



**Studies on the development of fruit rot of tomato caused by
Alternaria solani (Ellis & Mart.) Jones & Grout**

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Abstract

During the regular survey of local Tomato growing field of Tikamgarh, it was observed that most of the Tomato fruits have been suffered by fruit rot disease caused by *Alternaria solani*. The maximum incidence of fruit rot disease has been observed in ill drained and low lodging fields, where water lodging was common and soil moisture found to be high. It was also noticed that tomato fruits which developed near ground level and came in contact with soil, almost suffered from the disease. In the present study the development of fruit rot disease has been studied on three different types of fruits of various age, i.e., Green, Semi ripe and Ripe Tomato fruits. Among the three types of fruits, the green fruits found to be very less susceptible and have shown some resistant against pathogen *Alternaria solani*. The semi ripe fruits have been found to be most susceptible for the pathogen, where as maximum rotting has been recorded in semi ripe fruits. The ripe fruits has been found to be moderately susceptible.

Key-Words: Tomato, *Alternaria solani*, Tikamgarh

Introduction

Tomato (*Lycopersicon esculentum* Mill.) popularly known as Tamatar, is an important vegetable and fruit crop in India. It is small annual or short lived perennial herb belonging to the family solanaceae of dicot angiosperm, is probably native of 'Peru-Ecuador'. It is eaten raw or cooked as vegetable or used in the form of salad, juice, Paste, ketchup, Sauce, Soap etc. In India, every tomato grower, dealer, whole seller and retailer are faced with the great loss from diseases caused by fungi and bacteria. Out of these, the fungal diseases are most common which cause considerable damage to the tomato fruits (Chenulu and Thakur 1968, Mehta 1973, Sharma 1994, Chaurasia 2001).

Amongst fungal pathogens, *Alternaria solani* (Ellis & Mart.) Jones & Grout is one of the most destructive and common pathogen of tomato fruits causing fruit rot disease in fields and during storage, marketing and transportation in Tikamgarh district of Madhya Pradesh. Due to this disease, the tomato fruits not only lost their nutritional values but also quick and severe rotting makes them unfit for domestic use. Therefore, the present investigation was carried out to study the effect of *Alternaria solani* on fruit rot disease development.

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Material and Methods

Field survey: A general field survey of tomato growing areas of Tikamgarh was carried out by frequently visiting the various fields of different localities. The diseased tomato fruits were examined carefully in the field and their description were recorded.

Collection of disease samples: The diseased tomato fruits were collected from the local field of tikamgarh. The diseased fruits were kept in sterilized polythene bags and brought to the laboratory for the purpose of isolation of the pathogen.

Isolation and Purification of pathogen: For isolation and purification of the pathogen, diseased portion from fruits were cut with sterilized blade in to small pieces (2-5mm). The pieces were surface sterilized with 0.01% mercuric chloride solution for about 30 seconds and washed with sterilized distilled water for three times. These diseased pieces were placed in the center of solidified potato dextrose agar (PDA) plates in aseptic condition by using sterile forceps. The plates were incubated in incubator at 28^oc and examined daily for the growth of the pathogen. After six days, the young growing hyphal tips were transferred to freshly prepared PDA plates by hyphal tip method given by Aneja (1993) and Chaurasia (2001).

Identification of pathogen: For identification of isolated pathogen, morphological characters of isolated

pathogen, compared with *Alternaria solani* (Ellis & Marts.) Jones & Grout.

Pathogenicity of pathogen: In order to investigate the pathogenicity of isolated pathogen, a small injury was made on the surface of sterilized tomato fruit. Then an agar disc, taken from the margin of the freshly grown colony of isolated pathogen was placed on injured surface. These inoculated fruits were kept in a suitable place at room temperature in laboratory conditions. As soon as the disease symptoms were evident, the pathogen was again reisolated from the artificially inoculated diseased fruits. Then reisolated culture was compared with original isolated pathogen.

Development of fruit rot disease on different types of tomato fruits: Three different types of tomato fruits viz. Green, semi ripe and ripe were collected from the field of Tikamgarh in order to study the development of fruit rot disease. Only healthy and uninjured fruits were selected and brought to the laboratory in polythene bags. Collected healthy tomato fruits were taken out from polythene bags for inoculation purpose. The fruits were surface sterilized with 0.01% mercuric chloride solution for about 20 second and washed thoroughly with sterilized distilled water to free them from the mercuric chloride. After surface sterilization the fruits were inoculated with 8.0 mm diameter inoculum discs by cavity method (Granger and Hornes, 1924, Chaurasia 2009,2010). All the inoculated fruits were kept in moist chamber having 100 percent relative humidity and then incubated at 28^oc temperature for 2,4,6,8,10 and 12 days. This experiment was performed in triplicates. At the end of each incubation period, the diameter of rotten area was measured in mm. The diameter of rotten area as mm per day was also calculated in each case with the help of the following formula:

$$\text{Rotten area (mm/day)} = \frac{\text{Rotten area in mm}}{\text{Total time period in days}}$$

Results and Discussion

Field observation: The results of regular field survey revealed that in the month of November /December, most of the tomato fruits have been suffered by fruit rot disease by *Alternaria solani*. On disease tomato fruits, dark brown to black colored rotten area was seen.

The incidence of fruit rot disease on tomato fruit, observed in ill drained and low lying fields where water lodging was common. During survey, it has also observed that tomato fruits have suffered a lot from this disease, in those fields which having high soil moisture and in which tomato plant were populated densely. It has also noticed that tomato fruits which touches the ground level, infected first. Accumulation of dead

decaying plants debris near the plant also favoured the incidence of disease.

Field observations revealed that on tomato fruit, The disease appeared in the form of small, pale brown, water soaked spot on the skin of fruit. With the age, the size of spot has been increased and it became dark brown in colour and almost rounded in shape. In humid weather, the concentric rings in the form of ridges were seen on brown developing spot, which gives a target board like appearance. This is important symptoms of fruit rot disease of tomato fruit caused by *Alternaria solani*.

In advanced stages of disease development, target board effect symptoms has disappeared and spotted area covered by deep bluish- green to brownish- black growth of fungus, which were actually the fructifications of fungus, i.e., conidia and conidiophores of pathogen. In favourable conditions, disease spreaded rapidly and about three fourth (3/4) tissues of tomato fruit have been found to be rotten and thus lost its economic value.

In dry weather conditions, the spotted area on fruits spreaded slowly and somewhat sunken and the aerial growth of fungus (fructifications) disappeared gradually.

Isolation and purification of pathogen: The pathogen was successfully isolated on potato dextrose agar medium by tissue segment method and it was purified by hyphal tip method. After inoculation, within 4-5 days, around the inoculated diseased bits, the growth of pathogen has been observed with its characteristic colony characters.

Pathogenicity of pathogen: To confirm the pathogenic ability and pathogenicity of isolated pathogen, in laboratory fresh tomato fruits successfully inoculated and after few days production of typical disease symptoms on inoculated fruits has been seen successfully.

From this artificially inoculated disease fruit, the pathogen was again reisolated on potato dextrose agar medium. When culture characters of re-isolated pathogen was compared with the original culture (isolated from field) then it was found to be the same and morphologically identical. Thus it prove the pathogenic ability of pathogen and also confirmed kotch's postulates. The *Alternaria solani* as a pathogen for the fruit rot disease of tomato have also reported by several workers (Shrivastava and tondon, 1966; Mehta, 1973; Chaurasia and Chaurasia, 2010).

Identification of Pathogen: On the basis of colony characters, characters of hyphae, conidiophores and conidia the pathogen was identified as *Alternaria solani* (Subramanian, 1971).

Development of fruit rot disease on different types of tomato fruits: In the present study the development of fruits rot disease has been studied on three types of

fruits of various age i.e., green, semi ripe and ripe fruit of tomato and results are presented in table 1 and Fig.1.

Table 1: Development of Fruit rot disease on different types of Tomato Fruits

Tomato fruits	Diameter of Rotten area (in mm)*						Rotten area (mm/day)
	Days after inoculation						
	2	4	6	8	10	12	
Green fruit	10.2	17.4	25.6	34.4	44.3	55.6	4.51
Semi ripe fruit	16.3	26.3	36.2	50.3	64.8	78.8	6.68
Ripe fruit	12.4	21.6	31.3	42.4	55.3	70.3	5.58

*Average of three replicates

From the results, it is evident that all the taken fruits of various age, i.e., green, 'semi ripe' and ripe fruits were found to be susceptible for the development of fruit rot. The initial disease symptoms appeared on second day of inoculation and the development of disease has been increased with increase in the incubation period up to twelve days in each case. Among the three types of inoculated fruits, the semi ripe tomato fruits were found to be most susceptible for pathogen *Alternaria solani* as in this type of fruits the maximum rotting, i.e., 6.68 mm per day has been recorded. The ripe fruit has been found to be moderately susceptible as in ripe tomato fruits 5.58 mm per day rotting on the fruits was recorded. The green fruits found to be very less susceptible and have shown some resistant against pathogen *Alternaria solani* as in these fruits about 4.51 mm per day rotting was recorded.

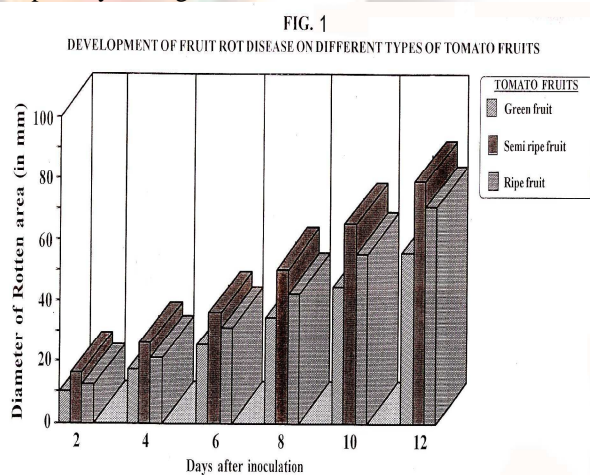
From the foresaid results it can be concluded that biochemical and nutritional composition and their concentrations may changed with the age and maturity of fruits, therefore the rate of development of disease varied with the age of fruits. Perhaps, in semi ripe tomato fruits, the nutritional condition has been found to be favourable for pathogen hence in this semi ripe tomato fruits maximum disease development has been recorded.

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