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RESEARCH ARTICLE

SIGNIFICANCE OF *IPOMOEA CARNEA* JACQ.: A COMPREHENSIVE REVIEW

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ABSTRACT

Ipomoea carnea Jacq. (Family: Convulvulaceae), the pink morning glory, is a species of morning glory. This plant is formerly from the tropics of South America. This evergreen, flowering shrub has spread to Asia, Africa and North America. It is well dispersed in India and found predominantly in Chhattisgarh and Madhya Pradesh. It has been described to possess medicinal properties and is used in traditional medicine in several countries. It is used in different traditional medical systems including Ayurveda, Siddha and Unani. The stem of *I. carnea* can be used for making paper. It contains a component identical to marsilin, a sedative and anticonvulsant. A glycosidic saponin has also been purified from *I. carnea* with anti-carcinogenic and oxytoxic properties. This significant plant is easy-to-grow, fast growing, and is generally problem-free plant that will grow in even the poorest soil conditions. The present communication constitutes a review on the importance of *Ipomoea carnea* Jacq.

INTRODUCTION

Ipomoea carnea (Family: Convulvulaceae) which is generally known as Besharam, Behaya in India and Bush Morning Glory in English. The hindi/marathi names besharam/behaya, meaning shameless, refers to its rampant spreading. This plant is spread all over the world including Asia, Africa and North America(Shinners, 1970).Morning glory, the name itself introduces the shimmering flower which blooms with the sunlight, dries up in the afternoon and fades into the darkness of the night giving way to new flowers day after day. This evergreen, flowering shrub grows to a height of 5-6 m. The stem is thick and develops into a solid trunk over several years with many branches from base (Bhalerao, 1985). 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 leaves are light green, heart shaped or somewhat lanceolate and 10-25cm long. 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 (Afifi *et al.*, 1988; Chaudhuri *et al.*, 1994; Sharma and Bachheti, 2013). The plants bloom in clusters of 4 inch pink flowers all spring and summer long.

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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 (Cook C.D.K, 1987). The flowers are pale rose, pink or light violet in lax, terminal, pedunculate cymes; fruits have aglabrous capsule; seed is silky.

SIGNIFICANCE OF *IPOMOEA CARNEA*

As a Raw Material for Paper Making

This plant is a very decent raw material for replacement of wood. Soda lignin and Soda Anthraquinone lignin components derived from wood and *Ipomoea carnea* is almost same. The functional groups of the components are very much similar. The presence of vanillin and syringaldehyde was found in both the lignin samples. Adding of anthraquinone to the pulping process does not affect the quality of lignin precipitated from soda black liquor; however it nearly doubles the amount of lignin precipitated from black liquor. Rate of delignification was significantly greater with 0.1% addition of anthraquinone (NandKumar, 2011).

Ipomoea carnea had been found that very useful for paper making (Nandkumar, 2011; Srivastavaand Shukla, 2015).

Raw material for Activated Carbon

It has been proved that the *Ipomoea carnea* is potent raw material in the removal of copper from aqueous solution. It was proven that the activated carbon derived from morning glory by zinc chloride activation process has shown better adsorbing capacity of copper as compared to the raw adsorbent. After activation with zinc chloride there was increase in number of micro pores. Hence with the increase in micro pores the adsorption percentage of copper was also increased. The adsorption of copper was found to be higher at its natural pH. The adsorption of copper by raw adsorbent and activated carbon both follows pseudo second order rate kinetics (Miranda, et al., 2012; Srivastava and Shukla, 2015).

As a potential source of Energy

Ipomoea carnea is a likely biogas source of Energy. It was seen that cellulose content of *Ipomoea carnea* is over 55% and lignin content is about 17% which specifies it is a fibrous material and can be used as filler for making light weight polymer composite which provides an effective means of utilization of a large quantity of this diffuse shrub. 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. *Ipomoea carnea* biomass and distillery waste admixture proved to be the best substrate. The plant has a suitable methane content which makes *Ipomoea carnea* suitable for energy production (Deshmukh, 2012; Srivastava and Shukla, 2015).

As a Biocompost

It was proven that the *Ipomoea carnea* is useful to increase the microbial activity of bio compost. The organic content of biocompost also rises after treatment of *Ipomoea carnea*. The thermophilic bacteria are in highest number in *Ipomoea carnea* compost their number is (43x106) at 50^{O}C biocompost of 30th day. *Ipomoea carnea* is also useful in germination of several seeds. Such as in groundnut *Ipomoea carnea* compost mixture revealed maximum (83%) percentage of germination when compared to OS (49%) in 5th day (Moindi et al., 2012; Sharma and Bachheti, 2013).

As a Pesticide

I. carnea extracts were studied for their antifeedant efficacy against rice pest namely the Leaf folder (*Cnaphalocrosis medinalis*). It was revealed that the mortality percentage on exposure (hr) in 100% EtOH extract of *I. carnea* was 100% mortality detected in 12 hr in all the three test concentrations. In 50% EtOH extract of *I. Carnea* was 100% (1000ppm), 5% (500ppm) and 18% (100ppm) on 12 hr. 95% (500ppm) on 24 hr. In water extract of *I. Carnea* the mortality was observed on 24. Mortality observed after pupa formation (48 hr) in control (Agnello, *et.al.,*2013). Sahayaraj and Ravi (2008) reported that in Ipomoea carnea benzene and chloroform extracts yielded the compounds such as neophyadiene, 1-decanol, tetradecanoic acid, pentadecane, 1-iodo-2-methylundecane, trans-caryophyllene, eicosane, 2-butenoic acid and cholestan-3-one. Cholestan-3-one is a steroidal compound and it has a high pesticide property.

As a Potential Source of Textile

Cellulose content of this shrub is over 55% and lignin content is about 17% which indicates it is a fibrous material and can be used as filler for making light weight polymer composite which provides an effective means of utilization of a large quantity of this diffuse shrub (Basumatary and Acharya, 2013). Basumatary and Acharya (2013) investigation can be used as an effective reinforcement in polymeric composite creating a variety of technological applications beyond its traditional uses. It can also be used as a substitute for wood based composite. The composite prepared have low density compared to synthetic fibers and also to some natural fibers. Therefore, it can judiciously be used for producing light weight composite materials. Reinforcement of Ipomoea carnea particulate into the epoxy matrix shows improvement in both the tensile and flexural properties compared to pure epoxy (Basumatary and Acharya, 2013).

Inhibition Activity

Ipomoea carnea is very much effective agent against the weight loss for mild steel due to rusting (Srivastava & Srivastava 2012). It has been revealed that when 0.01 % *Ipomoea carnea* was added to paste containing 4N HCl (40 Parts) + H_2SO_4 (60 Parts) then weight loss decreased from 20.4 mg/dm2/hr to 10.2 mg/dm2/hr, as the concentration of *Ipomoea carnea* was further increased weight loss was further decreased. At 5% concentration, the weight loss gained was 6.9 mg/dm2/hr. Inhibitor effectiveness was 50% which unceasingly increased with increase in concentration of inhibitor up to 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 unvaryingly over the surface act as ananodic type inhibitor. The result is isolation of swainsonine, 2-epilentiginosine, calystegine A3, B1, B2, B3 and C1 and N-methyl-trans-4-hydroxy-1-proline (Balogh, 1999; Haraguchi,*et al*., 2003). Swainsonine and calystegine A3, B1 and B2 are potent inhibitors (Ikeda, *et al*., 2003). A new type of enzyme (ICChI) has been purified and characterized from the latex of *Ipomoea carnea*. It is extremely stable enzyme and can be very valuable in Industrial and Biotechnological applications. In addition, it may be active in agriculture, environmental protection, recycling chitinous waste, and chito-oligosaccharide production (Patel, *et al.,* 2009b).

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 and Ash Content were 8.43, 12.60 ,3.04, 8.46, 28.6, 17.60, 18.08, 67.49 ,22.40 ,46.45, 4.32, 4.76, 3.45 and 6.14 respectively.

The values are expressed in % on OD woody material basis (Nandkumar, 2009; Srivastava and Shukla , 2015).

Pharmacological Profile

The plant had immense potential as an Anti-inflammatory Activity, Antioxidant Activity, Antidiabetic Activity, Antimicrobial Activity, Wound Healing Activity, Immuno modulatory Activity, Cardiovascular Activity, Embryotoxic effect, Antifungal Activity, Hepatoprotective Activity, Inhibition Activity and Anxiolytic Properties (Sharma and Bachheti, 2013). Adsull et al. (2012) reported that the acetone extract shows antimicrobial activity against two strains, *Ptroteus vulgaris* and *Salmonella typhimurium*. Ethanol extract also exhibits indicative activity against *Pseudomonous auroginosa*. N-Hexane and ethyl acetate extracts do not show any antimicrobial activity against the said strains. Ambiga and Jeyaraj (2015) studied in vitro antioxidant activity of Ipomoea carnea using different models of screening viz. DPPH radical scavenging, ABTS radical scavenging, iron chelating activity, nitric oxide scavenging assay, and alkaline DMSO assay. Their results showed good dose dependant free radical scavenging property in all the models. Phytochemical analysis revealed the presence of major phyto compounds like alkaloids, glycosides, phenolics and saponins. The antioxidant property may be related to the polyphenols and flavonoids present in the extract.

Conclusion

The plant as discussed above evidently proves that *Ipomoea carnea* Jacq. Is one of the most promising shrub which possess a lot of significant values. The present literature survey revealed that the plant *Ipomoea carnea* is a base of various vital phyto constituents and hence shows several mechanical, pharmacological, inhibitor and insecticidal properties. This plant has shown tremendous applications in the field of paper making, as a source of energy, as a fertilizer and as a potent bio-sorbent in the form of activated carbon. This plant is known to encompass a component identical to marsilin, a sedative and anticonvulsant. Colourful flowers of this plant are often grown as ornamentals. Their deep flowers attract Butterflies and hummingbirds. Hence because of this wide list of significant values; in future the standardization and stabilization studies on *Ipomoea carnea* need to be carried out which can help in proving it to be a promising source in pharmaceutical, medicinal as well as neutraceutical industry.

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