



Review Article

A REVIEW ON *IPOMOEA CARNEA*: AN EXPLORATION

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ABSTRACT

Ipomoea carnea commonly known as Besharam or Behaya tree belongs to the Convolvulaceae family. Plant is the native of America. Because of fast growing nature of *Ipomoea carnea*, it is widely distributed in India. If the pregnant animal (Goat) eat this plant it was found that a lack of maternal infants bonding. Due to this nature, generally the plant called as Besharam / Behaya or Shameless. In this article we emphasize on control the uncontrolled propagation of *Ipomoea carnea*, and utilize as biogas with cow dung cake, different Species of *Ipomoea* available in different part of India, phytoconstituent of *Ipomoea carnea*, responsible for his toxic nature like Swainsonine, and pharmacological, toxicological property of *Ipomoea carnea*, like anti-bacterial, anti-fungal, anti-oxidant, anti-cancer, etc.

Keywords: *Ipomoea carnea*, Swainsonine, maternal Infants bonding

INTRODUCTION

Bush Morning Glory botanically named as "*Ipomoea carnea*" from the family of Convolvulaceae. It is a large, diffuse or straggling perennial shrub. Plant originally from tropical America; it was introduced to India at the end of the last century as a garden and hedge plant now days it is well distributed in India and found particularly in Chhattisgarh and Madhya Pradesh. In Hindi it is known as *besharam / behaya*, its meaning shameless¹. This genus is exceptionally diverse, containing over 600 species of vines and shrubs widely distributed throughout the tropics and subtropics region².

Ipomoea carnea grows up to a height of 6 m on terrestrial land, but acquires a shorter height in the aquatic habitats. After the growing of some year the stem is thick and converts in to thick trunk and has several thick branches from the base. The stem of *Ipomoea carnea* is erect, woody, hairy, and more or less cylindrical in shape and greenish in color. Plant also contains alternate leaves. Leaf is simple and petiolate. Petiole is cylindrical, attains 4.0 - 7.5 cm length and 2.5 - 3.0 mm diameter. Upper surface of leaf is dull green and the lower is pale. Leaves which grow in shade is larger than the which grow in sunlight. Its flower is axial with green pedicel and cylindrical in shape. Flower up to 1.5 to 2.2 cm in length³⁻⁵. Scientifically it known as *Ipomoea crassicaulis* and *Ipomoea fistulosa*⁶⁻⁸. Seed has the three sides in which two flat ventral surfaces with central depression and convex dorsal surface⁹. *Ipomoea carnea* was introduced to Egypt as ornamental plant because of its luxuriant vegetative growth and attractive large pink flowers. Now a days it is well distributed at road side, canal bank, cultivated land, waste land etc¹⁰. *Ipomoea fistulosa* is also cultivated in some part of China, Hainan, Guangxi as well as Taiwan¹¹.

Growth of *Ipomoea carnea* depends upon the seasonal pattern. The fastest, highest growing in the month of September to October and lowest in June to July. It has the lowest value of growth in railway sides and field edges. While the highest value on the road dividers, road side and canal bank. It has the no of flowers and fruits during September till December. So, it also indicates the flower time also depends on the season and habitat types¹².

Scientific Classification

Kingdom- Plantae
Sub kingdom- Tracheobionta
Division- Spermatophyta
Subdivision- Magnoliophyta
Class- Magnoliopsida – Dicotyledons
Subclass- Asteridae
Order- Solanales
Family- Convolvulaceae
Genus- *Ipomoea*
Species- *carnea*¹³

Local Name

Hindi- Beshram, Behaya,
English- Bush Morning glory
Oriya- Behayo
Marathi- Beshram
Bengali- Beshram¹⁶

Propagation of *Ipomoea carnea*

The plant normally propagates by stem (vegetative method) and which have the capability rooting within a week. Creeping along the ground branches roots in the soil, and before growing

upward direction a new plant grows up separately from the main plant. In heavy rain fall or floods or other natural disaster the plants are flows in river to downstream habitats, which is established on bank. Another method of propagation is seed. This method is commonly used. In winter fruit is open by the fissure of the dry fruit wall and the hairy seeds are dispersed by the wind as well as water. Seed do not germinate immediately due to its hard seed coat. Due to temperature and treatment with water the outer coat of seed is removed afterwards it is germinate. Due to its spreading nature the plant stem is collected for the fuel. Some years before in Orissa, there is intensive drive to grow the plant for used as a green manure which is only uncontrolled population in many locations¹⁴.

In Figure 1 blue color dots represent the major occurrence and availability of *Ipomoea*. This occurrence doesn't represent the specific species¹⁵.

Ipomoea carnea as aquatic weed problem

Due to uncontrolled population its known as weed and rapidly spread on land and water. Plant cause obstruction and difficulties in the proper use of the land for cultivation. In water it affects the irrigation, navigation and fisheries. Because of rapid growth rate, spread and adaptability from aquatic to xerophytes habitats indicate that this plant may be another ecological disaster in India.¹⁴

Control of *Ipomoea carnea*

Cutting and digging is one manual method by which the growth rate may be control. But its not effective because very soon re-infest the cleared area. By using 2,4-D (2,4-dichlorophenoxy acetic acid) is maximum control of *Ipomoea carnea*. 2,4-D is sprayed in selected field and controlled up to 90%. It surmised as under in a form of table¹⁴.

Table 1: Amount of 2,4-dichlorophenoxy acetic acid for control of *Ipomoea carnea*

Field Trial	Doses (Kg active ingredient per hectare)	Spray volume (Liter/Hectare)	Doses above which 90% controlled	Regeneration
1	5,10	5000	5	0
2	1,2,3,4,5	2000	2	5-10% after 3 months
3	2,5	800-2000	2	5-10% after 3 months
4	3,5,5	1000	2.5	5-10% after 5 weeks
5	5	1000	5	5-10% after 5 weeks
6	5	1000	5	5-10% after 2-3 months
7	3	2000	3	0
8	1,2	2000	2	0
9	2	2000	2	10%
10	2	2000	2	10%
11	1.07	2000	1.07	Not observed
12	2.32	2000	2.32	10%
13	8	2000	8.00	0

It is observed that if the spray volume is more than 2000 Lit/hectare then we can control above than 90 percent growth of *Ipomoea carnea*¹⁴. Continuation with the above table we can say that Manual removal and mechanical removal of *Ipomoea carnea* is not possible due to so many factors like Man power availability, Cost involved, Clearing operations in muddy ponds and Weed regrowth in a very short time.

If we go for the spray of above mention chemical in floating pant than it is probability that some amount of weedicide mixed with water and leading cause of death of fishes. We can't use this water for irrigation because it is harmful for plant. Growth of this plant is double in 10 days so they cause navigation, clogging irrigation channels and mosquito breeding ground. In all over the world these plants are used as feed for the following insect. Water hyacinth Weevils, Water hyacinth mites, Fish (Grass carp), Pond snail, Grass hopper, Fungi and Snail (*Pila globosa*) Indian scientists and the Government have to think of other constructive ways as listed here under to control the spread of this dreadful weed for the environmental safety:

Manufacturing of degradable plastic: *Ipomoea carnea* is useful in manufacturing of degradable plastic (Dr.A.G.Murugesan of Sri Paramakalyani centre for Environmental sciences, Alwarkurichi, Tirunelveli has got national award on this study)

Formulation of manure: *Ipomoea carnea* compost, *Ipomoea carnea* and Vermicompost, *Ipomoea carnea* and Poultry waste compost,

Miscellaneous: *Ipomoea carnea* for paper industry, *Ipomoea carnea* leaf extracts as pest repellent, *Ipomoea carnea* for Biomass power Energy plants¹⁶.

Chemical analysis Depends on the solubility of phytoconstituent with different polar and non polar solvent the chemical analysis were performed i.e.¹⁷

Table 2: Chemical analysis of *Ipomoea carnea*

Ash Content	6.14	Acetyl content	4.32
Alpha cellulose	46.45	Alcohol benzene extractive value	8.46
Cold water extractive value	8.43	Ether extractive value	3.04
Hot water solubility	12.60	Lignin content	18.08
Methoxyl content	4.76	1% NaOH s extractive value	28.6

Similar looking plants of Beshram

There are lots of species are available of *Ipomoea carnea*. Some different similar looking plants are of arrange in Figure 2¹⁷.

Phytochemistry of *Ipomoea carnea*

Mainly *Ipomoea carnea* contains the phenol, tannins and flavonoids. GC-MS analysis for the leaves extracts of benzene and chloroform showed the presence of Neophyadien, 1-Decanol, Tetradecanoic acid, Pentadecane, 1-Iodo-2-methylundecane, Trans-caryophyllene, Eicosane, 2-Butenoic

acid, Cholestan-3-one^{3,18}. Plant possess various bioactive compounds such as glycosides, alkaloids, reducing sugars, fatty acid, esters, alcohol. The phenolic compound present in Flavonoids and phenolic compound one of the most important constituent of a plant for their pharmacological action. A study represents the amount of phenols and flavonoids in different parts of the plant in the following table. By the comparative study of constituent obtain from leaves, stem and flower the phenolic content is more than the flavonoid content. In Figure 3, 4 and 5 graphically present the Concentration of phenol and flavonoid contents in leaves, stem and flower of *I. carnea*

Table 3: Concentration of phenol and flavonoid contents in leaves, stem and flower of *I. carnea*

S.No	Plant Part	Phenol content (mg catechol equivalent/g dry material)	Flavonoid content (mg quercetin equivalent /g dry material)
1	Leaves	45	84
2	Stem	30	168
3	Flower	75	422

From the different parts of this poisonous plant (leaves, flowers, and seeds) lots of Polyhydroxylated alkaloids were isolated, which named as²⁰

Table 4: List of Isolated constituent from the different parts of *Ipomoea carnea*

S.No	Isolated Compound	Plant Part and Use
1	2- <i>epi</i> -lentiginosine	(Leaves, flower, seeds) Powerful inhibitor of lysosomal α -mannosidase
2	Calystegines B ₁	An intermediate in the biosynthesis of 2- <i>epi</i> -lentiginosine) Potent inhibitor of α -mannosidase
3	Calystegines B ₂	(Seeds) Potent inhibitory activity toward rat lysosomal β -glucosidase
4	Calystegines B ₃	(Seeds) Potent inhibitory activity toward rat lysosomal β -glucosidase
5	Calystegines C ₁	Moderate inhibitor of α - and β -mannosidases
6	N-methyl-trans-4-hydroxy-L-proline	Potent inhibitory activity toward rat lysosomal β -Glucosidase

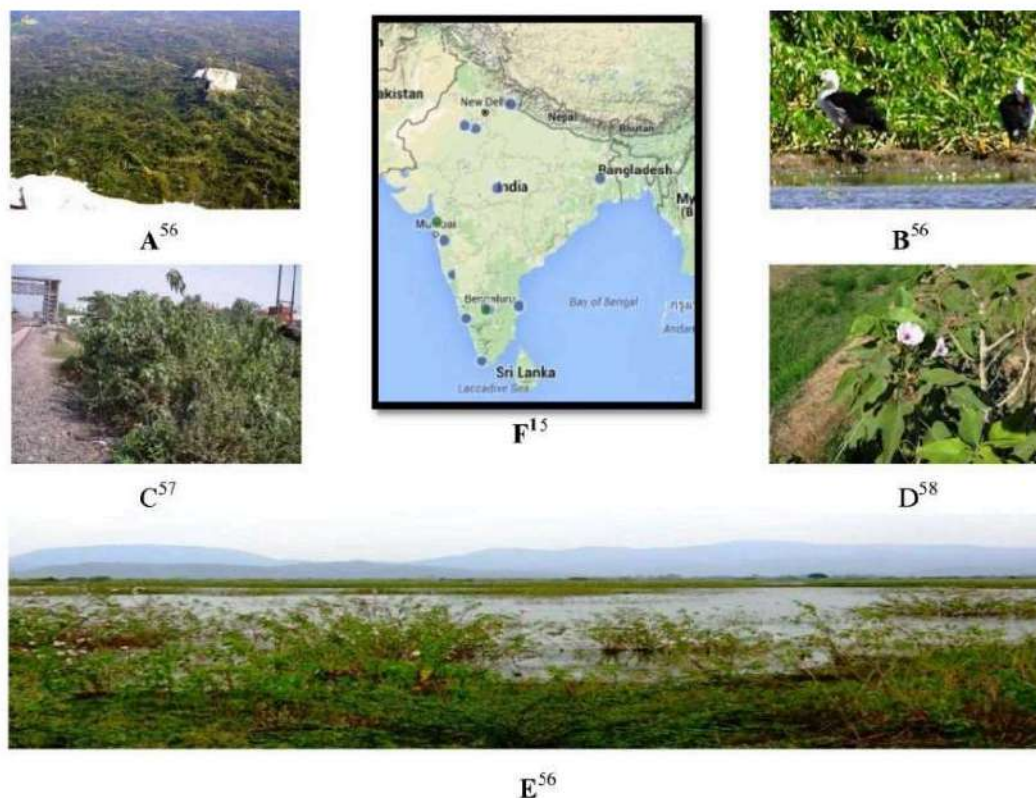


Figure 1: Occurrence of *Ipomoea carnea*



Figure 2: Different species of Ipomoea

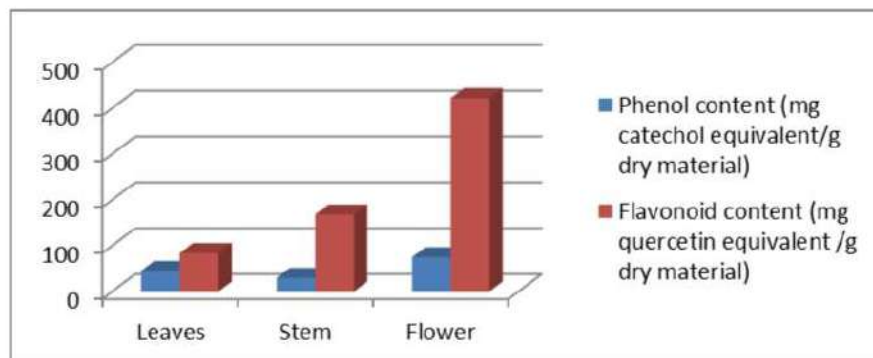


Figure 3: Phenol and flavanoids content ratio

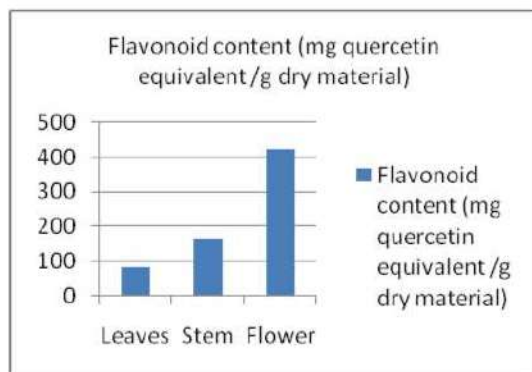


Figure 4: Quercetin content ratio in different part of plant

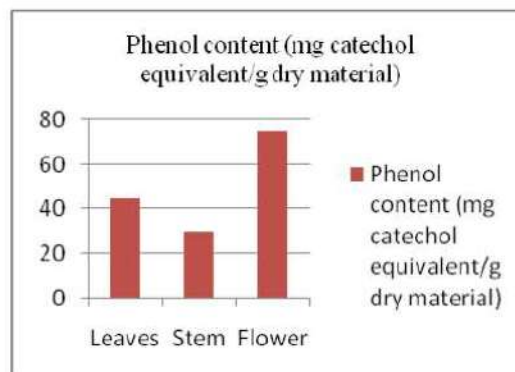


Figure 5: Catechol content ratio different part of plant

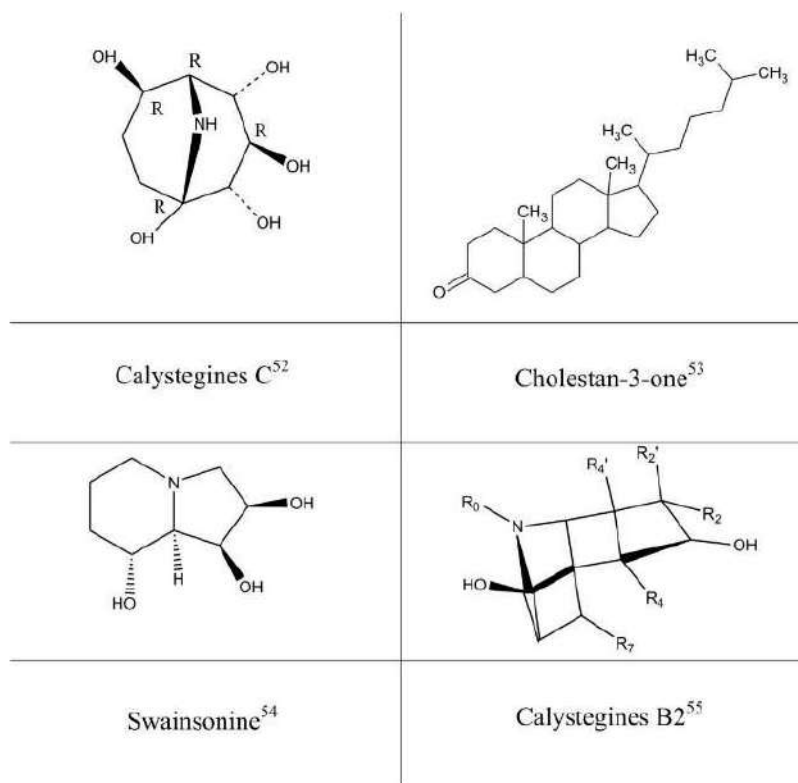


Figure 6: Chemical structure of phytoconstituent obtain from the plant *Ipomoea carnea*

An enzyme Carnein, a Serine Protease isolated from Noxious Plant Weed *Ipomoea carnea*.²¹ When we go for the chemical analysis of leaf and flower then we saw a wide range occurrence of complex organic components ie. resins - sitosterol, triacontane, kaempferol, anthocyanin, agroclavine and dihydrolysergol.^{22,23} Structure of compound elobrated in Figure 6.

Pharmacology & Toxicology of Beshram

Homo-dimeric enzyme Superoxide dismutase (SOD) has scavenging activity to convert toxic superoxide radicals by dismutation reaction. The amino acid Cysteine (Cys) plays a vital role in protein behavior of IcSOD (*Ipomoea carnea* SOD). Dimeric strength was increased by Substitution of a conserved

serine by cysteine (Ser95Cys) in *Ipomoea carnea* CuZn-SOD. This substitution in *Ipomoea carnea* CuZn-SOD leads to the creation of a new subunit interface by which an increase dimeric strength of the protein²⁴.

Intake of fresh *Ipomoea carnea* show the negative impacts on growing animals and male and female reproduction. Twenty-four pregnant goats were randomly allocated into four treatment groups and received the following doses (g/kg BW) of fresh I. carnea: 0 (control group), 1.0 (IC1), 3.0 (IC3), and 5.0 (IC5) from day 27 of gestation until parturition. After the birth dams from IC3 and IC5 groups spent less time paying attention to the newborn. Ingestion of *Ipomoea carnea* by dams shows the lack of maternal- infants bonding and it is very difficult to child in standing, sucking, recognize his mother after birth²⁵.

Hairy roots of *Ipomoea carnea* used as decolourising agent when tested for 25 textile azo dyes, out of which more than ninety percent decolourization was observed in 15 dyes²⁶.

Ipomoea carnea shows significant hematologic alterations due to its poisonous nature. *Ipomoea carnea* mixed with commercial crushed pellets for rodents and given to guinea pig. After the twenty days study, significant changes in the weight of spleen and decrease in peripheral red blood cells, bone marrow hypoplasia and vacuolation of white cells of spleen²⁷.

Daily intake of pink morning glory by goat show the suspected natural lysosomal storage disease. Clinical symptoms were showed by the affected animal i.e. abnormal increase in neck muscle tension, thinness, state of tiredness, ataxia, abnormal postural reactions and death. Histopathological examination of the affected animals showed a fine vacuolar degeneration of the Purkinje cells in the cerebellum with gliosis. Above histological and ultrastructural analyses represent the identification of a lysosomal storage disease²⁸.

Volatile fatty acids (VFAs) isolated from weed ipomoea (*I. carnea*) and used as to operate the reactor with the cow dung (cellulolytic and acidogenic microorganisms). Volatile fatty acids (are mixture of acetic acid and lesser quantities of propionic and butyric acids, these VFAs are generated when zoomass or phytomass is acted upon by acidogenic and acetogenic microorganisms. We can utilize the VFAs by methanogens under anaerobic conditions to generate flammable methane-carbon dioxide which is mainly known as 'biogas'^{29,30}.

Swainsonine is a phyto-constituent of *Ipomoea carnea* is responsible for neurologic disease in livestock (Brazil). The concentration of swainsonine is higher in rainy season or with his continuous month. There is no change in calystegine and protein with the changes in month³¹.

Chloroform fraction of the ethanol extract of *Ipomoea carnea* flowers found to be more effective to suppress airway hyper reactivity symptoms, and decreased count of differential inflammatory cells³².

Different extracts of *I. carnea* plant showed significant antibacterial, anti-fungal, anti-oxidant, anti-cancer, anti-convulsant, immunomodulatory, anti-inflammatory, hepatoprotective, wound healing, anti-diabetic sedative and anxiolytic activities³³.

Monoamine levels were pragmatic by giving the extract of *I. carnea* leaves to guinea pigs. The poisoned animals show increased, lethargy, vocalization, and a reduction in the locomotion frequency after the fourth week of intoxication, as demonstrated in the open-field test. *I. carnea* ingestion in guinea pigs induced neurological toxicity with physical and behavioral impairment. Specific neuropathological lesions and changes in concentrations of euro transmitters were observed: serotonin decreased in plasma, whereas dopamine decreased and noradrenaline increased in urine. We can utilize this model for studying the pathogenesis of plant-induced lysosomal storage diseases³⁴.

Swainsonine is a phyto-constituent of *Ipomoea carnea* and cause a neurologic disease in grazing livestock. Fungal endosymbiont in legumes of the Astragalus and Oxytropis genera produced Swainsonine, and it causes a similar neurologic disease in grazing livestock called locoism. If *Ipomoea carnea* plants are infected with a fungal endosymbiont and culture from its seeds which produced swainsonine³⁵.

Randomly selected 47 goats were selected for this activity and significantly it shows study of treatogenicity by the use of ultrasonography in goats ingested with *Ipomoea carnea* ³⁶.

A mixture of (E)-octadecyl p-coumarate and (Z)-octadecyl p-coumarate obtained from leaves of *Ipomoea carnea* were tested against the Colletotrichum gloeosporioides and Cladosporium cucumerinum. The mixture and isomer of above mention compound showed the significant antifungal active for the above organism³⁷.

Swainsonine is a toxic indolizidine alkaloid isolated from *Ipomoea carnea*. By inhibiting the glycoprotein metabolism it reveals the immunomodulatory effects. Two parameters evaluated for evaluating the immune power. The result was found to be doubtful but the alkaloid did not make down in humoral immune response³⁸.

Aqueous Spray of leaf extract of *Ipomoea carnea* showed the significant inhabitation of in vitro mycelial growth of *Rhizoctonia solani* (plant pathogenic fungus), and effectively reduce the incidence of sheath blight disease in rice³⁹.

Most of the toxic study of this plant performs on sheep, goat and cattle. In all of these cattle goat is perfect for the study. Toxicity of *Ipomoea carnea* concluded by its clinical and morphological changes in ewes and fetuses. Toxicity of *Ipomoea carnea* showed the significant changes which is as follows weight loss, abnormal behavior, cytoplasmic vacuolation etc as neurologic abnormalities⁴⁰.

Ipomoea carnea subsp. fistulosa induces an intralysosomal accumulation of mannose-containing oligosaccharides in guinea pigs, which makes it a valuable animal model for the reproduction of induced alpha-mannosidosis⁴¹.

Carnein is an 80 kDa subtilisin-like serine protease isolated from the latex of the plant *Ipomoea carnea*, which is purified and crystallized by the hanging-drop vapour-diffusion method⁴².

Extract of the flower of *Ipomoea carnea* show significant wound healing activity against the male wistar rats by Excision wound model Incision wound model⁴³.

The aqueous extract of *Ipomoea carnea* initial blockade the isolated frog heart for 5-10 sec followed by dose dependent increase in both amplitude and rate that lasts up to 2 min. The aqueous extract of *Ipomoea carnea* produces positive inotropic effect on isolate frog heart possibly by sodium extrusion or release of the intracellular calcium. Because decrease in sodium chloride concentration or increase in potassium chloride concentration or calcium chloride concentration in physiological salt solution inhibited the responses to aqueous extract while an increase in sodium chloride concentration or decrease in potassium chloride or calcium chloride concentration in physiological salt solution potentiated the responses to the aqueous extract of *Ipomoea carnea* ⁴⁴.

CONCLUSION

The above discussion shows that *Ipomoea carnea* is a ethnic valuable plant and it is used in a number of activities such as Glycosidase Inhibitory Activities, Antioxidant Activity Anti-Inflammatory Activity, Antidiabetic Activity, Wound Healing Activity Antimicrobial Activity, Immunomodulatory Activity, Cardiovascular Activity, abortifacient, Antifungal Activity, Anticancer and Hepatoprotective Activity etc. The plant shows

the presence of many active chemical constituents which are responsible for various pharmacological medicinal uses. Hence *Ipomoea carnea* has a leading role for the development of novel efficacious drugs in future.

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