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Occurrence and distribution of *Alternaria* blight disease of sesame in major growing districts of Rajasthan state, India

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Abstract

Field survey was done during *kharif* 2019 in major sesame growing districts of Rajasthan viz., Pali, Sawai Madhopur, Jodhpur, Karauli, Bikaner, Ajmer and Jaipur, covering six agro climatic zones of the Rajasthan state, respectively. Survey was conducted in four villages from two Tehsil of each districts. During the survey small debate held with farmers concerned related to disease occurrence and severity. The results of the survey indicated that disease intensity of *Alternaria* blight of sesame was ranged from 12.90 percent to 44.09 percent in all surveyed field of various districts of Rajasthan. With 44.09 percent, Jaipur district had the highest mean disease intensity, followed by Karauli (34.02%), Swai Madhopur (33.99%), Pali (30.21%), Jodhpur (22.96%), and Ajmer (22.89%). The district of Bikaner had the lowest percentage of disease intensity, at 12.90 percent. Chomu tehsil in Jaipur district had the highest mean percent disease intensity of 44.58 percent, followed by Phulera tehsil with 43.60 percent. Bikaner tehsil in Bikaner district had the lowest mean percent disease intensity, with 12.35 percent, followed by Sri Durgapura tehsil with 13.45 percent.

Keywords: Survey, *alternaria*, intensity, sesame

Introduction

Sesame (*Sesamum indicum* L.) is an oldest valuable oilseed crop grown in more than 55 countries throughout the world. It is a member of the *Pedaliaceae* family and is native to India (Weiss, 1983). Sesame is known as the "Queen" of oilseeds due to its high quality edible oil (38 to 54%) and high protein content (18 to 25%). Sesame seed is high in protein (20%) and edible oil (50%) as well as oleic acid (47%) and linoleic acid (39%) acids (Shym and Hwang, 2002). Sesame is one of the earliest domesticated plants of India with an annual all season acreage of about 18-20 lakh ha. India ranks first position in both area and production (about 80 MT) of sesame in the world. In India sesame grow mainly under MP, UP, Rajasthan, Orissa, Gujarat, Karnataka, Chhattisgarh and Maharashtra (Anonymous, 2021) ^[1]. In Rajasthan, sesame occupied nearly 3.05 lakh ha area and total estimated production of sesame crop 12.59 MT with an average yield of 412 kg/ha (Anonymous, 2021) ^[1]. Mainly sesame growing districts in Rajasthan are Pali, Sawai Madhopur, Jodhpur, Karauli, Bikaner, Jalore, Bhilwara and Ajmer.

Sesame is attacked by a number of diseases viz., *Alternaria* blight disease (*Alternaria sesami*), Bacterial blight (*Xanthomonas campestris* pv. *sesami*), *Cercospora* leaf spot/White spot (*Cercospora sesami*), Damping off/Root Rot/Charcoal Rot (*Macrophomina phaseolina*), Powdery mildew (*Oidium erysiphe*), Sesame phyllody (Phytoplasma) and Fusarium wilt (*Fusarium oxysporum* f. sp. *sesami*). Among these diseases, at present *Alternaria* blight of sesame caused by *Alternaria sesami* (Kawamura) is widespread and has continued to be the major constraints in the production and productivity of sesame all over the country in general as well as in the state of Rajasthan particularly. The disease (*A. sesami*) has been reported to cause 20 to 40 percent yield losses all over India (Kumar and Mishra, 1992, Prasad and Reddy, 1997) ^[2, 4].

Keeping in view, a roving survey was planned in various major sesame growing districts of Rajasthan to assess the occurrence and distribution of *Alternaria* blight disease of sesame.

Materials and Methods

Surveys were conducted during the *Kharif* season of 2019 in major sesame growing districts of

Rajasthan viz., Pali, Sawai Madhopur, Jodhpur, Karauli, Bikaner, Ajmer and Jaipur. The selection of two villages from each tehsil was made randomly. To assess the disease intensity, two sesame fields were selected in each village in each tehsil of district and average disease intensity in each village was calculated. In each field, five spots of one square

meter area were marked diagonally at randomly to cover entire field.

In the selected sesame crop fields, 10 plants were randomly selected and recorded observations on blight disease intensity by applying 0-9 grade disease rating scale (Mayee and Datar, 1986)^[7], as detailed in following Table.

Table 1: Alternaria blight disease rating scale

Rating scale	Description
0	No symptoms on the leaf
1	Small, irregular brown spots covering 1 percent or less of the leaf area.
3	Small, round to irregular brown spots with concentric rings covering 1-10 percent of the leaf area
5	Round to irregular brown lesions enlarging, with concentric rings covering 11-25 percent of the leaf area.
7	Lesions enlarging and coalescing to form irregular brown patches with concentric rings and covering 26-50 percent of the leaf area. Lesions also appeared on stem petioles and pods.
9	Lesions enlarged coalesced to forming irregular, dark brown patches with concentric rings covering 51 percent or more of the leaf area. Lesions on stem petioles and pods.

Percent Alternaria blight disease intensity (PDI) was worked out by applying following formula (McKinney, 1923).

$$\text{Alternaria blight disease intensity (\%)} = \frac{\text{Sum of all numerical rating}}{\text{Total number of observation} \times \text{Highest grade in the scale}} \times 100$$

Table 2: Isolates of *A. sesami*, representing seven agro-climatic zones of the Rajasthan state

S. No	Agro-climatic zones	District	Tehsil	Village	Latitude	Longitude
1	Transitional Plain of Luni Basin	Pali	Sojat	Bagawas	25.8593	73.5554
				Lundawas	25.9934	73.6082
			Jaitaran	Rampura kalan	26.0838	73.8708
				Banjakundi	26.2898	73.9445
2	Humid S-E Plain	Sawai Madhopur	Gangapur City	Chhan	26.5190	76.8019
				Lalpur	26.4221	76.6937
			Swai Madhopur	Soorwal	26.1073	76.3469
				Kawad	26.0627	76.2570
3	Arid Western Plain	Jodhpur	Bilara	Khariya Mithapur	26.2100	73.7655
				Nokhara	26.1965	73.7217
			Borunda	Ghodawat	26.4946	73.7715
				Ransigaon	26.3497	73.7457
4	Flood Prone Eastern Plain	Karauli	Karauli	Barkhera	26.4612	76.9891
				Manch	26.4640	76.9216
			Nandoti	Lahawad	26.6456	76.7343
				Jeerna	26.6986	76.7343
5	Hyper Arid Partially Irrigated Western Plain	Bikaner	Bikaner	Khara	28.2002	73.3960
				Norangdesar	28.0732	73.5337
			Shri Dungargarh	Jetasar	28.4209	74.0481
				Benisar	28.0794	73.9103
6	Semi-Arid Eastern Plain	Ajmer	Ajmer	Saradhana	26.3400	74.5906
				Tabiji	26.3687	74.6246
			Puskar	Devnagar	26.5366	74.5696
				Banseli	26.5115	74.5591
7	Semi-Arid Eastern Plain	Jaipur	Phulera	Gumanpura	26.9395	73.3333
				Boraj	26.8833	75.4405
			Chomu	Rampura Dabri	27.1016	75.7413
				Moriya	27.1556	75.7584

Results

During the *Kharif* season of 2019, a field survey was conducted in seven important sesame-growing districts in Rajasthan, namely Pali, Sawai Madhopur, Jodhpur, Karauli, Bikaner, Ajmer and Jaipur, comprising six agro-climatic zones in the state. The survey was carried out in four villages from two tehsil of each district's. During the survey, farmers who were concerned about disease prevalence and severity had a little discussion. According to the survey's findings presented in Table 3 & Fig. 1 the disease intensity of Alternaria blight of sesame ranged from 12.90 percent to

44.09 percent in all studied fields across Rajasthan's several districts. Jaipur district had the highest mean disease intensity (44.09%) followed by Karauli (34.02%), Swai Madhopur (33.99%), Pali (30.21%), Jodhpur (22.96%), and Ajmer (22.89%). The district of Bikaner had the lowest percentage of disease intensity, at 12.90 percent. Chomu tehsil in Jaipur district had the highest mean percent disease intensity of 44.58 percent, followed by Phulera tehsil with 43.60 percent. Bikaner tehsil in Bikaner district had the lowest mean percent disease intensity, with 12.35 percent, followed by Sri Durgapura tehsil with 13.45 percent.

Table 1: Percent Disease intensity of Alternaria Blight of sesame in surveyed areas of Rajasthan during *Kharif* 2019

S. No	Agro-climatic zones	District	Tehsil	Village	Global Positioning System (GPS)		Percent disease intensity
					Latitude	Longitude	
1	Transitional Plain of Luni Basin	Pali	Sojat	Bagawas	25.8593	73.5554	30.56
				Lundawas	25.9934	73.6082	28.20
				Mean			29.38
			Jaitaran	Rampura kalan	26.0838	73.8708	32.40
				Banjakundi	26.2898	73.9445	29.68
	Mean			31.04			
2	Humid S-E Plain	Sawai Madhopur	Gangapur City	Chhan	26.5190	76.8019	34.39
				Lalpur	26.4221	76.6937	32.50
				Mean			33.44
			Swai Madhopur	Soorwal	26.1073	76.3469	35.90
				Kawad	26.0627	76.2570	33.20
	Mean			34.55			
3	Arid Western Plain	Jodhpur	Bilara	Khariya mithapur	26.2100	73.7655	22.37
				Nokhara	26.1965	73.7217	24.20
				Mean			23.28
			Borunda	Ghodawat	26.4946	73.7715	23.34
				Ransigaon	26.3497	73.7457	21.94
	Mean			22.64			
4	Flood Prone Eastern Plain	Karauli	Karauli	Barkhera	26.4612	76.9891	34.74
				Manch	26.4640	76.9216	32.53
				Mean			33.63
			Nandoti	Lahawad	26.6456	76.7343	33.71
				Jeerna	26.6986	76.7343	35.14
	Mean			34.42			
5	Hyper Arid Partially Irrigated Western Plain	Bikaner	Bikaner	Khara	28.2002	73.3960	11.24
				Norangdesar	28.0732	73.5337	13.46
				Mean			12.35
			Shri Dungargarh	Jetasar	28.4209	74.0481	14.60
				Benisar	28.0794	73.9103	12.31
	Mean			13.45			
6	Semi-Arid Eastern Plain	Ajmer	Ajmer	Saradhana	26.3400	74.5906	23.28
				Tabiji	26.3687	74.6246	21.47
				Mean			22.37
			Puskar	Devnagar	26.5366	74.5696	22.32
				Banseli	26.5115	74.5591	24.51
	Mean			23.41			
7	Semi-Arid Eastern Plain	Jaipur	Phulera	Gumanpura	26.9395	73.3333	44.43
				Boraj	26.8833	75.4405	42.78
				Mean			43.60
			Chomu	Rampura Dabri	27.1016	75.7413	45.78
				Morija	27.1556	75.7584	43.39
	Mean			44.58			

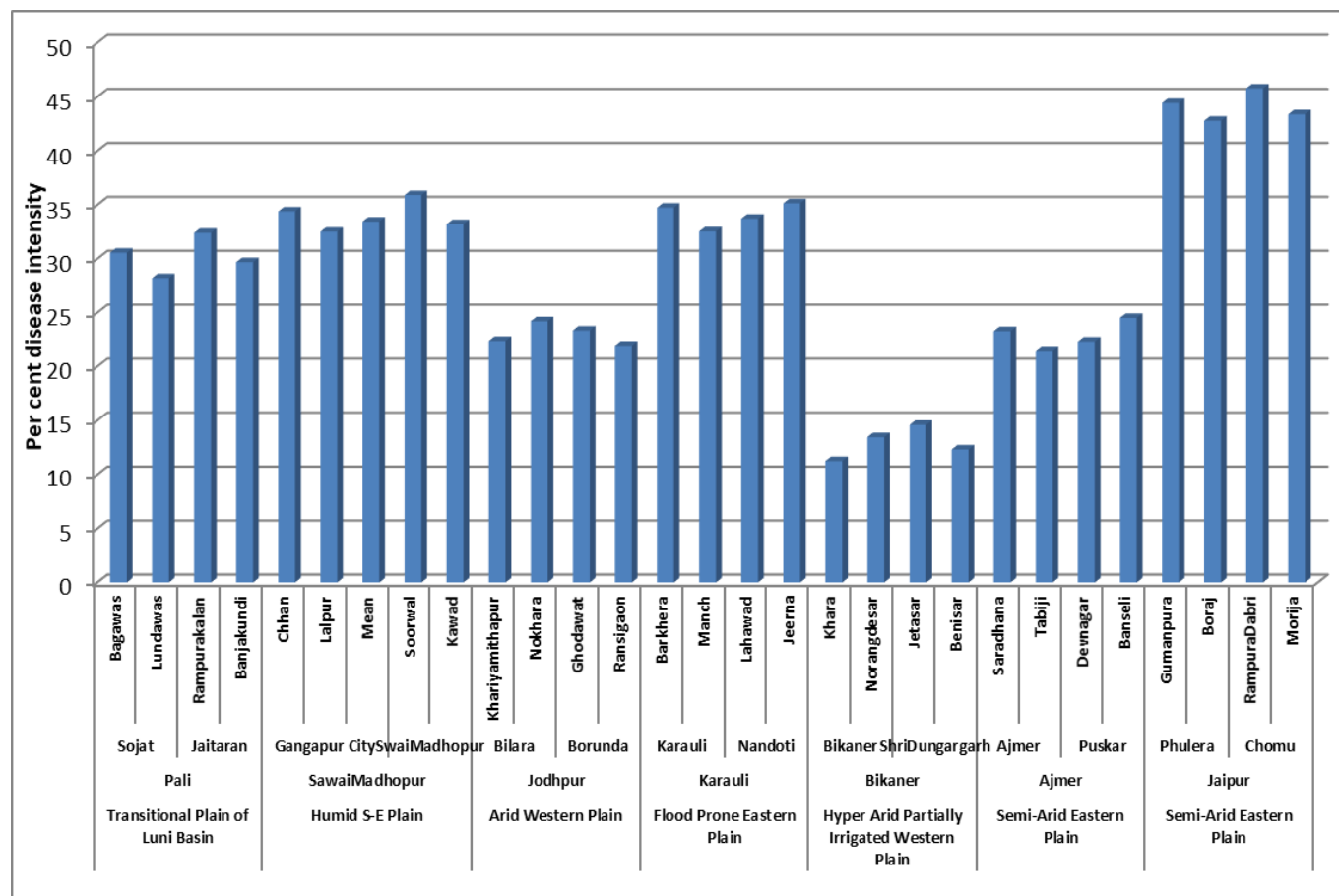


Fig. 1: Percent disease intensity of Alternaria Blight of sesame in surveyed area areas of Rajasthan during Kharif 2019

Discussion

Field survey was done during *kharif* 2019 in seven major sesame growing districts of Rajasthan viz., Pali, Sawai Madhopur, Jodhpur, Karauli, Bikaner, Ajmer and Jaipur, covering seven agro climatic zones of the Rajasthan state, respectively. Survey was conducted in four villages from two Tehsil of each districts. During the survey small debate held with farmers concerned related to disease occurrence and severity. The results of the survey indicated that disease intensity of Alternaria blight of sesame was ranged from 12.90 percent to 44.09 percent in all surveyed field of various districts of Rajasthan. With 44.09 percent, Jaipur district had the highest mean disease intensity, followed by Karauli (34.02%), Sawai Madhopur (33.99%), Pali (30.21%), Jodhpur (22.96%), and Ajmer (22.89%). The district of Bikaner had the lowest percentage of disease intensity, at 12.90 percent. Chomu tehsil in Jaipur district had the highest mean percent disease intensity of 44.58 percent, followed by Phulera tehsil with 43.60 percent. Bikaner tehsil in Bikaner district had the lowest mean percent disease intensity, with 12.35 percent, followed by Sri Durgapura tehsil with 13.45 percent. Similarly, Mahadevaswamy *et al.* (2016) [3] conducted survey to assess the incidence of Alternaria blight of sunflower caused by *A. helianthi* and it ranged from 31.11 to 51.11 percent. Sharma *et al.* (2020) [5] led a survey of the Alternaria blight disease covering guar-growing areas in Gwalior, Bhind, Morena, Shivpuri and Datia fields. Its percent intensity in Gwalior, Morena, Bhind, Datia and Shivpuri districts ranged from 28.8 to 34.36 percent.

Conclusion

Under surveyed districts of Rajasthan the maximum percent

disease intensity was observed from Jaipur district with 61.43 percent. While minimum percent disease intensity was observed from Bikaner district with 20.35 percent.

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