6

0.640
0.867

0 791
1 076
1.242

0.270
0.500

0.230
0.353
0.423

0.528
1.150
0.724
0.000
0.208

.136
.170
180
200
200

23
53
35
2

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Prediction of Bollworms' Damage in Cotton in Relation to Weather Factors

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The statistical analysis of the data on the incidence of bollworms in relation to weather factors revealed the existence of significant positive correlation with the maximum temperature (r=0.742) and sunshine hours (r=0.518) as well as significant negative correlation with the minimum temperature (r=-0.341), morning relative humidity (r=-0 670) evening relative humidity (r=-0.746) intensity of rainfall (r=-0.372) and number of rainy days (r=-0.651). Multiple regression analysis has led to the conclusion that increase in maximum temperature by 1°C would result in an increase of 4.17% bollworms damage while one day increase in rainfall would decrease the bollworms damage by 4.05%.

Among different pests of cotton, cotton bollworms, viz., the spotted bollworm, *Earias insulana* Boised., *E. vitella* F (*E fabia*), the American cotton bollworm, *Heliothis armigera* Hubner and the pink bollworm. *Pectinophora gossypiellas* saund, cause heavy damage to the bolls. Earlier studies on the influence of weather factors indicated that the spotted bollworms don't undergo hibernation, begin to multiply in April-May and are abundant during July-September in North India (Sohi, 1963). Regarding the pink bollworm a temperature of 75-82°F and a relative humidity of 60-80% at the time of emergence of moths, lead to rapid multiplication of the pest (Sohi, 1963). The upper limits for successful development of this pest was 40°C for the eggs and pupae and 35°C for larvae (Prodhan and Bhatia, 1964), In the present study, observations were made on the incidence of bollworms in toto during the years 1976-77 to 1979-80. The influence of macro elements of weather was studied by working out simple correlations and multiple regression analysis with the bollworms damage and the results are presented.

MATERIAL AND METHODS

The field experiment was conducted to study the seasonal incidence of bollworms at Agricultural College and Research Institute, Coimbatore over a period of four years from 1976-77 to 1979-80 with MCU 5 (susceptible) cotton. The crop was sown on 15th August of every year with a spacing of 75×30 cm over an area of 25 cents. Weekly observations were made from the time of square formation till the first picking of kapas by counting the total number of squares and bolls and number of affected squares and bolls from 40 plants selected at random under unprotected condition. The percentage of bollwoms' damage was worked out. As the damage by bollworms was found to be increasing in the young bolls from November onwards, the data collected

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from November onwards, the data collected from November to February were utilised for correlation and regression analysis.

RESULTS AND DISCUSSION

The bollworms' damage is found to increase from November onwards (75. days after sowing) in the young bolls and reach the maximum during January-February months (135 to 165 days after sowing). As the stage of the crop increases, the bollworms' damage is also increased and attains its maximum at the maturity of the crop.

Simple correlations between bollworms damage and different weather elements worked out are presented in Table 1. There was significant positive correlation between maximum temperature (ry x_1=0.742), sunshine hours (ry x_7=0.518) and bollworms damage. There were significant negative correlations observed between the other variables and bollworms' damage *viz.*, minimum temperature (ryx_2=-0.341) morning relative humidity (ryx_3=-0.670) evening relative humidity (ryx_4=-0.746), intensity of rainfall (ryx_5=-0.372) and number of rainy days (ryx_6=-0.651).

The intraclass correlations were found to exist among all the weather elements except between the maximum and minimum temperatures (Table 1).

The partial regression coefficients of maximum temperature and number of rainy days were significant and those of minimum temperature, morning relative humidity, evening relative humidity, rainfall intensity and sunshine hours were non-significant (Table 2).

The multiple regression equation fitted with weather elements to predict the bollworms' damage (Y) was

$$Y = -18.816 + 4.173\ x_1 + 1.282\ x_2 - 0.625\ x_3 - 0.482\ x_4 + 0.056\ x_5 - 4.049\ x_6 - 1.762 x_7$$

with R^2 value of 0.712.

The results revealed that an increase of maximum temperature by 1°C would increase the bollworms' damage by 4.17%. Similarly an increase of one day rainfall decreased the bollworms, damage by 4.05%. The results are in conformity with the findings of Pradhan and Bhatia (1964).

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Table 2.

Table 1. Correlation matrix of bollworms incidence with weather factors (n=64)

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Y (Percentage of damage of bollworms)	0.742**	-0.341**	-0.670**	-0.746**	-0.372**	-0.651**	0.518**
X_1 (Maximum temperature)		-0.221**	-0.664**	-0.673**	-0.328**	-0.482**	0.484**
X_2 (Minimum temperature)			-0.298**	0.695**	0.315**	0.630**	-0.615**
X_3 (Morning relative humidity)				0.668**	0.376**	0.521**	-0.464**
X_4 (Evening relative humidity)					0.545**	0.897**	-0.808**
X_5 (Rainfall intensity)						0.696*	-0.595**
X_6 (Number of rainy days)							-0.829**
X_7 (Sunshine hours)							

*P=0.05 **P=0.01