



# MINERAL METABOLISM IN THE LEAVES OF *SYNGONIUM PODOPHYLLUM* SCHOTT UNDER PATHOGENESIS

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**Abstract:** The present research paper deals with mineral metabolism in the leaves of *Syngonium podophyllum* Schott infected with fungus *Colletotrichum* sp. Leaves samples were acid digested according to the method of Toth *et al.*, (1948). The minerals such as manganese, zinc, copper, iron and boron were estimated by Atomic Absorption spectrophotometer- Thermo-scientific-AAA-Chemito AA 203 model, while potassium, calcium, sodium were estimated by Flame photometer (Systronics-128 model), and element phosphorus was estimated by Sekine *et al.*, (1965) method. The minerals phosphorus, calcium, zinc, iron and manganese were considerably enhanced in the infected leaves, on contrary sodium, potassium, copper and boron content were diminished in the infected tissue, resulting in high metabolic shift under pathogenesis.

**Key words:** *Syngonium podophyllum*, *Colletotrichum* sp., minerals, AAS, Flame-photometer.

## INTRODUCTION

The genus *Syngonium* comprises more than 36 species, belongs to family Araceae, in which *Syngonium podophyllum* Schott is the most commonly cultivated species - a perennial vine, growing to the height of 10-15 meters, with arrow shaped, green thin undulating leaves as it matures, leaf changes its shape to bigger and lobed condition. The plant is native to Mexico and Costa Rica; nowadays it is cultivated throughout India, as a beautiful leafy plant in gardens.

No doubt, *Syngonium podophyllum* Schott beautifies the garden but also has several medicinal properties, hence used in Ayurveda, folk medicine as well as traditional medicine. The phytochemical screening of leaves shows the presence of alkaloids and saponins (Seline Omondi & J. C. Omandi, 2015). The plant also contains alpha-ionone, Ay-ionone, hexadecanoic acid, geranyl acetone, dithroachtinidiolide, phytol, linoleic acid, fatty acids reducing sugars, flavonoids, terpenoids, steroids etc. Therefore, plants possess antibacterial, antifungal, antioxidant, analgesic, anti-inflammatory, cytotoxic, hepatotoxic, anticancer and antihypertensive properties. Anti-inflammatory (Sosa *et al.*, 2002), antibacterial, antioxidant, cytotoxicity, and hepatotoxic (Shashank *et al.*, 2014), Cytotoxicity (Sarwar Hossain *et al.*, 2015), anticandidal (M. Yasir *et al.*, 2017), antioxidant (Sarwar Hossain *et al.*, 2017). As the plants possess huge properties, hence an attempt was made to study mineral contents under infection.

## MATERIAL AND METHODS

*Syngonium podophyllum* Schott, healthy leaves and infected with *Colletotrichum* sp. were collected from the garden of Mercara (Karnataka State), brought to the AGPM Laboratory, initially washed with tap water followed by distilled water and then blotted to dry. The samples were sundried for one day followed by an electric oven for a period of 2-3 days, maintaining a temperature of 50-60°C. Later the samples were powdered in a domestic grinder. The dried 500g of healthy and infected samples were digested by tri-acid method prescribed by Toth *et al.*, (1948). The samples were filtered through whatman filter paper no. 1 and made to 100ml with distilled water and used for estimation of minerals by Atomic Absorption Spectrophotometer Thermo-scientific-AAA-Chemito AA 203 model. The elements calcium, potassium and sodium were estimated by Flame photometer (Systronics-128 model), while non-metal phosphorus by Sekine *et al.*, (1965) method. The results were expressed as  $\text{mg g}^{-1}$  of dried tissue.

## RESULT AND DISCUSSION

The results were depicted in Table- 1. The element potassium plays an important role in translocation of organic solutes, it controls the opening and closing of stomata by inducing the movement of guard cells, again as an activator of many enzymes, even it is essential for fungi. The element potassium content gets reduced in the infected leaves of *Syngonium podophyllum* Schott (Table. 1). This indicates the pathogen *Colletotrichum* sp. consumed potassium ions for its metabolism. A similar condition was recorded by Nagaraja (2008, 2020, 2022) under pathogenesis. Consequently, sodium element helps in regulation of amino acids as well as controls over the synthesis of nucleoproteins and as co-factor of ATPase enzymes, gets decreased to 4.6mg per gram of infected tissue of *Syngonium podophyllum* Schott (Table. 1), reflects its essentiality for nutrition and sporulation of fungus *Colletotrichum* sp. (Brain and Hemming, 1950). A parallel result was documented by Sujay Hodage (2023) in *Cochlospermum religiosum* L under pathogenesis. The element calcium forms chief constituent of middle lamella of the cell as well as an activator of many enzymes like kinase, phospholipid, succinate dehydrogenase etc. The calcium content gets accumulated in the infected leaves of *Syngonium podophyllum* Schott, under infection, Sasikumar *et al.*, (1979) and Nagaraja (1988, 1996, 2020) reported considerable elevated quantity of calcium during pathogenesis in several medicinal plants.

The element manganese is essential for the synthesis of chlorophyll, nucleic acids, along with some fatty acids. It also acts as an activator of many enzymes like malic dehydrogenase, oxalosuccinic decarboxylase, nitrate reductase etc., has a greater impact on fungal metabolism. The element manganese content gets accumulated in the infected leaves of *Syngonium podophyllum* Schott (Table 1). This shows less utilization of elements by the pathogen, as a result it gets accumulated. A complementary condition was reported by Sakshi Kadam *et al.*, (2024) and Ingavale *et al.* (2020) under pathogenesis. The element iron is essential for oxidative phosphorylation as ATP synthesis and again a component of ferredoxin, helps in the electron transport system in plants as well as fungi get intensified in the infected leaves of *Syngonium podophyllum* Schott Table 1. by *Colletotrichum* sp., this may be due to failure to be translocated to a physiologically active site as cited by Brown (1976). A concurrent report was published by Nagaraja (2001) in *Woodfordia* sp. under Infection.

The element zinc is involved in biosynthesis of IAA, again acts as an activator of enzymes such as carbonic anhydrase, pyridine nucleotide dehydrogenase, hexose kinase etc. get slightly elevated in infected leaf of *Syngonium podophyllum* Schott Table. 1. A collateral condition was reported by Nagaraja (2007 and 2008). The element boron regulates translocation of sugars mainly responsible for pollination and formation of fruits, as well as hormone metabolism was first documented by Bowen and Gauch (1996), slightly consumed by pathogen *Colletotrichum* sp. on the leaf of *Syngonium podophyllum* Schott

Table. 1. The element copper forms one of the constituents of plastocyanin and is essential for the activity of the enzymes, cytochrome oxidase, polyphenol oxidase etc., greatly dropped in the infected leaves of *Syngonium podophyllum* Schott Table. 1 under infection. The reduction in copper content ions due to absorption by the pathogen for its metabolism and it increases respiration rate under pathogenesis. An equivalent condition was documented by Nagaraja (2001) and Sakshi kadam *et al.* (2024) under pathogenesis.

The phosphorus, a non-metallic element is a constituent of nucleic acids, nucleoproteins, phospholipids and energy rich phosphate molecules gets accumulated in infected leaves of *Syngonium podophyllum* Schott Table 1. A commensurate finding was documented by Pratik Sarade *et al.*, (2022) and Sakshi kadam *et al.*, (2024) under pathogenesis.

Hence, mineral nutrition forms part and parcel in the metabolism of pathogens and host, which reflects its physiognomy.

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**Table- 1. MINERAL METABOLISM OF SYNGONIUM PODOPHYLLUMSCHOTT UNDER PATHOGENESIS**

Sr. No.	Elements	Content*	
		Healthy leaves	Infected leaves
1.	Potassium	48.1	46.5
2.	Calcium	23.6	25.6
3.	Sodium	5.2	4.6
4.	Phosphorus	3.6	6.0
5.	Boron	0.0033	0.00309
6.	Zinc	0.209	0.260
7.	Iron	0.0334	0.1918
8.	Copper	0.012	0.00029
9.	Manganese	0.485	0.763

\*Expressed as mg g<sup>-1</sup> of dried tissue.

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