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## Reaction of Tomato varieties against *Alternaria* blight (*Alternaria alternata*) of Tomato under field conditions

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*Alternaria* blight disease caused by *Alternaria alternata* has been a serious problem in tomato growing areas particularly at temperate subtropical, humid tropical regions of the world. An investigation was carried out at Horticulture Experimental farm, SKNAU Jobner with twenty one varieties of tomato. The experiment was conducted consecutively for two years during *zaid* seasons of 2017 and 2018 in replicated trails. Out of twenty one varieties only Switzieland and AngourLata were observed to be resistant against *Alternaria* blight. The six varieties were found moderate resistance. Four varieties were found moderate susceptible. Six varieties were found susceptible. Three varieties were found highly susceptible.

**Key words:** Tomato, *Alternaria alternata*, varieties, blight

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### INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the most popular, highly remunerative and widely grown vegetable in the world. Tomato is a native to Peruvian and Mexican region. Though there are no definite records of when and how it came to India, the Portuguese perhaps introduced it to India. Tomato cultivation has become more popular since mid nineteenth century because of its varied climatic adaptability and high nutritive value. Tomato is being exported in the form of whole fruits, paste and in canned form to West Asian countries, U.K., Canada and USA. Being the world's fourth most cultivated crop, with a production of 130 million tonnes and area of 5.2 million hectares, the tomato is an indispensable vegetable crop world over and, of course, for India.

India is the second largest producer of tomato in the world after China having an area of 808.50 million hectares with a production of 19696.90 million tonnes during 2016-17 (Anonymous, 2017).

In India, tomato crop is mainly grown in the states of Odisha, Andhra Pradesh, Madhya Pradesh, Karnataka, West Bengal, Chhattisgarh, Telangana, Bihar, Gujarat, Rajasthan and Uttar Pradesh etc.

In Rajasthan, tomato crop is mainly grown in Jaipur, Dausa, Alwar, Tonk, Dholpur, Bharatpur and Chittorgarh districts etc. In Rajasthan, tomato is cultivated over an area of 85.00 million hectares with an annual production of 21.00 million tonnes (Anonymous, 2017).

Tomato is one of the most important "protective foods" because of its special nutritive value. Tomato is grown for its edible fruits, which can be consumed either fresh or in processed form and is a very good source of vitamin A, B, C and minerals as well as lycopene-natural antioxidant. It has niacin 0.712 mg, calcium 31 mg and water 94.28 g per hundred g weight . So tomatoes are called as 'Poor man's fruit'. The crop is grown from almost MSL to an altitude of 1500 m in tropical and subtropical regions, with an annual rainfall of 60-150 cm. Well drained sandy loam soil with high level of organic contents is suitable for tomato cultivation. Soil with high acidity is not suitable for tomato cultivation. Tomato is highly sensitive to abiotic stresses especially extreme temperature, salinity, drought, excessive moisture and environmental pollution and biotic stresses. Tomato plants are suffered with large number of biotic stresses including insect pests and diseases from the time of emergence to harvest. It suffers with various diseases incited by fungi, bacteria, viruses, nematodes etc. in several countries. Large number of fungal diseases occur in tomato,

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***Alternaria* blight disease rating scale on tomato**

Disease rating /grade	Per cent leaf area affected	Description	Disease reaction
0	-	No symptoms on the leaf, fruit	Immune (I) or Highly resistant (HR)
1	0.1-5.0	leaf area infected and covered by spot, no spot on petiole and branches, fruits	Resistant (R)
2	5.1-10.0	leaf area infected and covered by spot, some spots on petiole, branches, fruits	Moderately resistant (MR)
3	10.1-25.0	leaf area infected and covered by spot, spots also seen on petiole, branches, fruits	Moderately susceptible (MS)
4	25.1-50.0	leaf area infected and covered by spot, spots also seen on petiole, branches, fruits	Susceptible (S)
5	>50.0	leaf area infected and covered by spot, spots also seen on petiole, branches, fruits	Highly susceptible (HS)

among which Early blight also known as target spot disease incited by *Alternaria solani* is very important. *Alternaria* blight caused by *A. alternata* (Fr.) Keissler is one of the most catastrophic disease. It is very difficult to manage *Alternaria* blight because the pathogen has wide host range, extreme variability in pathogenic isolates and prolonged active phase of the disease cycle. The causal organism is air borne and soil inhabiting and is responsible for early blight, collar rot and fruit rot of tomato.

## MATERIALS AND METHODS

During the course of present investigation, all the experiments were carried out during *Zaid* 2017 and 2018 in the Department of Plant Pathology and also at the Horticulture Research Farm, S.K.N. College of Agriculture, Jobner, Sri Karan Narendra Agriculture University, Jobner, Jaipur (Rajasthan). Jobner is situated at latitude 26°5' N, longitude of 75°20' E and altitude of 427 meters above MSL (mean sea level). The region falls under semi-arid eastern plain (Agro Climatic Zone- III A) of Rajasthan. In order to find out resistant source against the *Alternaria* blight disease, an experiment was laid out in RBD. Twenty one cultivars of tomato were screened against *Alternaria* blight under artificial inoculation conditions during *Zaid* 2017 and 2018 seasons at Horticulture Farm, S.K.N. College of Agriculture, Jobner. Seeds of different varieties of tomato were obtained from ICAR-Indian Institute of Vegetable Research Varanasi (UP). They were graded

according to the techniques mentioned below. One month old seedlings were transplanted in the area of 2.4 m X 2.25 m with spacing of 60 cm X 45 cm. Inoculum was applied after 15 days of transplanting crop per cent disease intensity was recorded up to 90 DAT by using 0-5 rating scale. The disease intensity was assessed by grading forty leaves of ten tagged plants randomly selected from all the varieties by using 0-5 scale. Per cent disease index (PDI) was calculated by using following formula

$$PDI = \frac{\text{Sum of the individual disease ratings}}{\text{Number of fruits/leaves observed} \times \text{Maximum disease grade}} \times 100$$

## RESULTS AND DISCUSSION

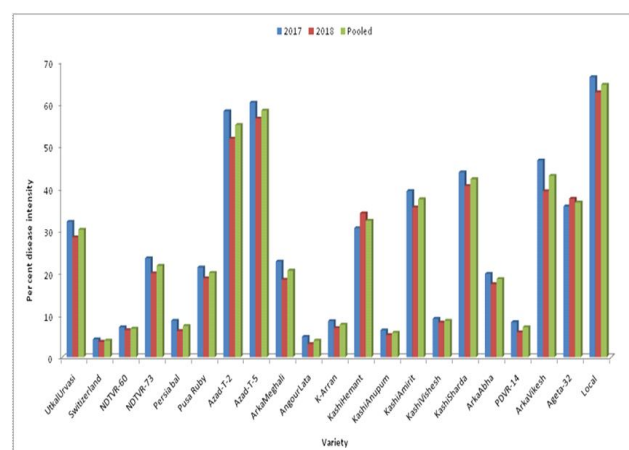
Twenty one varieties of tomato were screened under artificial inoculation field conditions against *Alternaria* blight disease. The observations on disease intensity on various varieties were recorded and were categorized as per their reaction. The results of pooled data (Table 1 and Fig.1) revealed that none of tomato entry was found completely free from the disease but Switzerland and AngourLata were found resistant as it showed 3.96 % and 3.97 disease intensity. KashiAnupum, NDTV-60, PDVR-14, Persia Bal, K-Arran and KashiVishesh variety were found moderately resistant as they showed 5.80, 6.78, 7.11, 7.43, 7.73 and 8.66 per cent disease intensity. Further, four varieties namely NDTV-73, Pusa Ruby, Arkameghali and ArkaAbha were found moderately susceptible whereas, UtkalUrvasi, KashiHemant, KashiAmirit,

**Table 1:** Screening of tomato varieties against *Alternaria alternata* in artificial epiphytotic field conditions

Variety	Per cent disease intensity*			Host reactions
	2017	2018	Pooled	
UtkalUrvasi	32.10	28.4	30.25	R
Switzerland	4.26	3.66	3.96	R
NDTVR-60	7.11	6.45	6.78	MR
NDTVR-73	23.46	19.88	21.67	MS
Persia bal	8.65	6.21	7.43	MR
Pusa Ruby	21.28	18.70	19.99	MS
Azad-T-2	58.30	51.80	55.05	HS
Azad-T-5	60.35	56.57	58.46	HS
ArkaMeghali	22.68	18.38	20.53	MS
AngourLata	4.83	3.11	3.97	R
K-Arran	8.56	6.90	7.73	MR
KashiHemant	30.60	34.12	32.36	S
KashiAnupum	6.37	5.23	5.80	MR
KashiAmirit	39.40	35.50	37.45	S
KashiVishesh	9.10	8.22	8.66	MR
KashiSharda	43.82	40.60	42.21	S
ArkaAbha	19.76	17.32	18.54	MS
PDVR-14	8.32	5.90	7.11	MR
ArkaVikesh	46.65	39.35	43.00	S
Ageta-32	35.74	37.60	36.67	S
Local	66.40	62.80	64.60	HS

\*Average of three replications

Reaction category: R (Resistant) = upto 0.1-5.0 per cent leaf area infected, MR (Moderately resistant) = 5.1-10.0 per cent leaf area infected, MS (Moderately susceptible) = 10.1-25.0 per cent leaf area infected, S (Susceptible) = 25.1-50.0 per cent leaf area infected, HS (Highly susceptible) = >50.0 per cent leaf area infected

**Fig. 1 :** Screening of tomato varieties against *Alternaria alternata* in artificial epiphytotic field conditions

KashiSharda, ArkaVikesh and Ageta-32 were found susceptible to the disease. Remaining varieties viz Azad-T-2, Azad-T-5 and Local were found highly susceptible to the disease.

Testing of resistance is a continuous process due to evolution of new biotypes of the pathogen or break down of resistance in host genotypes. Combating plant disease through host resistance is an economic, ecologically safe and a viable proposition for disease management. Monoculture/lack of diversity, pre-dispose a crop to disease and the situation is more alarming in cases where pathogen evaluation frequently takes place. Twenty one varieties were tested for their resistance to *Alternaria* blight of tomato. Variety Switzerland and AngourLata were found resistance, while NDTV-60, Persia Bal, K-arran, KashiAnupum, KashiVishesh and PDVR-14 were found moderately resistance. Similar results have also been obtained by Kumar and Srivastava (2013); Sahu *et al.* (2014); Yadav *et al.* (2014); Chohan *et al.* (2015); Kumar *et al.* (2015) and Rani *et al.* (2015). Kumar and Barnwal (2017) noted reactions that varied with the cultivars. The mean disease intensity ranged from 16.0 to 40.7%. whereas eight varieties namely PusaRohini, BT 12, ArkaMeghali, PusaUphar, SwarnSamridhi, SwarnLalima, ArkaAbha and PusaRubi showed moderately susceptible reactions. The cultivars, SwarnBaibhav, BT10 and S-22 showed susceptible reaction against early blight disease. Two varieties *i.e.*, ArkaVikas and SwarnSampada were found moderately resistant against early blight. The cultivars, SwarnSampada recorded highest yield (233.6 q/ ha), which was at par with cultivar ArkaMeghali (213.5 q/ ha). The next higher yielder in order to superiority were ArkaVikas (210.6 q/ha), SwarnLalima (206.4 q/ ha) and SwarnSamridhi (202.6 q/ ha).

Twenty one varieties were screened against *Alternaria alternata* under artificial inoculation in field conditions. Based on disease reaction, tomato varieties were grouped into six categories. On the basis of two years observations, it was recorded that none was found highly resistant (HR) against *Alternaria* blight disease. Two varieties Switzerland and AngourLata were resistant (R), five varieties NDTV-60, Persia Bal, K-Arran, KashiAnupum, KashiVishesh and PDVR-14 were moderately resistant (MR), four varieties NDTV-73, Pusa Ruby, ArkaMeghali and ArkaAbha were moderately susceptible (MS), six varieties UtkalUrvasi, KashiHemant, KashiAmirit, KashiSharda, ArkaVikesh and Ageta-32 were found susceptible (S) and three varieties viz., Azad-T-2 Azad-T-5 and Local were highly Susceptible (HS).

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