REVIEW OF LITERATURE

Habit :
Ipomoea carnea
Sub sp
carnea, Jacq.

Habit :
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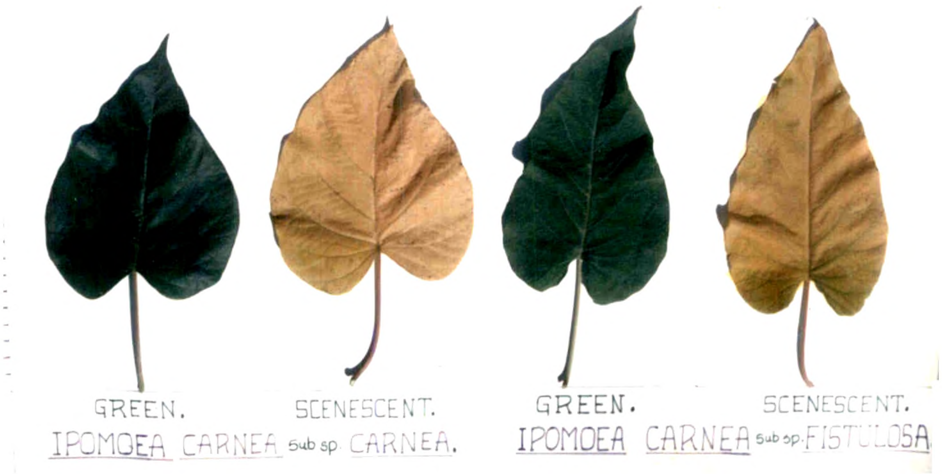
Sub sp
fistulosa, Mart
ex choisy.


GREEN.
SCENESCENT.
IPOMOEA CARNEA sub sp. CARNEA.
GREEN.
SCENESCENT.
IPOMOEA CARNEA sub sp. FISTULOSA

1) GENERAL ACCOUNT ON IPOMOEA CARNEA JACQ :

The genus Ipomoea comprises the largest number of species within the convolvulaceae. Throughout the world Ipomoea is usually estimated to contain 500 species, (Mabberley, 1989; Mc Donald and Mabry, 1992). However Austin and Huaman (1996) believed that Ipomoea is more likely to contain 600 - 700 species. Ipomoea carnea, Jacq is one of the major weeds in India. Though it is a weed, it is used for fencing around the field to protect the crops from grazing animals. However on the basis of morphological and anatomical characters Ipomoea carnea, Jacq divided into two sub species i.e. Ipomoea carnea sub species carnea, Jacq and Ipomoea carnea sub species fistulosa, Mart ex choisy. These two sub species are characterised as follows.

a) **Ipomoea carnea sub sp. carnea Jacq :**

It is a perennial shrub with milky latex. The height is about 15 to 20 ft and woody in nature. The stem is errect and terminaly climbing, branched, cylindrical, green, and hallow. The leaves are simple, alternate, 7 to 9 cm long petiole and typicaly chordate or heart shaped lamina with entire margin and acute apex. The lamina is 10 to 12 cm in length and 10 to 11 cm in breadh. Inflorescence of this species is polychaseal cymose type. Flowers are with pedicel 1 to 2 cm long, regular, actinomorphic, bisexual, pentamerous and hypogynous. It develops showy pinkish coloured corolla with 6 to 7 cm long tube infundibuliform or funnel or bell shaped.

Calyx five small and polysepalous. Stamens five unequal in length of filament, anthers dioceous, basifixed and epipetalous. Bicarpellary, syncarpous, superior ovary with axile placentation. Ovary two locular, stigma capitate and long style. Fruit is a 4-6 valved capsule, seeds usually 4 or 6, glabrous valvety or woolly, cotyledons crumpled bilobed.

b) Ipomoea carnea sub sp fistulosa,Mart ex choisy :

The Ipomoea carnea sub sp. fistulosa, Mart ex choisy is a perennial shrub with milky latex and woody in nature. The height is about 15 to 20 ft and woody in nature. The stem is errect, branched, cylindrical, green and hallow. The leaves are simple, alternate, 8 to 9 cm long petiole and elongated linear lamina, entire margin with acute apex. The lamina is 18 to 19 cm in length and 10 to 11 cm in breadth. Trichomes are present on young leaves. The inflorescence is polychaseal cyme type. Flowers are with pedicel 1 to 2 cm long, regular, actinomorphic, bisexual, pentamerous and hypogynous. It consists of five sepals and polysepalous. It develops showy pinkish coloured cololla with 6 to 7 cm long tube infundibuliform or funnel or bell shaped and qamopetalous. Stamens five unequal length of filament, anther dioceous, basifixed and epipetalous. Bicarpellary, syncarpous, superior ovary with axile placentation. Ovary two locular, stiqma capitate and long style. Fruit is a 4-6 valved capsule, seeds usually 4 or 6, glabrous valvety or woolly, cotyledons crumpled bilobed.

2) PHYSIOLOGY OF SENESCENCE :-

In India especially in Maharashtra Ipomoea carnea, Jacq plants are cultivated as the hedge plant around the crop fields. However these plants are mainly known as weed plant. Few of them are cultivated as ornamental plants in gardens due to their showy attractive flowers.

A weed Ipomoea carnea, Jacq can grow luxuriently in any environmental conditions. It is a sturdy plant and does not require and special type of climate and soil. There fore we have undertaken the study of this plant and its senescence. Senescence is called the aging or yellowing of the plant part. Generally senescence in leaf is studied. Tollenaar and Daynard, (1982) defined leaf senescence as a series of events of deterioration and changes which leads to the death of leaf. While according to Leopold, (1961) the deteriorative process which naturally terminate the functional life of an organ or an organism are collectivelly called the senescence.

The yellowing of leaf is the visible symptoms of senescence and it is due to degredation of chlorophylls and carotenoids (Chaudhari et al, 1976). The chlorophylls is decreased due to decreased synthetic activity than degradative process, (Goldthwaite and Leatsch, 1967). Along with chlorophylls the accessary pigments (carotenoids) also decreased during leaf senescence, although this aspect is not paid much attention, (Sastak, 1985).

During senescence there is an increased rate of protein breakdown and is mainly correlated with rapid protein loss during senescence, (Lorenzo et al, 1985), The amino acid accumulate in detached leaves and with time there is an increased utilization of these amino acids as respiratory substances. The nitrogenous componants appear to be accumulated in the amino residues of glutamine and asparagine.

Decline in photosynthesis is associated with senescence and decline in RuBP - case activity and chlorophylls associated with onset of senescence. The activities of other enzymes, malate, dehydroginase, malic enzyme, phosphoglycerite, Kinase, NADH linked glyceraldehyde-3-phosphate dehydroginase ribose-5-phosphate, isomerases, Fructose 1-6-disphosphate also decrease along with senescence, (Woolhouse and Batt, 1976).

There are also reports of changes in activities of enzymes such as pyruvate, kinase and aldolase during senescence and ageing, (Sacher et al, 1972, Murumkar, 1986). The other oxidative enzymes such as catalase and peroxidase have been reported to exhibit opposite behaviour during the course of leaf senescence. The activity of enzyme peroxidase showed considerable increase during senescence in leaves of monocot and dicot species, (Datta and Mishra, 1976). On the other hand a decline in catalase activity has been noticed during leaf senescence.

Dezsi (1975) observed a decreased in glycolate oxidase activity with age in barley leaves. In case of senescence of Chickpea leaves a decline in activities of other key enzymes of photorespiration, phosphoglycolate, phosphatase has been reported by Murumkar (1986).

The functional life span of the leaf cells can be extended or curtailed by harmone treatment. According to Staddart and Thomas (1982) plant growth regulaton exerts a controlling influence over leaf senescence. All cytokinin are playing a role in preventing or at least greatly delaying senescence. They delay proteolysis and chlorophylls less in the dark. Kinetin and benzylaminopurine (BAP) have been most used.

Neumann and Nooden (1983) reported that cytokinin delayed development of unable leaf senescence in Soyabean. Kinetin exerts a striking efffect on respiration. Partial uncoupling of electron transport and ATP synthesis take place in senescence and kinetin may be able to maintain coupling, which could in consequence keep the respiratory rate low. It also influences protein metabolism in senescent leaves. In case of senescing Wheat leaves. Lanathma et al, (1987) observed that kinetin actas on preventing protein breakdown was in fold average higher than its action of proholding protein synthesis.

Gibberelic acid (G.A.) seems to be most effective at stages when endigenous G.A. is low, (Fletcher and Osborne, 1965).

Elkmaway (1984) studied the harmonal changes with leaf senescence in cotton and observed that the definate crop in free Indol acetic acid (IAA) below its initial level seccured on 24th day when most of leaf protein and chlorophylls were already broken down.

a) **Mechanism of Senescence** :-

Leaf senescence is an integral part of the organ development and is subject to direct genetic control. Leaf cells development is an out come of the interaction between the genomes of the nucleus and chloroplast. Available studies suggest that chloroplast DNA codes for components of chloroplast assembly especially during early stages of leaf development. In fully matured leaf the plastid genome is completly repressed. Mae et al, (1984) have suggested that loss of chloroplast protein is characterstic features of senescent leaves during early phase of aging. Chloroplast proteins disappears more rapidly than plastid organelles. There is plastic disintegration and visible senescence (yellowing) begins, which is directly controlled by nuclear genes.

Senescence appear to occur in response to direct physical influence of near by structures on the shoot. Possible role of physical stress in development and reaction of stressed tissues in relation to senescence of lamina deserve attention. Some worker have also observed relationship between leaf senescence and pollination, flowering, fruiting etc.

The active role of harmons in the developing fruits or seeds control the production of substances which are translocated to the leaves to cause senescence. During senescence rate of photosythesis is decreased due to loss of chlorophylls enzymes which reduce ATP and carbohydrate production. Thus senescence cause the plastid pH falls and stimulation of hydrolase.

According to Butler and Simon (1970) the nucleus remain stable until the later stages of senescence and then undergoes degenerative changes marked by vesiculation of nuclear membrane, breakdown of internal matrix. Mitochondrial function continues until quite late and that may be related to continued need for energy by the active process in senescence.

b) **Effect of environmental factor** :-

Exposure of plant to adverse temperature in high or low range can initiate the begning of yellowing. In case of freezing the senescence is a tropical and could be due to cellular collapse or necrotic injury. Effect of low temperature will be dependent upon several other variables including light intensity to cause senescence. According to Lyons (1973) exposure to adverse temperature in either light or low range can initiate the onset of yellowing.

According to Shuner and Boyer (1976) water stress causes induction of senescence through reduction of incarporation of amino acids in to RuBP carboxylase protein relative to other protein and depression of leaf nitrate reductase activity by reducing nitrate flux. There is evidence that inhibited nutrient uptake and nutrient deficiency are directly responsible for enhanced leaf senescence and cessation of shoot growth in plants subjected to water logging, (Trought and Drew, 1980a).

According to Levitt (1980b) salinity may also cause changes resembling senescence in perticular high salt levels around the roots may cause leaf yellowing.

c) <u>Harmone regulation</u> :-

The plant growth regulator excerts a controlling influence over leaf senescence.

1) The harmones applied to leaves alter the rate and cause of senescence.

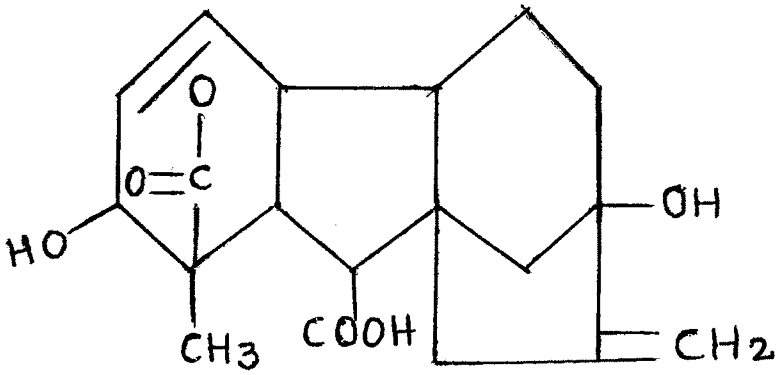
2) It offer correlated with endogenous harmone level.

3) Simple source sink interaction are inadegulate to account for the co-ordination of senescence in whole plant.

i) <u>Gibberelic Acid (G.A.)</u> :-

There are 52 gibbrellins discovered in the fungus <u>Gibberella fujikuroi</u>. The basic structure is the gibbane carbon skeleton. The acid is a terpenoid with a simple variation with gibbane ring. G A_3 is termed as gibberelic acid and different gibberellin are named as GA_1, GA_2, GA_3 ....

GA_3 is tetracyclic dinydroxylactonic acid having the formula C_{19} H_{22} 0_6 and its chemical structure as bellow.

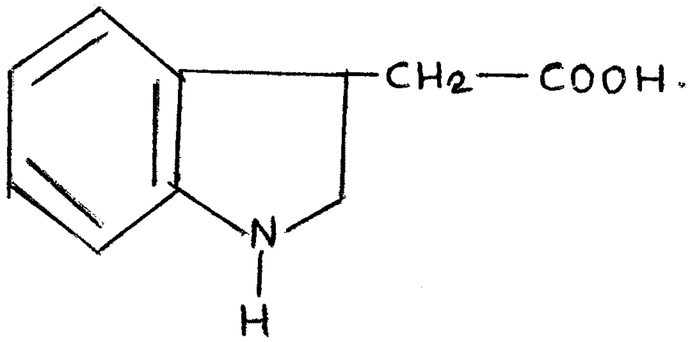


The actively growing tissues produces maximum anount of gibberellins and is most effective at stages when endogenous G.A. is low, (Fletcher and Osborne, 1965). Senescing tissue metabolise G.A. more rapidly. G.A. inhibits photorespiration and can delay senescence. However folliar spray of G.A. do not alter monocarpic senescence or pod development in Soyabean, (Nooden, 1980).

ii) Auxins : Indole - acetic - acid (IAA)

Auxins Indole - acetic - acid (IAA) is synthesised in meristem of young part of the plant. eg. shoot apex or embryos.

Several of the synthetic auxins have been reported and some of these include indole butyric acid (IBA), 2-4D, α - Naphylacetic acid, 2 - 4 ; 6 - T etc.

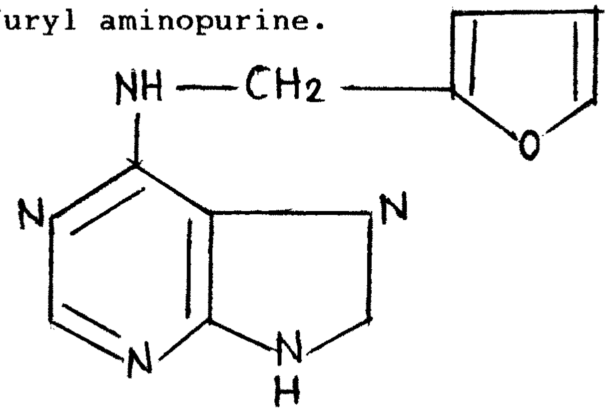


Auxins cause inhibition of lateral bud development through the apical dominance.

Sacher (1959) found α-napthalene acetic acid to retard senescence of leaf discs and bean pods. Elkinaway (1984) studied the harmonal changes with leaf senescence in Cotton and observed that the definate drop in free IAA below it initial level on 20th day. When most of leaf protein and chlorophylls use already broken down. It Oat leaf the auxin retarded senescence only at concentration about 500 times that of kinetin, (Shibaoka and Thimann, 1970).

iii) <u>Kinetin</u> :

Kinetin was discovered as factor additional to auxin necessory in minute quantities for cell division in certain types of plant tissne culture. It has been isolated as product of the autoclaved yeast DNA by Miller <u>et al</u>, (1955) and structurally 6-furfuryl aminopurine.



All cytokinins and playing a role in preventive or at least greatly delaying senescence. The delay proteolysin and chlorophylls loss in the dark. Neumann and Nooden (1983) reported that cytokinins delayed development of visible leaf senescence in Soyabean. Kinetin excists a striking effects of respiration keeping rate low. Lamathina <u>et al</u>, (1987) observed that kinetin action on preventing protein breakdown was found higher than action of promoting protein synthesis. Kinetin promoted the transporation of leaf discs of <u>Brassica</u> and <u>Nicotina</u> whose stomata occurs on both sides, (Thimann and Safler, 1976).

3) SCOPE OF PRESENT IVESTIGATION :-

The present work is design and conduct fundamental study of various physiological aspects of Ipomoea very few reports are available on the physiology and biochemistry of this plant. It is difficult to understand the effect of harmone on growth of these plant. The Ipomoea species are studied under different growth regulation in present investigation.

Though Ipomoea is weed it has economic importance as hedge and ornamental plant. It can grow in any type of climate, soil and rain fall. In the present investigation an attempt has been made to study the leaf senescence and effects of growth harmones during the senescence. Various experiments designed and conducted to study the organic and inorganic status of this plant under G.A,IAA and kinetin trentment during senescence.

The inoranic content and the role of various elements has been studied in the green and senescent leaves of Ipomoea carnea, Jacq The investigation is also extended to study the role of enzymes during senescence.