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PREVALENCE OF EARLY BLIGHT OF TOMATO (*ALTERNARIA SOLANI*) IN IRRIGATED NORTHWESTERN PLAIN OF RAJASTHAN, INDIA

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ABSTRACT

Tomato (*Solanum lycopersicum* Linnaeus) is an important vegetable crop belonging to the family Solanaceae. The early blight of tomato caused by *A. solani* is the major constraint for the production and productivity of tomato. To find out the status of early blight, a roving survey was conducted to record early blight disease intensity during two *Rabi* seasons (2022-23 and 2023-24), covering 150 tomato growing fields of 30 villages in Sriganganagar and Hanumangarh region under Zone IB (irrigated northwestern plain) of Rajasthan, India. Alternaria blight disease appeared in all the surveyed areas of the regions. In Sriganganagar, the early blight intensity ranged from 18.09 to 39.36 per cent with an average of 29.96 per cent during 2022-23. During 2023-24, the average per cent disease intensity was 35.94, with a range from 19.01 to 41.01 percent. In Hanumangarh district, the early blight intensity was less compared to Sriganganagar, ranging from 17.01 to 33.34 and 18.14 to 39.13 percent with an average of 25.24 and 28.34 percent during 2022-23 and 2023-24, respectively. The maximum disease intensity was observed at village Kararwala, in Sadulsahar tehsil of Sriganganagar (39.36 & 41.01%) during 2022-23 and 2023-24, respectively. Whereas, in Hanumangarh district village Likhamisar of Sangria tehsil recorded maximum disease intensity (33.34 & 39.13%) during both the years. Overall, our study provides evidence on the status of early blight severity with cultivars adopted by the farmers, which is helpful in the selection of resistant cultivars and developing stable disease management strategies.

Key words: Early blight, Alternaria, survey, disease intensity, and Tomato

Introduction

Tomato, scientifically known as *Solanum lycopersicum* L., is a member of the Solanaceae family and its origins to tropical America (Thompson and Kelly, 1957). It stands as one of the most economically significant and widely consumed solanaceous vegetables, second only to the potato. Despite being a herbaceous perennial, it is cultivated as an annual vegetable crop. Tomatoes are versatile, enjoyed both fresh and in various processed forms such as ketchup, pickles, powders, pastes and canned whole fruits. India stands as the world's second-largest producer of tomatoes following China, with a sprawling cultivation area spanning 0.849 million hectares and a robust production of 20.46 million tones recorded

during the 2022-23 period. The cultivation of tomatoes in India is primarily concentrated in states such as Odisha, Andhra Pradesh, Madhya Pradesh, Karnataka, West Bengal, Chhattisgarh, Telangana, Bihar, Gujarat, Rajasthan, and Uttar Pradesh. Rajasthan, specifically, contributes significantly to India's tomato cultivation landscape, covering an expanse of 18.63 thousand hectares and yielding an impressive annual production of 2.33 lakh tones. Within Rajasthan, prominent tomato-growing regions include Jaipur, Sirohi, Dausa, Alwar, Tonk, Dholpur, Bharatpur and Chittorgarh, alongside Sriganganagar and Hanumangarh districts. Among these, Jaipur takes the lead in both area under cultivation and production, boasting 12.60 thousand hectares and 1.63

lakh tones of production, respectively (Anonymous, 2021). Notably, Sriganganagar contributes to the state's tomato production with 19 hectares under cultivation and an annual output of 114 tones (Anonymous, 2021). This comprehensive distribution of tomato cultivation across various regions of Rajasthan underscores the state's significant role in India's tomato production landscape, highlighting the diverse agricultural prowess within the country.

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 (Mark and Brooke 2006). More than 200 diseases have been reported to infected tomato in the world (Atherton and Rudich, 1986). Large number of fungal diseases such as Alternaria blight (*Alternaria alternata*), Early blight (*Alternaria solani*), Late blight (*Phytophthora infestans*), Septoria leaf blight (*Septoria lycopersici*), Powdery mildew (*Oidiopsis taurica*), Fusarium wilt (*Fusarium oxysporum* f. sp. *lycopersici*), Collar rot (*Sclerotium rolfsii*) and Damping off (*Pythium* sp.) are causes severe losses in tomato. Among the fungal diseases, early blight caused by *Alternaria solani* is one of the most important and frequently occurring disease of the crop nation and worldwide (Jones *et al.*, 1993).

Alternaria solani causing early blight of tomato is a serious disease, causing 50% to 86% losses in fruit yield and 20% to 40% losses in seedling establishment (Saha *et al.*, 2012 and Abada *et al.*, 2008). 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 (Datar and Mayee, 1981).

The disease, favored by high temperature and humidity (crowded plantation, high rainfall and extended period of leaf wetness from dew) and plants are more susceptible to the blight infection during fruiting period (Gondal *et al.*, 2012). While the fungus can persist on infected seeds for several days, its role as a primary source of infection in subsequent seasons remains speculative (Neergaard, 1945). *Alternaria solani* overwinters in infected plant debris or soil, maintaining viability for at least one and possibly multiple years. This comprehensive understanding of *Alternaria solani* biology and pathogenicity underscores the critical need for effective management strategies to mitigate its impact on tomato production and safeguard global food security.

Table 1: Alternaria blight disease rating scale.

Rating Scale	Description
0	No symptoms on the leaf, fruit
1	0-5% leaf area infected and covered by spots, no spot-on petioles and branches, fruits
2	5.1-20% leaf area infected and covered by spots, some spots on petioles, branches, fruits
3	20.1-40% leaf area infected and covered by spots, spots also seen on petioles, branches, fruits
4	40.1-70% leaf area infected and covered by spots, spots also seen on petioles, branches, fruits
5	>70% leaf area infected and covered by spots, spots also seen on petioles, branches, fruits
Per cent disease intensity of each plot was calculated by following the formula (Wheeler, 1969).	

Materials and Methods

A survey was carried out in Sriganganagar and Hanumangarh districts of Rajasthan state during the Rabi season, 2022-23 and 2023-24 to observe the prevalence of early blight of tomato caused by *Alternaria solani*. Three tehsils namely Sadulshahar, Padampur and Kesrisinghpur under Sriganganagar and Tibbi, Sangria and Pilibanga under Hanumangarh district and five villages under each tehsil were selected. Under each village, five farmer's fields were selected for assessed. Selected a large number of diseased samples of tomato plants showing the characteristic symptoms of early blight were collected from farmer's field in villages of Sriganganagar and Hanumangarh districts and also from research farm of ARS, Sriganganagar. In each field, plants were selected randomly and the per cent disease intensity of early blight of tomato was recorded starting from its first appearance and till the crop maturity at weekly interval by using 0-5 scale of Mckinney *et al.*, (1923). The following rating scale was used for Early blight disease of tomato:

$$\text{Percent disease intensity} = \frac{\text{Sum of the individual disease ratings}}{\text{Total no. of leaves observed} \times \text{Maximum grade}} \times 100$$

Results and Discussion

A survey was conducted across three tehsils situated in Sri Ganganagar and Hanumangarh districts, encompassing five villages within each tehsil. During survey, natural blight symptoms expressed a wide range of variability in respect of their shape, size, colour and presence or absence of concentric zonation etc. The focus of the survey was to assess the severity of early blight on tomato. Data on the severity of early blight was recorded for each village, likely using a scale of measurement. In Sri Ganganagar district the survey was

Table 2: Per cent Disease Intensity of early blight of tomato incited by *A. solani* in Sri Ganganagar District during *Rabi* 2022-23 and 2023-24.

District	Tehsil	Village	Disease intensity (%)		Mean PDI
			2022-23	2023-24	
Sri Ganganagar	Sadulshahar	Hathyawala	29.27	31.85	30.56
		24 KSD	35.26	39.45	37.36
		Kararwala	39.36	41.01	40.19
		Patli	27.36	29.65	28.51
		Gadder khera	21.16	32.25	26.71
		Mean	30.48	34.84	32.66
	Padampur	Fakirawali	20.51	23.12	21.82
		Ridmalsar	18.09	20.14	19.12
		28 BB	26.66	28.12	27.39
		Sawantsar	21.02	24.12	22.57
		36 RB	27.05	19.01	23.03
		Mean	22.67	22.90	22.78
	Kesrisinghpur	Matili Rathan	33.93	39.91	36.92
		17 F	35.67	40.05	37.86
		Kaminpura	39.16	32.25	35.71
		18 F	36.78	39.45	38.12
		Fusewala	29.96	35.94	32.95
		Mean	35.10	37.52	36.31
		Over all mean	29.42	31.75	30.59

conducted across fifteen villages in three tehsils: Sadulshahar, Padampur and Kesrisinghpur. The average disease intensity during the *Rabi* seasons of 2022-23 and 2023-24 ranged from 19.12% to 40.19%. The highest intensity was at Kararwala village (40.19%) in Sadulshahar tehsil, while the lowest was at Ridmalsar village (19.12%) in Padampur tehsil. In Sadulshahar tehsil, the highest Intensity was at Kararwala village (40.19%), followed by 24 KSD village (37.36%), Hathyawala village (30.56%), Patli village (28.51%) and the lowest at Gadder khera village (26.71%). In Padampur tehsil, the highest intensity was at 28 BB village (27.39%), followed by 36 RB village (23.03%), Sawantsar village (22.57%), Fakirawali village (21.82%) and the lowest at Ridmalsar village (19.12%). In Kesrisinghpur tehsil, the highest intensity was at 18 F village (38.12%), followed by 17 F village (37.86%), Matili Rathan village (36.92%), Kaminpura village (35.71%) and the lowest at Fusewala village (32.95%). The average disease intensity for the district was recorded at 30.58%. Data on the prevalence of Early blight disease of tomato summarized under (Table 2).

In Hanumangarh district fifteen villages across three tehsils (Tibbi, Sangaria and Pilibanga) was covered for survey during the *Rabi* seasons of 2022-23 and 2023-24, the average disease Intensity ranged from 16.28% to 36.24%. The highest intensity at Likhamsar village (36.24%) in Pilibanga tehsil, while the lowest was at 6

NTW village (16.28%) in Sangria tehsil. In Tibbi tehsil, the highest intensity was at Jhamber Kamrani village (31.29%), followed by Surewala village (30.34%), Meharwala village (29.19%), Sherekan village (24.04%) and the lowest at Salemgarh Masani village (23.29%). In Sangaria tehsil, the highest intensity was at Dhaban village (23.39%), followed by Nathwana village (21.83%), 2 MJD village (20.99%) and 3 NTW village (19.90%). In Pilibanga tehsil, the highest intensity was at Likhamsar village (36.24%), followed by Thirajwala village (34.52%), 16 PBN village (32.18%), 18 MOD village (28.07%) and the lowest at 18 PBN village (27.16%). The district's average disease intensity was recorded at 26.57%. Data on the prevalence of Early blight disease of tomato summarized under (Table 3).

During the survey (*Rabi* 2022-23 & 2023-24), it was found that the early blight disease was prevalent in all villages of Sriganganagar and Hanumangarh districts and Average per cent disease intensity was ranged from (19.12 – 40.19% and 16.28 – 36.24%, respectively) on the tomato crop. The maximum disease intensity was observed in district Sriganganagar (40.19%) and minimum disease intensity was also observed in district Sriganganagar (19.12%). A survey conducted by Kamble *et al.*, (2009) in Konkan region of Maharashtra State, it was found that early blight disease intensity in Raigad district ranged between 20.78 to 42.30 per cent and 35.12 to 55.75 per cent in Thane district. Mahantesh *et al.*,

Table 3: Per cent Disease Intensity of early blight of tomato incited by *A. solani* in Hanumangarh District during *Rabi* 2022-23 and 2023-24

District	Tehsil	Village	Disease intensity (%)		Mean PDI
			2022-23	2023-24	
Hanumangarh	Tibbi	Salemgarh Masani	21.23	25.35	23.29
		Sherekan	25.63	22.45	24.04
		Jhambher Kamrani	29.32	33.26	31.29
		Surewala	31.52	29.15	30.34
		Meharwala	26.31	32.06	29.19
		Mean	26.80	28.45	27.63
	Sangria	Nathwana	20.53	23.12	21.83
		2 MJD	17.01	24.96	20.99
		6 NTW	18.25	20.66	16.28
		Dhaban	20.12	26.65	23.39
		3 NTW	21.66	18.14	19.90
		Mean	19.51	22.71	21.11
	Pilibanga	16 PBN	28.19	36.17	32.18
		Likhamisar	33.34	39.13	36.24
		18 MOD	23.96	32.17	28.07
		18 PBN	29.45	24.87	27.16
		Thirajwala	32.12	36.91	34.52
		Mean	29.41	33.85	31.63
		Over all mean	25.24	28.34	26.58

(2017) conducted a survey during *Kharif*, 2015 in Shivamogga and Davanagere districts of Karnataka, revealed that maximum per cent disease intensity was recorded in Nyamati village (47.25%) followed by village Savalanga (46.20%) of Davanagere district. In Shivamogga district maximum per cent disease intensity was recorded at Kommanal (42.50%) and minimum per cent disease intensity 22.35% was recorded in village Avarekoppa. Similarly, Kumar and Barnwal (2017) conducted a survey for early blight disease of tomato in seven villages across different blocks of Ranchi district (Jharkhand) during the *Rabi* season of 2013-14. They reported that the disease intensity ranged from 12.0% to 34.6%, depending on the locality.

The early blight disease was prevalent in all the tomato growing areas of southern Rajasthan viz, Udaipur, Rajsamand and Chittorgarh district during *Kharif*, 2014. The overall mean disease intensity ranged from 35.14 to 51.88% in open field and 33.94 to 69.28% in protected condition (Polyhouse) on different cultivars, respectively. The highest disease intensity (51.88%) was recorded in field condition on cultivar Nandani in district Rajsamand and the lowest level of disease recorded (35.14%) in district Udaipur on cultivar Global Omni, respectively. The highest disease intensity in protected condition (polyhouse) was recorded (69.28%) on cultivar Mithili in district Rajsamand and lowest intensity (33.94%) recorded in district Udaipur on cultivar NUN-7711, respectively

(Soni *et al.*, 2017).

Conclusion

From the study it is clearly evident that during the survey, occurrence of early blight of tomato was observed in serious proportion, inflicting heavy losses in different areas of Sriganganagar and Hanumangarh region under irrigated northwestern plain (Zone IB) of Rajasthan, India. Considering the seriousness of the disease, the present investigation was carried out on disease intensity related information on this important pathological problem, which can help in the development of suitable management strategies to prevent crop losses. The mean early blight intensity was observed 29.46 & 35.94 percent, during 2022-23 and 2023-24, respectively, in Sriganganagar district. Whereas, in Hanumangarh district, the early blight intensity was less compared to Sriganganagar, i.e. 25.24 & 28.34 percent, during 2022-23 and 2023-24, respectively. Overall, our study provides evidence on the status of early blight of tomato with cultivars adopted by the farmers, which are helpful in developing stable disease management strategies.

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References

- Abada, K.A., Mostafa S.H., Mervat R., Abada K.A., Mostafa S.H. and Mervat R. (2008). Effect of some chemical salts on suppressing the infection by early blight disease of tomato. *Egyptian Journal of Applied Science*, **23(20)**, 47-58.
- Atherton, J.G. and Rudich J. (1986). The Tomato crop. Chapman and Hall, London, New York. 661.
- Datar, V.V. and Mayee C.D. (1981). Assessment of losses in tomato yields due to early blight. *Indian Phytopathology*, **34**, 191-195.
- Gondal, A.S., Ijaz M., Riaz K. and Khan A.R. (2012). Effect of different doses of fungicide (*Mancozeb*) against *Alternaria* leaf blight of tomato in tunnel. *Journal Plant Pathology Microbiology*, **3(03)**.
- Jones, J.B., Jones J.P., Stall R.E. and Zitter T.A. (1993). Compendium of tomato diseases, *St. Paul. American Phytopathological Society, St. Paul, Minnesota, USA*, 28-29.
- Kamble, S.B., Sankeshwari S.B. and Arekar J.S. (2009). Survey on early blight of tomato caused by *Alternaria solani*. *International Journal of Agricultural Sciences*, **5(1)**, 317-319.
- Kumar, T.R. and Barnwal M.K. (2017). Survey and screening of tomato varieties against early blight (*Alternaria solani*) under field condition. *Contemporary Research in India*, **7(3)**, 188-193.
- Mahantesh, S.B., Karegowda C., Narayanaswamy H., Manu T.G. and Unithkumar N.D. (2017). Status of tomato early blight in Shivamogga and Davanagere districts. *Journal of Pharmacognosy and Phytochemistry*, **6(5)**, 2317-2319.
- Mark, L. Gleason and Brooke A. Edmunds (2006). Tomato diseases and disorders. *Physiological disorder*. **12**.
- McKinney, H.H. (1923). Influence of soil temperature and moisture on infection of wheat seedlings by *Helminthosporium sativum*. *Journal of Agriculture Research*, **26**, 195-217.
- Neergaard, P. (1945). Danish species of *Alternaria* and *Stemphylium*, *Hamphry Millfor*. Oxford University Press, London, 566.
- Saha, P. and Das S. (2012). Assessment of yield loss due to early blight (*Alternaria solani*) in tomato. *Indian Journal of Plant Protection*, **40(3)**, 195-198.
- Soni, R., Tanwar, V.K. and Yadav S.M. (2017). Survey and Screening of genotypes against *Alternaria solani* caused early blight of tomato in southern part of Rajasthan. *Chemical Science Review Letters*, **6**, 1483-1489.
- Thompson, H.C. and Kelly W.C. (1957) Vegetable Crops. *McGraw Hill Book Company Inc.*, New York. N.Y. 611.
- Wheeler, B.E.J. (1969). An Introduction to Plant Diseases. *John Wiley and Sons Limited*, London, 301.