INTRODUCTION

Plate - 1 *Ipomoea carnea* spp. *fistulosa* in flowering

PLATE-1

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The family convolvulaceae is large alliance of sympetalous dicotyledons. The members are widely distributed over both tropical and temparate regions of the world. The family convolvulaceae consist of aproximately 55 genera and 1650 species (Van Ooststroom, 1953). In South India the species occur much wide spread in the plains as well as in the hills.

Ipomoea L. a polytypic genus of family convolvulaceae having 500 species mostly a large genus of twining, creeping, floating or errect herbs rarely shrubs and trees, widely distributed throughout the tropical and warm temperate regions of the world. The most important crop plant is Ipomoea batata commonly known as sweet potato is used for daily consumption by human being. The pharmacological study on Ipomoea carnea with respect to its parasiticidal activities were conducted. Phytochemical test showed presence of alkaloid in both the aqueous and ether extracts while reducing sugars and glycocides as well as tannins were found in the aqueous extracts of leaves of this species. The aqueous extract showed marked parasiticidal activity against mites and lice of buffalo which was comparable to melathion except that the onset of action was delayed (Tirkey et al., 1988).

Twenty nine members belonging to Ipomoea and related genera have been analysed for flavonoides, quinones, phenolic acides, iridoids saponins and tannins. Flovonoids are the dominant phenolic pigments in this family through glycoflavins and proanthocyanins are located in a few species. The chemical identities of Anisiea merremia and Operculina are established and their generic status have been accepted. The concept of the genus Xenostegia finds support from Merrenia to Ipomoea is suggested to make the former genus more homogenous (Nair Geethag et al. 1986).

Jha et al. (1980) showed that for improving the growth and yield of rice incorporation along or in combination with inorganic fertilizer $(NH_4)_2SO_4$ resulted in increased grain and straw yields through increased number of ear bearing tillers/m^2. Uptake of nitrogen by rice grain and straw was much higher with Ipomoea carnea than through $(NH_4)_2SO_4$. Continuous application of this green leaf manure for 6 seasons in the same field left some residual fertility which resulted in increased grain and straw yields and nitrogen up take. $(NH_4)_2SO_4$ alone did not leave any residual fertility.

Taptour et al. (1974) studied the development of anemia in goats fed with Ipomoea carnea. Ten healthy Nabian goats were fed with fresh green leaves of I.carnea at the rate of 5 g/kg body weight/day. The animals showed signs of toxicity and elevation of body temperature. Six goats died

within 15 - 49 days, 1 after 107 days and the remaining 3 survived throughout the period of observation and were subsequently sacrificed. Certain hematological changes indicating development of anemia and progressive leakopenia were noted during the course of toxicity.

Pandey et al. (1978) showed that leaves petrolium ether extract of this species and Adhatoda vasica and Acorus calamus along with garlic, onion and neem oil effectively protect gram seeds from damage by the brachid for at least 125 days.

Witters and Weldon (1975) state that Ipomoea violacea contains lycergic acid and clavine alkaloid. In the same species using 150 µg of total alkaloid and mass spectrometry after TLC separation the absolute identification of 6 alkaloids (lysergic acid amine, isoglyseric acid amide, ergonovin, ergometrinine, argoclavin and elymolcavine) was established. The presence of another alkaloid chanoclavine in leaves also observed by Weber et al. (1976).

From the early days the showy flowers and leaves of Ipomoea attracted the attention of horticultarists and attempts of introduction to ornamental have been made. Probably the best known ornamental climbers in the family are Ipomoea pururea and Ipomoea tricolor from the tropical America and cultivated as annuals. About 50 species of Ipomoea are found in India out of which number of species have been

introduced for ornamental purpose while some are of medicinal value. However ergine as an active alkaloid and ergot like alkaloids are recorded in Ipomoea species. Ventura (1946) states that active principles from some species of Ipomoea are toxic to live stock.

Rao et al. (1990) have also studied the leaves of fourteen species of Ipomoea. The leaves are simple or palmataly compound. The major venation pattern conforms either brachidodromas or actinodromas type. The leaf shape, apex, base number of areoles and vein ending entering the areoles are species specific. The studied species are I.aquitica, I.batata, I.fistulosa, I.nil, I,laderifoliq, I.abscuru, I.pescarpae, I.quamaclit, I.sepiaria, and I.tubarosa.

Plants are generally very sensitive to their surrounding environment may be climatic, edaphic biotic or otherwise. Changing environmental conditions on the other hand exert immense influence on growth, development and subsequent establishment of plants in a particular habitat.

From ecological point of view Ipomoea carnea spp. fistulosa is tolerant where tolerance may possibly is achived by different morphological or physicological features. Many of the aspects are poorly known.

Plants growing in different climatic regions, in arid or aquatic environment show distinct variations in their internal and external structures. All these modifications

hopefully aid their successful adaptation and establishment in particular regions. The fact that superior or maximum plant productivity is associated with superior adaptation, suggests that component physiological process, fit in well in such a manner that will help in optimum performance in a perticular habitat.

The plant selected for present work fistulosa is Ipomoea carnea spp. fistulosa is a stout staggling shrub native to south America and is grown in gardens for dense foliage and flowers (Umraosling 1983). In India, it is introduced as an ornamental plant. It is cultivated in gardens near houses in villages. In many parts of India usually it is used for fencing, naturalised at the edges of ponds and also as hedge plant in crop fields. The plant is easily propogated by cuttings. It produce dense foliage and flowers practically throughout year.

Bhattacharyya (1976) studied two South American perenial shrubby ornamentals Ipomoea carnea jaeg. and Ipomoea fistulosa martex choisy, were introduced in the graden Asia and are now growing wild in the area and are incorporated in the regional floras. He observed that these two species are very similar and are often confused with each other. To understand their distinguishing characters clearly, detailed morphological, ecological and anatomical studies were carried out. Floral and fruit structure of the two species are identical

but the habit leaf structure and anatomy help to distinguish them easily.

Austin (1977) reviewed original publications illustrations, type specimens; distribution and habitat preferences are reviewed and the criteria used to separate two names Ipomoea carnea and Ipomoea fistulosa at the species level were found invalid. Modern interpritation of I. carnea based in part on a misconception of the original publication and on complex population adapted for two habitat. Two species are recognised Ipomoea carnea Jaeg. and Ipomoea carnea spp. fistulosa mart ex. choisy.

The distribution of plants depends upon (a) climatic conditions (b) edaphic factors (c) absence of excessive competition and (d) adaptability of plants to changing conditions.

Climatic conditions determine the range over which the growth of species population can spread and edaphic conditions determine how well the species flurish. Whether plants survive or perish depend upon the range of climatic conditions in which they grow. This is called the range of tolerance. Every environmental factor has a range in which a plant can survive and grow. The tolerance ranges are based on physiological requirements which are determined by genes. Thus the tolerance range for any species is ultimately determined genetically. Seed germination is very essential

parameter for populations of weed species to maintain themselves in nature. The onset of seed germination in many weeds is inhibited or delayed due to some internal and external factors. Seed dormancy in nature may however results in poor germination of weed seeds. Dormancy in seeds can be caused by characteristics of the seed or the environment.

In the present work an attempt has been made to remove seed dormancy by few techniques.

Life history of plant species involves seed germination vegetative growth, flowering etc. Environmental factors influence the phenological behaviour of a species. The dispersion of species population in a community varies due to soil conditions and other factors. Thus, phenological records were also noted.

The present investigation is with relation to habitat which includes distribution, growth analysis, seed germination and anatomical features.

Various species have different ecological limits of tolerance and optima for the ecological parameters. The species under study have wide ecological amplitude for most factors.

In view of solving the problem of pollution and green belt development, parameters like growth analysis, air pollution tolerance index and distribution were also studied.

For any plant the knowledge of structure function and ecology of stomata is very essential. Stomata are considered as portals through which carbon dioxide enters into leaf and large quantity of water evaporate in the form of vapours from the leaf to the atmosphere.

The evolution of stomatal pore is probably the most important structural innovation contributing to the adaptation of plants to the aerial environment. Ecophysiology of water relations, stomatal behaviour and water loss becomes one of the important parameter to judge the capability of a particular species to adjust itself under prevailing climatic and edaphic conditions.

Therefore the present study was planned to determine the variations in stomatal behaviour from different habitat.

Ugborogho et al., (1992) discussed stomatal measurements distribution types and structural variations of six taxa of Ipomoea in Nigeria including I. fistulosa, and I.carnea. A considerable overlaps are recorded in the stomatal quantitative measurements. The paracytic stomata are frequent and common to all taxa studied.

Karatela and Gill (1985) studied epidermal morphology and stomatal antogeny in some convolvulaceae species and observed dominant stomatal type is paracytic which follows

anisocytous ontogeny. Anisocytic stomata are recorded in I.fistulosa and other 6 species. Rao and Dubey (1992) studied the chemical nature of air born particles, their accumulation in certain tropical plants growing around an industrial area. Epidermal fruits of five different plants indicate unilateral stomatal indices, trichome length and trichome frequency. Changes in epidermal traits were found to be greatest in Mangifera indica, followed by I.fistulosa, C.procera and C.siamea.

The relative dust capturing capacity of I. fistulosa speices have been investigated by Khan and Pandey (1989). They suggested the importance of plant in mitigating dust pollution in the environment.

A number of plants develop unique adaptive features to overcome the environmental stress. Such modifications include alteration of gross morphological features as well as anatomical structures. The present attempt was made to find out difference in anatomy of arid and aquatic Ipomoea carnea spp. fistulosa.

Medonald and Andrew (1992) have reported typical and anamolous secondary growth in arborecent species of new world Ipomoea. Concentric rings of included phloem derived from successive cambia characterize the anamolous woody growth occuring in I.muarcoides. Typical secondary

growth occurs in Ipomoea carnea spp. fistulosa. Bhattacharyya (1988) studied vascular cambia of 20 species including I.fistulosa. In natural condition all of them contain anomalous cambia.In the stem and roots of the convolvulaceae a series of widely different anomalous cambia were found which sometimes different in stem and roots of same species. The evolutionary history of the vascular cambium in the convolvulaceae was mainly one of reduction in activity and area. The species of Impomoea carnea spp. fistulosa are extensively used as a fuel. Poor people cut this wood and use for fuel. To know the potential of the wood as fire wood, energy content was determined.

According to Singh et. al., (1987) the fast growing shruby woods can be coppied regularly and their biomass yields can be optimized by identifying the time period after which coppicing should be done with the establishment of root system and certain growth of the shoot system. The plant becomes ready for regeneration after cutting at field level. Studies of physical composition of Ipomoea fistulosa and Adathoda vasica indicated growth periods in terms of plant height after which the plants produce more secondary growth.

Several workers have carried out applied aspects of this plant. Sharma et al., (1989) showed that Biogasification of Ipomoea fistulosa plant stem was carried out in batch digesters at 37°C when cattle dung was mixed with it in ratios

of 1:0, 3:1, 1:1, 1:3. Highest quantity of biogas was produced by the digestor with 75% cattle dung and 25% Ipomoea stem.

Allelopathy is important aspect of the present work. Ecological studies on crop wood interactions have led to the development of various methods to evaluate their effects. Most of the Indian weeds and crops have been worked out for their interaction and reported for allelopathic potentials. Allelopathic substances play major role in crops and weeds which grow together. Keeping this view in mind attempts have been made to follow the action of extracts and leachates from Ipomoea carnea spp. fistulosa as they contains several chemical substances, (allelochemicals).

Gupta and RajniGupta (1980) observed presence of new anthocyanin; Peonidin-3-o Larabino pyranosyl, 0- β -D Glycopyrnolside and the flovonal kaeanpferol by chemical examination of flowers. Umar Sidik et al., (1989) isolated and identified agroclavine and α -dihydrolysrgal from leaves of this species.

Singh et al., (1988) studied the replacement of chemical fertilizers fully or partially through green biomass of Ipomoea carnea spp. fistulosa. Its digested slurry and biogas slurry was studied for radish, a root crop. Application of digested slurry or replace half the nitrogen of chemical fertilizer gave better yields than its total replacement.

Lardizabal and Ricord (1990) showed that grafting of sweet potato to root stalks of Ipomoea carnea spp. fistulosa increased flower number, percentage capsulset and number of seeds in all cultivars.

Joseph and Dube (1988) isolated eight isolates of phosphate from rhizosphere of this species. Solubilizing fungi were obtained and were identified as Aspergillus niger. The in vitro experiment indicated difference in amount of tricalcium phosphate solubilized by fungi and showed a negative correlation with pH during the early part of the experiment.

Marquez et al., (1980) studied alkaloids, glycocides and kauranols of the seeds of Fubina corynbosa in comparison with profiles of the seeds of several species of convolvulaceae including I.fistulosa. Kahaujia (1977) studied fungistasis property of soils of plotes amended with urea, ammoniumsulfate super phosphate, organic manure, fresh leaves and twigs of Ipomoea fistulosa and unamended plots were determined using 10 test fungi commonly isolated from the different plots of experimental area. Fungistasis property of soils of amended plots was higher than that of controlled plot except that amended with leaves and twigs of I.fistulosa.

Thakur and Thakur (1990) tested water and methenol extracts (leaf and stem) of I.fistulosa on the dormant stem cuttings of Bopulas delitoides and Phaseolus valgaris seedings.

Extract treated seedlings of Phaseolus valgaris produced more number of root as compaired to control. Similarly cuttings of populus when treated with ether extract of leaf and stem showed significant increase in number length and dry weight of roots as compare to control. Abdelhadi et al., (1989) tested an aqueous and alcoholic extract of Ipomoea carnea spp. fistulosa in vitro on isolated preparations of the frog rectus abdomines muscle and the rabbit perfused heart as well as vivo in the chicken. The extract and succinylcholine contracted the frog rectus abdomines muscle and this action was blocked by tubocoranin 1.5 µg/ml. Both extract and succinylcholine produced bradycardia of the rabbit heart which was antagonized by atropine 20 µg/ml like succinylcholine. The extract produced spastic paralysis in chickens. It is suggested that the extract possesses a dipolarizing action similar to that of succinylcholine.

Bhanot and Bhawane (1993) studied effect of five different plant extracts viz. Ipomoea fistulosa, Pongamia glabra, Parthenium, Azadirecta indica and Calophyllum on digestive carbohydrates of adult Leacopholis lepidophora and observed extracts of I. fistulosa, P.glabra and Colophyllum are more effective in action than Parthenium and Azadirecta.

Gold et al., (1991) studied effect of mulches on foraging behaviour of Microtermes obesi and observed termites scarification of groundnut was 80 to 90% lower for pods dried in Ipomoea fistulosa mulches.