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MINERAL METABOLISM IN *PONGAMIA PINNATA* Linn Merr UNDER PATHOGENESIS

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Abstract: The paper deals with mineral analysis of leaves of *Pongamia pinnata* Linn. Merr infected with *Fusicladium effusum* fungus causing brown spot disease. The dried leaf samples of infected and healthy were subjected to tri acid digestion, prescribed by Toth et al.,(1948). The acid digested sample were used for analysis of mineral elements by Atomic Absorption Spectrophotometer (CHEM BIOTECH, MODEL- CB-AAS-3510) , Visible Spectrophotometer (CHEM BIOTECH, Model CB-104) and Flame photometer (Labotronics Model LT-671. The elements such as Potassium, Calcium and Sodium were estimated by Flame photometer, while phosphorous estimated by Sekine et al.,(1966) method, and sulphur element were determined by Blanchar et al.,(1965) method. The elements such as Sodium, Calcium, Zinc, Iron and Phosphorous were enhanced in infected leaves, where as Potassium, Copper, Manganese and Sulphur were decreased in the infected leaves, expresses a high metabolic shift.

Keywords : Pongamia pinnata, minerals, Fusicladium effusum, AAS, Spectrophotometer, Flame photometer.

INTRODUCTION

Pongamia pinnata Linn Merr. a deciduous medium sized tree commonly called 'Indian beech' luxuriantly growing in forest, as well as cultivated as a avenue tree, also having some medicinal properties. The *Pongamia pinnata* seeds contain 25 to 37 % of bitter fatty oil, most common ingredients are pongamol, glabrin and Karanjin, while root shows presence of furoflavones, such as pinnatin, gamatin, and pongapin. Whereas stem bark shows β-sitosterol, tetra-O-methylfistein etc. Therefore, it is an effective for the treatment of skin disease like scabies, eczyma and ulcers. Leaves in form of poultice usually applied for treatment ulcers infected by worms. The seed oil has antiseptic, stimulant with healing properties used for cutaneous infections, herpes and scabies. Hence, such a useful plant get affected by *Fusicladium effusum* fungus during rainy and autumn season. Therefore, an attempt was made to study mineral contents during pathogenesis.

MATERIAL AND METODS

The healthy and infected leaves of plant material *Pongamia pinnata* Linn merr were collected from Shivaji University campus during autumn season 2022, for experimental analysis. The collected samples were brought to the laboratory, washed with tap water followed by distilled water and then blot to dry. The samples were kept in electric oven for 1-3 consecutive days maintained a temperature of 60-70° C. The dried sample of healthy and infected were subjected to tri-acid digestion, prescribed by Toth et al.,(1948). The acid digested sample, filtered and diluted to 100 ml, used for estimation of elements by Atomic Absorption Spectrophotometer (CHEM-BIOTECH Model-CB-AAS-1310). The minerals such as Potassium, Calcium and Sodium were estimated by Flame photometer (LT-671, Labotronics) meanwhile element phosphorous was determined by the method of Sekine et al.,(1966) and non-metal sulphur was estimated by Blanchor et al.,(1965) method and expressed in terms of percentage, while rest of the elements by mg^{-1} g^{-1} of dried tissue.

RESULTS AND DISCUSSION

The results were expressed in Table-I, the element potassium get reduced in the infected leaves (Table-I) as it plays important role in synthesis of chlorophyll, opening and closing of stomata, and breakdown of carbohydrates during respiration, hence potassium content greatly utilized by the pathogen, reflects its essentiality, a similar finding were recorded by Nagaraja (1998 and 2005) under pathogenesis. While calcium content enhanced in the infected leaves of *Pongamia pinnata* (Table-I), it may influence activity of several enzyme during metabolism as it forms integral part of cell wall pectin, such findings was recorded by Sasikumar et al.,(1979) and Nagaraja (1996) in medicinal plants affected by fungal pathogen.

The element sodium involve in electric neutralization of organic and inorganic anions. The uptake of ubiquitous sodium ions is desirable to maintain osmotic potential and sustain turger pressure, again it regulates transport of amino acids for synthesis of nucleo proteins as well as a cofactor for ATPase and many enzymes (Evans and Sorger.,1966). The present investigation reveals element sodium has enhanced, in the infected tissue 174 mg of sodium per gram dried sample increased to 243 mg reflects high metabolics shift in infected leaves, such type of investigation was carried out by several workers. A parallel report was documented by Nagaraja (1998 and 2001) in *Dioscoria bulbifra* and *Woodifordia floribunda* under pathogenesis.

The element Zinc and Iron were found to be increased in the infected leaves of *Pongamia pinnata* (Table-I). It acts as a energy source and metallo enzyme (Riordan.,1976) and a dual role in plant defense with potential to simultaneously aid in metabolism. The increased condition of zinc has been Nagaraja (2008, 2008, 2007) reported in infected leaves under infection. The element iron acts as biocatalyst in various biochemical reaction, mainly enzymes such as nitrate reductase, aconitase, peroxidase, cytochromes. The enhanced content of iron may be due to its failure to be translocated or to more physiologically active site as cited by Brown (1976). An equivalent result was reported by Philip and Devadath (1981) in rice under infection.

The element such as Copper and Manganese to a great extent declined in the infected leaves of *Pongamia pinnata* (Table-I). Element copper activates several enzyme systems required for lignin synthesis, protein and carbohydrate metabolism, reflects is essentiality, as result it get consumed by pathogen. A identical report was published by Nagaraja (2007, 2008) and Ingavale (2020), much the same element manganese required for several metallo enzyme synthesis of nucleic acids and fatty acids and get declined in infected tissue (Table-I). A connate report was recorded by Ghorpade (2018) in *Hyptis suaveolens* under infection.

The non-metallic element such as Phosphorous slightly increased in the infected tissue of *Pongamia pinnata* (Table-I) as it required in minor qualities for pathogen and host, as is part and parcel of nucleic acids and energy source, it accumulated in infected leaves, commensurate report was documented by Ingavale (2020) in *Cestrum diurnum* under pathogenesis. The non metal sulphur content diminished to half in infected leaves of *Pongamia pinnata* (Table-I), required for biosynthesis of amino acids, secondary metabolites and sulfoflavonoids, hence it get consumed by pathogen (Table-I).

TABLE-I

Mineral composition of *Pongamia pinnata* Linn merr infected with *Fusicladium effusum*.

Sr. No.	Elements	Healthy leaves	Infected leaves
1	Potassium	19.0	14.0
2	Sodium	174.0	243.0
3	Calcium	166.0	246.0
4	Zinc	14.0	17.0
5	Iron	51.0	62.1
6	Copper	3.38	0.72
7	Manganese	32.01	12.02
8	Phosphorous	0.26	0.57
9	Sulphur	4 %	2 %

* Expressed as mg^{-1} - g^{-1} of dry tissue.

** Expressed as of percentage.

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