

## Effect of Weather Parameters on *Corynespora* Leaf Spot Disease Severity of Blackgram

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**Abstract:** A field experiment was conducted to study the influence of weather parameters on the severity of *Corynespora* leaf spot of blackgram (*Corynespora cassiicola*) during 2012-13 at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh. The data was analyzed using multiple linear regression and correlation. Disease first appeared in the first week of September and progressed rapidly during 17<sup>th</sup> November (37.78%) to 29<sup>th</sup> December (51.11%). The coefficient of determination ( $R^2$ ) for PDI was 0.538 which showed that weather factors were able to cause the variation in PDI to an extent of 53.8%. Partial regression coefficient (b) for relative humidity at 7.22 A.M was significant and positively correlated (0.82) with PDI. It reveals that every one unit increase in relative humidity at 7.22 A.M there is 0.82 per cent increase in disease severity. Among the weather parameters studied, maximum temperature (0.31), minimum temperature (0.70), relative humidity at 2.22 P.M (0.50) and rainfall (0.27) were significant and negatively correlating factors with PDI. While, there is a significant positive correlation between PDI and relative humidity at 7.22 A.M (0.36) and sun shine hours (0.42).

**Key Words:** *Corynespora cassiicola*, *Corynespora* leaf spot, Weather parameters, Blackgram

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### I. Introduction

Blackgram or urdbean (*Vigna mungo* L.) is an important pulse crop of Andhra Pradesh (A.P) grown in an area of 4.29 lakh ha producing 2.51 lakh tonnes with a productivity of 585 kg/ha (Department of Agriculture and Cooperation, Government of A.P, 2010). The crop is of special significance in A.P as it fits well in rice – pulse cropping system as a relay crop particularly in Krishna – Godavari and North Coastal zones. Urdbean is very rich source of protein containing 24% in its seed and is the richest in phosphoric acid among pulses and in combination with cereal it fulfills the requirement of protein in human diets (Duffus and Slaughter, 1980).

Leaf spot incited by *C. cassiicola* (Berk. and Curt.) Wei (1950) is the major in A.P. *Corynespora* leaf spot caused yield loss ranging from 15-60 per cent. The loss may be extended to the tune of 60 per cent in blackgram (Reddy, 1998). The disease has recently assumed endemic to epidemic status which is mainly due to lack of coordinated approach to control the disease. Hence, the present study was carried out to study the effect of weather parameters on *Corynespora* leaf spot of blackgram.

### II. Material And Methods

#### Effect Of Weather Parameters On The Severity Of *Corynespora* Leaf Spot Of Blackgram

Field experiment was conducted to assess the severity of *Corynespora* leaf spot of blackgram in relation to weather parameters through correlation and regression analysis during *kharif* and *rabi* 2012-13 at Regional Agricultural Research Station (RARS), Lam, Guntur. LBG 752 was sown in 25 sq m plots from 29.6.2012 to 29.1.2013 at 15 days intervals at different dates of sowing. Data on disease severity of *Corynespora* leaf spot was recorded from 15 DAS upto 90 DAS at weekly intervals in each plot by adopting 1-9 scale (Alice and Nadarajan, 2007). Disease severity was assessed by tagging 5 plants in each date of sowing.

Correlation and multiple regression analysis were carried out between PDI and with weather parameters viz., maximum temperature ( $^{\circ}\text{C}$ ), minimum temperature ( $^{\circ}\text{C}$ ), relative humidity at 7.22 AM, relative humidity at 2.22 P.M, sunshine hours (h) and rain fall (mm) which was recorded from Meteorological observatory, RARS, Lam, Guntur.

### III. Results And Discussion

#### Effect Of Weather Variables On The Severity Of *Corynespora* Leaf Spot Of Blackgram

*Corynespora* leaf spot disease on blackgram first appeared on 8.9.12 when the corresponding maximum temperature, minimum temperature, R.H at 7.22 A.M, R.H at 2.22 P.M, sunshine hours and rainfall were 32.8 $^{\circ}\text{C}$ , 24.69 $^{\circ}\text{C}$ , 87.29%, 69.00%, 3.66 h and 69.60 mm, respectively (Table 1 and Fig. 1) which is in conformity with Mehrotra (1989) observation on initial appearance of disease during first week of October. The

disease rapidly progressed during 17<sup>th</sup> November (37.78%) to 29<sup>th</sup> December (51.11%) is in agreement with Mehrotra (1989), corresponding temperature range during progress of disease was 16.71<sup>o</sup>C to 32.13<sup>o</sup>C, R.H of 51 to 98%. Sharma and Kaushal (2009) reported that temperature range of 25-30<sup>o</sup>C, R.H of 80% and twelve hours of alternate light and dark periods were optimum for corynespora leaf spot development in soybean. Prakash and Garg (2007) also reported that *C. cassicola* required temperature of 20±5<sup>o</sup>C and RH of 80±5% for appearance of symptoms when incubated in polyhouse in Aonla seedlings. Choudhary *et al.* (2007) observed that the temperature range of 23-34<sup>o</sup>C, RH 68 to 89%, rainfall of 6-13 mm and 12-14 rainy days were favourable for maximum disease development.

The data on per cent disease index was subjected to multiple linear regression (MLR) and correlation with weather variables and the following equation was obtained (Table 2).

$$Y = 105.06 - 2.50 X_1 - 1.50 X_2 + 0.82 X_3 - 0.80 X_4 - 0.07 X_5 + 0.02 X_6$$

Thus it was observed that the coefficient of determination ( $R^2$ ) for PDI was 0.538 which showed that weather factors were able to cause the variation in PDI to an extent of 53.8%. It was also evident from the multiple linear equation that among weather factors studied the partial regression coefficient (b) for relative humidity at 7.22 A.M was significant and positively correlated (0.82) with PDI. It reveals that every one unit increase in relative humidity at 7.22 A.M there is 0.82 per cent increase in disease severity. Whereas, partial regression coefficient (b) for relative humidity at 2.22 P.M was significant and negatively correlated (-0.80). It shows that every one unit increase in relative humidity at 2.22 P.M there is 0.88 per cent decrease in disease severity.

Among the weather parameters studied, maximum temperature (0.31), minimum temperature (0.70), relative humidity at 2.22 P.M (0.50) and rainfall (0.27) were significant and negatively correlating factors with PDI. While, there is a significant positive correlation between PDI and relative humidity at 7.22 A.M (0.36) and sun shine hours (0.42).

Stan and Neamtu (1988) reported that temperature 25<sup>o</sup>C-30<sup>o</sup>C, maximum relative humidity and temperature variations favoured *C. cassicola* development in cucumber. Singh (1979) observed that the disease was favoured by 20- 33<sup>o</sup>C in brinjal. Jones and Jones (1984) reported that the per cent disease intensity of *C. cassicola* on tomato was favoured by maximum temperature 20<sup>o</sup>C-28<sup>o</sup>C.

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**Table 1: Progression of corynespora leaf spot of blackgram with weather parameters in different dates of sowing during 2012-13**

Date of observation	Temperature (°C)		Relative humidity (%)		Sunshine hours (h)	Rainfall (mm)	PDI
	Max	Min	Morn.	Even			
14.07.12	31.50	24.80	92.00	80.00	8.05	7.40	0.00
21.7.12	30.80	24.51	92.86	77.43	3.66	112.60	0.00
28.7.12	32.37	25.44	86.71	71.86	1.44	20.00	0.00
4.8.12	34.00	25.13	80.29	58.29	3.26	10.00	0.00
11.8.12	32.97	23.84	90.43	69.43	2.87	140.40	0.00
11.8.12	32.97	23.84	90.43	69.43	2.87	140.40	0.00
18.8.12	33.07	24.97	86.86	64.71	6.14	38.00	0.00
18.8.12	33.07	24.97	86.86	64.71	6.14	38.00	0.00
25.8.12	33.71	24.46	89.57	62.57	4.75	12.00	0.00
25.8.12	33.71	24.46	89.57	62.57	4.75	12.00	0.00
25.8.12	33.71	24.46	89.57	62.57	4.75	12.00	0.00
1.9.12	33.01	24.71	90.00	65.43	3.21	16.00	0.00
1.9.12	33.01	24.71	90.00	65.43	3.21	16.00	0.00
1.9.12	33.01	24.71	90.00	65.43	3.21	16.00	0.00
1.9.12	33.01	24.71	90.00	65.43	3.21	16.00	0.00
8.9.12	32.80	24.69	87.29	69.00	3.66	69.60	2.22
8.9.12	32.80	24.69	87.29	69.00	3.66	69.60	0.00
8.9.12	32.80	24.69	87.29	69.00	3.66	69.60	0.00
8.9.12	32.80	24.69	87.29	69.00	3.66	69.60	0.00
8.9.12	32.80	24.69	87.29	69.00	3.66	69.60	0.00
15.9.12	32.57	26.01	87.71	66.86	1.16	2.40	6.67
15.9.12	32.57	26.01	87.71	66.86	1.16	2.40	0.00
15.9.12	32.57	26.01	87.71	66.86	1.16	2.40	0.00
15.9.12	32.57	26.01	87.71	66.86	1.16	2.40	2.22
15.9.12	32.57	26.01	87.71	66.86	1.16	2.40	2.22
22.9.12	33.86	25.16	85.57	64.29	5.54	106.40	8.89
22.9.12	33.86	25.16	85.57	64.29	5.54	106.40	0.00
22.9.12	33.86	25.16	85.57	64.29	5.54	106.40	0.00
22.9.12	33.86	25.16	85.57	64.29	5.54	106.40	4.44
22.9.12	33.86	25.16	85.57	64.29	5.54	106.40	6.67
22.9.12	33.86	25.16	85.57	64.29	5.54	106.40	0.00
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	11.11
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	0.00
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	2.22
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	6.67
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	8.89
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	0.00
29.9.12	30.51	23.70	93.29	78.43	5.13	25.60	0.00
6.10.12	30.64	24.27	94.29	79.14	1.66	63.20	2.22

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6.10.12	30.64	24.27	94.29	79.14	1.66	63.20	6.67
6.10.12	30.64	24.27	94.29	79.14	1.66	63.20	8.89
6.10.12	30.64	24.27	94.29	79.14	1.66	63.20	15.56
6.10.12	30.64	24.27	94.29	79.14	1.66	63.20	2.22
6.10.12	30.64	24.27	94.29	79.14	1.66	63.20	2.22
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	6.67
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	13.33
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	15.56
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	20.00
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	6.67
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	4.44
13.10.12	33.76	23.80	88.00	57.43	6.78	15.00	0.00
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	20.00
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	17.78
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	17.78
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	22.22
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	11.11
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	8.89
20.10.12	31.93	22.63	90.57	60.00	7.69	15.40	0.00
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	28.89
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	26.67
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	22.22
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	26.67
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	15.56
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	13.33
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	2.22
27.10.12	30.09	22.81	96.57	77.71	4.29	30.20	0.00
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	31.11
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	28.89
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	33.33
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	20.00
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	17.78
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	6.67
3.11.12	29.61	21.54	90.29	71.71	5.70	116.50	2.22
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	35.56
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	33.33
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	37.78
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	24.44
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	20.00
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	11.11
10.11.12	30.66	20.97	97.29	67.86	3.56	99.20	8.89
17.11.12	30.03	17.60	92.29	52.00	8.71	0.00	37.78
17.11.12	30.03	17.60	92.29	52.00	8.71	0.00	44.44
17.11.12	30.03	17.60	92.29	52.00	8.71	0.00	33.33
17.11.12	30.03	17.60	92.29	52.00	8.71	0.00	28.89
17.11.12	30.03	17.60	92.29	52.00	8.71	0.00	20.00

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17.11.12	30.03	17.60	92.29	52.00	8.71	0.00	11.11
24.11.12	30.70	17.61	84.86	55.29	6.66	0.00	40.00
24.11.12	30.70	17.61	84.86	55.29	6.66	0.00	40.00
24.11.12	30.70	17.61	84.86	55.29	6.66	0.00	33.33
24.11.12	30.70	17.61	84.86	55.29	6.66	0.00	26.67
24.11.12	30.70	17.61	84.86	55.29	6.66	0.00	17.78
1.12.12	31.07	20.96	97.14	60.71	5.23	0.00	44.44
1.12.12	31.07	20.96	97.14	60.71	5.23	0.00	37.78
1.12.12	31.07	20.96	97.14	60.71	5.23	0.00	37.78
1.12.12	31.07	20.96	97.14	60.71	5.23	0.00	20.00
8.12.12	30.51	19.41	89.14	57.86	5.26	0.00	51.11
8.12.12	30.51	19.41	89.14	57.86	5.26	0.00	40.00
8.12.12	30.51	19.41	89.14	57.86	5.26	0.00	40.00
8.12.12	30.51	19.41	89.14	57.86	5.26	0.00	26.67
15.12.12	32.13	19.26	98.00	53.71	7.51	0.00	44.44
15.12.12	32.13	19.26	98.00	53.71	7.51	0.00	42.22
15.12.12	32.13	19.26	98.00	53.71	7.51	0.00	37.78
22.12.12	30.46	17.30	96.86	51.00	6.92	0.00	44.44
22.12.12	30.46	17.30	96.86	51.00	6.92	0.00	40.00
29.12.12	29.81	16.71	95.86	51.14	7.09	0.00	51.11
29.12.12	29.81	16.71	95.86	51.14	7.09	0.00	40.00
5.1.13	30.67	19.74	95.29	66.86	3.48	0.00	44.44
5.1.13	30.67	19.74	95.29	66.86	3.48	0.00	0.00
12.1.13	31.06	19.23	95.86	52.14	5.21	0.00	51.11
12.1.13	31.06	19.23	95.86	52.14	5.21	0.00	2.22
19.1.13	31.39	16.07	94.57	46.14	8.20	0.00	6.67
26.1.13	30.93	17.59	98.00	49.71	6.99	0.00	11.11
2.2.13	30.44	18.73	97.00	55.00	4.63	0.00	17.78
9.2.13	31.30	17.30	97.29	51.57	7.39	0.00	20.00
16.2.13	31.89	19.53	93.86	49.86	6.13	0.00	26.67
23.2.13	29.60	21.26	94.71	65.43	6.02	115.00	37.78
2.3.13	33.63	18.94	94.14	43.86	8.54	0.00	40.00
9.3.13	34.03	19.60	90.71	44.71	7.51	0.00	44.44
16.3.13	34.16	23.07	95.14	45.86	7.17	0.00	51.11
23.3.13	35.27	21.17	91.86	42.71	7.58	0.00	53.33

**Table 2: Multiple correlation and regression of certain weather variables on Percent Disease Index (PDI) of corynespora leaf spot of blackgram during 2012-**

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S. No.	Variables	Correlation coefficient (r)	Partial regression coefficient (b)	Standard error (E)	't' values
y	Percent Disease Index (PDI)				
X <sub>1</sub>	Maximum temperature (°C)	-0.3143*	-2.5026 <sup>NS</sup>	2.0910	-1.1968
X <sub>2</sub>	Minimum temperature (°C)	-0.7047*	-1.5013 <sup>NS</sup>	1.4101	-1.0646
X <sub>3</sub>	Relative humidity- 7.22 AM (%)	0.3679*	0.8224*	0.3196	2.5730
X <sub>4</sub>	Relative humidity- 2.22 P.M (%)	-0.5093*	-0.8095*	0.3680	-2.1997
X <sub>5</sub>	Sun shine hours (hrs/day)	0.4288*	-0.0710 <sup>NS</sup>	0.7374	-0.0963
X <sub>6</sub>	Rainfall (mm)	-0.2704*	0.0212 <sup>NS</sup>	0.0297	0.7152

Coefficient of determination ( $R^2$ ) = 0.538    F value = 22.01    T tab value = 1.98

\*Significant at 5% LOS            NS = Non Significant    Intercept (a) = 105.06

**Fig 1: Progression of corynespora leaf spot of blackgram with weather variables in different dates of sowing during 2012-13**

