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Progression of Corynespora Target Spot and Estimation of Yield Losses in Cotton

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ABSTRACT

An investigation was conducted during July, 2019–February, 2020 and July, 2020–February, 2021 at Regional Agricultural Research Station, Lam, Guntur, to assess the influence of weather factors on the progression of Corynespora leaf spot in cotton. The study revealed the maximum and minimum temperatures, evening relative humidity and number of rainy days were critical factors. Another independent field experiment conducted to assess the losses due to Corynespora leaf spot by the application of one to five sprays of propiconazole at 0.1% along with control, in randomized block design, with four replications, showed the lowest per cent disease index (7.4 PDI) and the highest yield (3060 kg ha^{-1}) with five sprays. Per cent disease control and yield showed positive correlation whereas PDI showed negative correlation with number of sprays. Yield and avoidable yield loss showed negative correlation with PDI. Regression analysis indicated that every additional spray resulted in reduction of PDI by 4.89 with goodness of fit (R^2) of 98%; increase of PDC by 13.50% with R^2 of 99% and promotion of yield to 178.80% in pooled analysis data with R^2 97%. Regression analysis of PDI as independent and yield, avoidable yield loss as dependent variables registered increase in 1% PDI resulted in the reduction of yield to 35.41 times with R^2 of 92%; comparable increase in 1% PDI resulted in the reduction of avoidable yield loss with 1.31% with R^2 as 90%. These results suggested timely protection of crop to minimize yield losses and achieve potential yields.

KEYWORDS: Cotton, Corynespora leaf spot, weather factors, yield loss

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1. INTRODUCTION

Cotton is an important commercial crop in India with a production of 299.26 l bales of 170 kg from 113.6 l ha with a productivity of 448 kg lint ha^{-1}, which is far behind the leading countries. Andhra Pradesh stood 8th both in cultivated area (4.53 l ha) and production (9.41 l bales) and 9th in productivity with 353 kg lint ha^{-1} in India (Anonymous, 2025). Farmers should adopt the proven technologies with superior management for cotton yield enhancement (Narayanan et al., 2017). Cotton crop is affected by a number of foliar diseases throughout the season. Fulmer et al. (2012) reported target spot caused by *Corynespora cassiicola* on cotton for the first time in Georgia. The disease affects leaves, stems, squares and bolls. Severely affected leaves drop prematurely. The pathogen was reported to cause leaf spot on cotton from different parts of the world (Jones, 1961; Fulmer et al., 2012, Price et al., 2015). Sarbhoy et al. (1971) documented the occurrence of target leaf spot on cotton from southern India. It was reported from the Junagadh district of Gujarat in cotton Hybrid-4 and Hybrid-6 during 1984-1985 (Parakhia et al., 1989). Corynespora leaf spot has been increasing its prevalence and severity (Salunkhe et al., 2019; Siva Prasad et al., 2022). On infected cotton leaves initially, minute pinhead size light orange to brick red minute spots appeared that gradually enlarged and became circular to oval or irregular concentric spots with tan to light brown centre with yellow halo around the margin. These spots enlarged and concentric zonations were formed resulting in target board symptom. In advanced stage, uncontrolled conditions lead to premature defoliation and yield losses. Host range studies of cotton isolate of *C. cassiicola* included different crop plants viz., blackgram, greengram, chilli, castor and tomato (Kalpana et al., 2025). Significant negative correlation was observed for maximum temperature and minimum temperature with per cent disease intensity. Multiple linear regression of PDI indicated that for every 1% increase in evening relative humidity there was corresponding increase of 0.64% disease index of grey mildew in Jaadoo BG II cotton hybrid (Bhattiprolu et al., 2017). Maximum, minimum temperatures, evening relative humidity, rain fall, number of rainy days and wind speed were significant and negatively correlated while number of sunshine hours showed positive significant correlation. Maximum, minimum temperatures, number of rainy days and wind speed significantly influenced the development of Alternaria leaf spot (R^2=0.984) (Bhattiprolu and Monga, 2018). Evening relative humidity, sunshine hours and evaporation significantly influenced PDI of the target spot in G. Cot 38 cotton variety (Davara et al., 2024). Among the fungal diseases, Alternaria leaf spot/blight, grey mildew and rust cause economic losses in the range of 26.59%–34.05% under congenial conditions (Monga et al., 2013). Roshan Baba et al. (2022a) reported seed cotton yield loss of 16.14% in Jaadoo BG II, 20.34% in RCH 2 BG II and 26.28% in L 1060 due to major foliar diseases in cotton. Corynespora leaf spot has dominated Alternaria leaf spot in recent years and emerged as major leaf spot in cotton. Estimated yield losses due to target spot in selected cultivars (Deltapine 1050 and Phytogen 499) exceeded 336 kg ha^{-1} seed cotton (Conner et al., 2013). Lint yield loss due to target spot on apparently susceptible cotton cultivar had been estimated to be as high as 484 kg lint ha^{-1} (Hagan et al., 2015). In view of the economic importance, the influence of weather factors to strategically manage the disease was investigated and a field trial was conducted to estimate the avoidable yield losses by protection against Corynespora leaf spot in cotton.

2. MATERIALS AND METHODS

Two independent field experiments were conducted during *kharif* seasons (July 2019–February 2020 and July 2020–February 2021) at Regional Agricultural Research Station (RARS), Lam, Guntur, Andhra Pradesh (latitude of 16.3437555 and longitude of 80.4409937) to understand the role of weather parameters in the progression of Corynespora leaf spot of cotton and to estimate the avoidable yield losses due to this disease.

2.1. Progression of Corynespora target spot in relation to weather parameters

Jaadoo BG II with 105×60 cm^2 spacing was raised in a bulk plot of 150 m^2. Corynespora target spot was scored on 0 to 4 scale (Sheo, 1988), at weekly intervals on 10 labelled plants in the middle rows up to first week of February along with phenological stage of the crop and Percent Disease Index (PDI) was calculated (Wheeler, 1969).

$$(PDI) = \frac{\text{Sum of all the numerical ratings}}{\text{Total number of leaves scored} \times \text{Maximum disease grade}} \times 100$$

Meteorological data maximum temperature (T_{max}), minimum temperature (T_{min}), morning relative humidity (RH I), evening relative humidity (RH II), sunshine hours (SSH), wind speed (WS), evaporation (Evap.) rainfall (Rf) and number of rainy days (Rd) were recorded daily from sowing onwards and weekly means were calculated while rainfall during the standard meteorological week was totalled. Correlation between progress of Corynespora leaf spot severity and weather factors was calculated to understand the quantitative relationship. Multiple regression equations with independent weather variables to identify the critical parameters for development of disease were derived using Excel programme.

2.2. Estimation of yield loss due to Corynespora leaf spot in cotton

A field experiment was conducted for two seasons to assess the losses due to *Corynespora* using a popular hybrid Jaadoo BG II with 105×60 cm^2 spacing at RARS, Lam, Guntur during *kharif* 2019 and 2020. Propiconazole at 0.1% was applied to protect the crop and compared with unsprayed

crop. Six treatments viz., T_1-Only one spray; T_2-Two sprays; T_3-Three sprays; T_4-Four sprays; T_5-Five sprays and T_6-No spray were imposed with four replications in randomized block design. First spray was applied immediately after first appearance of the disease and the repeated at 15 days interval. Corynespora leaf spot was scored, prior to each spray and 15 days after the last spray in randomly labelled plants of middle rows in different treatments using 0-4 scale (Sheo, 1988). PDI reduction and yield losses were calculated as per the formulae of Wheeler, 1969.

$$\text{PDI reduction over control (PDC)} = \frac{\text{PDI in unprotected plot-PDI in protected plot}}{\text{PDI in unprotected plot}} \times 100$$

$$\text{\% avoidable yield loss} = \frac{\text{Yield in protected plot-Yield in unprotected Plot}}{\text{Yield in protected plot}} \times 100$$

3. RESULTS AND DISCUSSION

3.1. Progression of Corynespora target spot development in relation to weather parameters

Field experiment was conducted to study the progression of Corynespora target spot caused by *C. cassiicola* in relation to weather parameters along with phenological stage of the crop in Jaadoo BG II hybrid (Table 1). During 2019–2020, Corynespora target spot disease appeared in 40th meteorological week (Oct 1-Oct 7) with 14.5 PDI and reached peak at boll maturity stage at 49th meteorological week (Dec 3-Dec 9) with 44.25 PDI. During 2020–2021 disease first appeared in 40th meteorological week (Oct 1-Oct 7) with 4.0 PDI and attained peak at boll formation stage at 45th meteorological week (Nov 5-Nov 11) with 34.3 PDI. Pooled data indicated that flowering (October) to boll bursting stages (December) need to be protected to avoid losses due to Corynespora leaf spot.

Pooled analysis of two seasons revealed that PDI of Corynespora target spot was significantly and positively correlated with maximum temperature, minimum temperature, rain fall and wind speed and showed negative correlation with sunshine hours and evaporation. Non-significant positive correlation with RH, RH II and Rd was observed (Table 2).

Regression analysis of different weather parameters resulted in the following equation to predict PDI with R^2 value of 0.937.

$Y= -419.7+9.56\ T_{max}{}^{**}+2.84\ T_{min}{}^{**}+1.48\ RH\ II^{**}-14.28\ Rd^{**}$

R^2=0.937, F value=41.30, Standard error=2.40

Table 1: Progress of Corynespora target spot development in Jaadoo BG II in relation to phenological stage of crop

Sl. No.	Std. week	Phenological stage	I Season (*kharif*, 2019–2020)	II Season (*kharif*, 2020–2021)	Pooled PDI (2019–2020 and 2020–2021)
			PDI	PDI	
1.	40	Flowering stage	14.50	4.00	9.25
2.	41	Flowering stage	15.75	4.50	10.13
3.	42	Flowering stage	24.50	19.25	21.88
4.	43	Flowering stage	25.50	25.00	25.25
5.	44	Flowering stage	39.25	26.50	32.88
6.	45	Boll formation stage	38.50	34.25	36.38
7.	46	Boll formation stage	36.00	26.50	31.25
8.	47	Boll maturity stage	38.50	33.00	35.75
9.	48	Boll maturity stage	31.25	28.50	29.88
10.	49	Boll maturity stage	44.25	25.25	34.75
11.	50	Boll maturity stage	33.50	14.00	23.75
12.	51	Boll maturity stage	29.25	8.75	19.00
13.	52	Initial boll bursting stage	23.25	7.25	15.25
14.	1	Initial boll bursting stage	19.00	6.00	12.50
15.	2	Boll bursting stage	15.00	5.00	10.00
16.	3	Boll bursting stage	12.50	4.00	8.25
17.	4	Harvesting stage	10.50	3.50	7.00
18.	5	Harvesting stage	7.50	3.00	5.25

Table 2: Correlation between per cent disease index of Corynespora target spot and weather factors (Pooled data of *kharif*, 2019–2020 and 2020–2021)

Weather parameter	Correlation coefficient (r)		
	2019-2020	2020-2021	Pooled
T_{max}-Maximum temperature (°C)	0.27	0.69**	0.75**
T_{min}-Minimum temperature (°C)	0.56*	0.73**	0.72**
RH I-Morning relative humidity (%)	0.77**	0.16	0.19
RH II-Evening relative humidity (%)	0.20	0.54*	0.44
Rf-Rainfall (mm)	0.25	0.63**	0.50*
Rd-Number of rainy days	0.18	0.57*	0.42
SSH-Sunshine hours (h day^{-1})	-0.30	-0.81**	-0.69**
WS-Wind speed (km h^{-1})	-0.45	0.84**	0.65**
Evap.-Evaporation (mm)	-0.58*	-0.52*	-0.59*

*Significant at $p \leq 0.05$; **Significant at $p \leq 0.01$

Regression equation indicated that maximum, minimum temperatures, evening relative humidity and amount of rainfall were the critical weather parameters in the progression of Corynespora target spot in cotton.

Humid minimum temperature index (HT_0I) value of >5.5 for seven consecutive days was found to be the most critical for heavy leaf fall in rubber plantations (Raj and Joseph, 2011). Sharma (2017) observed that long period of leaf wetness and moderate temperatures favoured target spot development in cotton under greenhouse conditions. Overall rainfall and temperature patterns from July to September favoured development of Corynespora leaf spot (Kelly and Raper, 2017; Bowen and Hagan, 2018). Pernezny et al. (2000) reported that target spot occurred at low temperatures (20 °C) with maximum severity at 28 to 32 °C in tomato. Prolonged humidity and leaf wetness were the most important factors for disease development and sporulation (Schlub et al., 2009). Roshan Baba et al. (2022b) observed that sunshine hours, the number of rainy days and wind speed were the common critical parameters contributing to the development of Alternaria and Corynespora leaf spots in cotton. Significant negative correlation was observed between PDI and maximum temperature, minimum temperature, rainfall, wind speed and evaporation whereas sunshine hours showed significant and positive correlation at different spacing(s) (Mounika et al., 2023). They reported evening relative humidity, wind speed and evaporation as critical factors under close spacing in LHDP 5 cotton variety. Maximum and minimum temperatures, morning relative humidity, rain fall and wind speed were significant and negatively correlated with PDI in BG II hybrids, Jaadoo and RCH 2 whereas number of rainy days was also significant with negative correlation in varieties, NDLH 1938 and L 1060 (Bhattiprolu, 2025). Minimum temperature, morning relative humidity and wind speed significantly influenced the progress of Corynespora leaf spot in L 1060; rainfall, number of rainy days, wind speed and evaporation were critical in NDHL 1938 and maximum temperature also played major role in BG II hybrids (Bhattiprolu, 2025).

3.2. Estimation of crop loss due to Corynespora target spot of cotton

The field experiment conducted to quantify yield loss due to Corynespora target spot by creating variable disease severity through number of sprays applied revealed significant differences among the treatments.

Pooled analysis of data for 2019–2020 and 2020–2021 showed the lowest PDI of Corynespora disease (7.4) in T_5 with five sprays followed by four sprays, three sprays and two sprays of fungicide with 13.0, 18.4 and 21.6 PDI, respectively, while single spray with propiconazole was least effective (25.6 PDI) (Table 3). The highest per cent disease reduction over control (PDC) was observed with five sprays (77.8%) followed by four sprays, three sprays and two sprays with 61.10%, 44.90% and 35.3%, respectively, while the lowest PDC was observed in single spray schedule (23.4%). The highest yield was recorded in T_5 with 3060 kg ha^{-1} seed cotton yield which was on par with T_4 with four sprays (2989 kg ha^{-1}) followed by T_3 with three sprays (2781 kg ha^{-1}) while the lowest yield was recorded in the single spray treatment with 2328 kg ha^{-1} which was on par with T_6 i.e., no spray (2260 kg ha^{-1}) (Table 3). The maximum per cent avoidable yield loss was recorded in T_5 (26.14%) followed by T_4 (24.39%) while the least per cent avoidable yield loss (2.92%) was recorded in single spray schedule. This clearly showed that on an average 26.14% reduction in yield would have occurred in Jaadoo BG II due to Corynespora target spot, if unprotected (Table 3). BC ratio varied from 1.86 to 2.47. The highest BCR observed in T_5 with five sprays (2.47).

Crop loss experiments data were utilized for crop loss model. The relationship between number of sprays and PDI /PDC/ yield; PDI and yield/avoidable yield loss, were expressed by correlation and simple linear regression models (Table 4 and Figure 1 and 2). Correlation studies revealed positive correlation of PDC and yield and negative correlation of PDI with number of sprays. Yield and avoidable yield loss showed negative correlation with PDI (Table 4).

Regression analysis of number of sprays as independent and PDI as dependent variable helped in assessment of

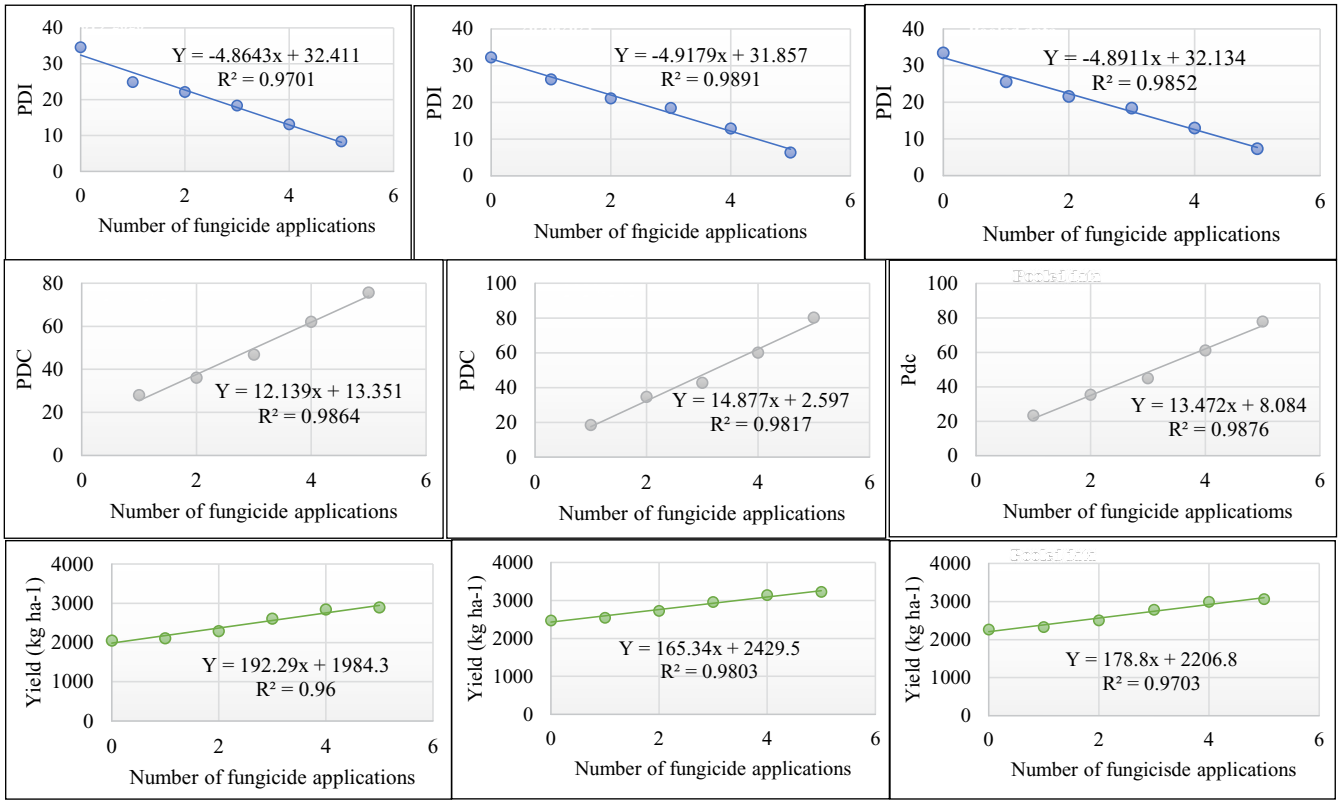

Figure 1: Effect of number of fungicide applications against Corynespora target spot in relation to PDI, PDC and yield

PDI with application of number of sprays viz., with every additional spray, reduction in PDI will be to the tune of 4.86, 4.92 and 4.89 times the number of sprays in 2019–2020, 2020–2021 and pooled years data with goodness of fit (R^2) 97%, 99% and 98%, respectively. Regression analysis of number of sprays as independent; PDC and yield as dependent variables helped in assessment of PDC, yield viz., with increase in every spray, PDC was promoted to the tune of 12.14, 14.88 and 13.50 times the number of sprays with goodness of fit (R^2) of 99%, 98% and 99%;

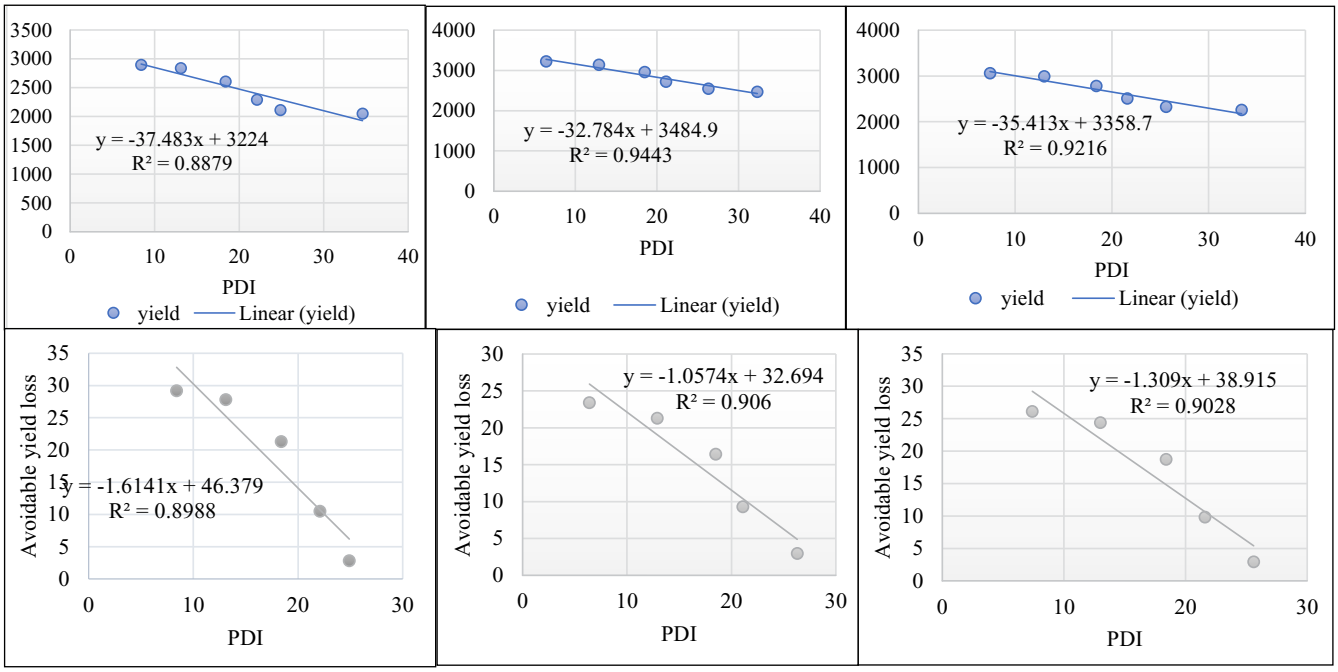

Figure 2: Per cent disease index of Corynespora target spot in relation to yield and avoidable yield loss

Table 3: Effect of Corynespora target spot on cotton yield (Pooled data of *kharif*, 2019–2020 and 2020–2021)

Tr. No.	Number of fungicide applications	After 1st spray (90 DAS)		After 2nd spray (105 DAS)		After 3rd spray (120 DAS)	
		PDI	PDC	PDI	PDC	PDI	PDC
T_1	One spray	5.6 (13.6)[a]	64.6	13.1 (21.2)[b]	34.5	16.6 (24.0)[c]	36.9
T_2	Two sprays	6.1 (14.3)[a]	61.4	9.8 (18.2)[a]	51.0	13.4 (21.5)[b]	49.1
T_3	Three sprays	5.8 (13.9)[a]	63.3	9.9 (18.3)[a]	50.5	10.1 (18.4)[a]	61.6
T_4	Four sprays	5.9 (14.0)[a]	62.7	9.8 (18.2)[a]	51.0	10.3 (18.7)[a]	60.8
T_5	Five sprays	6.1 (14.2)[a]	61.4	10.2 (18.6)[a]	49.0	11.6 (19.9)[a]	55.9
T_6	No spray	15.8 (23.4)[b]		20.0 (26.5)[c]		26.3 (30.8)[d]	
	SEm±	0.36		0.48		0.42	
	CV (%)	4.66		4.75		3.77	
	CD (p≤0.05)	1.09		1.44		1.26	

Tr. No.	Number of fungicide applications	After 4th spray (135 DAS)		After 5th spray (150 DAS)		Yield (kg ha^{-1})	Per cent avoidable yield loss	BC ratio
		PDI	PDC	PDI	PDC			
T_1	One spray	22.5 (28.3)[d]	29.5	25.6 (30.4)[e]	23.4	2328[d]	2.92	1.91
T_2	Two sprays	18.5 (25.5)[c]	42.0	21.6 (27.7)[d]	35.3	2506[c]	9.82	2.04
T_3	Three sprays	14.3 (22.2)[b]	55.2	18.4 (25.4)[c]	44.9	2781[b]	18.73	2.17
T_4	Four sprays	9.1 (17.5)[a]	71.5	13.0 (21.1)[b]	61.1	2989[a]	24.39	2.42
T_5	Five sprays	10.5 (18.8)[a]	67.1	7.4 (15.7)[a]	77.8	3060[a]	26.14	2.47
T_6	No spray	31.9 (34.4)[e]		33.4 (35.3)[f]		2260[d]		1.86
	SEm±	0.45		0.32		24.89		
	CV (%)	3.67		2.49		1.88		
	CD (p≤0.05)	1.35		0.97		75.03		

PDI: Per cent Disease Index; PDC: Per cent disease reduction over control; Figures in parentheses are arc sine transformed values; Figures indicated with the same alphabets are statistically not significant

increase in number of sprays showed the promotion of yield to the tune of 192.29, 165.34 and 178.8times number of sprays in 2019–2020, 2020–2021 and pooled analysis data with goodness of fit (R^2) 96%, 98% and 97%, respectively (Figure 1).

Regression analysis of PDI as independent; yield and avoidable yield loss as dependent variable helped in the assessment of yield, avoidable yield loss. Increase in 1% PDI resulted in the reduction of yield to tune of 37.48, 32.78 and 35.41 times the increase in PDI with goodness of fit of 89%, 94% and 92%; comparable increase in 1% PDI resulted in the reduction of avoidable yield loss to the tune of 1.61, 10.6 and 1.31 times the increase on PDI in 2019–2020, 2020–2021 and pooled analysis data with goodness of fit of 90%, 91% and 90%, respectively (Figure 2).

Hagan et al. (2015) reported lint yield loss due to target spot in susceptible cultivar as high as 448 kg lint ha^{-1}. Single fungicide application against target spot resulted in 4 to 6% yield gain compared to no spray besides defoliation reduction and increased yield (Mehl et al., 2020). There was significant variation in the number of sprays application and disease severity in cotton cultivars where seed cotton yield gain of 3.2 to 7.2% was achieved with two applications of fungicide compared with untreated control (Bowen et al., 2018).

Fungicide applications, beginning when lesions were first seen reduced Alternaria-incited premature defoliation of cotton and improved seed yield by 22% (Bashi et al., 1983). Avoidable yield loss of 32.38% due to Alternaria leaf spot was reported with five sprays of propiconazole 0.1% with highest B:C ratio of 1.72 (Hosagoudar et al., 2014). Three sprays of propineb at 2.8 g l^{-1} was reported effective against Alternaria and Helminthosporium leaf spot diseases of cotton by preventing yield losses to the tune of 31.56% (Bhattiprolu and Prasada Rao, 2014). Both kresoxim methyl (0.1%) and propiconazole (0.1%), sprayed thrice at 15 days

Table 4: Correlation matrix for number of sprays, PDI, PDC, yield and avoidable yield loss

Correlation between	2019-20	2020-21	Pooled
PDI and number of sprays	-0.985**	-0.995**	-0.993**
PDC and number of sprays	0.993**	0.991**	0.994**
Yield and number of sprays	0.980**	0.990**	0.985**
Yield and PDI	-0.942**	-0.972**	-0.960**
Avoidable yield loss and PDI	-0.946**	-0.952*	-0.950*

interval starting from the first appearance were effective against foliar diseases in cotton and significantly increased the yield to the tune of 59.66 and 56.99%, respectively (Bhattiprolu, 2015). Four sprays of carbendazim (0.1%) at 15 days interval realized 534 kg ha^{-1} additional yield in Bunny Bt (Bhattiprolu, 2012). Need based sprays under integrated disease management in cotton resulted in significant increase in the yield (20.34%–34.75%) with maximum IBCR of 1.35 (Bhattiprolu and Monga, 2017).

4. CONCLUSION

Weather factors viz., maximum, minimum temperatures, evening relative humidity and number of rainy days were critical for the progression of Corynespora leaf spot in cotton and initiation of protective sprays with 0.1% propiconazole soon after the appearance of the disease helped to minimize yield losses and achieve potential yields.

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7. REFERENCES

Anonymous, 2025. ICAR–AICRP (Cotton) Annual Report (2024–25) ICAR–All India Coordinated Research Project on Cotton, Nagpur. Available from: https://aiccip.cicr.org.in/aicrp-annrep.html; https://aiccip.cicr.org.in/pdf/ annual_report/ AICRP_AR_2024_25.pdf Accessed on 08.05.2025.

Bashi, E., Sachs, Y., Rotem, J., 1983. Relationship between disease and yield in cotton fields affected by *Alternaria macrospora*. Phytoparasitica. 11, 89–98. Available from: https://link.springer.com/article/10.1007/BF02980716.

Bhattiprolu, S.L., 2012. Estimation of crop losses due to grey mildew (*Ramularia areola* Atk.) disease in Bt cotton hybrid. Journal of Cotton Research and Development. 26(1), 109–112. Available from: https://www.cabidigitallibrary.org.doi/pdf/10.5555/20123124260.

Bhattiprolu, S.L., 2015. Efficacy of kresoxim methyl against foliar diseases of cotton. Journal of Cotton Research and Development 29(1), 112–115. http://www.crdaindia.com/fileserve.php?FID=4.

Bhattiprolu, S.L., 2025. Effect of weather factors on the development of Corynespora leaf spot in cotton. Journal of Cotton Research and Development 39(1), 47–51. http://www.crdaindia.com/fileserve.php?FID=1027.

Bhattiprolu, S.L., Monga, D., 2017. Integrated management of foliar diseases in cotton. Journal of Cotton Research and Development 31(1), 97–101. http://www.crdaindia.com/fileserve.php?FID=385.

Bhattiprolu, S.L., Monga, D., 2018. Effect of weather parameters on the development of Alternaria leaf spot and grey mildew in cotton. Journal of Agrometeorology 20(4), 315–318. DOI: https://doi.org/10.54386/jam.v20i4.573.

Bhattiprolu, S.L., Prasada Rao, M.P., 2014. Evaluation of propineb against fungal leaf spot diseases of cotton. Journal of Cotton Research and Development 28(2), 324–326. Available from: https://www.cabidigitallibrary.org.doi/pdf/10.5555/20143328834.

Bhattiprolu, S.L., Ratnam, M., Ratna Kumari, S., 2017. Development of grey mildew disease in cotton as influenced by weather parameters and its management. International Journal of Economic Plants 4(2), 080–083. Available from: https://ojs.pphouse.org/index.php/IJEP/article/view/4504/1963.

Bowen, K.L., Hagan, A.A., Pegues, M., Jones, J., Miller, H.B., 2018. Epidemics and yield losses due to *Corynespora cassiicola* on cotton. Plant Disease 102(12), 2495–2499. https://doi.org/10.1094/PDIS-03-18-0382-RE.

Conner, K.N., Hagan, A.K., Zhang, L., 2013. First report of *Corynespora cassiicola*-incited target spot on cotton in Alabama. Plant Disease 97(10), 1379. https://doi.org/10.1094/PDIS-02-13-0133-PDN.

Fulmer, A.M., Walls, J.T., Dutta, B., Parkunan, V., Brock, J., Kemerait, R.C., 2012. First report of target spot caused by *Corynespora cassiicola* on cotton in Georgia. Plant Disease 96(7), 1066. https://doi.org/10.1094/PDIS-01-12-0035-PDN.

Hagan, A.K., Bowen., K.L., Pegues, M., Jones, J., 2015. Relationship between target spot intensity and seed cotton yield. Phytopathology. 105, S2.4. Available from: http://www.researchgate.net/publication/295581079.

Hosagoudar, G.N., Chattannavar, S.N., Benagi, V.I., Adiver, S.S., Patil, S.B., Ashtaputre S.A., Patil, R.S., 2014. Estimation of crop loss and optimization

of spray schedule for Alternaria leaf spot disease in Bt cotton. Karnataka Journal of Agricultural Sciences 27(4), 472–475. Available from: http://www.researchgate.net/profile/Sudheendra-Ashtaputre/publication/314436808.

Jones, J.P., 1961. A leaf spot of cotton caused by *Corynespora cassiicola*. Phytopathology 51(5), 305–308. https://archive.org/details/sim_phytopathology_1961-05_51_5.

Kalpana, K., Bhattiprolu, S.L., Bindu Madhavi, G., Sai Ram Kumar, D.V., 2025. Host range of *Corynespora cassiicola* isolate of cotton. Journal of Cotton Research and Development 39(1), 38–46. Available from: http://www.crdaindia.com/fileserve.php?FID=1025.

Kelly, H., Raper, T., 2017. The response of cotton to fungicides application for target spot in Tennessee. Beltwide Cotton Conferences, Texas. Available from: https://ncc.confex.com/ncc/2017/webprogram/Paper17660.html.

Mehl, H.L., Dufault, N.S., Allen, T.W., Hagan, A.K., Price, P., Kemarait, R.C., Kelly, H., Mulvanney, M.J., Nicholas, R., 2020. Multiyear regional evaluation of foliar fungicide applications for cotton target spot management in the Southeastern United States. Plant Disease 104(2), 438–447. https://doi.org/10.1094/PDIS-06-19-1150-RE.

Monga, D., Bhattiprolu, S.L., Prakash, A.H., 2013. Crop losses due to important cotton diseases. Technical Bulletin No.1, Central Institute for Cotton Research, Nagpur, p23.

Mounika, P., Bhattiprolu, S.L., Khayum Ahammed, S., Sreekanth, M., 2023. Influence of spacing on the progress of Corynespora leaf spot in cotton. Journal of Cotton Research and Development 37(2), 227–232. Available from: http://www.crdaindia.com/fileserve.php?FID=966.

Narayanan S.S., Singh, P., Ravindranath, K., 2017. Proven technologies for doubling cotton production in India and enhancing quality of lint and seed. International Journal of Economic Plants 4(01), 021–030. Available from: https://ojs.pphouse.org/index.php/IJEP/article/view/4492/1951.

Parakhia, A.M., Andharia, J.H., Vaishnav, M.U., 1989. A new leaf spot disease of cotton in India. Gujarat Agricultural University Research Journal 14(2), 100–102. Available from: https://www.cabidigitallibrary.org/doi/full/10.5555/19922320673.

Pernezny, K., Datnoff, L.E., Rutherford, B., Carroll, A., 2000. Relationship of temperature to growth, sporulation, and infection of tomato by the target spot fungus. Florida Tomato Committee Tomato Research Report for 2000, 16–19.

Price, T., Singh, R., Fromme, D., 2015. First report of target spot caused by *Corynespora cassiicola* in Louisiana cotton. Plant Health Progress 16(4), 223–224. https://apsjournals.apsnet.org/doi/pdf/10.1094/PHP-BR-15-0036.

Raj, S., Joseph, A., 2011. Critical weather factors influencing the incidence and severity of Corynespora leaf fall disease in Hevea. Natural Rubber Research 24(1), 124–131. Available from: https://www.researchgate.net/publication/263747490.

Roshan, B.S., Bhattiprolu, S.L., Kumari, V.P., Chiranjeevi, C., 2022a. Estimation of yield losses in cotton due to major fungal foliar diseases. The Journal of Research ANGRAU 50(3), 17–27. http://www.cabdigitallibrary.org/doi/pdf/10.5555/20220542574.

Roshan, B.S., Bhattiprolu, S.L., Kumari, V.P., Chiranjeevi, C., 2022b. Progress of fungal foliar diseases in relation to weather parameters in cotton. The Journal of Research ANGRAU. 50 (4), 10–19. https://doi.org/10.58537/jorangrau.2022.50.4.02.

Salunkhe, V.N., Gawande, S.P., Nagrale, D.T., Hiremani, N.S., Gokte-Narkhedkar, N., Waghmare, V.N., 2019. First report of Corynespora leaf spot of cotton caused by *Corynespora cassiicola* in Central India. Plant Disease 103(7), 1785–1787. http://doi.org/10.1094/PDIS-05-18-0823-PDN.

Sarbhoy, A.K., Lal, G., Varshney, J.L., 1975. Fungi of India (1967–71). Navyug Traders, New Delhi, India, 148.

Sharma, N., 2017. Epidemiology of target spot of cotton and tomato. M. S. Thesis, Auburn University. Available from: https://etd.auburn.edu/handle/10415/6011.

Sheo, R., 1988. Grading system for cotton diseases, Nagpur. CICR, Technical Bulletin, 1–7.

Schlub, R.L., Smith, L.J., Datnoff, L.E., Pernezny, K., 2009. An overview of target spot of tomato caused by *Corynespora cassiicola*. Acta Horticulturae 808, 25–28. https://doi.org/10.17660/ActaHortic.2009.808.1.

Siva Prasad, B.M.V., Bhattiprolu, S.L., Kumari, V.P., Manoj Kumar, V., Divyamani, V., Patibanda, A.K., Jayalalitha, K., Sai Ram Kumar, D.V., 2022. First report of *Corynespora cassiicola* (Berk. and Curt.) Wei. causing target spot on cotton (*Gossypium hirsutum* L.) in South India. Plant Disease 106(8), 2255. http://doi.org/10.1094/PDIS-11-22-2599-PDN.

Wheeler, B.E.J., 1969. An Introduction to plant diseases. John Wiley publication, London. 301. Available from: https://www.cabidigitallibrary.org.doi/full/10.5555/19701604180.