



EFFECT OF PHYSICAL FACTORS ON TOXIN PRODUCTION IN TOMATO FUNGI

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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 toxins during pathogenesis. During the present investigation, studies were made on the effect of physical factors like incubation period, temperature and pH on toxin production in some fungi isolated from tomato fruits. These factors were found to affect the toxin production in the fungi.

KEYWORDS : Physical factors, toxin production, tomato fungi.

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.

Toxins are important metabolites of microorganisms. The role of toxins in pathogenesis has been discussed by various workers (Wheeler and Luke, 1963; Deverall, 1994 and Wood, 1967). The medium used for cultivation of fungi and its effect on toxin production was studied by different scientists like Vidyasekaran et al. (1970), Mishra and Kanujia (1973) and Charya and Reddy (1982). The effect of fungal toxins on seed germination in tomato was studied by Bakhariev (1978), in arhar by Kamal and Verma (1978), in mung by Sinha and Prasad (1981), in soybean by Singh et al. (1986) and Sharma (1990) and in groundnut by Reddy et al. (1991).

In the present investigation, effect of physical factors like incubation period, temperature and pH was studied on toxin production in some fungi isolated from tomato fruits. These factors were found to affect the toxin production in the fungi.

MATERIAL AND METHODS:

a) Production of Phytotoxins

The test fungi isolated from tomato fruits were grown on three different culture media viz. Glucose nitrate medium, Richard's medium and Czapek's medium. Twenty five ml of each medium was added in 100 ml conical flask and autoclaved at 15 lb pressure for 15 minutes. On cooling, the flasks were inoculated separately with 1 ml of spore suspension of the test fungi prepared from 7 days old cultures grown on PDA slants. The flasks were incubated at 25 °C for 9 days and were harvested by filtering their contents through Whatman No. 1 filter paper. The filtrates were collected in pre-sterilized bottles and termed as crude toxin preparation. These preparations were tested for their toxicity.

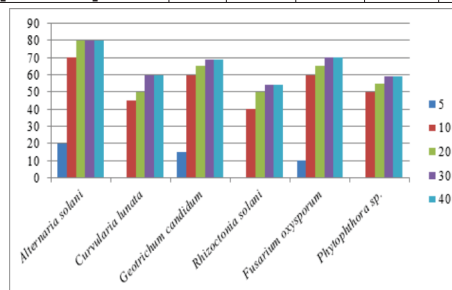
b) Assay of Phytotoxins by Seed Germination Method:

Surface sterilized hundred seeds of tomato were soaked in crude toxin preparation for 24 hours. They were then placed on moist blotters in petriplates. Seeds soaked similarly in freshly prepared uninoculated liquid medium served as control. Percent inhibition of seed germination was recorded after 7 days of incubation at room temperature.

RESULTS AND DISCUSSION

Table 1: Effect Of Incubation Period On Toxin Production In Tomato Fungi

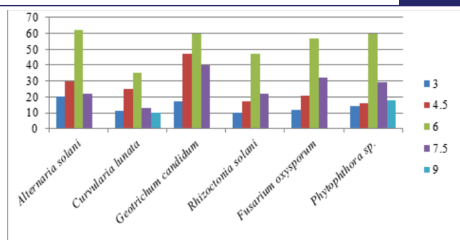
Fungi	Days				
	5	10	20	30	40
<i>Alternaria solani</i>	20	70	80	80	80
<i>Curvularia lunata</i>	00	45	50	60	60
<i>Geotrichum candidum</i>	15	60	65	69	69
<i>Rhizoctonia solani</i>	00	40	50	54	54
<i>Fusarium oxysporum</i>	10	60	65	70	70
<i>Phytophthora sp.</i>	00	50	55	59	59



In order to study the optimum incubation period for toxin production, the fungi were grown for different incubation periods ranging from 5-40 days. From Table-1, it becomes clear that with the increase in incubation period, toxicity was also increased. After 5 days, only *Alternaria solani*, *Geotrichum candidum* and *Fusarium oxysporum* could produce toxin. The culture filtrates of all the fungi harvested from 10th day onwards showed increase in toxicity with increase in the incubation period up to 30 days. Similar type of results have been recorded in *Fusarium moniliforme* and *Aspergillus flavus* (Vidhyasekaran et al., 1970) and in *Fusarium oxysporum* (Charya and Reddy, 1982), where the fungi produced highest amount of toxin in between 25 and 30 days of incubation.

Table 2: Effect Of Ph On Toxin Production In Tomato Fungi

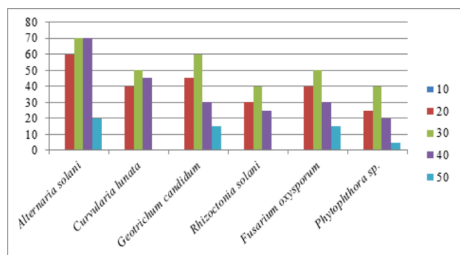
Fungi	pH				
	3.0	4.5	6.0	7.5	9.0
<i>Alternaria solani</i>	20	30	62	22	00
<i>Curvularia lunata</i>	11	25	35	13	10
<i>Geotrichum candidum</i>	17	47	60	40	00
<i>Rhizoctonia solani</i>	10	17	47	22	00
<i>Fusarium oxysporum</i>	12	21	57	32	00
<i>Phytophthora sp.</i>	14	16	60	29	18



The fungi were grown at different pH values ranging from 3.0-9.0 and culture filtrates were tested for their toxic effect on tomato seeds. From Table-2, it becomes clear that toxin production in all the fungi was observed at pH 3.0 and gradually increased with increase in pH up to 6.0. Toxin production at pH 9.0 was not found in *Alternaria solani*, *Geotrichum candidum*, *Rhizoctonia solani* and *Fusarium oxysporum*. It was interesting to note that *Curvularia lunata* and *Phytophthora sp.* could produce toxin at pH 9.0. Optimum pH for toxin production was 6.0 in all the fungi.

Table 3: Effect Of Temperature On Toxin Production In Tomato Fungi

Fungi	Temperature (0C)				
	10	20	30	40	50
<i>Alternaria solani</i>	00	60	70	70	20
<i>Curvularia lunata</i>	00	40	50	45	00
<i>Geotrichum candidum</i>	00	45	60	30	15
<i>Rhizoctonia solani</i>	00	30	40	25	00
<i>Fusarium oxysporum</i>	00	40	50	30	15
<i>Phytophthora sp.</i>	00	25	40	20	05



Effect of temperature on toxin production in tomato fungi was studied by growing them at different temperatures ranging from 10-50°C. The culture filtrates obtained were studied for their toxic effect on tomato seeds. From Table-3, it becomes evident that at 10°C, none of the fungi could produce toxin. Toxin production in all fungi was seen at 20°C and increased up to 30°C. The maximum toxin production was observed in all the fungi at 30°C. At 50°C, there was low toxin production in *Alternaria solani*, *Geotrichum candidum* and *Fusarium oxysporum*, while there was no toxin production in *Curvularia lunata*, *Rhizoctonia solani* and *Phytophthora sp.* Optimum pH for toxin production was 30-40°C in *Alternaria solani* and *Curvularia lunata*, while it was 30°C in case of all other fungi.

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