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RESEARCH ARTICLE

Effect of date on sowing and correlation of weather parameters on the incidence of anthracnose of greengram

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ABSTRACT

Greengram one of the important pulse crops of India, is being affected by several foliar diseases among which anthracnose is the most important. The crop sown on 4th June recorded significantly less disease severity, which was enhanced in subsequent sowing dates because the weather conditions were very much congenial that is moderate temperature coupled with higher humidity. Correlation of weather parameters indicated that maximum and minimum temperatures had significantly negative correlation with disease. However, correlation coefficient with relative humidity and rainfall were positive but non-significant.

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INTRODUCTION

Greengram [*Vigna radiata* (L.) Wilczek] is an ancient and well known leguminous crop of Asia. It is quite versatile crop grown for seeds, green manure and forage and it is also considered as "Golden bean". Greengram is one of the important pulse crops, of India. Among the major diseases of greengram, anthracnose caused by *Colletotrichum truncatum* (Schw.) Andrus and Moore is a major disease. The disease severity varying from 18.2 to 86.57 per cent have been reported in northern Karnataka (Laxman,2006). The yield losses caused by anthracnose is proportional to the disease severity and varies remarkably depending on the stage of infection, genotypes and environmental conditions. To over come some of these problems, the present investigations were undertaken to study the effect of sowing dates and weather factors on severity of the disease to understand their practical utility in integrated disease management strategy of anthracnose.

MATERIALS AND METHODS

A field experiment was conducted during *Kharif* 2007 and 2008 at ARS, Bidar to assess the progress of anthracnose at different time interval in different dates of sowing. A replicated field trial was carried out to explore the possibility of disease escape.

The experiment was conducted in Randomized Block Design with four replications. The first date of sowing was done with highly susceptible variety Chinamung on 4th June and subsequent sowings were done at weekly interval. Totally six different dates of sowings were undertaken. The severity of anthracnose was recorded at 40 DAS on five randomly selected plants using a disease rating scale 0 to 9 (Mayee and Datar,1986) Further, these ratings were converted to per cent disease index (PDI). The meteorological data for the experimental period *viz.,* maximum and minimum temperatures, rainfall and relative humidity (morning and evening) were recorded during the crop growth period for each sowing.The correlation between anthracnose severity and weather parameters was made. Further grain yield was recorded.

RESULTS AND DISCUSSION

A field experiment was conducted during *Kharif* season of 2007 and 2008 with six different sowing dates starting from

4th June to 9th July at weekly intervals at Agricultural Research Station, Bidar to know the effect of different dates of sowing and the meteorological conditions associated with the disease development. The information on the incidence of disease as affected by different dates of sowing and also to know the influence of meteorological conditions in disease development will be very much useful to adjust the sowing times for growing good crop under very low disease pressure.

Effect of sowing dates :

Effect of different sowing dates on disease severity is depicted in Table 1. During 2007, there was a significant difference in the severity of anthracnose at different sowing dates. The per cent disease index varied from 24.29 to 59.87 per cent. The least PDI was recorded on crop sown on 4th June (24.29%) and was found on par with PDI of the crop sown on 11th June (26.10%), while the highest PDI was recorded on crop sown on 9th July (59.87%).

Similar results were obtained during 2008 also. The least severity of 25.77 per cent was recorded on crop sown on 4th June, while maximum PDI on crop sown on 9th July (61.24%). The mean PDI ranged from 25.03 to 60.56 per cent. The mean data of two years indicated the same trend as observed in individual years with respect to per cent disease index of anthracnose.

The grain yield in both the years indicated that higher yields (9.61 q/ha and 9.18 q/ha) were obtained in 4th June sowing of 2007 and 2008, respectively. The mean yield data revealed that highest mean yield of 9.40 q per ha was obtained in crop sown on 4th June followed by 11th June (8.83 q/ha). The results are similar to Mittal (1998) who reported that early sown blackgram crop suffered least due to low inoculum potential and unfavourable weather conditions for pathogen, whereas late sown crop suffered more because of ready availability of inoculum build up in early sown crop. Similar observations were made by Naidu and Chandrika (1997) in case of leaf spot of groundnut and Das (2005) in foliar diseases of greengram.

Effect of weather factors :

In the present study, severity of anthracnose of greengram was found to be influenced by environmental factors, which prevailed during crop growth period. Table 2 indicates that in both the years, the crop sown during 4th and 11th June recorded a lower per cent disease index coupled with higher yield. This could be due to higher temperature of 31^{0}C during the crop growth period coupled with lower humidity (88–89%) which were less congenial to the disease development. Whereas, the disease severity was maximum at the end of June month onwards. During that period, the weather conditions were very much congenial *i e.*, moderate temperature of 29^{0}C coupled with higher humidity of 90 to 92 per cent, with respect to rainfall received with range of 173.60 to 332.08 mm, though the amount received was less compared to early sowings but there was frequent rains received during crop growth period. The disease coincidence of the favourable period with stage of the crop led to considerable increase in disease severity. Chambers (1969) reported that amount of rain was found to be of less importance than prolonged wetness with high humidity which are necessary for infection by *C. truncatum* in bean.

Correlation coefficients between disease severity and weather parameters during both the years (pooled) revealed that there was significantly negative correlation between maximum and minimum temperatures with correlation coefficient of -0.782 and -0.600, respectively while, relative humidity morning (0.517), relative humidity evening (0.389) and rainfall (0.329) were positively correlated with PDI but non-significant (Table 3). Similar results were also reported by Kumar *et al.* (1999).

In the present study, the crop sown on first fortnight of June recorded minimum disease severity compared to rest of the dates of sowings. This clearly indicated that crop sown during this period suffers less, which may be due to low inoculum potential, whereas the late sown crop suffers more because of the readily available inoculum in the early sown crops. Low disease severity in first fortnight sowing may be

Table 1: Effect of date of sowing on percent disease index of anthracnose and yield of greengram during *Kharif* 2007 and 2008

Sr. No.	Sowing date	Per cent disease index at 40 DAS			Grain yield (q/ha)		
		Kharif -07	*Kharif* -08	Mean	*Kharif* -07	*Kharif*-08	Mean
1.	4th June	24.29 (29.52)*	25.77 (30.50)	25.03	9.61	9.18	9.40
2.	11th June	26.10 (30.72)	27.67 (31.73)	26.89	9.06	8.60	8.83
3.	18th June	28.78 (32.44)	29.65 (32.99)	29.22	7.87	7.34	7.61
4.	25th June	32.91 (35.00)	35.07 (36.31)	33.99	6.91	6.59	6.75
5.	2nd July	52.17 (46.24)	55.45 (48.13)	53.81	5.97	5.43	5.70
6.	9th July	59.87 (50.69)	61.24 (51.50)	60.56	5.34	5.02	5.18
	S.E.±	0.68 2.07	0.70		0.19	0.20	
	C.D. at 5%		2.10		0.56	0.60	

*values in parenthesis are arcsine transformed values

Table 2: Effect of dates of sowing and environmental factors in relation to anthracnose of greengram caused by *Colletotrichum truncatum* during *Kharif* 2007 and 2008

Sr. No.	Date of sowing	PDI at 40 DAS	Temperature (^{0} c)		Relative humidity (%)		Total rainfall (mm)
			Maximum	Minimum	Morning	Evening	
***Kharif* 2007**							
1.	4th June	24.29	31.80	22.10	88.16	53.23	155.12
2.	11th June	26.10	30.95	21.88	89.55	58.04	318.64
3.	18th June	28.78	30.26	21.52	91.86	61.36	332.08
4.	25th June	32.91	29.93	21.35	92.47	62.39	330.96
5.	2nd July	52.17	29.87	21.27	92.25	61.95	313.04
6.	9th July	59.87	29.96	21.16	92.05	60.73	309.12
***Kharif* 2008**							
1.	4th June	25.77	31.73	21.47	89.02	57.39	356.16
2.	11th June	27.67	30.95	21.33	90.00	59.79	355.60
3.	18th June	29.65	30.24	21.05	90.70	62.61	325.92
4.	25th June	35.07	29.91	21.03	90.57	61.46	202.72
5.	2nd July	55.45	29.25	21.09	90.29	60.05	173.60
6.	9th July	61.24	29.22	21.07	91.11	60.86	202.72

Table 3: Correlation studies of weather parameters with anthracnose severity on greengram

Sr. No.	Weather parameters	Correlation coefficient (r)		
		2007	2008	Pooled
1.	Maximum temperature (^{0}C)	- 0.680*	- 0.869**	- 0.782**
2.	Minimum temperature (^{0}C)	- 0.823**	- 0.551*	- 0.600*
3.	Relative humidity (%) morning	0.619*	0.605*	0.517
4.	Relative humidity (%) evening	0.516	0.196	0.389
5.	Rainfall (mm)	0.331	- 0.838**	0.329

* and ** Indicated significance of value at P=0.05 and 0.01, respectively

attributed to the non-congenial weather factors (higher temperature coupled with lower humidity) for the development of the disease. Hence, alternation of the date of sowing of crop always plays an important role in disease escape due to unfavourable weather conditions for infection.

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