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Influence of Weather Parameters on the Development of Grey Mildew Disease in Cotton

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A study was conducted at the Regional Agricultural Research Station in Warangal to investigate the impact of environmental factors on the development of grey mildew (*Ramularia aerola* Atk) in cotton. The research spanned from the *Kharif* season of 2019-20 to 2022-23 and focused on both

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Bt and non-Bt cotton genotypes grown in vertisols. Disease scores were recorded weekly on randomly selected labeled plants, and the percentage of disease intensity (PDI) was analyzed in relation to various weather parameters. Grey mildew was observed during the boll development stage up to the boll bursting stage, reaching its peak during the latter phase. Correlation analysis revealed significant negative associations between PDI and maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall, and the number of rainy days. These findings indicate that these environmental factors influenced the development of the disease in both Bt and non-Bt genotypes. Furthermore, multiple linear regression analysis of PDI demonstrated that one percent increase in evening relative humidity led to a corresponding increase in the percent disease index of grey mildew. Specifically, in Bt (RCH 2 BG II) genotype, the increase was 0.38%, while in non-Bt (LRA-5166) genotype, it was 1.87%. Consequently, the study suggests the implementation of preventive and/or protective measures, such as the use of recommended fungicides like 0.3% wettable sulphur or 0.1% carbendazim.

Keywords: Cotton; correlation; grey mildew; regression; weather parameters.

1. INTRODUCTION

Cotton is one of the important fibre crop playing a pivotal role in economic and social status of the world. Known as 'white gold' locally, it stands as a prominent cash crop. In India, the cotton production for the year 2022-23 reached approximately 337.23 lakh bales of 170 kg each, cultivated across 130.49 lakh hectares. The productivity recorded was an average of 439 kg lint per hectare, as reported in the Annual Report of the All India Coordinated Research Project (AICRP) on cotton for the year 2022-23 [1].

While India holds the top position in terms of cotton area and production, its productivity remains relatively low compared to other cotton-growing nations. This disparity can be attributed to various factors, and one of the significant constraints is the prevalence of diseases. Fungal and bacterial diseases pose a substantial threat to cotton yield, leading to decreased productivity. Major diseases affecting cotton crops in India include bacterial leaf spot, Alternaria leaf spot, Corynespora leaf spot, rust, boll rot, and grey mildew.

The presence of fungal and bacterial diseases in cotton plants has a detrimental impact on their overall health and vigor, ultimately leading to a decrease in crop yield. To ensure the productivity and profitability of cotton farming in India, it becomes imperative to address and effectively manage these diseases.

Implementing proactive disease management strategies is essential. This includes adopting preventive measures such as practicing crop rotation, ensuring proper sanitation in the field, and using disease-resistant cotton varieties. Additionally, timely and accurate diagnosis of diseases is crucial for implementing appropriate control measures.

Integrated pest management techniques, including the judicious use of fungicides and bactericides, can help control the spread and severity of these diseases. It is important to follow recommended application guidelines and adhere to appropriate timing to maximize their effectiveness.

Furthermore, promoting good agricultural practices, such as maintaining proper soil fertility, managing irrigation efficiently, and providing optimal plant nutrition, can enhance the overall health and resilience of cotton plants, making them less susceptible to diseases.

By adopting a comprehensive approach to disease management and implementing these strategies, cotton farmers in India can mitigate the negative impacts of fungal and bacterial diseases, leading to improved cotton productivity and increased profitability in the industry.Grey mildew in cotton is one of the important disease that affects the cotton yields, caused by *Ramularia aerola* Atk and vernacularly known as ‘White mould’ ‘Dahiya’/ ‘Areolate mildew’ is increasing as an emerging disease in cotton.

The disease was first reported by Atkinson [2] in USA. In India, the disease has been reported to occur in Tamil Nadu, Andhra Pradesh, Karnataka, Bihar, Madhya Pradesh, Gujarat, Maharashtra [3-6]; 1962; [7-10], affecting very severely the diploid Desi/ Asiatic *G. arboreum* and *G. herbaceum* cottons. Both the surfaces of leaves get uniformly covered by white powdery growth of the fungus is the main symptom of the disease. This further leads to curling and drying of the leaves and the diseased leaves defoliate eventually. Under prolonged favourable atmospheric conditions, disease aggravates and the mildew spots appear on bracts and bolls. Shedding of leaves and buds takes place and further development of the newly formed bolls is affected. It has been reported that the grey mildew disease reduces yield as much as 38.38 % from Andhra Pradesh [11] and 29.20 % in India [12]. The cultivation of 'Diploid' cotton in exclusive monoculture has been associated with significant losses, with recorded losses reaching as high as 90 percent [13]. Considering this alarming scenario, the current study aimed to assess the progression of grey mildew disease in cotton by examining its relationship with weather parameters.

By investigating the correlation between grey mildew disease and various weather factors, the study aimed to provide insights into predicting the disease's development. This research is crucial for understanding the impact of weather conditions on the prevalence and severity of grey mildew in cotton crop.

2. MATERIALS AND METHODS

The effect of weather parameters on the development of grey mildew in both Bt cotton *i.e.,* RCH 2BG II and susceptible non Bt cotton *i.e.,* LRA- 5166 was investigated from 2019-20 to 2022-23 in black cotton soils at Regional Agricultural Research Station, Warangal under rainfed conditions. The crop was sown during1st week of July month in a bulk plot with Bt and non Bt variety each with an area of 192 m^{2}for four consecutive years (2019-20 to 2022-23). Ten plants, in the middle rows, at random were tagged and grey mildew disease was scored using 0-4 scale [14] at weekly intervals on labeled plants upto the end of December and expressed as percent disease Intensity (PDI) using Wheeler's formula:

$$\text{PDI} = \frac{\text{Sum of all the numerical ratings}}{\text{Total No. of leaves x Maximum disease grade}} \text{ X } 100$$

Meteorological data (maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall, sunshine hours, rainy days, evaporation) was recorded daily from sowing onwards and weekly means were calculated, while rainfall during the standard meteorological week was totalled. The Correlation between the progress of grey mildew severity and weather factors was calculated and a multiple regression equation was derived using an Excel programme.

2.1 Infection Rate

The apparent infection rate (r/unit/day) of the disease was calculated using the formula given by Vander Plank [15]:

$$\text{Infection rate (r)} = \frac{2.3}{t_2 - t_1} \log \frac{X_2}{x_1}$$

Where r= apparent infection rate per unit per day, t_1 = time of first date of recording disease intensity, t_2 = time of second date of recording disease intensity, x_1 = disease intensity at time t_1, x_2 = disease intensity at time t_2, 2.3 = Constant value.

2.2 The Area Under Disease Progress Curve (AUDPC)

The area under disease progress curve (AUDPC)was calculated using the formula proposed by Madden *et al*. [16].

$$\text{AUDPC} = \sum_{i=1}^{n-1} \frac{y_i + y_{i+1}}{2} \text{ X } (t_{i+1} - t_i)$$

Where y_i is an assessment of a disease at the ith observation, t_i is time (in days, hours, etc.) at ith observation and n is the total number of observations.

3. RESULTS

From the pooled data (2019-20 to 2022-23), grey mildew appeared during the 43rdMeteorological week (22nd Oct – 28th Oct) in Bt cotton, RCH 2 BG II when the crop is at the boll development stage to boll bursting stage with mean maximum temperature (T_{max}) 30.60^{o}C, mean minimum temperature (T_{min}) 20.35^{o}C, mean morning relative humidity (RH I) 89.30 %, mean evening relative humidity (RH II) 59.90 % , sunshine hours (SSH) 7.35 h day^{-1}, rainfall 12.00 mm (Table 1). There after the disease increased progressively and reached its peak (15.89 %) during 50thMeteorological week (10th–16thDecember) when the crop is at boll bursting stage with mean maximum temperature (T_{max}) 29.90^{o}C, mean minimum temperature (T_{min}) 18.20^{o}C, mean morning relative humidity (RH I)

88.48 %, mean evening relative humidity (RH II) 54.00 %, sunshine hours (SSH) 4.80 hday^{-1}and nil rainfall (Fig. 1).

From the pooled data (2019-20 to 2022-23) grey mildew on cotton appeared during 41st meteorological week (8th – 14th Oct) in non Bt (LRA- 5166),when the crop is at boll development stage to boll bursting stage with mean maximum temperature (T_{max}) 31.15ºC, mean minimum temperature (T_{min}) 23.33ºC, mean morning relative humidity (RH I) 92.63 %, mean evening relative humidity (RH II) 72.53 % , sunshine hours (SSH) 4.39 hday^{-1}and 33.15 mm rainfall (Table 2).Thereafter it increased progressively and reached its peak (45.19 %) during 46th Meteorological week (12th – 18th November) when the crop is at boll development to boll bursting stage with mean maximum temperature (T_{max}) 30.63ºC, mean minimum temperature (T_{min}) 19.65ºC, mean morning relative humidity (RH I) 89.38 %, mean evening relative humidity (RH II) 62.30 %, sunshine hours (SSH) 5.38 hday^{-1} and 20.75 mm rainfall (Fig. 2).

Grey mildew disease incidence in LRA-5166 appeared and reached the maximum when the crop is at boll development to boll bursting stage while in RCH 2 BG II the disease incidence appeared when the crop is at boll development to boll bursting stage but it reached the maximum when the crop is at boll bursting stage (Usually when the last picking is going on). Due to the early maximum incidence of the disease in LRA-5166, the leaves started curling and drying which further led to premature defoliation of leaves which also resulted in reduced photosynthesis, boll development and yields. The increase in disease severity at different growth stages were reflected in Area under disease progress curve (AUDPC). Maximum AUDPC observed in RCH 2 BG II was 107.2 and in LRA-5166 was 304.4 (Fig. 3).

The scatter plot shows that disease incidence of grey mildew in Bt cotton RCH 2 BG II was more common at a weekly average maximum temperature of 29 to 31ºC, weekly average minimum temperature of 16 to 20ºC, weekly average morning relative humidity of 84 to 90%, weekly average evening relative humidity of 44 to 62%, weekly average rainfall of 0 to 20 mm, weekly average sunshine hours of 3.91 to 7.35, weekly average rainy days of 0 to 0.5 (Fig. 4).

In LRA 5166, the disease incidence was more common at a weekly average maximum temperature of 29 to 31ºC, weekly average minimum temperature of 14 to 23ºC, weekly average morning relative humidity of 84 to 92 %, weekly average evening relative humidity of 44 to 72 %, weekly average rainfall of 0 to 33 mm, Weekly average sunshine hours of 3.91 to 7.35, weekly average rainy days of 0 to 1.75 (Fig. 5).

When comparing the results of the four consecutive years (2019-20 to 2022-23), it was observed that the maximum disease severity occurred in 2019 for both the hybrid, RCH 2 BG II (Fig. 6) and variety, LRA-5166 (Fig. 7) of cotton. This can be attributed to the favorable weather conditions that prevailed during that period, including low temperatures, high relative humidity, and low sunshine hours.The combination of these weather factors created an environment conducive to the development and spread of the grey mildew disease. As a result, the disease severity reached its peak in 2019, impacting both the Bt and non-Bt cotton studied.This comparison of disease severity across the four years highlights the influence of varying weather conditions on the occurrence and intensity of grey mildew in cotton crops. It emphasizes the importance of monitoring weather patterns and understanding their impact on disease development in order to implement appropriate management strategies.

3.1 Correlation between Grey Mildew of Cotton Percent Disease Index and Weather Variables

In Bt and Non Bt cotton, the correlation analysis revealed significant negative correlations between the percent disease index (PDI) of grey mildew and several weather variables. These variables include maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall, and the number of rainy days. In Bt cotton a negative correlation was observed between PDI and sunshine hours, but it was not statistically significant. Interestingly, a positive correlation was observed between PDI and sunshine hours in non Bt, but it was not statistically significant. This implies that the duration of sunshine hours did not have a significant impact on the severity of grey mildew in Bt and non Bt cotton. These insights can be valuable for farmers and researchers in managing and mitigating the impact of grey mildew on Bt cotton crops (Table 3).

Table 1. Pooled data on appearance and progress of grey mildew in Bt cotton, RCH 2 BG II from *Kharif,* 2019-20 to 2022-23

Standard Weeks		Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)	Sunshine (hrs)	Number of rainy days	Intensity of Grey mildew (%)	AUDPC	Apparent infection rate 'r' per unit per day
		Max.	Min.	Max.	Min.						
40	01-07 Oct	31.73	23.70	91.33	70.43	17.50	4.88	1.5	0.00	0.00	-
41	08-14 Oct	31.15	23.33	92.63	72.53	33.15	4.39	1.75	0.00	0.00	-
42	15-21 Oct	30.78	22.95	93.55	72.45	56.60	3.61	3	0.00	0.00	-
43	**22-28 Oct**	**30.60**	**20.35**	**89.30**	**59.90**	**12.00**	**7.35**	**0.5**	**1.89**	6.6	0.100
44	29-04 Nov	30.45	20.35	88.85	62.45	8.10	5.58	0.5	3.81	20.0	0.053
45	05-11 Nov	30.25	18.53	88.53	54.48	0.00	5.32	0	5.51	32.6	0.106
46	12-18 Nov	30.63	19.65	89.38	62.30	20.75	5.38	0.25	11.63	60.0	0.005
47	19-25 Nov	31.15	19.60	88.28	60.38	1.50	3.91	0.25	12.08	83.0	0.039
48	26-02 Dec	29.35	18.20	89.68	58.30	1.55	4.52	0.5	9.20	74.5	0.045
49	03-09 Dec	30.05	16.98	84.03	51.83	0.00	4.53	0	12.58	76.2	0.033
50	**10-16 Dec**	**29.90**	**18.20**	**88.48**	**54.00**	**0.00**	**4.08**	**0**	**15.89**	99.6	0.011
51	17-23 Dec	29.00	14.93	88.35	44.60	0.00	4.24	0	14.75	107.2	0.067
52	24-31 Dec	29.30	17.20	90.93	46.38	0.00	4.32	0	9.20	83.8	-

Table 2. Pooled data on appearance and progress of grey mildew in Non-Bt cotton, LRA- 5166 from *Kharif,* 2019-20 to 2022-23

Standard Weeks		Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)	Sunshine (hrs)	Number of rainy days	Intensity of Grey mildew (%)	AUDPC	Apparent infection rate 'r' per unit per day
		Max.	**Min.**	**Max.**	**Min.**						
40	01-07 Oct	31.73	23.70	91.33	70.43	17.50	4.88	1.5	0.00	0.0	-
41	**08-14 Oct**	**31.15**	**23.33**	**92.63**	**72.53**	**33.15**	**4.39**	**1.75**	**2.00**	7.0	0.064
42	15-21 Oct	30.78	22.95	93.55	72.45	56.60	3.61	3	3.13	17.9	0.208
43	22-28 Oct	30.60	20.35	89.30	59.90	12.00	7.35	0.5	13.39	57.8	0.078
44	29-04 Nov	30.45	20.35	88.85	62.45	8.10	5.58	0.5	23.09	127.7	0.085
45	05-11 Nov	30.25	18.53	88.53	54.48	0.00	5.32	0	41.78	227.0	0.011
46	**12-18 Nov**	**30.63**	**19.65**	**89.38**	**62.30**	**20.75**	**5.38**	**0.25**	**45.19**	304.4	0.049
47	19-25 Nov	31.15	19.60	88.28	60.38	1.50	3.91	0.25	32.08	270.4	0.024
48	26-02 Dec	29.35	18.20	89.68	58.30	1.55	4.52	0.5	27.20	207.5	0.007
49	03-09 Dec	30.05	16.98	84.03	51.83	0.00	4.53	0	28.65	195.5	0.007
50	10-16 Dec	29.90	18.20	88.48	54.00	0.00	4.08	0	27.20	195.5	0.021
51	17-23 Dec	29.00	14.93	88.35	44.60	0.00	4.24	0	31.44	205.2	0.022
52	24-31 Dec	29.30	17.20	90.93	46.38	0.00	4.32	0	26.89	204.1	-

Table 3. Correlation between grey mildew and weather factors in Bt cotton hybrid (RCH 2 BG II) and Non Bt cotton (LRA 5166) (Pooled data of 2019-20 to 2022-23)

Variable	Correlation co- efficient (r) of Grey mildew	
	RCH 2 BG II	LRA 5166
Maximum temperature (°C)	-0.61 **	-0.50 **
Minimum temperature (°C)	-0.83**	-0.74**
Morning relative humidity (%)	-0.66**	-0.62**
Evening relative humidity (%)	-0.75**	-0.66**
Rainfall (mm day^{-1})	-0.66**	-0.63**
Rainy days	-0.74**	-0.80 **
Sunshine hours (hours day^{-1})	-0.31NS	0.04NS

*** Significant at (p=0.05); NS: Non significant*

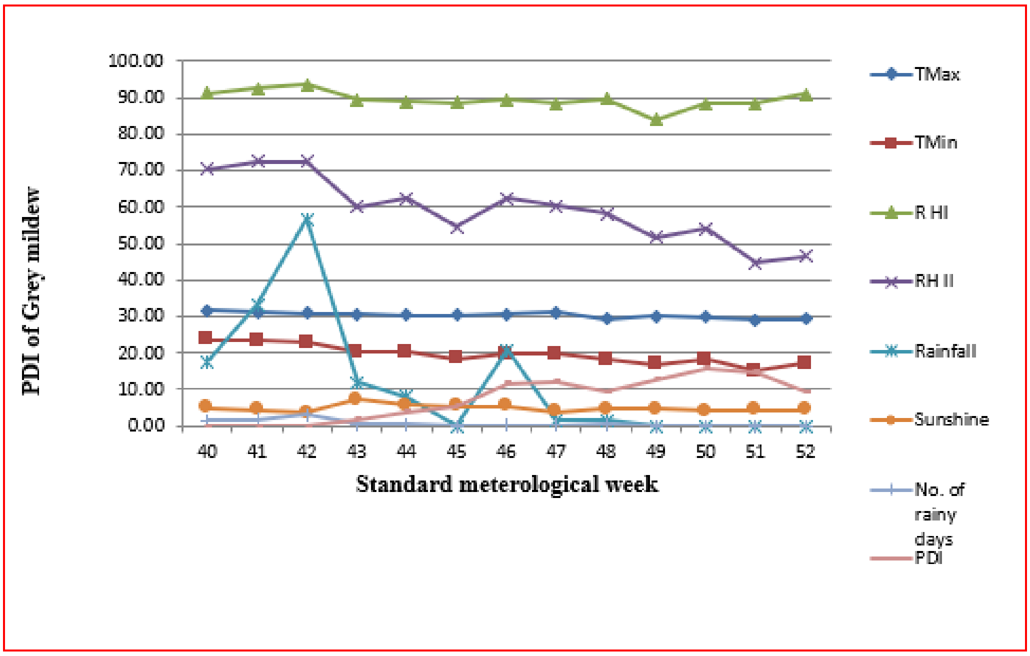


Fig. 1. Progress of grey mildew in Btcotton hybrid RCH 2 BG II during 2019-20 to 2022-23

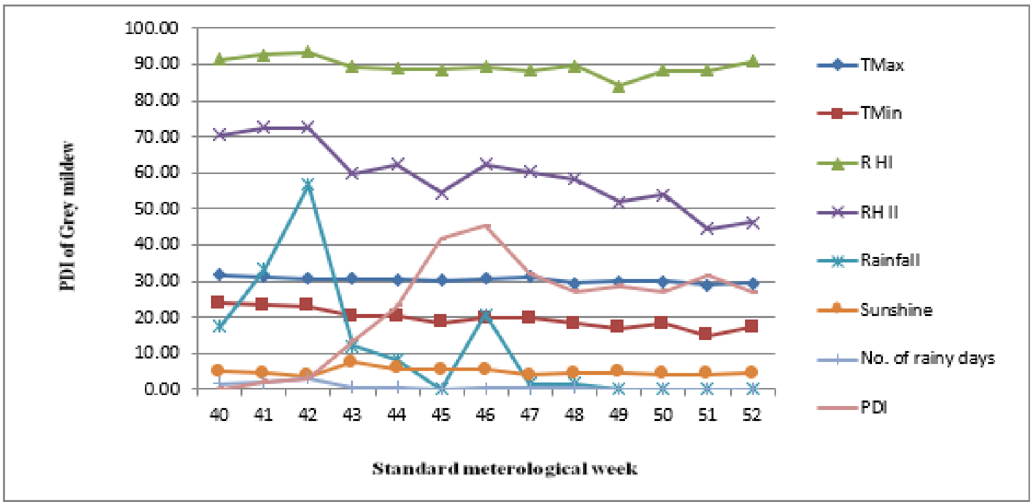


Fig. 2. Progress of grey mildew in non Bt cotton, LRA 5166during 2019-20 to 2022-23

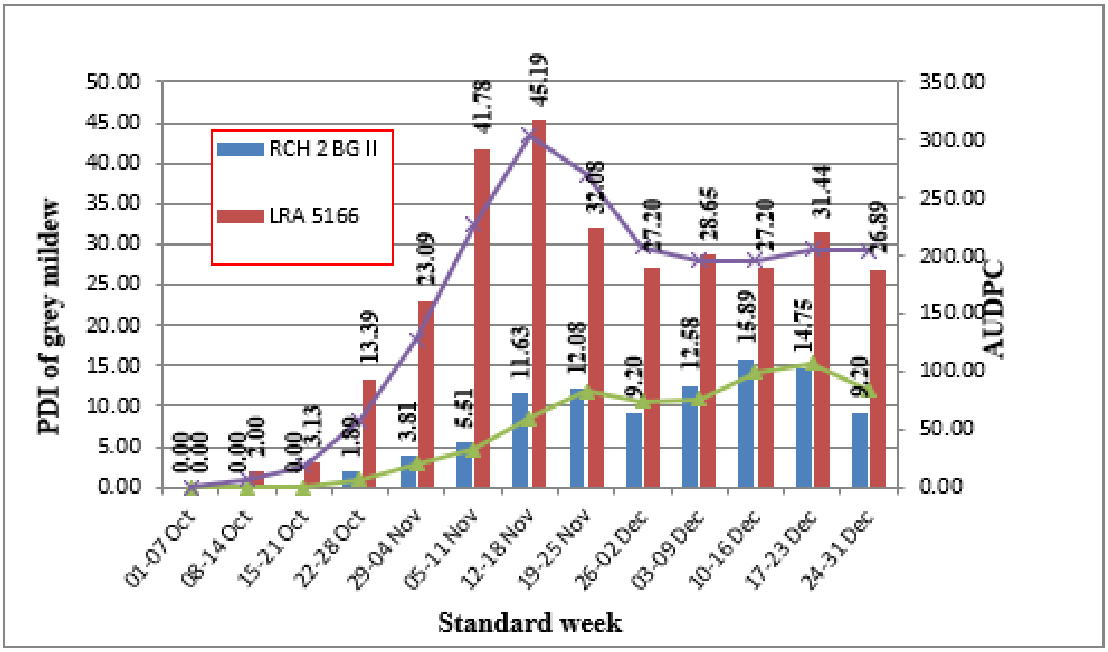
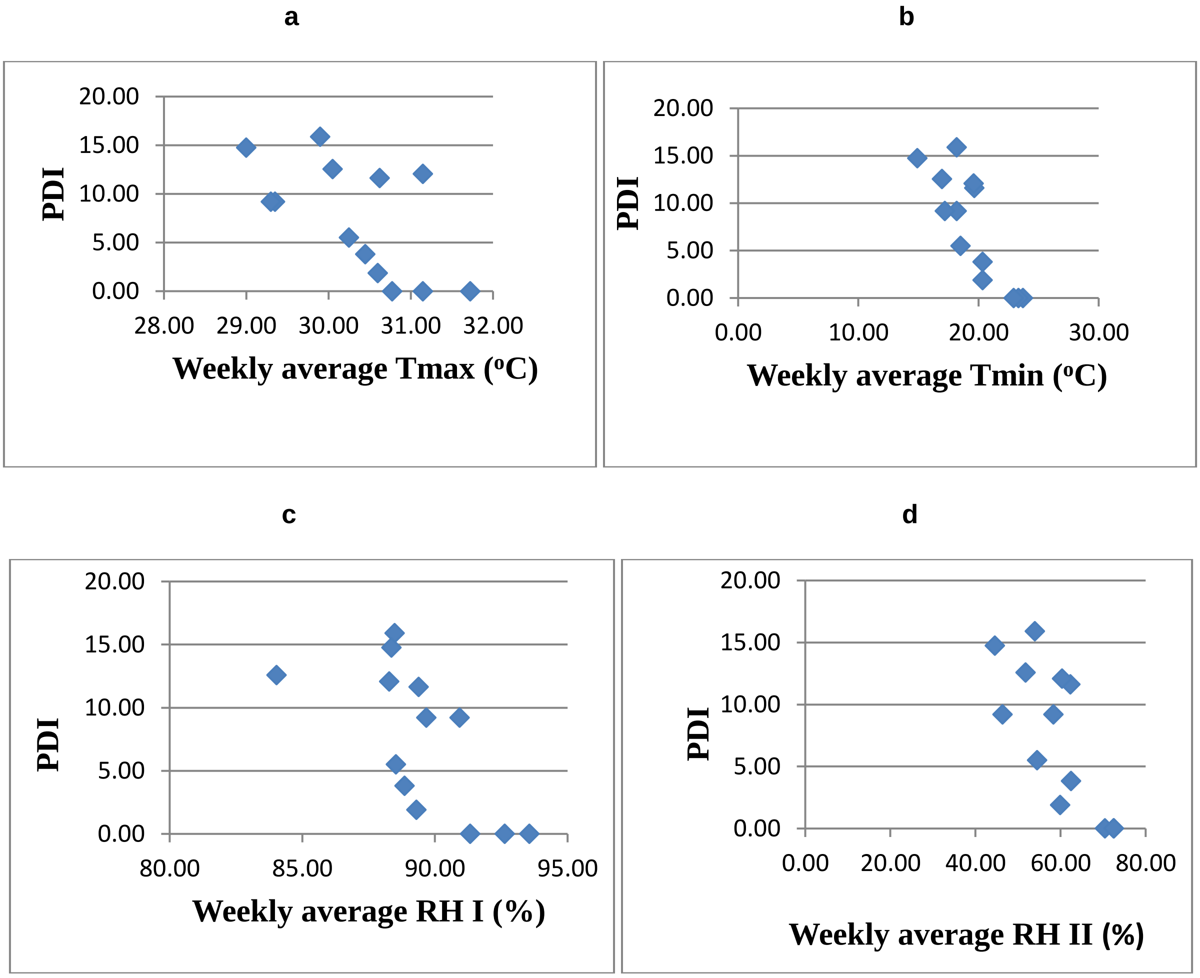


Fig. 3. Progression of disease severity during different stages of crop growth



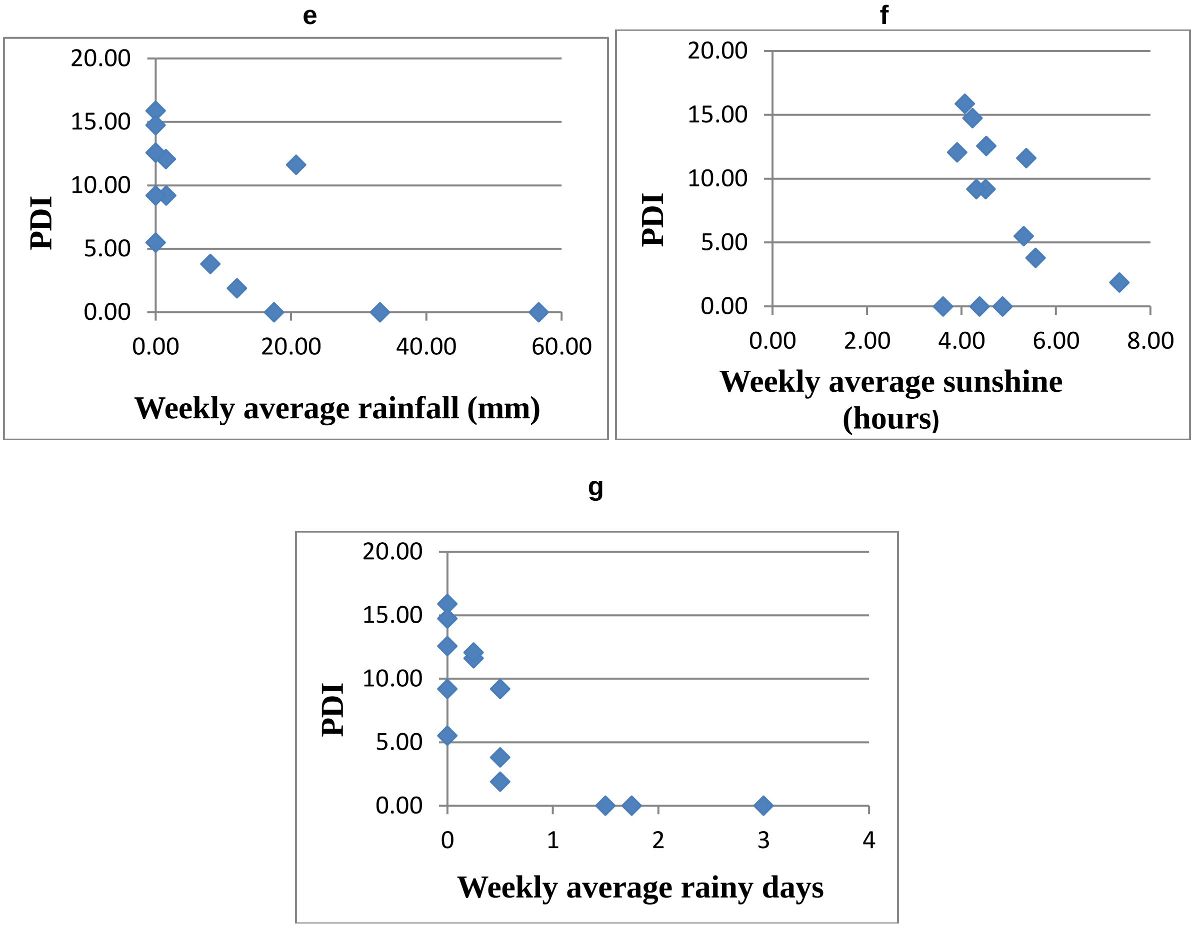
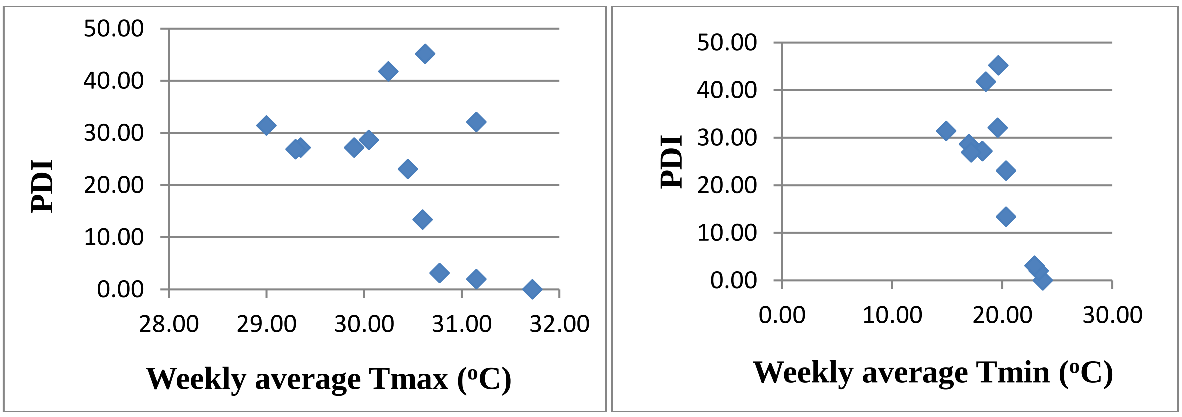


Fig. 4. Effect of different weather variables on grey mildew of cotton in RCH 2 BG II
a) Weekly average maximum temperature
b) Weekly average minimum temperature
c) Weekly average morning relative humidity
d) Weekly average evening relative humidity
e) Weekly average rainfall
f) Weekly average sunshine hours
g) Weekly average rainy days

a **b**



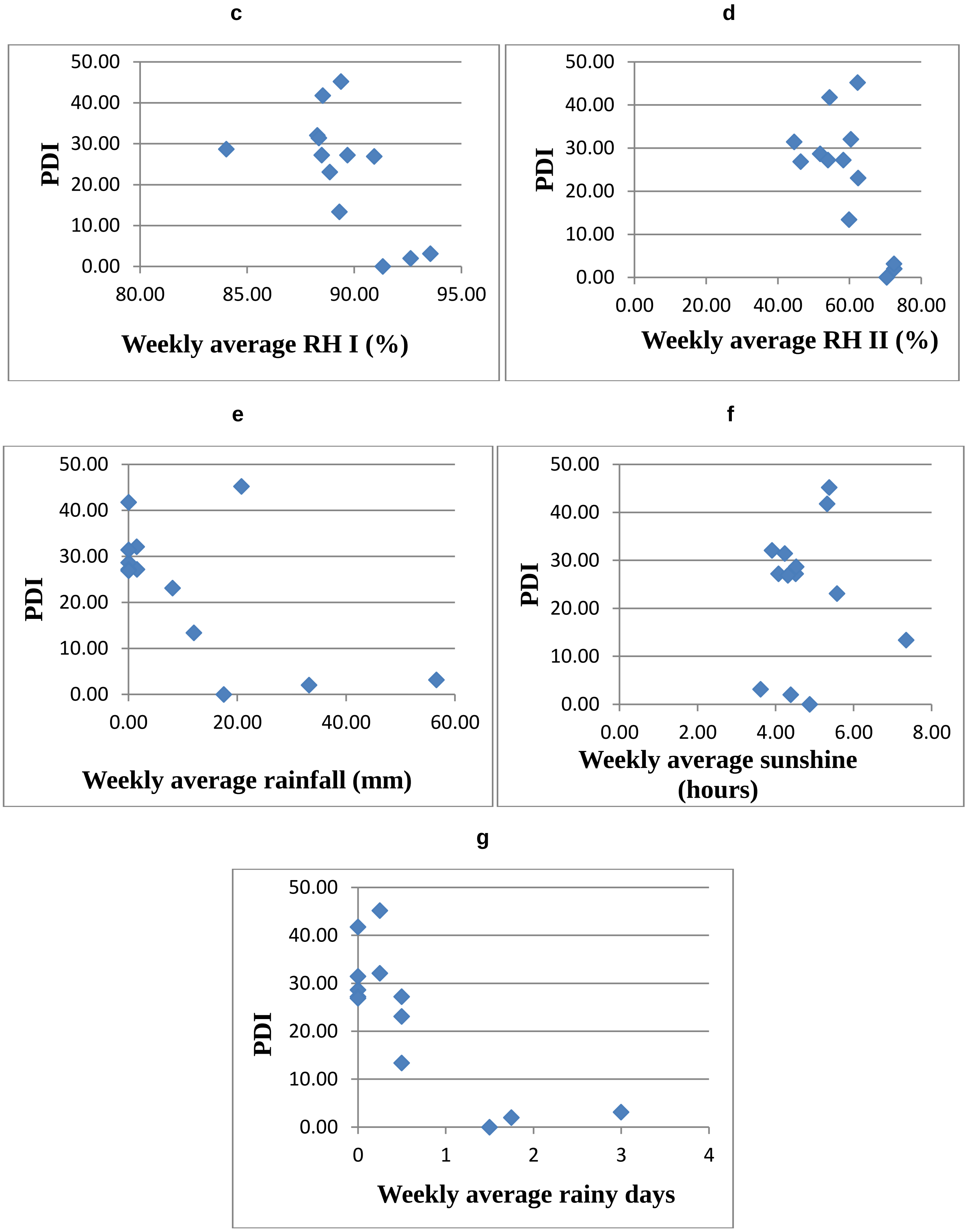


Fig. 5. Effect of different weather variables on grey mildew of cotton in LRA 5166

a) Weekly average maximum temperature
b) Weekly average minimum temperature
c) Weekly average morning relative humidity
d) Weekly average evening relative humidity
e) Weekly average rainfall
f) Weekly average sunshine hours
g) Weekly average rainy days

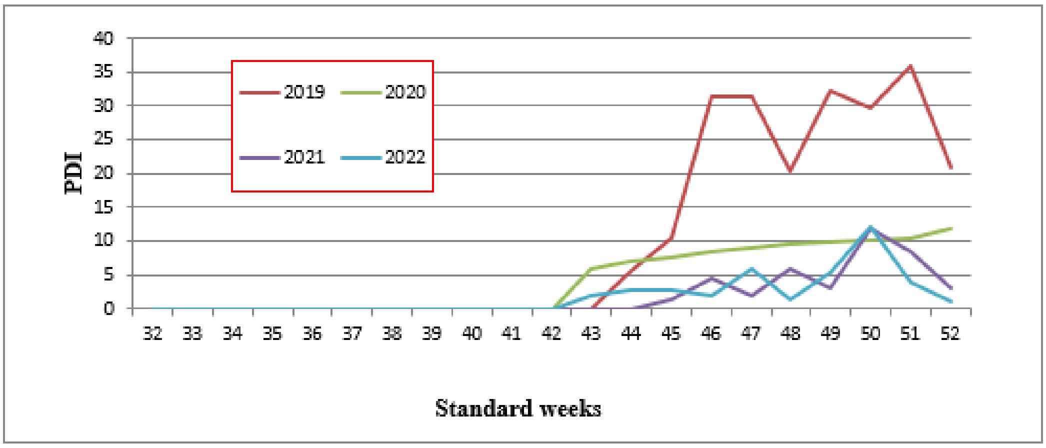


Fig. 6. Development of grey mildew inBt cotton RCH 2 BG II during different weeks from 2019-20 to 2022-23

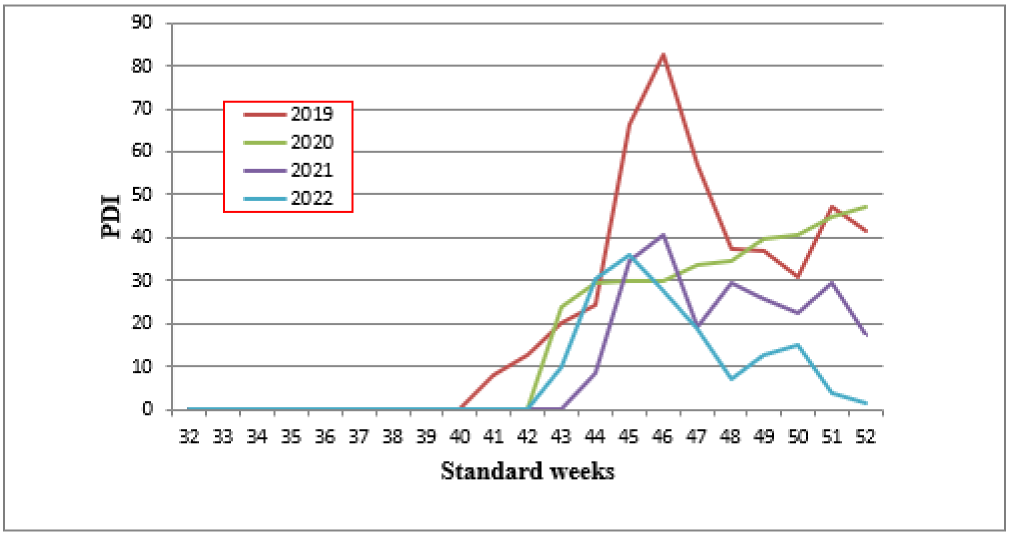


Fig. 7. Development of grey mildew in non Bt cotton LRA 5166 during different weeks from 2019-20 to 2022-23

3.2 Fitting and Validation of Grey Mildew Prediction Model

Key weather variables incorporated into the grey mildew model were weekly average minimum temperature, weekly average maximum temperature, weekly average morning relative humidity, weekly average evening relative humidity,weekly average rainfall,weekly average sunshine hours and weekly average rainy days. The developed prediction model had R^2 value of 0.914 for Bt cotton, RCH 2 BG II and 0.866 for non Bt cotton, LRA- 5166.

The data on percent disease index was subjected to step up multiple linear regression analysis (Table 4) and the prediction model was developed.

i) Bt cotton (RCH 2 BG II):

PDI = 16.81 + 1.04T_{max} -2.18T_{min}+ 0.38 RH II + 0.15 R – 2.70 S – 6.69 Rd (R^2 = 0.914)

ii) Non Bt cotton (LRA-5166):

PDI = - 274.35+ 7.05 T_{max} - 9.62 T_{min}+1.95 RH I + 1.87RH II + 0.59 R - 1.36 S –23.91 Rd (R^2 = 0.866)

Where, PDI = Percent disease index, T_{max}= Maximum temperature, T_{min}= Minimum temperature, RH I= Morning relative humidity, RH II= Evening relative humidity, R = Rainfall, S =Sunshine and Rd= Number of rainy days.

Table 4. Multiple linear regression analysis of percent disease index of grey mildew and weather factors (Pooled data of 2019-20 to 2022-23)

Variable	Bt cotton (RCH 2 BG II)			Non Bt cotton (LRA- 5166)		
	Regression co-efficient (b)	Standard error (E)	t- value	Regression co-efficient (b)	Standard error (E)	t- value
Maximum temperature	1.04*	3.43	0.30	7.05*	10.66	0.66
Minimum temperature	-2.18*	2.34	-0.93	-9.62*	7.28	-1.32
Morning relative humidity	-0.06NS	0.79	-0.08	1.95*	2.45	0.79
Evening relative humidity	0.38*	0.41	0.92	1.87*	1.28	1.46
Rainfall	0.15*	0.15	1.04	0.59*	0.46	1.27
Sunshine	-2.70*	1.10	-2.44	-1.36*	3.43	-0.39
Rainy days	-6.69*	3.61	-1.84	-23.9*	11.2	-2.13

Bt cotton: Intercept percent of variation attributable to the regression (R^2 = 0.914)
**Significant at (p= 0.05); NS: Non significant*
Non Bt cotton: Intercept percent of variation attributable to the regression (R^2= 0.866)
** Significant at (p = 0.05); NS: Non significant*

3.3 Multiple Regression Analysis between Weather Variables and Percent Disease Index of Grey Mildew of Cotton

Multiple regression analysis of pooled data (2019-20 to 2022-23) showed that maximum temperature, evening relative humidity, rainfall, sunshine and rainy days significantly influenced the development of disease in Bt cotton.

In Non Bt cotton, maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall, sunshine and rainy days significantly influenced the development of disease.

The coefficient of determination (R^2) was 0.914 for Bt cotton and 0.866 for Non Bt cotton which showed that weather factors caused variation in percent disease index to the extent of 91.40 % and 86.60 % for Bt and non Bt respectively. It was observed from the step up regression equation that among weather factors studied, the partial regression coefficient (b) for evening relative humidity was significant and positively correlated in Bt (0.38) & Non Bt (1.87) cotton and for maximum temperature the partial regression coefficient was significant and positively correlated with Bt (1.04) and Non Bt (7.05) whereas minimum temperature for the Bt (-2.18) and non Bt(-9.62) cotton had a significant negative correlation with percent disease index. For morning relative humidity the partial regression coefficient was significant and positively correlated with Non Bt (1.95) and for rainfall with Bt (0.15) and non Bt (0.59) cotton whereas sunshine with Bt (2.70) and non Bt (1.36) cotton and rainy days with Bt (6.69) and non Bt (23.9) cotton had significant negative correlation with percent disease index.

Therefore, it was evident that for every one percent increase in evening relative humidity there was a corresponding increase in percent disease index of grey mildew of 0.38 % and 1.87 % in Bt (RCH 2 BG II) and Non Bt (LRA-5166) respectively, and for every one percent increase in morning relative humidity there was a corresponding increase of percent disease index of grey mildew of 1.95 % in Non Bt (LRA-5166) and for every one percent increase in maximum temperature there was a corresponding increase of percent disease index of grey mildew of 1.04 % and 7.05 % in Bt (RCH 2 BG II) and Non Bt (LRA-5166) respectively and for every one percent increase in rainfall there was a corresponding increase of percent disease index of grey mildew of 0.15 % and 0.59 % in Bt (RCH 2 BG II) and Non Bt (LRA-5166) respectively, where as one percent increase in minimum temperature led to a corresponding decrease in percent disease index of grey mildew of 2.18 % & 9.62 % in Bt & Non Bt respectively and one percent increase in sunshine hours led to a corresponding decrease in percent disease index of grey mildew of 2.70 % &1.36 % in Bt & Non Bt respectively and one percent increase in a number of rainy days led to a corresponding decrease in percent disease index of grey mildew of 6.69 % & 23.9 % in Bt & Non Bt respectively.

4. DISCUSSION

Previous studies have also reported similar observations regarding the influence of weather conditions on the development of grey mildew in cotton. In Maharashtra, heavy rainfall (833.2 mm) from June to September, along with minimum and maximum temperatures ranging from 19.7°C to 23.7°C and 29.4°C to 30.9°C respectively, and relative humidity (RH) between 78% and 85% in the morning hours and 45.5% to 62% in the evening hours, were identified as contributing factors for grey mildew development [17]. In Central India, the occurrence of grey mildew epidemics in 1988 and 1993 was associated with minimum and maximum temperatures in the ranges of 24°C to 25°C and 28°C to 31°C respectively, high relative humidity (RH) between 90% and 91%, and the cultivation of highly susceptible *G. arboretum* cultivar AKH 4 [18,19]. Furthermore, studies have highlighted that a temperature regime of 20°C to 30°C, coupled with prolonged high humidity (> 80%) and frequent rains, is favorable for the infection and development of grey mildew. However, cool weather accompanied by prolonged periods of dew in the absence of rainfall has also been found to be conducive to the development of grey mildew [20]. Additionally, the minimum temperature and wind speed are the critical parameters contributing to the development of in case of grey mildew [21]. The correlation studies indicated that rainfall (-0.531) had significantly negative correlation with the disease development whereas Morning RH (-0.747) and Evening RH (-0.761) had highly significant negative correlation. The weather conditions during 39th to 43rd SMW were observed to be the most congenial for the crop infection and further rapid build-up of grey mildew disease [22].

5. CONCLUSION

In conclusion, the present studies have identified maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall, and rainy days as critical parameters that contribute to the development of grey mildew in cotton. Understanding the influence of these weather conditions is essential for planning effective management strategies against the disease.By utilizing this model, farmers can make informed decisions and implement appropriate control measures to mitigate the impact of grey mildew. This will help reduce unnecessary fungicide applications and promote more targeted and sustainable disease management practices. Overall, the findings from these studies provide valuable insights for cotton farmers, enabling them to proactively plan and implement measures to prevent and manage grey mildew outbreaks. This knowledge will contribute to improved disease management and ultimately enhance the productivity and sustainability of cotton cultivation.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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