar near the hilum in the central depression of the ventral surface. The raphe is represented by a raised ridge which extends from the hilum at the base to the chalaza at the apex. The seeds are covered by a dense, cottony, furry indumentum consisting of slightly glossy, and 0.01-0.02 mm thick hairs that are slightly swollen at the base. Hairs are much longer on the edge of the rounded abaxial surface of the seeds (at the top and at the base of the elliptically complanate cross-section). The seeds have a black, 0.3 mm thick, very hard, bilayered testa (Fig. 4).



**Figure 4.** Seed of *Ipomoea carnea*,

#### Microscopic Features of leaf *Ipomoea carnea*

The form and shape of the stomata and their associated epidermal cells, stomatal frequency, type of epidermal hairs (indumentums) and their pattern of distribution form 19 are important sources of taxonomical characters. While the degree of hairiness is usually affected by environmental factors, the nature of hairs or trichomes is found to be more or less constant for many species. Along

with other characters, these may be used as major criteria in the subdivision of the family into tribes, genera etc. The trichomes do afford useful characters for taxonomic separation at generic and specific levels. It has been found that considerable differences exist in the characters of epidermis such as distribution of stomata on the upper as well as on the lower epidermis, nature of indumentum, shape and size of the stomata and associated epidermal cells, degree of sinuosity of the upper and lower epidermal cells and others. There is appreciable difference in the degree of sinuosity between the upper and lower epidermal cells of many species of Convolvulaceae. (Fig.5)



**Figure 5.** Stomata Leaf of *Ipomoea carnea*

#### The Petiole of *Ipomoea carnea*

Upper Epidermis Single layer, Polygonal parenchymatous cells with trichomes. Upper Palisade 2-3 layers of elongated parenchymatous. Spongy parenchyma Presence of parenchymatous cells between upper and lower palisade. Lower palisade same to upper palisade 1-2-layer cells. Lower Epidermis Similar to upper epidermis with more trichomes. Collenchyma Presence multiple layers of both upper and lower end of midrib. Vascular Bundle Dorsal side of leaf contains lignified xylem and non-lignified phloem fiber. Trichomes Glandular epidermal multicellular, branched, thin-walled trichomes Stomata Presence of paracytic type stomata. (Fig.6)



**Figure 6.** T.S. Petiole *Ipomoea carnea*,

### The Root of *Ipomoea carnea*

Externally, the root is yellowish brown, with a rough surface showing longitudinal striation, cylindrical in shape, solid, with flexible fracture when fresh, becoming fibrous when dry. Epidermal cells Oval, thick cuticle, angular and compact parenchymatous cells Pith Circular, thin-walled parenchymatous cells with large size central pith contain few crystals of calcium oxalate, resin cells and schizogenous glands. Medullary rays are three layers of elongated parenchymatous cells with close arrangement, uniseriate three layers of thin-walled parenchymatous cells in phloem region and elongated cells with lignified walls in the xylem region. The Vascular bundle was closely aggregated phloem both outer and inner sides and primary lignified xylem vessels present. 5-7 layers of tangentially elongated Cambium radially arranged cambiform cells. (Fig.7)

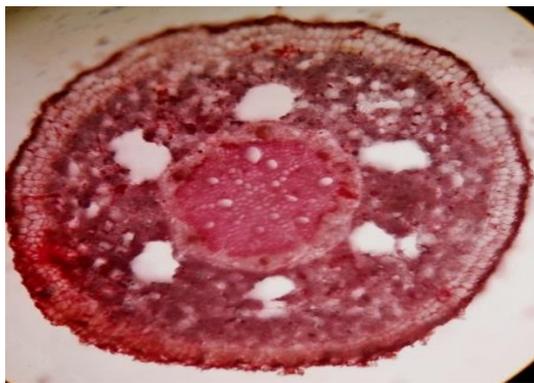


Figure 7. T.S. of Root

### The Pollen of *Ipomoea carnea*

The pollen morphology of Convolvulaceae is known to be highly diverse and has taxonomic importance. The present study was undertaken to know the pollen morphology of *Ipomoea carnea* by Light microscope. Pollen grains oblate spheroidal, radially symmetrical, outline circular, pantoporate, tetragonal area formed by the spine and the ridges of bacula around each extrapolar region, aperture circular sculpturing echinate, spine bulbous protuberance at the base of spine, exine microreticulum between the spine and on the bulbous base. (Fig.8)



Figure 8. Pollen of *Ipomoea carnea*,

### Conclusion

*Ipomoea carnea* propagate vegetatively, it spread soon and covers vast area in land as well as water. The morphological characters like hollow stem, root proliferating from nodal region of stem and some other anatomical characters like Spongy parenchyma presence of parenchymatous cells between upper and lower surface of petiole and stem, flexible fracture, of root tangentially elongated Cambium radially arranged cambiform cells helps it to survive both in land and water.

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