STUDY OF PEROXIDASE AND ACID PHOSPHATASE ENZYME ACTIVITY DURING SENESCENCE OF IPOMOEA CARNEA JACQ.

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Abstract:

The genus *Ipomoea* comprises the largest number of species within the Convolvulaceae. Recently *Ipomoea carnea* Jacq is recognized in two sub species i.e *Ipomoea carnea,* sub sps *carnea* Jacq and *Ipomoea carnea* sub sps *fistulosa* Mart-ex- choicy which are studied for activity of peroxidase and acid phosphatase during senescence. The present communications reports higher values of both enzymes in both the taxa viz., *Ipomoea carnea,* sub sps *carnea* and *Ipomoea carnea* sub sps *fistulosa* (2.12, 2.10; 3.75, 3.62) during senescence. This confirms the role of peroxidase and acid phosphatase in senescence.

Keywords: Peroxidase, acid phosphatase, senescence, *Ipomoea carnea*

1. Introduction

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.

Ipomoea carnea Jacq from above is characterized by showy and pale rose coloured corolla with long tube. Generally the plant is about 20 feet in height and woody in nature. It is introduced in many gardens of Bombay presidency.

The *Ipomoea carnea* Jacq occurs all over the world but it is a native of South America. It occurs in many states of India. In Maharashtra these species are commonly occurring in all the districts and cultivated as hedge plant and termed as weed. It does not require any special

type of climate and soil. It is popular amongs the farmers with local name as "Garvel" or "Besherm". Recently *Ipomoea carnea* Jacq is recognized in two sub species i.e *Ipomoea carnea,* sub sps *carnea* Jacq and *Ipomoea carnea* sub sps *fistulosa* Mart-ex- choicy. These two species are studied in present investigation.

2. Material and Method

I) **PEROXIDASE:-**

Peroxidase from fresh plants leaves was determined by the method described by Maebly (1954). The enzyme was extracted by homogenizing the plant material (0.5 g) in 10 ml ice cold water. It was filtered through two layered cheese cloth and the filtrate was centrifuged for 15 minutes at 50000 rpm. at 0°C to 4°C and supernatant was used as an enzyme source. Enzyme assay mixture contained 2 ml of 0.1 m phosphate buffer (pH 7) 1 ml of 20 mm guiacol and 0.5 ml of enzyme. The reaction mixture was started by addition of 0.04 ml of 10 mm H2O2.The change in optical density (OD) due to oxidation of guiacol was recorded per minute at 470 nm on spectrophotometer with frequent stirring of the reaction mixture with glass rod. Enzyme activity is expressed a change in OD min -1 g -1 fresh tissue.

II) **ACID POSPHATASE: -**

The enzyme was isolated from fresh leaves by the method of Mclachlan(1980). The enzyme was prepared by homogenizing 0.5 g of plant leaves in 10 ml of 0.1 m acetate buffer (pH-5) with a mortar and pestle. The extract was filtered through the muslin cloth already mistered with acetate buffer and the filtrate was centrifuged at full speed of 5000 rpm for 10 minutes. The supernatant was stored at 0 to 4 c and used as an enzyme source.

Enzymes assay mixture contained 3 ml of p-nitrophenol phosphate (0.1 mg. ml -1) 2 ml of 0.1 m acetate buffer (pH-5) and 1 ml of enzyme. Enzymatic reaction was initiated by the addition of enzyme and was stopped by the additional of 1.5 ml of 1.68 N NaOH. Yellows colored complex p- nitrophenol produced because of reaction between enzymatic breakdown of p-nitrophenol phosphate and NaOH was estimated spectrophotometrically at 420 nm. The enzyme activity was expressed as change in ΔOD hr^{-1} gm^{-1} fresh tissue.

Ipomoea carnea subsp. carnea *Ipomoea carnea subsp. fistula*

3. Result and Discussion

ACTIVITIES OF ENZYME DURING SENESCENCE:

1) PEROXIDASE:

The enzyme peroxidases an indicator of respiration rate (Harvortz et al, 1968). There are several reports regarding the peroxidase activity during senescence. In case of detached tobacco leaf segment, Parish (1968) noticed increase in peroxidase activity. The activities of several enzymes either generating or decomposing O_2 or H_2O_2 were investigated during the course of senescence in detached wheat and rice leaves in light and darkness by Kar and Feierabend (1984). The increase was higher in the dark than in light. According to those workers the increased peroxidase activity accompanies the senescence of detached leaves.

Pilet et al (1970) have reported that peroxidase can bring about oxidation of opines and hence its increase in senescent leaves may induce hormonal imbalance. However Parish (1968) suggested that increase in peroxidase activity is one of the most reliable indicators of maturity and senescence. According to Mukharjee and Rao (1993) peroxidase activity increased constantly during leaf maturation and much higher level was during senescence.

According to Rane and Chavan (1993) change in peroxidase activity during senescence of detached leaf segment in darkness of groundnut cultivars TMV-10 and JL-24 should that in both the cultivars there was continuous increase in peroxidase activity as

senescence progressed. Liu Yang et. al. (2019) has reported peroxidase activity in *Ipomoea batatas*. They effectively precipitated peroxidase by ammonium sulphate at 60% saturation orhigher.

Patel et. al. (2008) purified heme peroxidase MGP from the latex of *Ipomoea carnea* subsp. *fistulosa* (morning glory) belonging to the Convolvulaceae family using ammonium sulfate precipitation, anion exchange, hydrophobic interaction, and gel filtration chromatography.

Our result of present investigation (Table No. 1) clearly indicates that the peroxidase activity is increased during the senescence of both the species of *Ipomoea carnea* Jacq.

2) **ACID PHOSPHATASE:**

Acid phosphatase is one of the important enzymes of phosphorous metabolism which is involved in breakdown of several phosphates including sugar phosphates and even ATP (De Levand Sacher 1970). Acid phosphatase has multiple molecular forms perticuraly with respect to possible changes during maturation and senescence of plant tissues (Baker and Tekeo 1973). In certain plant tissues like leaf discs of *Rheo discolor*, acid phosphatase increased considerably (De Leo and Sacher 1970). According to Baker and Tekeo (1973) this significant rise in acid phosphatase prior or during senescence of certain plant tissue is not clear and they reported that it is not general phenomenon of senescence of plant tissue. This enzyme is involved in autolytic process during senescence. An increase in acid phosphatase involve in catabolic process during rice leaf senescence was found by Kar and Mishra (1976). Besford (1979) reported that the acid phosphatase activity in the expanding leaves was greater on a fresh wet basis than in the fully expanded or mature leaves.

Recently Rane (1991) has observed the activity of acid phosphatase on groundnut and found that acid phosphatase activity is elevated during course of induced senescence in the two groundnut cultivars. Rane also found that the increase in acid phosphatase in senescence of groundnut leaf takes place depending upon decrease in proline level during senescence. Thus during leaf senescence process and phosphatase may play a critical role particularly with respect to translocation of phosphorus.

Zink (2011) studied the levels and developmental patterns of the two acid phosphatases in the two strains of *Ipomoea* sp. (morning glory) grown *in vitro* by influencing differently by gibberellic acid (GA3). Durmus et. al. (1999) purified

and characterized acid phosphatase from *Ipomoea batatas* using spectroscopic techniques.

In the present investigation we found increased acid phosphatase activity in thesenescence leaves of both the species of *Ipomoea carnea* Jacq.

Table No. 1

Activities of enzyme Peroxidase and Acid phosphatase Green and Senescent leaves *Ipomoea carnea* Jacq :-

Plant Material	Leaf Stage	Peroxidase Activity	Acid Phosphatase Activity
Ipomoea carnea sub sp. carnea	Green	1.27	2.43
	Senescent	2.12	3.75
Ipomoea carnea sub sp. fistulosa	Green	1.18	2.28
	Senescent	2.10	3.62

Values are expressed in ΔOD hr^{-1} gm^{-1} fresh tissue.

4. Conclusion-

In the present investigation the activity of peroxidase and acid phosphatase enzyme increased during the senescence of bot the sub species of *Ipomoea carnea* Jacq. The metabillides decreases and catabolic activities increased during senescence.

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