



**A REVIEW ON *IPOMOEA CARNEA***

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**ABSTRACT**

The plant *Ipomoea Carnea* belongs to family Convolvulaceae, It was used in ancient system of medicine in many countries but not to great extent. The fact is that the plant had immense potential as an Anti-Inflammatory Activity, Antioxidant Activity, Antidiabetic Activity, Antimicrobial Activity, Wound Healing Activity, Immunomodulatory Activity, Cardiovascular Activity, Embryotoxic effect, Antifungal Activity, Hepatoprotective Activity, Inhibition Activity and Anxiolytic Properties. The present aim of study is to review the potential of *Ipomoea Carnea* with reference to its Phytochemical, pharmacological and other activities.

**KEYWORDS:** *Ipomoea Carnea*, Chemical constituents, Phytochemical and Pharmacological activity.



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## INTRODUCTION

*Ipomoea Carnea* is popularly known as Besharam, Behaya in India and Morning glory in English. It is a large diffuse shrub with milky juice. The flowers are pale rose, pink or light violet in lax, dichotomously branched axillary and terminal, pedunculate cymes; fruits have a glabrous capsule; seed is silky. The plant belongs to family Convolvulaceae<sup>1-3</sup>. In India it is distributed particularly in Chhattisgarh and Madhya Pradesh<sup>4, 5, 6</sup>. This plant is spread all over the world including American tropics, Argentina, Brazil and Bolivia<sup>7</sup>, Pakistan, Srilanka etc<sup>8, 9, 10, 11, 12</sup>. It is used in different traditional medical systems including Ayurveda, Siddha, and Unani. The plant part is used for Safed Dag (Leucoderma)<sup>13</sup>, Cyclophosphamide<sup>14</sup> as aphrodisiac, purgative and cathartic<sup>15</sup>. *Ipomoea Carnea* grows to a height of 6 m on terrestrial land, but acquires a shorter height in the aquatic habitats. The stem is thick and develops into a solid trunk over several years with many branches from base. The stem is erect, woody, hairy, and more or less cylindrical in shape and greenish in colour. It has alternate leaves. Normally it attains 1.25 -

2.75 m long and 0.5 - 0.8 cm diameter. The internodes measure 3.5 - 6.0 cm in length. The leaf is simple and petiolate, petiole is cylindrical, attains 4.0 - 7.5 cm length and 2.5 - 3.0 mm diameter. The upper surface of leaf is dull green and the lower surface is paler. The leaves which receive lesser sunlight may grow larger than the leaves which receive full sunlight. The difference is more in aquatic conditions<sup>16, 17</sup>. Flowers of *Ipomoea Carnea* are axial. The pedicel is green, erect and cylindrical. Its length ranges between 1.5 - 2.2 cm and diameter ranges between 0.15 - 0.20 cm. The mouth of the corolla has an entire margin, with slight conspicuous depressions at the points of the cohesion of the petals, measure 5.2 - 6.0 cm long and 1.6 - 1.8 cm width at its mouth<sup>18</sup>. One report shows that identification and phylogenetic analysis of *Ipomoea* species collected from eastern India using inter simple sequence repeat markers<sup>19</sup>. Both molecular and morphological markers will be useful for preservation of the *Ipomoea* germplasm collected from Eastern part of India.



Figure No. 1  
Photograph of *Ipomoea Carnea*

**BOTANICAL CLASSIFICATION OF IPOMOEA CARNEA**

Kingdom: Plantae  
 Sub kingdom: Tracheobionta  
 Division: Spermatophyta  
 Subdivision: Magnoliophyta  
 Class: Magnoliopsida – Dicotyledons  
 Subclass: Asteridae  
 Order: solanales  
 Family: convolvulaceae  
 Genus: *Ipomoea*.  
 Species: *Ipomoea Carnea L.*

**Synonym**

Hindi: Beshram, Behaya; English: Morning glory; Oriya: Behayo; Marathi: Beshram; Bengali: Beshram; Gujarati<sup>20</sup>

**PROXIMATE CHEMICAL ANALYSIS**

Proximate Chemical analysis includes cold water solubility, hot water solubility, ether solubility, alcohol benzene solubility, 1% NaOH solubility, pentosan content, lignin content, holocellulose, hemicellulose, alpha cellulose, acetyl content, methoxyl content, uronic anhydride, Ash Content<sup>21</sup>. The values for proximate chemical analysis tabulated in Table 1.

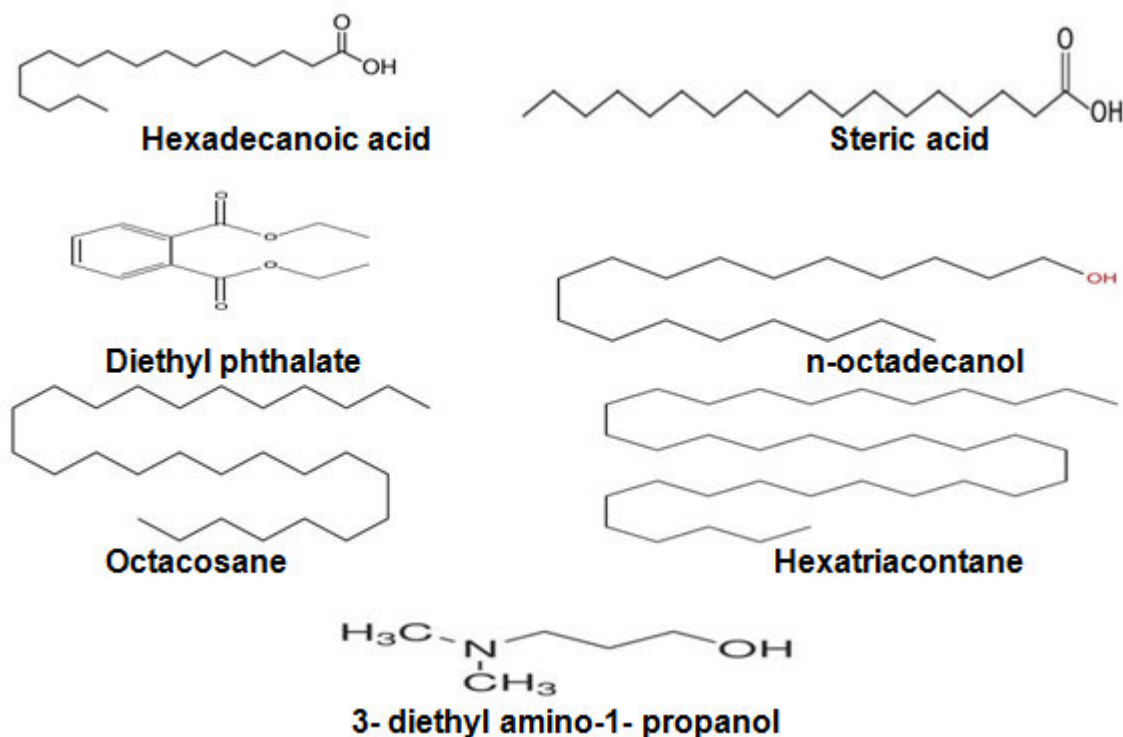
**Table 1**  
**Proximate Chemical Analysis of *Ipomoea Carnea***

S. No.	Parameters	Results
1	Cold water solubility	8.43
2	Hot water solubility	12.60
3	Ether Solubility	3.04
4	Alcohol benzene solubility	8.46
5	1% NaOH solubility	28.6
6	Pentosan Content	17.60
7	Lignin content	18.08
8	Holocellulose	67.49
9	Hemicellulose	22.40
10	Alpha cellulose	46.45
11	Acetyl content	4.32
12	Methoxyl content	4.76
13	Uronic anhydride	3.45
14	Ash Content	6.14

Note: The values are expressed in % on OD woody material basis

**CHEMICAL CONSTITUENTS**

The literature survey reveals that the plant possess various bioactive compounds such as glycosides, alkaloids, reducing sugars, flavonoids, fatty acid, esters, alcohol<sup>1</sup> and tannins<sup>22</sup>. The leaves of this plant showed the presence of thirteen compounds which include hexadecanoic acid, stearic acid, 1, 2 diethyl phthalate, n-octadecanol, octacosane, hexatriacontane, tetracontane, 3-diethylamino-1-propanol<sup>23, 24</sup> (Figure No. 2).



**Figure No. 2**  
**Structure of compounds present in *Ipomoea Carnea***

i) One study shows that Ethanol – Water (80:20) extract of *Ipomoea Carnea* contains appreciable amount of flavonoids and phenol. Flowers contain maximum amount of phenolic compounds while stem contain their minimum amount. Phenolic values lies between 45 to 73 mg catechol equivalent / gm<sup>25, 26</sup>. *Ipomoea Carnea* is a rich source of chemical compounds, pigments, steroid etc<sup>27</sup>. Chloroform extract of *Ipomoea Carnea* showed the presence of steroids, carbohydrates, alkaloids, phenolic compounds, saponins, xanthoproteins and flavonoids<sup>25</sup>.

ii) Gupta A et al studied that when *Ipomoea Fistulosa* flowers were analyzed with Petroleum ether and Hydro alcoholic treatment then Flavonoids, Tannins, Glycosides, Alkaloids, Carbohydrates, and Phenolic compound were observed<sup>28</sup>.

iii) In another study, leaves, flowers and seeds of *Ipomoea Carnea* were treated with aqueous ethanol. The extracts obtained were purified with Amberlite IR-120B (H<sup>+</sup> form). After this they were treated with *N*-methyl-*N*-

(trimethylsilyl) trifluoroacetamide. These derivatives were analysed by capillary GCMS (GAS CHROMATOGRAPHY MASS SPECTRUM) presence of swainsonine and calystegines B1, B2, B3, and C1 are found in all parts of the plant *Ipomoea Carnea*. Swainsonine are found in all parts of *Ipomoea Carnea*. It is lysosomotropic compound which produces neurological disorders. The nortropane alkaloids calystegines B2 (4) and C1 (6), together with swainsonine (1) (Figure No. 3), have been detected in the leaves collected in Mozambique where goats were intoxicated<sup>29</sup>.

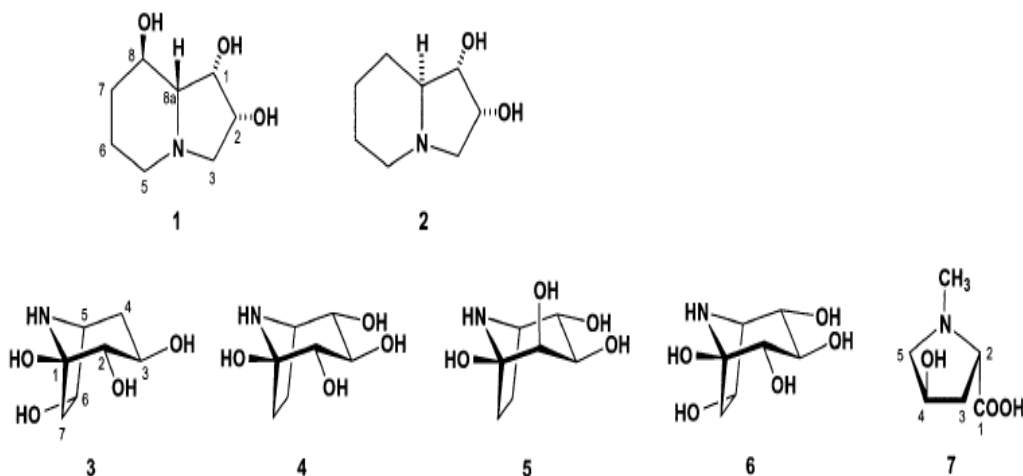
iv) Khatiwora E. et al and Adsul V. et al studied that when bioactive secondary metabolite dibutyl phthalate was separated from *Ipomoea Carnea*. Its structure was studied by HPTLC, IR, MS, <sup>1</sup>H-NMR, <sup>13</sup>C-NMR<sup>30, 31</sup>.

v) Saleem M. et al and Sahayaraj K et al studied that when bioactive secondary metabolites isolated from the *n*-hexane soluble part of the ethanolic extract of *Ipomoea Carnea*, which were identified as octyl-*p*-coumarate, umbelliferone, β-sitosterol, stigmasterol,

dodecyl-*p*-coumarate, methyl-*p*-coumarate, scopoletin and 3-oleanone<sup>32, 26</sup>.

vi) Latex of *Ipomoea Carnea* contains a compound Carnein. It is 80 kDa subtilisin-like serine protease. It shows exceptionally high

resistance to chemical and thermal denaturation. Carnein were isolated from *Ipomoea Carnea* latex, purified and crystallized by the hanging-drop vapour - diffusion method<sup>33</sup>.



**Figure No. 3**  
**Structures of alkaloids isolated from *Ipomoea Carnea***

### PHARMACOLOGICAL PROFILE

#### (i) Glycosidase Inhibitory Activities

Analysis of *Ipomoea Carnea* plant material by gas chromatography–mass spectrometry established the presence of the mannosidase inhibitor swainsonine and 2 glycosidase inhibitors, calystegine B2 and calystegine C1, consistent with a plant-induced  $\alpha$ -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*)<sup>29</sup>.

#### (ii) Anti-Inflammatory Activity

Aqueous extracts of mature green leaves of *Ipomoea Carnea* were used for anti – inflammatory activity. The extracts were used at a dose of 250 mg/kg and 500 mg/kg body weight. The study concluded that *Ipomoea Carnea* leaves posses a strong anti-inflammatory activity at dose of 500 mg/kg and possesses better result as compare to Etoricoxib 6 mg/kg<sup>34</sup>.

#### (iii) Antioxidant Activity

In one research study the methanolic extract of *Ipomoea Carnea* was dissolved in distilled water and partitioned with *n*-hexane, chloroform, ethyl acetate and *n*-butanol successively. The antioxidant potential of all these fractions and remaining aqueous fraction was evaluated by four methods: DPPH free radical scavenging activity, total antioxidant activity, FRAP assay and ferric thiocyanate assay and total phenolics were also determined. Different fraction show variable activities with respect to different values. The percentage inhibition of DPPH radical was highest for *n*-Butanol fraction (91.11%  $\pm$  0.68), total antioxidant activity was highest for chloroform (0.9096  $\pm$  0.1). FRAP value was highest for ethyl acetate fraction (511.99  $\pm$  1.8  $\mu$ g of trolox equivalents). Total phenolic contents were maximum for chloroform fraction (113.05  $\pm$  1.2 mg of gallic acid equivalents)<sup>35</sup>.

#### (iv) Antidiabetic Activity

In one study antidiabetic property of *Ipomoea Carnea* leaves were carried out in normal rats

and in streptozotocin induced diabetic rats. The aqueous extract of *Ipomoea Carnea* significantly reduces the blood glucose level of rats. It increases the glucose tolerance in normal rats<sup>36</sup>.

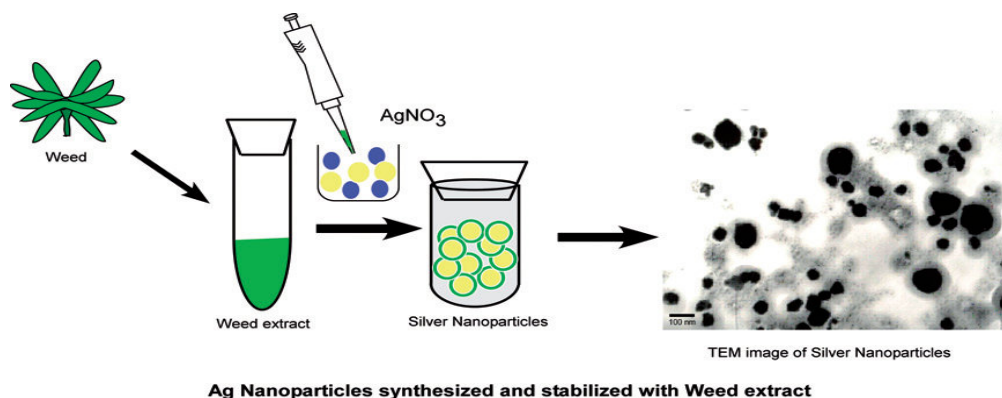
#### (v) Antimicrobial Activity

In one study n- hexane (1), ethyl acetate (2), acetone (3), ethanol (4) and acetone fraction (A) extract were prepared from *Ipomoea Carnea* leaves. Crude extracts were prepared from leaves of *Ipomoea Carnea* in n- hexane (1), ethyl acetate (2), acetone (3), ethanol (4) and acetone fraction (A). Crude acetone extracts shows activity against *Proteus vulgaris* and *Salmonella typhimurium*, while the crude ethanol extract elucidates antimicrobial activity against *pseudomonas aeruginosa*. This is the first report showing inhibition of *Proteus vulgaris* and *Salmonella typhimurium* by the acetone extract while ethanol extract exhibits promising

inhibition against *pseudomonas aeruginosa* of *Ipomoea Carnea* leaves<sup>37</sup>. Antimicrobial activity of metal complexes prepared from leaf proteins of *Ipomoea Carnea* was reported<sup>38</sup>.

#### (vi) Antibacterial Activity of nanoparticles synthesized from *Ipomoea Carnea* extract

Recently biosynthetic method has been developed using plant resources, *Ipomoea Carnea* has also been used for this purpose. It contains polyphenols and alkaloids which can be used as reducing agents in the synthesis of nanoparticles. Thus *Ipomoea Carnea* has additional antimicrobial use. The weed is extracted and silver nitrate is added to it. Silver nanoparticles are obtained by this method. The reaction of silver nitrate with calystegine B<sub>2</sub> present in *Ipomoea Carnea* is shown by following reaction (Figure No. 4).



**Figure No. 4**

The weed extract-based synthesis of silver nanoparticles is very efficient against selected human pathogens and can be used in the fabrication of hospital clothes, gloves and masks to avoid the spread of infection among healthcare workers<sup>39</sup>.

#### (vii) Wound Healing Activity

Ambiga S et al studied fresh flowers of *Ipomoea Carnea* extracted with 95% ethanol. The extract was concentrated in vacuum and the aqueous concentrate was treated with successive fraction of various solvents viz., diethyl ether,

chloroform and ethyl acetate. The fresh flowers of *Ipomoea Carnea* contain Kaempferol and its 3-O-β-D glucoside (Figure No. 5). These were found to possess appreciable wound healing activity. Wound healing normally involves an initial inflammatory phase followed by fibroblast proliferation, formation of collagen fibres and shrinking and drying of the scar. These phases are concurrent but independent of each other. These activities are comparable to Sulphathiazole and significantly improved than untreated wounds<sup>40</sup>.

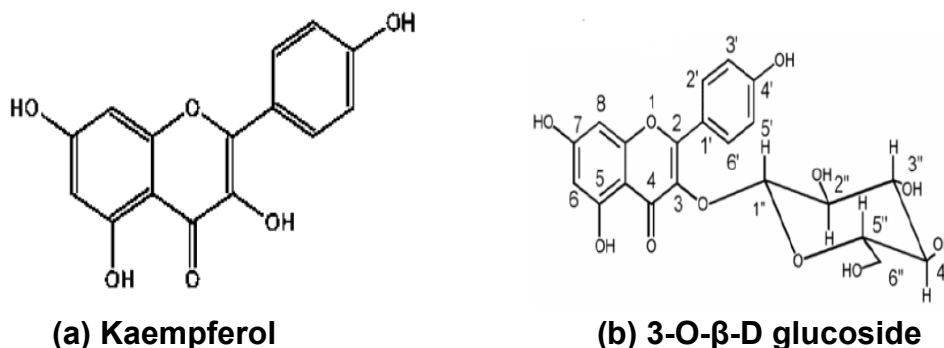


Figure No 5

Structure of Kaempferol and its 3-O-β-D glucoside present in flowers of *Ipomoea Carnea*.

#### (viii) Immunomodulatory Activity

*Ipomoea Carnea* is a poisonous plant. Toxic component in it are- the nortropane alkaloid calystegines B1, B2, B3 and C1 and the indolizidine alkaloid swainsonine (SW) [18, 26]. Effects of swainsonine (SW) in female rats were (a) Reduction in body weight (b) Increase in spleen/body weight ratio, (c) Decrease in the thymus/body weight ratio, and (d) Histological changes. When pregnant rats were treated with 7 gm/kg of *Ipomoea Carnea* AF, all of the litters died immediately after birth. Rats consume significantly less food due to effect of *Ipomoea Carnea*. Swainsonine has immune effect due to glycoprotein metabolism. Due to this rheumatoid arthritis (RA) was developed to both adult (70 days old) and juvenile rats (21 days old). So swainsonine modulates immune function<sup>41, 42</sup>.

#### (ix) Cardiovascular Activity

When aqueous extract of *Ipomoea Carnea* was introduced to isolated frog heart then initial blockade for 5 - 10 seconds was observed. When dose increased then the timing increased up to 2 minutes. It may be suggested that *Ipomoea Carnea* produces a positive inotropic effect on isolated frog heart by sodium extrusion or release of the intracellular calcium<sup>43</sup>. When atropine 1 μ gm/ml was introduced in extract then the initial different phase was blocked used stimulant effect become stronger.

#### (x) Embryotoxic effect

Dried leaves of *Ipomoea Carnea* were used to prepare an aqueous extract of prenatal daily exposure to 0.0, 0.7, 3.0 or 15.0 mg/kg. When these extract were introduced to rats following result were observed.

- Maternal reproductive performance showed adverse effect.
- Skeletal and visceral abnormalities.
- Malformations were observed.

Prenatal ingestion of the *Ipomoea Carnea* AQE in rats induces embryotoxicity. These effects are associated to an active principle from *Ipomoea Carnea* acting on maternal homeostasis, or directly in the conception<sup>44</sup>.

#### (xi) Antifungal Activity

Antifungal activity of *Ipomoea Carnea* has been identified against *Alternaria alternate* and *curvularia lunata*<sup>45, 46</sup>. Chloroform and Methanol extract of *Ipomoea Carnea* show antifungal activity against eleven pathogenic and nonpathogenic fungi<sup>47</sup>. Antifungal fractions of the leaves of *Ipomoea Carnea* were achieved using *Colletotrichum gloeosporioides* and *Cladosporium cucumerinum* as test organisms. The activity of the purified fraction was further confirmed by the dose dependent inhibition of the spore germination of *Alternaria alternata* and *A. porri*. The active fraction was identified as a mixture of (E)-octadecyl p-coumarate and (Z)-octadecyl p-coumarate<sup>48</sup>.

**(xii) Hepatoprotective Activity**

Liver diseases are serious health problem whose treatment is limited. *Ipomoea Carnea* can be a promising bioactive substance for prevention and treatment of liver injury<sup>49</sup>. *Ipomoea Carnea* possesses hepatoprotective activity using CCl<sub>4</sub> induced hepatotoxicity in rat. This hepatotoxicity is due to free radical CCl<sub>3</sub> which is metabolite. It reduces alkalization of cellular proteins and other macromolecules with simultaneous attack on polyunsaturated fatty acids to produce lipid peroxide. It results in liver damage<sup>50</sup>.

**(xiii) Effect of *Ipomoea Carnea* on Nervous System**

*Ipomoea Carnea* is a poisonous plant, it affects central nervous system adversely. When goats were fed with fresh leaves flowers and stems of *Ipomoea Carnea* for 45 to 60 days then Hirsute coat, depression, difficulty to stand up, ataxia, hypermetria, wide-based stance, incoordination of muscular movements, intense tremors, spastic paresis, abnormal postural reactions, nystagmus, hyperreflexia, hypersensitivity to sound, head tilting and loss of equilibrium were observed in all treated animals. The cerebellum is one of the main affected organs in the *Ipomoea Carnea* intoxication. This organ processes information from other nervous areas, mainly spinal cord and sensory receptors, with the purpose to coordinate skeletal muscle movements<sup>51</sup>. The functional units of the cerebellum cortex are the Purkinje

cells; these cells send inhibitory projections to the deep cerebellar nuclei. These neurons were severely affected in this intoxication, including necrosis in some of them<sup>52</sup>.

**(xiv) Anxiolytic Activity**

*Ipomoea Carnea* appears to fall under the sedative-hypnotic category of central depressants activity. The anxiolytic effects of the aqueous and methanolic extract of *Ipomoea Carnea* leaves (32.50 and 16.25mg/kg i.p.) was evaluated in mice using elevated plus maze, open field test and hole board test models, diazepam was used as positive standard. The intra-peritoneal (i.p.) LD50 of the *Ipomoea Carnea* leaf aqueous extract (ICLAE) and *Ipomoea Carnea* methanolic extract (ICLME) in mice was found to be 325 mg/kg i.p. body weight. ICLME showed greater anxiolytic effect as compared to ICLAE (doses of 32.5mg/kg and 16.2mg/kg) and diazepam. The effect of the ICLAE and ICLME showed a dose dependent significant increased the number of head dipping behavior in hole board test at doses 32.5 and 16.2 mg/kg when compared with control and diazepam 1mg/kg, 2mg/kg as a standard. These observations indicate that ICLAE and ICLME showed an anxiolytic activity<sup>53</sup>. In experimental studies in which the plant was given to adult goats, all animals showed disorders of behaviors and consciousness as well as abnormalities of gait, ability to stand, and posture (Figure No. 6 ), and one goat died<sup>54</sup>.





**Figure No. 6**

**Contracture defects in the front legs of a goat produced by consumption of *Ipomoea Carnea*.**

#### **IPOMOEA CARNEA AS A BIOCOMPOST**

Composting is one of the most promising ways to recycle the wastes generated from power plants, as the process reduces the volume and stabilizes the waste. The high organic matter content in the compost product also preserves soil fertility. A large variety of thermophilic micro-organisms have been reported in composting and other self-heating organic materials. *Ipomoea Carnea* is useful to increase the microbial activity of Biocompost. The organic content of Biocompost also increases after treatment of *Ipomoea Carnea*. The thermophilic bacteria are in highest number in *Ipomoea Carnea* compost their number is (43x10<sup>6</sup>) at 50<sup>0</sup> C Biocompost of 30<sup>th</sup> day. *Ipomoea Carnea* is also useful in germination of different seeds. Such as in groundnut *Ipomoea Carnea* compost mixture showed highest (83%) percentage of germination when compare to OS (49%) in 5<sup>th</sup> day<sup>55</sup>.

#### **EFFECT OF IPOMOEA CARNEA ON AQUATIC CREATURES**

When ethanolic extract of *Ipomoea Carnea* leaves was tested for its toxicity against fish Guppy *Poecilia Reticulata* then toxicity was proved. The extract was used in 0.025, 0.050, 0.07 and 0.1 mg/ml concentrations. Ethanolic extract of *Ipomoea Carnea* leaves showed toxic

effect, causes mortality in guppy fishes. All concentrations of ethanolic extracts of *Ipomoea Carnea* leaves were found toxic. The experiment have shown that ethanolic extract of *Ipomoea Carnea* leaves showed three times higher mortality than control in guppy fishes, *Poecilia reticulata* Peters. On exposure of guppy fishes to various concentrations of solid ethanolic extract of *Ipomoea Carnea* leaves it shows change in behavior like surfacing, gulping, mucous secretion from skin, omitting, increase in rate of gill opercular movement, loss of body balance and change in body colour to white<sup>56</sup>.

#### **OTHER USES OF IPOMOEA CARNEA**

##### **(i) *Ipomoea Carnea* as a raw material for paper making**

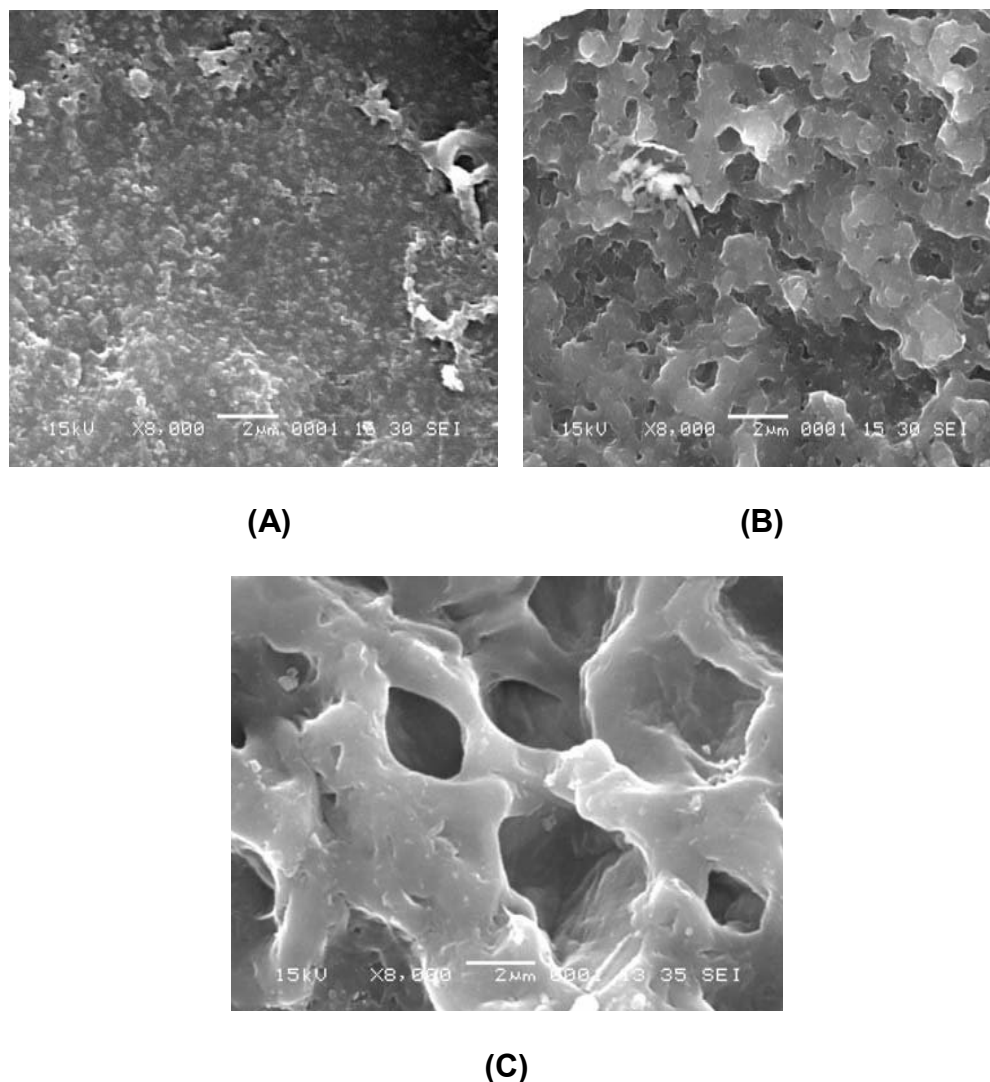
*Ipomoea Carnea* is a good raw material which is replacement of wood. Soda lignin and Soda Anthraquinone lignin obtained from wood and *Ipomoea Carnea* is almost same. Their functional groups are highly similar. In both the lignin samples the presence of vanillin and syringaldehyde was found. Addition of anthraquinone to the pulping process does not affect the quality of lignin precipitated from soda black liquor; even though it nearly doubles the amount of lignin precipitated from black liquor. Rate of delignification was higher with 0.1%

addition of anthraquinone<sup>57</sup>. *Ipomoea Carnea* had been found that very useful for paper making<sup>58</sup>.

**(ii) Activated Carbon from *Ipomoea Carnea***

It has been observed that *Ipomoea Carnea* is a suitable raw material for the production of activated carbon. It is effective in the removal of copper from aqueous solution. It was concluded that the activated carbon produced from morning glory by zinc chloride activation has

better adsorbing capacity of copper than the raw adsorbent. A SEM photograph clearly shows that after activation with zinc chloride lot of micro pores were produced (Figure No. 7). With the increase in micro pores the adsorption percentage of copper was increased. The adsorption of copper was found to be maximum at its natural pH. The adsorption of copper by raw adsorbent and activated carbon both follows pseudo second order rate kinetics<sup>59</sup>.



**Figure No. 7**

**(A) SEM micrograph of raw *Ipomoea Carnea* (RIC). (B) & (C) SEM micrograph of activated *Ipomoea Carnea* (AIC) activated with  $ZnCl_2$  in the ratio of 1:0.5 and 1:1 adsorbent to  $ZnCl_2$  weight.**

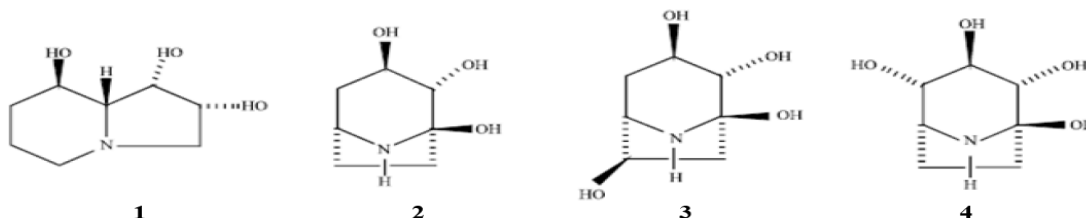
**(iii) *Ipomoea Carnea* as a potential source of Energy**

World is suffering from energy crisis. *Ipomoea Carnea* is a potential biogas source of Energy. *Ipomoea Carnea* biomass and distillery waste admixture proved to be the best substrate. The biomethanation parameters optimized at 4L digester level were used at 25L, 50L and 100L scale-up digesters, and it was found that these parameters were satisfactorily transformed to scale-up levels, as shown by good daily volumes of biogas produced and % methane contents. The chemical analysis of digester effluent for NPK and micronutrients showed that the sludge and remaining effluent possesses good manorial value to be used as a supplement to fertilizers in agriculture. *Ipomoea Carnea* has a suitable methane content which makes *Ipomoea Carnea* suitable for energy production<sup>60</sup>.

**(iv) Inhibition Activity**

*Ipomoea Carnea* is an effective agent against the weight loss for mild steel due to rusting. It

has been found that when 0.01 % *Ipomoea Carnea* was added to paste containing 4N HCl (40 Parts) + H<sub>2</sub>SO<sub>4</sub> (60 Parts) then weight loss reduced from 20.4 mg/dm<sup>2</sup>/hr to 10.2 mg/dm<sup>2</sup>/hr, as the concentration of *Ipomoea Carnea* was further increased weight loss was further decreased. At 5% concentration, the weight loss obtained was 6.9 mg/dm<sup>2</sup>/hr. Inhibitor efficiency was 50% which continuously increased with increase in concentration of inhibitor upto 66%. The inhibition is due to the formation of the film on the metal/acid solution interface through adsorption of *Ipomoea Carnea* leaves extract molecules. The absorption of *Ipomoea Carnea* leaves takes place uniformly over the surface act as a anodic type inhibitor. The result is isolation of swainsonine, 2-epi-lentiginosine, calystegine A3, B1, B2, B3 and C1 and N-methyl-trans-4-hydroxy-1-proline<sup>29,61</sup>. Swainsonine and calystegine A3, B1 and B2 are potent inhibitors<sup>47</sup>. Structure of alkaloids present in *Ipomoea Carnea*: Swainsonine (1); Calystegines A3 (2), B1 (3), B2 (4)<sup>62</sup> (Figure No. 8).

**Figure No. 8**

(v) A new type of enzyme (ICChI) has been purified and characterized from the latex of *Ipomoea Carnea*. It is highly stable enzyme and can be very useful in Industrial and Biotechnological applications. In addition, it may be employed in agriculture, environmental protection, recycling chitinous waste, and chito-oligosaccharide production<sup>63</sup>.

**CONCLUSION**

The above discussion shows that *Ipomoea Carnea* is an important plant and it is used in different activities such as Glycosidase Inhibitory Activities, Anti-Inflammatory Activity, Antioxidant Activity, Antidiabetic Activity, Antimicrobial Activity, Wound Healing Activity, Immunomodulatory Activity, Cardiovascular Activity, Embryotoxic effect, Antifungal Activity,

Hepatoprotective Activity, Inhibition Activity and Anxiolytic Properties. The plant shows the presence of many chemical constituents which are responsible for various pharmacological medicinal properties. Hence *Ipomoea Carnea* has a leading capacity for the development of new good efficacy drugs in future.

## REFERENCES

1. Frey R, *Ipomoea Carnea ssp. fistulosa* (Martius ex Choisy) Austin: taxonomy, biology and ecology reviewed and inquired. Tropical Ecology journal, 36 (1): 21 - 48, (1995).
2. Compendium of Indian Medicinal Plant. Central Drug Research Institute. Publication and Information Directorate. New Delhi, 2: 390 – 391, (1979).
3. Indian Herbal Pharmacopoeia. Mumbai: Indian Drug Manufacture Association, 498-99, (2002).
4. Ekka R. N, Dixit V. K, Ethnopharmacognostical studies of medicinal plants of Jashpur district Chattisgarh. Int Jour of Green Phar, 1(1): 2-4, (2007).
5. Dwivedi S. N, Traditional health care among the tribals of Rewa District of Madhya Pradesh with special reference to conservation of endangered and vulnerable species. Econ Taxon Bot, 23 (2) : 315 – 320, (1999).
6. Dwivedi S. N, Ethnobotanical studies and conservation strategies of wild and natural resources of Rewa district of Madhya Pradesh. J Econ Taxon Bot, 27 (1): 233-244, (2003).
7. Shinnars L. H, Convolvulaceae. In: Correll, D.S. and Johnston, M.C. (Eds.). Manual of the Vascular Plants of Texas, Texas. Renner, 1241-61, (1970).
8. Bhattacharyya P. K, A note on two species of *Ipomoea*, namely *Ipomoea Carnea* Jacq. and *Ipomoea fistulosa* Mart. ex Choisy in Eastern Asia. Journal of the Bombay Natural History Society, 73: 317-20, (1976).
9. Mahapata A. K, A brief survey of some unrecorded, less known and threatened plant species of Sundarban of West Bengal. Bulletin of the Botanical Society of Bengal, 32: 54-58, (1978).
10. Sharma M, Aquatic and marshy angiosperms of Punjab. Bulletin of the Botanical Society of Bengal, 31: 52-60, (1978).
11. Austin D. F, and Ghazanfar S, Convolvulaceae. In: Nasir, E. and Ali, S.I. (eds.) Flora of West Pakistan. Agricultural Research Council, Islamabad, 1-64, (1979).
12. Dassanayake M. D, and Fosberg F. R, A Revised Handbook to “The Flora of Ceylon” Vol 1. Amerind Publishing Co. Pvt. Ltd., New Delhi, 508, (1980).
13. Varghese E, SVD. Applied Ethnobotany- A case study among the Kharias of Central India. New Delhi: Deep Publications; (1996).
14. Phillips O, Gentry A. H, Reynal L, Wilkin P, Gulvez D. C. B, Quantitative Ethnobotany & Amazonian Conservation, Conser. Bio, 8: 225-248, (1994).
15. Ved G. A, Kinhal K, Ravikumar M. K, Vijaya S, Indresha J. H, Threat Assessment and Management prioritization for Medicinal Plants of Chattisgarh & Madhya Pradesh. FRLNI. Bangalore. India, (2004).
16. Afifi M. S, Amer M. M. A and El-Khayat S. A, Macro-and micro morphology of *Ipomoea Carnea* Jacq. Growing in Egypt. Part I. Leaf and flower. Mansoura Journal of Pharmaceutical Science, 3:41-57, (1988).
17. Chaudhuri H, Ramaprabhu T, and Ramachandran V, *Ipomoea Carnea* Jacq. A new aquatic weed problem in India. Journal of Aquatic Plant Management, 32: 37-38, (1994).
18. Cook C. D. K, *Ipomoea fistulosa*: A new problem for India, Aquaphyte journal, 7 (1) : 12, (1987).
19. Rout G. R, Senapati S. K, and Aparajita S, Identification and Phylogenetic analysis of *Ipomoea* species collected from eastern India using inter simple sequence repeat markers. International Journal of Pharma and Bio Sciences, Vol.1, Issue-4, (2010).
20. Shankul K, Prasad A. K, Iyer S. V, Patel J. A, Patel H. A, and Vaidya S. K, Pharmacognostical, phytochemical and

- pharmacological review on *Ipomoea Carnea*. Novus International Journal of Pharmaceutical Technology, Vol. 1, No. 4 (2012).
21. Nandkumar P, Pulp Blending and its Effects on the Strength Properties of *Ipomoea Carnea jacq*, Journal of Environmental Research And Development Vol. 3 No. 4, (2009).
  22. Afifi M. S, Amer M. M. A, and El-Khayat S. A, Macro-and micro morphology of *Ipomoea Carnea Jacq*. Growing in Egypt. Part II. Stem and root, Mansoura Journal of Pharmaceutical Science, 4:88-97, (1988).
  23. Tirkey K, Yadava R. P, Mandal T. K and Banerjee N. L, The pharmacology of *Ipomoea Carnea*, Indian Veterinarian Journal, 65: 206-210, (1988).
  24. Vaishali A, Eliza K, Manik K, Amuruta T, Pushpa P and Nirmala D, GC-MS Study of fatty acid, esters, alcohol from the leaves of *Ipomoea Carnea*, International Journal of pharmatech Research, 1 (4) : 1224 - 26, (2009).
  25. Khatiwora E, Adsul V. B, Kulkarni M. M, Deshpande N. R, Kashalkar R. V, Spectroscopic determination of total phenol and flavonoid contents of *Ipomoea Carnea*. International Journal of Chem Tech Research, 2 (3) : 1698-170, (2010).
  26. Sahayaraj K, Ravi C, Preliminary phytochemistry of *Ipomea Carnea jacq*. and *Vitex negundo* linn. Leaves. Int. J. Chem. Sci., 6 (1) : 1-6, (2008).
  27. Barenbaum M, Postingestive effects of phytochemicals on insects: on paracelsus and plant products. in : Insect Plant Interactions, J. Miller and T. Miller (Eds.) Springer-verlag, New York, 221, (1986).
  28. Gupta A, Nayak S, Mallik A, Preliminary Phytochemical Screening of hydroalcoholic Flower Extract of *Ipomoea fistulosa*. Inter J Curr Trends Sci Tech, 1 (2): 37-40, (2010).
  29. De Balogh, K. K. I. M, Dimande A. P, van der Lugt J. J, Molyneux, R. J, Naude, T. W, Welman, W. G, A lysosomal storage disease induced by *Ipomoea Carnea* in goats in Mozambique. *J. Vet. Diagn. In Vest.* 11, 266-273, (1999).
  30. Khatiwora E, Adsul V. B, Kulkarni M, Deshpande N. R, Kashalkar R.V, Antibacterial activity of Dibutyl Phthalate: A secondary metabolite isolated from *Ipomoea Carnea* stem. Journal of Pharmacy Research, 5 (1) : 150-152, (2012).
  31. Adsul V, Khatiwora E, Kale A, Deshpande N, HPTLC as a Standardization Tool: Dibutyl Phthalate isolated from *Ipomoea Carnea* leaves. Journal of Pharmacy Research, 4(7) : 2239-2240, (2011).
  32. Saleem M. et. al. Phytochemicals from *Ipomoea Carnea* collected from Murree Hills. J. Chem. Soc. Pak., 33 (5) : 746-50, (2011).
  33. Patel A. K et al. Crystallization and preliminary X-ray analysis of carnein, a serine protease from *Ipomoea Carnea*. Acta Crystallogr Sect F Struct Biol Cryst Commun., 65 (Pt 4) : 383-385, (2009).
  34. Khalid Md. S, Singh R. K, Reddy I. V. N, Kumar S. J, Kumar B. S, Kumar G.N.S, Rao S. K, Anti Inflammatory Activity of Aqueous Extract of *Ipomoea Carnea Jacq* *Pharmacologyonline* 1: 326-331, (2011).
  35. Abbasi M. A, Zafar A, Riaz T, Rehman A, Arshad S, Shahwar D, Jahangir M, Siddiqui S. Z, Shahzadi T and Ajaib M, Evaluation of comparative antioxidant potential of aqueous and organic fractions of *Ipomoea Carnea* Journal of Medicinal Plants Research Vol. 4 (18), 1883-1887, (2010)
  36. Kadiyawala A. L. A, et al. Comparative Antidiabetic Studies of Leaves of *Ipomoea Carnea* and *Grewia asiatica* on Streptozotocin Induced Diabetic Rats International Journal of Pharmaceutical & Biological Archives, 3 (4) : 853-857, (2012).
  37. Adsul V. B, Khatiwora E, Torane R, Deshpande N. R, Antimicrobial activities of *Ipomoea Carnea* leaves *J. Nat. Prod. Plant Resour*, 2 (5): 597-600, (2012).

38. Shahidul I, International journal of Food, Agriculture and Environment, 6: 14-17, (2008).
39. Daniel S. C. G. K, Banu B. N, Harshiny M, Nehru K, Ganesh P. S, Kumaran S. Sivakumar M, *Ipomea Carnea* - based silver nanoparticle synthesis for antibacterial activity against selected human pathogens, Journal of Experimental Nanoscience (2012).
40. Ambiga S *et al.* Evaluation of wound healing activity of flavonoids from *Ipomea Carnea Jacq* Ancient Science of Life Vol: XXVI (3) January, February, March (2007).
41. Rosenberg A, Bones, joints, and soft tissue tumors. In: Cotran R. S, Kumar V, Collins T (eds) Robbins Pathologic Basis of Disease. Pennsylvania: WB Saunders Company, 1215–1268, (1999).
42. Lunardi C, Bason C, Navone R, Millo E, Damonte G, Corrocher R, et al.. Systemic sclerosis immunoglobulin G autoantibodies bind the human cytomegalovirus late roteinUL94 and induce apoptosis in human endothelial cells. Nat Med; 6: 1183–1186, (2000).
43. Bachhav K. V, Burande M. D, Rangari V. D, Mehta J.K, Effect of aqueous extract of *Ipomea Carnea* leaf on isolated frog and mouse heart. Indian J Exp Biol. 37 (11) : 1080-4, (1999).
44. Hosomi R. Z et al, Embryotoxic effects of prenatal treatment with *Ipomea Carnea* aqueous fraction in rats. Braz. J. vet. Res. anim. Sci., 45 (1) : 67 - 75, (2008).
45. Agarwal R. K, Uppadhyay, R. K, Indian Drugs Phar. Ind, 14 (2) : 23-25, (1997).
46. Guleria, S. and A. Kumar, J. Cell Mol. Biol., 5: 95 - 98, (2006).
47. Ikeda K Kato A, Adachi I, Haraguchi M, and Asano N, J. Agric. Food Chem., 51: 7642-7646, (2003).
48. Nidiry E. S, Ganeshan G, Lokesh A. N, Antifungal activity and isomerization of octadecyl p-coumarates from *Ipomea Carnea* subsp. *Fistulosa*. Nat Prod Commun, 6 (12) : 1889-92, (2011).
49. Gupta R. K, Chaudhary S, Vaishali, Singh R. K, Antihepatotoxic Influence of Aqueous Extract of *Ipomea Carnea* Against Carbon Tetrachloride Induced Acute Liver Toxicity in Experimental Rodents Asian Journal of Pharmaceutical and Clinical Research Vol 5, Suppl 4, (2012).
50. Bishayee A, Sarkar A, Chatterjee M, The hepatoprotective activity of carrot (*Daucus carota* L) against carbon tetrachloride intoxication in mouse liver. J Ethnopharmacol 1995; 47: 69–74, (1995).
51. Rios. E, Cholich. L, Silva. J, Acosta de Pérez, O, Histopathological lesions in central nervous system of goats poisoned by *Ipomea Carnea*, Intoxicación en cabras. Rev. vet. 19 : 2, 130–134, (2008).
52. Barbosa R C, Riet–Correa F, Medeiros R M, Lima E. F, Barros S. S, Gimeno E. J, Molyneux R. J, Gardner D. R, Intoxication by *Ipomea Sericophylla* and *Ipomea Riedelii* in goats in the state of Paraíba, Northeastern Brazil. *Toxicon* 47: 371–379, (2006).
53. Bidkar J. S, Bhujbal M. D, Ghanwat D. D, Dama G.Y, Anxiolytic Activity of Aqueous and Methanolic Extracts of *Ipomea Carnea* Leaves. International Journal of Universal Pharmacy and Bio Sciences 1(2), (2012).
54. Tokarnia C. H, Dobereiner J, Peixoto P. V, Poisonous plants affecting livestock in Brazil. *Toxicon*, 40, 1635-1660 and references cited therein, (2002).
55. Moindi J, Onyambu E, Kiprono S. J, Titus S. K, Onyancha W. Studies of Biodegradation of *Ipomea Carnea* Weed from Kavinadu Big Tank in Pudukkottai District (India) Journal of Natural Sciences Research, Vol. 2, No.6, (2012).
56. Wanule D. D, and Balkhande J. V, Effect of Ethanolic Extract of *Ipomea Carnea* Leaves on Guppy, *Poecilia Reticulata* (Peters). Bioscience Discovery 3 (2) : 240 -242, (2012).
57. Nandkumar P, Comparative Study between soda Lignin and soda Anthraquinone lignin in terms of Physiochemical Properties of *Ipomea Carnea*, International Journal of Chemical,

- Environmental and Pharmaceutical Research, Vol. 2, No. 1, 26 – 29, (2011).
58. Nandkumar P, Studies on the Chemical Constituents and the Pulp and Paper Making Characteristics of *Ipomoea Carnea Jacq.* Oriental Journal of Chemistry, Vol. 27, No. (1) : 149 - 154, (2011).
59. Miranda M. A, Dhandapani P, Kalavathy M. H, Miranda L. R, Activated *Ipomoea Carnea* a biosorbent for the copper sorption from aqueous solution ([www.ntu.edu.sg/pbast/\\_abstract/104.Lima.Miranda.pdf](http://www.ntu.edu.sg/pbast/_abstract/104.Lima.Miranda.pdf)).
60. Deshmukh H. V, Economic Feasibility and Pollution Abatement Study of biogas Production Process utilizing Admixture of *Ipomoea Carnea* and Distillery Waste, Journal of Environmental Research And Development Vol. 7 No. 2, (2012).
61. Haraguchi M, et al. Alkaloidal Components in the Poisonous Plant, *Ipomoea Carnea* (Convolvulaceae), *J. Agric. Food Chem.* 51, 4995-5000, (2003).
62. Srivastava M and Srivastava K, Aqueous extract of *Ipomoea Carnea* leaves as green corrosion inhibitor for mild steel in pickling paste volume 2, Issue 1, 248 – 257, (2012).
63. Patel A. K, Singh V. K, Yadav R. P, Moir A. J. G, Jagannadham M. V, ICChI, a glycosylated chitinase from the latex of *Ipomoea Carnea*, *Phytochemistry* 70, 1210–1216, (2009).