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EFFECT OF SUPPLEMENTATION OF AMINO ACIDS ON PECTINASE PRODUCTION IN TOMATO FUNGI

Botany

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ABSTRACT

Tomato (Lycopersicon esculentum Mill.) is one of the common vegetables grown all over the country extensively almost the year round. The crop is reported to be affected by about twenty diseases of microbial origin. Among them, the fungal pathogens have been found to affect and damage severely the tomato fruits both in field at different developmental stages as well as in the market during storage. This may result in the qualitative and quantitative loss of tomato fruits. The fungi are known to produce different hydrolytic enzymes during pathogenesis. These enzymes degrade the food contents. In the present investigation, pectinase production in relation to different amino acids was studied in the fungi isolated from tomato fruits. The amino acids were found to affect the pectinase production in the fungi.

KEYWORDS

Pectinase Production, Tomato Fungi, Amino Acids.

INTRODUCTION:

Tomato (*Lycopersicon esculentum* Mill.) is one of the common vegetables grown all over the country extensively almost the year round. The crop is reported to be affected by about twenty diseases of microbial origin. Among them, the fungal pathogens have been found to affect and damage severely the tomato fruits both in field at different developmental stages as well as in the market during storage. This may result in the qualitative and quantitative loss of tomato fruits.

It is the well known fact that the fungi produce different hydrolytic enzymes during pathogenesis. The hydrolytic enzymes produced by the fungi like cellulases, pectinases, amylases, lipases and proteases are known to degrade food contents. Sreekantiah *et al*. (1971) found that, *Alternaria alternata, Fusarium solani* f.sp. *minus, Pleospora infectoria* and *Alternaria solani* were capable of producing all the four kinds of hydrolytic enzymes, viz., pectinase, cellulase, amylase and proteinase. Balsubramanian (1972) reported that, protease along with cellulase and pectinase was found to be effective in infection by *Rhizopus stolonifer* within the tissue. Mehta *et al*. (1974) found that, during pathogenesis of tomato fruits, *Alternaria* sp. produce pectolytic and celluloytic enzymes. They also reported that, polygalacturonase and pectin methyl galacturonase are found to play important role in pathogenesis due to *Alternaria solani* and in *A. tenuis* (*A. alternata*) infection. Ramasami and Shanmugam (1976) studied pectolytic and celluloytic enzymes of *Rhizoctonia bataticola in vitro* and *in vivo*. Hasija and Batra (1981) recorded that, *Phoma destructiva* produced pectin transliminase and polygalacturonase in diseased tomato fruits, while pectin methyl esterase, pectin methyl galacturonase occurred in both healthy and diseased tissue. Hasija and Batra (1984) found that, *Phoma destructiva* causing fruit rot of tomato fruits produced all types of pectic enzymes (PME, PMG, PG and PGTE *in vitro*).

In the present investigation, effect of amino acids on pectinase production was studied in some fungi isolated from tomato fruits.

MATERIAL AND METHODS:

A) PRODUCTION OF PECTINASE:

For the production of pectinase i.e. pectin methyl galacturonase (PMG), the fungi were grown in a liquid medium composed of Pectin - 1%, KNO_3 - 0.25%, KH_2PO_4 – 0.1%, and $MgSO_4$. $7H_2O$ - 0.05%, pH - 5.0. Different amino acids were added to it at 0.02 % concentration. Twenty five ml of the medium was taken in 100 ml conical flasks and autoclaved at 15 lbs pressure for 20 minutes. The flasks on cooling were inoculated separately with 1 ml standard spore suspension of test fungi prepared from 7 days old cultures grown on PDA slants. The flasks were incubated for 6 days at 25 °C. On 7th day, the flasks were harvested by filtering the contents through Whatmann No. 1 filter paper. The filtrates were collected in pre-sterilized bottles and termed as crude enzyme preparations.

B) ENZYME ASSAY (VISCOMETRY):

The Ostwald's viscometer was thoroughly cleaned with distilled water and dried before use. Six ml of 1% pectin in 2 ml of 0.2 M acetate buffer pH 5.2 and 4 ml of enzyme source were taken in viscometer and were thoroughly mixed and incubated at 25°C temperature. The efflux time of the mixture at 0, 5,10,20,30,40,50 and 60 minutes was recorded with the help of stop watch. The percent loss of viscosity was calculated by using the formula:

$$\text{Per cent loss of viscosity} = \frac{To-Tx}{To-Tw} \times 100$$

Where To = Flow time in seconds at zero time
Tx = Flow time of the reaction mixture at time 'T'
Tw = Flow time of distilled water.

RESULTS AND DISCUSSION:

Table 1: Effect of amino acids on pectinase production in tomato fungi

Amino acids (0.02% conc.)	Fungi					
	Aso	Clu	Gca	Rso	Fox	Phy
	% Viscosity loss after 40 minutes					
Serine	60.2	65.5	70.9	67.9	61.2	77.7
Valine	61.1	55.1	58.8	60.1	58.5	72.8
Phenylalanine	58.5	00.0	00.0	57.7	62.1	00.0
Proline	60.2	61.0	75.1	62.3	56.7	69.5
Threonine	30.0	22.7	30.8	00.0	00.0	21.9
Leucine	31.7	00.0	40.2	30.1	00.0	41.7
Aspartic acid	51.9	57.1	72.1	57.8	61.3	71.7
Glutamic acid	00.0	00.0	41.1	00.0	38.5	51.8
Alanine	60.1	55.1	47.8	47.5	47.8	69.2
Tyrosine	55.7	41.2	69.3	40.2	51.2	70.1
Control	68.0	61.3	80.7	65.0	67.0	80.8

Aso - *Alternaria solani* Clu - *Curvularia lunata*
Gca - *Geotrichum candidum* Rso - *Rhizoctona solani*
Fox - *Fusarium oxysporum* Phy - *Phytophthora* sp.

From Table-1, it is evident that, pectinase production in *Curvularia lunata* and *Rhizoctona solani* was stimulated by serine. Pectinase production in *Alternaria solani* was completely inhibited by glutamic acid, in *Curvularia lunata* by phenylalanine, leucine and glutamic acid. Pectinase activity in *Geotrichum candidum* and *Phytophthora* sp. was completely inhibited by phenylalanine. Threonine showed complete inhibition in case of *Rhizoctona solani* and *Fusarium oxysporum.* Complete inhibition of pectinase activity in *Fusarium oxysporum* was also shown by leucine. In short, all the amino acid except serine for *Curvularia lunata* and *Rhizoctona solani* were found to inhibit pectinase production in all the fungi. Asparagine was reported to be stimulatory for pectinase production in *Alternaria tenuissima* (Pandey and Gupta, 1966) and *Rhizopus stolonifer* (Balasubramaniam and Srivastava, 1973)

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