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Influence of dates on sowing and weather parameters incidence and development of *Alternaria* leaf spot of sesame

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ABSTRACT

The crop sown on June 5, recorded lowest percentage *Alternaria* leaf spot disease intensity (PDI) of 19.25 and 26.00 per cent during *Kharif*, 2002-03 and 2003-04 crop seasons, respectively. A relatively higher PDI was recorded with the advancement of dates of sowing. The late sowing (August) crop favoured quick disease development and recorded highest (60.50 and 70.50 %) disease intensity. The mean temperature 21.94 to 29.14°C; mean relative humidity 74.35 to 90.63 per cent, mean rainfall of 7.81 to 12.33 mm and 38 to 40 rainy days during the seasons favoured disease development. Highest seed yield of 380.0 kg/ha and 364.0 kg/ha were recorded when crop was sown timely on 25th June during both the years, respectively. Multiple regression equation between disease index and weather variables exhibited strong relationship among the different components of epiphytotics during both the years of study and indicated that the combined effect of different weather variables favoured the disease development causing upto 99 per cent variation in the disease index.

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INTRODUCTION

Sesame (*Sesamum indicum* L.) is an important edible *Kharif* oilseed crop grown in hotter and drier areas of the country. Regular occurrence of *Alternaria* leaf spot disease has been recorded from different districts of Jharkhand state with varying incidence per cent of 21.50 to 72.00 causing huge losses in yield. Maiti *et al*. (1985) reviewed the literature on sesame diseases in India and found *Alternaria sesami* was important among fungal diseases causing considerable losses. Dolle and Hegde (1984) surveyed area in Karnataka for *Alternaria* leaf blight of sesame and found that the incidence ranged from 32.38 to 72.21 per cent. Kumar and Mishra (1992) also recorded incidence of leaf spot/blight caused by *A. sesami* varied between 11 to 18 per cent. Thus, field trials were conducted to determine the influence of dates of sowing and weather parameters on incidence and development of *Alternaria* leaf spot of sesame disease and the results are presented in this paper.

MATERIAL AND METHODS

To determine the effect of different dates of sowing on disease development, field trials were carried out in Randomized Block Design. Seeds of sesame variety, Kanke safed were sown at 10 days intervals, starting from 5th June to 4th August during 2002 and 2003. Three replications were made for each date of sowing. The plot size was 6m^2. Sesame seeds

were sown in each plot at 30×10 cm spacing. Development of disease in terms of intensity was recorded at 60 days after sowing (DAS). Disease intensity was recorded on the basis of 100 leaves/root/stem/plants selected randomly from each replication by using 0-5 point scale (Anonymous, 1998). Cumulative weather parameter like temperature, relative humidity, rainfall and number of rainy days upto 60 days corresponding to the disease observations were taken from weather observatory, Department of Agricultural Physics, Birsa Agricultural University, Kanke, Ranchi and correlated with disease development. Total seed yield of sesame were calculated after harvest of the crop.

Step wise multiple regression analysis (MRA) was calculated to determine the effect of individual as well as combined weather factors on disease development. Disease prediction analysis equation *viz.*,

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6$$

was derived. Significance of co-efficient of multiple determination (R^2) and partial regression co-efficient (b) value was followed at 5 per cent level of probability.

RESULTS AND DISCUSSION

To find out most suitable date (s) for sowing of sesame crop for maximum yield and least disease incidence, a trial was conducted as detail described above.

The trials were conducted during *Kharif*, 2002-03 and 2003-04 crop seasons. The treatments included seven dates of sowing (June 5, 15, 25; July 5, 15, 25 and August 4) with three replications. Artificial inoculation was carried out by spraying spores-cum-mycelial suspension of the isolated pathogen. Observations on development of diseases were recorded in relation to temperature, relative humidity, rainfall and number of rainy days.

As evident from the data presented in Table 1, the crop sown on June 5, recorded lowest percentage *Alternaria* leaf spot disease intensity (PDI) of 19.25 and 26.00 per cent during above mentioned crop seasons, respectively. A relatively higher PDI was recorded in the crop sown on June 15, and corresponding higher intensity was observed with advancement of dates of sowing. The late sowing (August) crop favoured quick *Alternaria* leaf spot development and recorded highest (60.50 and 70.50 %) disease intensity. The mean temperature (21.94 to 28.63°C and 22.83 to 29.14°C); mean relative humidity (74.35 to 90.63% and 75.08 to 90.33%) mean rainfall of (12.33 and 7.81 mm) and 38 and 40 rainy days during above mentioned seasons, respectively, apparently favoured disease development. Highest seed yield of 380.0 kg/ha and 364.0 kg/ha were recorded when crop was sown timely on 25th June during both the years, respectively. Highest seed yield was not recorded with early sown crop (June, 5), despite least disease intensity.

Table 1 : Influence of dates of sowing on the development of *Alternaria* leaf spot of sesame and seed yield

Date of sowing	*Disease intensity (%)	*Yield (kg./ha)	**Mean temperature (°C)		**Mean relative humidity (%)		**Mean rainfall (mm)	**No. of rainy days
			Max^m	Min^n	Max^n	Min^n		
2002-03								
5th June	19.25 (26.02)	300.0	32.89	24.13	87.38	63.12	7.38	27
15th June	25.50 (30.31)	335.0	31.25	23.14	89.20	67.15	7.05	29
25th June	35.00 (36.26)	380.0	30.11	22.54	89.92	71.60	8.94	29
5th July	48.25 (44.01)	364.0	30.00	22.15	90.05	84.30	8.42	29
15th July	58.50 (49.90)	322.0	29.60	22.09	91.02	75.78	11.96	37
25th July	59.00 (50.19)	280.0	29.30	22.00	91.23	75.05	11.62	34
4th August	60.50 (51.07)	265.0	28.63	21.94	90.63	74.35	12.33	38
2003-04								
5th June	26.00 (30.65)	296.5	31.93	23.42	84.53	62.66	9.96	30
15th June	37.50 (37.75)	345.0	29.99	23.26	86.92	67.37	10.05	31
25th June	48.75 (44.26)	364.0	29.28	23.23	88.43	72.17	11.75	34
5th July	59.00 (50.19)	321.5	29.53	23.12	87.57	73.50	12.12	37
15th July	68.60 (55.95)	290.0	28.99	23.03	89.88	75.22	12.46	40
25th July	69.50 (56.52)	288.0	28.87	22.97	91.75	76.20	10.52	43
4th August	70.50 (57.18)	279.5	29.14	22.83	90.33	75.08	7.81	40
	Disease incicence (%)						Yield (kg/ha)	
	2002-03		2003-04			2002-03		2003-04
S.E. ±	1.50		0.47			2.61	1.67	
C.D. (P = 0.05)	4.27		1.42			8.18	4.98	

* Average of three replications; ** Average of 60 days; Figures in parentheses are transformed angular values

Table 2 : Correlation co-efficient and regression equation between *Alternaria* disease index and weather parameters

Independent variable	Correlation co-efficient (r)	Co-efficient of multiple determination (R^2)	Regression equation
2002-03			
Maximum temperature	-0.922*	0.850*	$Y = 381.625-11.169X_1$
Minimum temperature	-0.926*	0.857*	$Y = 488.235-19.695X_2$
Maximum relative humidity	0.916*	0.839*	$Y = -1027.062+11.908X_3$
Minimum relative humidity	0.720^{NS}	0.530^{NS}	$Y = -90.805+1.841X_4$
Mean rainfall	0.921*	0.848*	$Y = 24.136+7.016X_5$
No. of rainy days	0.870*	0.757*	$Y = -63.891+3.378X_6$
Yield	-0.369^{NS}	0.136^{NS}	-
2003-2004			
Maximum temperature	-0.882*	0.779*	$Y = 485.469-14.531X_1$
Minimum temperature	-0.947*	0.897*	$Y = 1983.277-83.424X_2$
Maximum relative humidity	0.923*	0.852*	$Y = -537.535+6.685X_3$
Minimum relative humidity	0.975**	0.951**	$Y = 191.892+3.423X_4$
Mean rainfall	0.048^{NS}	0.002^{NS}	$Y = 48.566+0.534X_5$
No. of rainy days	0.963**	0.928**	$Y = -70.263+3.418X_6$
Yield	-0.463^{NS}	0.214^{NS}	-

* and ** indicates significance of values at P = 0.05 and P = 0.01, respectively; NS = Non-significant, Y = Disease index, X_1 = Max temp, X_2 = Min temp, X_3= Max RH, X_4 = Min RH, X_5 = Mean Rainfall, X_6 = Number of rainy days

Table 3 : Multiple regression between weather parameters and *Alternaria* disease index during the year, 2002-03 and 2003-04

Disease Index	Correlation co-efficient (r)	Co-efficient of multiple determination (R^2)	Regression equation
2002-03	0.998**	0.996**	$Y = -5130.04 -43.073 X_1 +143.569 X_2+31.830 X_3 +4.736X_4 +2.942X_5$
2003-04	0.999**	0.999**	$Y =1391.636 + 3.868X_1 – 71.129X_2 + 0.921 X_3 + 1.128X_4 + 2.823X_5$

* and ** indicate significance of values at P = 0.05 and P = 0.01, respectively; NS = Non-significant, Y = Disease index, X_1 = Max temp, X_2 = Min temp, X_3= Max RH, X_4 = Min RH,X_5 = Mean Rainfall, X_6 = Number of rainy days

Tripathi *et al.* (1998) conducted field trials for study of the effect of sowing date and variety on severity of *Alternaria* leaf spot of sesame caused by *A. alternata* and found significant differences in disease severity between sowing dates and that disease severity increased with delayed sowings.

Percentage disease index (PDI) were significantly positively correlated with maximum relative humidity, mean rainfall and rainy days and non-significantly positively correlated with minimum relative humidity. Maximum temperature and minimum temperature were significantly negatively correlated and yield was non-significantly negatively correlated during *Kharif*, 2002-03 season. During *Kharif*, 2003-04, the PDI were significantly positively correlated with maximum relative humidity, minimum relative humidity and rainy days and significantly negatively correlated with maximum and minimum temperature. Mean rainfall showed non-significantly positively correlated and yield was non-significantly negatively correlated with PDI during above mentioned crop season (Table 2). Multiple regression equation between disease index and weather variables (independent variables) exhibited strong relationship among the different components of epiphytotics during both the years of study (Table 3), and indicated that the combined effect of different weather variables favoured the disease development causing upto 99 per cent variation in the disease index.

Dolle and Hegde (1984) found visible symptoms of the disease only after 3 days of germination and disease development reached its peak when the crop was 35 days old. Evening RH and maximum temperature were significant in disease development. Similar results were also obtained by Choudhary *et al.*, 2014 a, b, c and Palakshappa *et al.*, 2012.

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