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# Comparative study on enzymes activity of healthy and infected leaves of turmeric varieties

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## ABSTRACT

*Three varieties of turmeric viz. Salem, Rajapuri and Krishna were selected for present pathophysiological studies under leaf spot (Taphrina maculas) and leaf blotch (Colletotrichum capici ) infection. Salem variety increase protein in Colletotrichum infection as compare to other. All three varieties shows decrease in activity of nitrate reductase and increase in acid phosphatase activity after infection. The activity of amylase was increased in infected leaves of all varieties of turmeric.*

**Key Words**- Turmeric, Protein, Nitrate reductase, Acid phosphate, Amylase

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## INTRODUCTION

Many plants are used as drugs and medicines in India due to their medicinal potential [1]. India is famous for its turmeric production and export. Turmeric (*Curcuma longa* L.) is botanically related to ginger and belongs to the Zingiberaceae family[2].It is a perennial crop plant having a short stem with large oblong leaves and bears ovate, oblong rhizomes. Turmeric rhizome powder is used as a food additive (spice), preservative and colouring agent [3] in Asia including India and China. It is also considered as auspicious and is a part of religious rituals. The plant is affected by many diseases and pests which reduces its productivity. For this purpose Turmeric Research Centre, Kasabe Digraj, Dist sangli, (Maharashtra) developed three varieties viz. Salem, Rajapuri and Krishna. The Salem variety is highly susceptible to leaf spot and leaf blotch disease caused by *Taphrina maculas* and *Colletotrichum capici* respectively, while Rajapuri and Krishna varieties are resistant to leaf spot and susceptible to leaf blotch disease. By keeping all these in view, the present investigation focus on comparing the enzyme activity of three varieties of turmeric during infection of these pathogens.

## MATERIALS AND METHODS

The healthy and infected leaves of three varieties were collected from Turmeric Research Centre, Kasabe Digraj, Dist. Sangli, Maharashtra and enzyme activity Nitrate reductase is estimated after the method of Joworski [4] and Acid phosphate by method of Mc Lachlam [5]. For study of enzyme activity Amylase the method described by Katsuni and Fukuhani [6]was adopted and Protein estimated by method of Gornall *et al*.[7].

## RESULTS AND DISCUSSION

Proteins induced in the plant by pathogen attack are defensive compounds that are elicited due to hypersensitive response of the immune system of the turmeric plant [8]. The present investigation shown that total soluble protein found to increase in infected leaves of all turmeric varieties but Salem shows maximum protein content during infection of *Colletotrichum*(Table.1). The fungal infection increases the protein content [9] and these proteins are acting as defensive enzymes.

The nitrate reductase is chloroplastic enzyme [10] correlated in reduction of nitrates that are absorbed by the plants into nitrites and then immediately to ammonia which converted to amino acid and proteins[11]. The nitrate reductase is the key enzyme for nitrogen metabolism. Present work emphasizes the decrease in activity of nitrate reductase after infection in leaves of all turmeric varieties but Salem shows maximum reduction *Taphrina* infection (Table.1). It indicates that pathogen hampered the activity of nitrate reductase of host and block nitrogen metabolism during infection [12].

Acid phosphatase plays important role in defence mechanism of plant. The present investigation depicted (Table.1) increase in activity of acid phosphatase in infected leaves of all turmeric varieties but maximum in Rajapuri in *Colletotrichum* infection. The activity of acid phosphatase increased in fungal infection[13]. Similar result was found by Srikathaswamy *et al* in Mulbery plant during pathogenesis [14]. Such elevation in level of acid phosphatase is suggestive the good sensor mechanism for pathogen stress[15].

Plant pathogens are involved in the production of extracellular enzymes such as Cellulases, Pectinases, Amylases and Chitinases in order to digest cellulose and starch and to use it as the sole carbon source [16]. The activity of amylase is studied in present investigation under pathogenicity (Table.1) and it was found to increase in leaves of all infected turmeric varieties. The maximum increase observed in infected leaves of Krishna variety. Basalah *et al* also observed increased amylase activity in *Solanum melongena* during the infection *of Rhizoctonia solani* [17].This increase is due to high metabolic activities during infection [18].

**Table.1 shows values of Total Soluble Protein, Nitrate Reductase, Acid Phosphatase, Amylase**

| | **Salem** | | | **Rajapuri** | | **Krishna** | |
|---|---|---|---|---|---|---|---|
| | Healthy | Infected by Blotch | Infected by Spot | Healthy | Infected by Blotch | Healthy | Infected by Blotch |
| Total Soluble Protein | 2.83 | 5.1 | 3.21 | 2.64 | 3.46 | 2.25 | 3.08 |
| Nitrate Reductase | 0.25 | 0.23 | 0.18 | 0.14 | 0.11 | 0.21 | 0.19 |
| Acid Phosphatase | 12.88 | 17.16 | 17.82 | 16.48 | 22.48 | 13.06 | 19.00 |
| Amylase | 0.37 | 0.39 | 0.43 | 0.35 | 0.42 | 0.35 | 0.45 |

*Values of Proteins are expressed in g $100^{-1}$ fresh weight.*
*Values of enzymes are expressed in $\Delta$ OD $h^{-1}$ $g^{-1}$ fresh weight.*

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