Int.J.Curr.Microbiol.App.Sci (2021) *10*(03): 543-548

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 10 Number 03 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1003.071

Status of Septoria Leaf Spot (*Septoria lycopersici. Speg.*) of Tomato (*Solanum lycopersicum* L.) in North and Central Kashmir Areas of J & K

Aabida[1], Sabiha Ashraf[2*], Tariq A. Shah[1], Hilal A. Malik[3], Shaheena A. Nagoo[2] and Z. I. Buhroo[2]

[1]Division of Plant Pathology, [2]College of Temperate Sericulture, [3]Krishi Vighyan Kendra, Sher-e Kashmir University of Agricultural Sciences and Technology of Jammu, J&K, India

**Corresponding author*

Keywords

Leaf spot, Septoria, *Solanum lycopersicum*, Status, Tomato, Kashmir

Article Info

Accepted:
07 February 2021
Available Online:
10 March 2021

A B S T R A C T

Tomato (*Solanum lycopersicum* L.) regarded as poor man's apple is one of the most remunerable and amply cultivated vegetable crop belonging to family Solanaceae. Among several diseases affecting tomato, Septoria leaf spot has procured the status of a major disease and was prevalent in all the three districts of the valley surveyed during kharif, 2018 with overall disease incidence and intensity of 61.86 per cent and intensity 33.39 per cent. The highest disease incidence (71.96%) and intensity (36.66%) was recorded in district Budgam and least in district Kupwara (52.78% and 29.90%) respectively. Among three locations surveyed, Arigam of district Budgam exhibited highest disease incidence (81.57%) and intensity (47.32%) and Dolipora and Matipora of district Kupwara exhibited least disease incidence (40.92%) and intensity (18.37%) respectively.

Introduction

Tomato (*Solanum lycopersicum* L., Syn. *Lycopersicum esculentum* Mill.) originated in Andean region of South America, belongs to the family Solanaceae (Bosewell, 2000). It is one of the most requital and widely grown vegetable in the world (Peralta and Spooner, 2007). It is the second most consumed vegetable after potato and ranks first among the processing crops and unquestionably the most popular garden crop (FAO, 2007). As it is relatively short duration crop and gives a high yield, it is economically attractive and the area under cultivation is increasing quotidianly (Srinivasan, 2010). In India, it is being cultivated over an area of 7,99,000 ha with an annual production of 19,542 thousand MT (Anonymous, 2017a). Tomato for its high nutritive value is also being cultivated in Jammu and Kashmir on commercial scale besides in kitchen gardens during *Kharif* season over an area of 1840 ha with annual production of 50273 metric tons (Anonymous, 2017b).

Farmers get lower yield mostly due to pests, diseases and sub-optimal fertilization. Under

field conditions several fungal, bacterial and some viral diseases of tomato contribute to severe yield loss of tomato (Akram *et al.*, 2014). Among fungal diseases, Septoria leaf spot is probably the most common foliar diseases of field grown tomatoes causing yield loss of up to 100% (Mc Grath, 2015). The disease chiefly attacks leaves and is characterized by small circular water soaked spots which on enlargement develop dark margins and grey centres (Singh, 2018).

The disease causes severe leaf spot resulting in a heavy defoliation of the leaves, this prevents normal fruit production and matured fruits are subjected to sunscald. Keeping in view the economic importance of tomato crop and the disease in the valley, the aim of this study was to determine the extent of damage caused by the disease.

Materials and Methods

Field survey of commercially important vegetable growing belts in the districts of Budgam (Central Kashmir), Baramulla and Kupwara (North Kashmir) was carried out during kharif (August – September 2018). Each district was represented by three locations and each location by three sites. From each site 20 plants were randomly selected and from each plant 25 leaves were assessed to record the incidence and intensity of the disease. In all 500 leaves from each of the sites collected in the perforated polythene bags were brought to the laboratory for the assessing disease incidence and intensity.

Assessment of disease incidence

Disease incidence was calculated as per formula:

Disease incidence (%) =

$$\frac{No\ of\ diseased\ leaves}{Total\ no.of\ leaves\ examined} \times 100$$

Assessment of disease intensity

Per-cent disease intensity was calculated by adapting 0-5 scale given by Joshi (2011)[Plate 1].

The leaves were grouped in 6 categories as follows:

Category	Grade/numerical value	Per cent leaf area infected
I	0	Leaves free from spots
II	1	0-5 % leaf area infected and covered by spots
III	2	6-20 %leaf area infected and covered by spots
IV	3	21-40%leaf area infected and covered by spots
V	4	41-70%leaf area infected and covered by spots
VI	5	>70%leaf area infected and covered by spots

Per cent disease intensity (PDI) was calculated by using formula:

$$Per\ cent\ disease\ intensity = \frac{\Sigma(n \times v)}{N \times G} \times 100$$

Where,

∑ = Summation
n = Number of leaves in each category
v = Numerical value of the category
N = Total no of leaves examined
G = Highest grade value

Results and Discussion

The data presented in (Table 1 and Fig. 1) divulges that Septoria leaf spot of tomato was prevalent in all the locations of districts surveyed with varying levels of incidence ranging from 40.92 to 81.57 per cent and mean disease incidence of 61.86 per cent. Highest disease incidence of 81.57 per cent was recorded at Arigam site of district Budgam and lowest disease incidence of 40.92 per cent was recorded at Dolipora site of district Kupwara. Amongst the districts surveyed, highest disease incidence was recorded in district Budgam (71.96%) followed by district Baramulla (63.14%) while as the district Kupwara (52.78%) exhibited the least disease incidence.

Table.1 Incidence and intensity of Septoria leaf spot of tomato in North and Central Kashmir during 2018

District	Locations	Sites	Per cent disease incidence	CI**	Per cent disease intensity	CI**
Kupwara	Hechimarg	Hechimerg	60.50	47.09-58.45	42.18	23.52-36.35
		Tumna	49.75		23.40	
		Falmarg	56.20		38.43	
	Hafrada	Hafrada	50.19		37.96	
		Wudir	65.60		27.18	
		Matipora	49.39		18.37	
	Dhama	Dhama	51.63		29.61	
		Padder Gund	53.80		31.58	
		Dolipora	40.92		20.72	
Submean			**52.78**		**29.90**	
Baramulla	Arampora (Baramulla)	Arampora	69.46	58.08-68.20	43.36	28.19-38.96
		Janbazpora	52.13		24.25	
		Chakul	58.60		31.63	
	Palhallan	Saderbal	61.36		32.06	
		Bhat mohalla	72.19		41.83	
		Zangam	59.42		25.13	
	Arampora	Yaseen colony	70.36		40.50	
		Hanfiya colony	64.83		33.82	
		Bypass road	60.15		29.63	
Sub mean			**63.14**		**33.58**	
Budgam	Chadoora	Awanpora	75.88	66.37-77.56	42.12	30.69-42.62
		Tanghar	60.38		28.30	
		Hispora	73.20		33.65	
	Narbal	Kawoosa	77.40		40.08	
		Soizate	68.71		23.54	
		Goripora	72.48		38.10	
	Khansahib	Bugroo	76.85		44.18	
		Ichgam	61.19		32.63	
		Arigam	81.57		47.32	
Sub mean			**71.96**		**36.66**	
Overall mean			**61.86**	58.47-66.78	**33.39**	30.25-36.53

** Confidence interval

Fig.1 Incidence and intensity of Septoria leaf spot of tomato during 2018

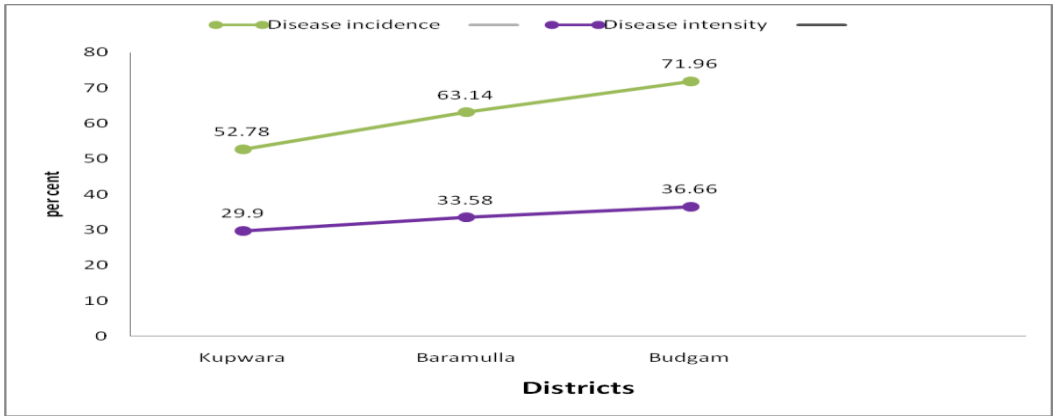

Plate.1

Statistical analysis of the surveyed data revealed that the limits for the average disease incidence fluctuated between 66.37 to 77.56 per cent for Budgam district, 58.08 to 68.20 per cent in Baramulla district and 47.09 to 58.45 per cent in Kupwara district. However, the average statistical limits in all the three districts at all the locations fluctuated between 58.47 to 66.78 per cent for disease incidence. The data on disease intensity (Table 1 and Fig.1) reveals varying levels of intensity ranging from 18.37 to 47.32 per cent. Highest disease intensity (47.32%) was recorded at Matipora site of district Kupwara. Other locations supporting higher disease intensity were Bugroo (44.18%), Awanpora (42.12%), Kawoosa (40.08%) from district Budgam and Arampora (43.36%), Bhat mohallah (41.83%) followed by Yaseen colony (40.50%) from district Baramulla and Hechimarg (42.18%) and Falmarg (38.43%) from district Kupwara. The highest disease intensity was recorded in district Budgam (36.66%) followed by district Baramulla (33.58%) while as the district kupwara (29.90%) exhibited the least disease intensity. Statistical analysis of the surveyed data revealed that the limits for average disease intensity in districts fluctuated

between 30.69 to 42.62 per cent for Budgam, 28.19 to 38.96 per cent for Baramulla and 23.52 to 36.35 per cent for Kupwara, while as the average statistical limits fluctuated between 30.25 to 36.53 per cent for disease intensity.

During the course of survey, it was observed that majority of the farmers used to raise tomato crop in fields without offering significant plant spacing, as well as adaption of staking process and continuous monoculturing. Higher disease incidence and intensity could be attributed to these factors as Septoria leaf spot becomes more serious when the foliage has become sufficiently dense to restrict air movement within the canopy. After canopy closure the humidity remains high and water on leaf surfaces either due to rainfall or irrigation facilities tends to dry slowly and leaves stay wet longer and this provides optimum conditions for infection by the fungus. Variability in incidence and intensity of the disease from place to place has also been reported by many workers (Sohiand Sokhi, 1973 and Khan, 2000)

Acknowledgement

I sincerely acknowledge the support from Division of Plant Pathology, Sher-e Kashmir University of Agricultural Sciences and Technology of Kashmir for providing facilities during the conduct of this survey program.

Competing interest

The authors declare that there is no competing interest in the publication of this manuscript.

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How to cite this article:

Aabida, Sabiha Ashraf, Tariq A. Shah, Hilal A. Malik, Shaheena A. Nagoo and Buhroo, Z. I. 2021. Status of Septoria Leaf Spot (*Septoria lycopersici. Speg.*) of Tomato (*Solanum lycopersicum* L.) in North and Central Kashmir Areas of J & K. *Int.J.Curr.Microbiol.App.Sci.* 10(03): 543-548. doi: https://doi.org/10.20546/ijcmas.2021.1003.071