

## Effect of Weather Parameters on Development of Powdery Mildew of Guar Caused by *Leveillula taurica*

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**Abstract** A field experiment was conducted during *kharif* season of 2013-2014 with an objective to study the effect of weather parameters on development of powdery mildew of guar. Observations on the incidence of disease were recorded at weekly intervals by using 0-5 scale in different treatments. Results revealed that 36<sup>th</sup> and 37<sup>th</sup> standard weeks were highly favorable for initiation and further development of disease. There was a negative correlation between the disease severity and all weather parameters. The multiple regression equation was fitted to the data and the equation arrived for all the weather parameters is  $Y = 338.29 - 2.11X_1 - 6.91X_2 - 0.97X_3 + 0.304X_4 - 0.284X_5$ . Where,  $X_1$  = Maximum temperature (°C),  $X_2$  = Minimum temperature (°C),  $X_3$  = Relative humidity (%) morning,  $X_4$  = Relative humidity (%) evening and  $X_5$  = Rainfall (mm).

**Keywords** Guar, Powdery mildew, Temperature, Relative humidity, Rainfall.

### Introduction

Guar (*Cyamopsis tetragonoloba* (L.) Taub) is a drought and temperature tolerant deep rooted summer annual legume. Guar is a native to the Indian subcontinent. The crop is grown mainly in the dry habitats of Rajasthan, Haryana, Gujarat, Punjab and limited extent in Uttar Pradesh and Madhya Pradesh. It includes the diseases caused by fungi, bacteria and viruses, among the fungal diseases alternaria blight (*Alternaria cucumerina* var *cyamopsidis*), powdery mildew (*Leveillula taurica*), bacterial blight (*Xanthomonas axanopodis* pv *cyamopsidis*) among bacteria and virus diseases like green sterile disease and top necrosis are important and cause economic losses [1]. Among the foliar diseases, powdery mildew caused by *Leveillula taurica* is an important disease causing a yield loss of 50—55%. The disease manifests mainly on leaves and pods. Severely affected plants are defoliated and weakened by premature drying and death of infected leaves. The incidence of powdery mildew is more observed in the regions where crop season is prolonged. Warm temperature (33°C or above), high humidity (more than 80%) and bright sunshine are congenial conditions for disease development.

### Materials and Methods

The *in vitro* studies related to epidemiology of the diseases such as effect of sugars, temperature and relative humidity which play an important role in germination of spore which leads to the disease de-

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**Table 1.** Effect of weather parameters on guar powdery mildew during *kharif* of 2014.

Standard week	Dates	Temperature (°C)		Rain-fall (mm)	Relative humidity (%)		
		Max	Min		RH 1	RH 2	PDI
32	Aug 6-12	34.2	23.6	0	79	47	4.00
33	Aug 13-19	34.1	23.0	7.9	78	50	10
34	Aug 20-26	33.7	22.3	187	89	62	0
35	Aug 27-Sep 2	28.0	21.6	190	93	83	0
36	Sep 3-9	30.0	21.7	20	87	68	20
37	Sep 10-16	32.2	22.5	20	83	57	36
38	Sep 17-23	29.8	22.3	46	90	79	48
39	Sep 24-30	32.4	23.7	0	83	55	64
40	Oct 1-7	34.2	22.4	35	75	46	68
41	Oct 8-14	31.8	21.8	0.6	83	60	72
42	Oct 15-21	32.9	22.7	0	75	51	72
43	Oct 22-28	29.9	20.7	15	81	61	80
44	Oct 29-Nov 4	30.5	16.1	0	76	42	84
45	Nov 5-11	31.6	17.7	4.4	68	48	88
46	Nov 12-18	30.4	19.8	7.6	83	59	92
47	Nov 19-25	31.3	18.1	0	84	48	96
48	Nov 26-Dec 2	30.1	14.0	0	87	34	100
49	Dec 3-9	30.1	14.2	0	93	53	100

velopment have been done in laboratory of plant pathology, college of agriculture raichur.

#### Correlation of weather parameters with percent disease index (PDI)

The epidemiological work has carried out at MARS, Raichur during 2013-14. HG-365, a susceptible variety for powdery mildew was selected and sown in 10 × 10 m plot for the study. The disease incidence was recorded at weekly intervals starting from 35 DAS till week before harvest during each standard meteorological week. For recording the disease score, ten plants were randomly selected, score was recorded using 0-5 scale, later PDI was worked out [2].

**Table 3.** Multiple linear regression of per cent disease index of powdery mildew in relation to weather parameters during *kharif* of 2014. X<sub>1</sub> –Max temperature, X<sub>2</sub> – Min temperature, X<sub>3</sub> –Max RH, X<sub>4</sub> – Min RH, X<sub>5</sub> –Rainfall.

Constant (a)	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	R	R <sup>2</sup>
338.29	-2.11	-6.91	-0.97	0.304	-0.284	0.832	0.691

**Table 2.** Correlation between per cent disease index of powdery mildew in relation to weather parameters during *kharif* of 2014. \*Significant at 5% probability levels.

Sl. No.	Weather parameters	Correlation coefficient (r)
1.	Maximum temperature (°C)	-0.268
2.	Minimum temperature (°C)	-0.684*
3.	Relative humidity (%) morning	-0.612
4.	Relative humidity (%) evening	-0.226*
5.	Rainfall (mm)	-0.489

For the disease development at weekly intervals was correlated with weather parameters viz., rainfall, maximum and minimum temperatures, maximum and minimum relative humidity of weekly weather parameters were monitored regularly during the crop season and average of weekly weather parameters were calculated. Correlation matrix was worked out. Further the data were subjected to multiple linear regression to find out the linearity of the independent variables.

## Results and Discussion

*In vitro* studies revealed that the maximum conidial germination of fungus observed at temperature of 25°C with followed by 20°C with 70 to 90% relative humidity.

#### Role of environmental factors on the development of powdery mildew

During *kharif* 2014, the powdery mildew symptoms were first observed on 32<sup>nd</sup> standard week reached the per cent incidence of 10 at 33<sup>rd</sup> MW and again there was no incidence during 34<sup>th</sup> and 35<sup>th</sup> MW. This is mainly due to higher rainfall which completely washed out the powdery growth of the disease. Fur-

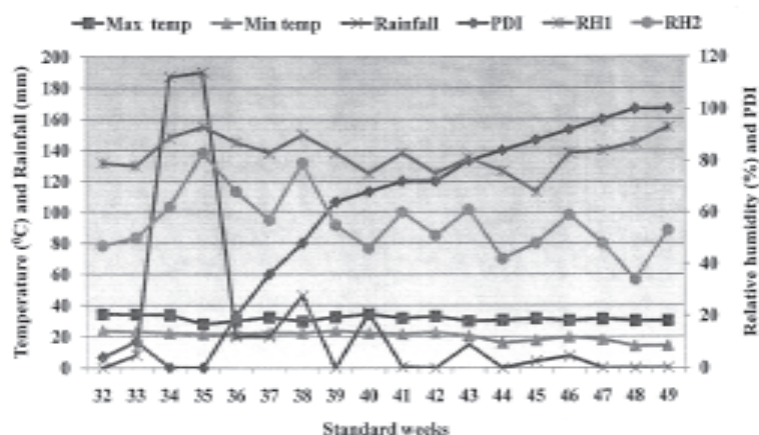


Fig. 1. Effect of weather parameters on guar powdery mildew during *kharif* of 2014.

ther, the severity increased slowly and reached a peak of 100% during 46<sup>th</sup> MW due to favorable conditions such as temperature (20 to 30°C), relative humidity (70 to 80%) and less rainfall favored the development and spread of disease (Table 1). The findings are in conformity with the reports of [3, 4] reported that the incidence of powdery mildew decreases as the rainfall increases. Temperature of 32°C and above, very low RH and continuous exposure to higher RH reduced spore germination of *L. taurica* and disease progress of powdery mildew of tomato [5].

Correlation and multiple linear regression equation analysis between severity of powdery mildew in relation to weather parameters

The analysis was made to establish the relationship between weather factors and per cent disease index of powdery mildew in highly susceptible guar variety HG-365 through correlation and multiple regression equation analysis. The relationship between powdery mildew per cent disease index and weather factors during 2014 indicated a negative correlation between all weather parameters and significant negative correlation with minimum temperature and evening relative humidity. In present investigation,

multiple linear regression equation was fitted to the data and the equation arrived for all the weather parameters during 2014 is  $Y = 338.29 - 2.11X_1 - 6.91X_2 - 0.97X_3 + 0.30X_4 - 0.28X_5$  (Tables 2 and 3). Hence, the weather parameters influence the disease incidence during 2014 to the extent of 69%. Correlation studies between PDI and weather parameters indicated a negative relationship with all the weather parameters [6].

### Conclusion

The studies on effect of weather factors on development of disease concluded that, 36<sup>th</sup> and 37<sup>th</sup> standard weeks were highly favorable for initiation and further development of disease. There was a negative correlation between the disease severity and all weather parameters. The multiple regression equation was fitted to the data and the equation arrived for all the weather parameters is  $Y = 338.29 - 2.11X_1 - 6.91X_2 - 0.97X_3 + 0.304X_4 - 0.284X_5$ . Where,  $X_1$  = Maximum temperature (°C),  $X_2$  = Minimum temperature (°C),  $X_3$  = Relative humidity (%) morning,  $X_4$  = Relative humidity (%) evening and  $X_5$  = Rainfall (mm). This gives the information that epidemiological factors such as temperature, relative humidity and rainfall plays a significant role on incidence of powdery mildew disease.

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