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Influence of Weather Factors on the Pheromone Trap Catches of Cotton Bollworm Moths*

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ABSTRACT

The influence of weather parameters on pheromone trap catches of cotton bollworm moths was studied at Main Research Station (MRS) and Agricultural Research Station (ARS), U.A.S., Dharwad, Karnataka during 1989-90 and 1990-91. Maximum temperature had negative relationship on trap catches of *Pectinophora gossypiella* (Saunders) moths. Significant negative (r = -0.506*) correlation was found between these two variables at M.R.S., Dharwad during 1990-91. Maximum temperature had no definite influence on trap catches of *Heliothis armigera* (Hubner) & *Earias* spp. Significant negative (r=-0.555*) correlation was noticed between trap catches of *H. armigera* and minimum temperature at M.R.S., Dharwad during 1990-91. This weather parameter did not influence the trap catches of other two species of bollworm moths. No definite relationship existed between trap catches of *Earias* spp. and both the levels of temperature. *P. gossypiella* trap catches was positively influenced by morning and evening R. H. Negative relationship was observed between trap catches of *H. armigera* and morining R. H. Highly positive and significant (r=-0.726) correlation was evident between weekly total rainfall and trap catches of *P. gossypiella* moths at M.R.S., Dharwad during 1990-91. Wind velocity exhibited negative influence on trap catches of all the three species of bollworms.**

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INTRODUCTION

Synthetic sex pheromone of cotton bollworms viz., pink bollworm. [*Pectinophora gossypiella* (Saunders)], gram pod borer, [*Heliothis armigera* (Hubner)] and sported bollworm, [*Earias* spp.] are being investigated and extensively used in pheromone traps for monitoring of the moths. Trap catches are greatly affected by many abiotic and biotic factors. Among the various factors, weather is one of the most important and major factor influencing the trap catches of these noctuid moths. Insect emergence and their flight activity are mainly determined by various weather parameters and thus affect trap catches.

Conflicting views on the influence of weather factors on trapping of bollworm moths have been placed on record. Person (1976) stasted that the weather factors have a long term and permanent effect on insect population, whereas according to Verma *et al.*, (1982), weather factors have no significant effect on flight activity of moths. In the present

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TABLE 1

Correlation coefficient (r) between trap catches of cotton bollworms and weather factors at MRS, Dharwad during 1989-91.

Year	Bollworm species	Weather factors					
		Minimum Temp. °C	Maximum Temp. °C	Morning R. H. (%)	Evening R. H. (%)	Rainfall (mm.)	Wind speed km/hr
1989-90	*Pectinophora gossypiella*	–0.178	–0.284	+0.087	+0.287	+0.148	–0.240
	Heliothis armigera	–0.147	+0.559	–0.333	–0.413	–0.399	–0.635
	Earias spp.	—	—	—	—	—	—
1990-91	*Pectinophora gossypiella*	+0.088	–0.506**	0.458	+0.347	+0.726**	–0.012
	Heliothis armigera	–0.555**	0.007	–0.074	+0.049	–0.214	–0.155
	Earias spp.	–0.330	+0.131	–0.084	–0.016	–0.368	–0.542

– Tapping was not successful.

* : [P < 0.05]

** : [P < 0.01]

study an attempt was made to determine the effect of various weather parameters on trap catches of bollworm moths. The results obtained are presented in this paper.

MATERIALS AND METHODS

The present study was undertaken at two different locations *viz.*, at the Main Research Station (MRS) and Agricultural Research Station (ARS), University of Agricultural Sciences, Dharwad, Karnataka during 1989-90 and 1990-91. Monitoring of cotton bollworm moths was done during the entire cotton growing seasons. For the purpose, delta sticky traps were used to monitor the pink bollworm (PBW), while polythene sleeve traps were used for *Heliothis* and *Earias* spp. Five pheromone traps each for all the three species baited with respective sex lures were installed at appropriate distance in general cotton fields and operated as per normal routine practices.

Weather data such as minimum and maxuimum temperature (°C), morning and evening relative humidity (%), rainfall (mm.) and wind speed (km/hr) were obtained from meterological laboratory located at respective trapping places. Mean value of trap catches and weather data were calculated for each week. The relationship between weather factors and trap catches of cotton bollworm moths was computed by using multiple correlation and the data thus obtained are presented in Table 1 and 2. Correlation coefficient (r) was worked out taking the mean trap catches as dependent (x) variable and means of weather factors as independent (y) variables.

RESULTS AND DISCUSSION

The analyses of data revealed that maximum temperature had negative effect on trap catches of PBW moths at both the seasons and locations, significant negative (r=-0.506*) correlation was found between these two variables at MRS, Dharwad during 1990-91 (Table 1). This is in accordance with the report of Lingren *et al.*, (1989) who recorded lower catches of PBW moths at higher temperature. However, this environmental factor no definite influence on trap-catches of *H. armigera* and *Earias* spp.

Earlier reports of Sundarmurthy (1985) and Naik (1988) about negative association between trap catches of *H. armigera* and minimum temperature agreed with the present findings, where significant negative (r=-0.555*) relationship between these two variables was noticed at former location during second year of experimentation (Table 1). Conversely, this weather parameter did not affect the trapping of other two species of bollworm moths. No precise relationship existed between trap catches of *Earias* spp. and both the levels of temperatures, which is corroborated by the findings of Marks (1977) in the case of red bollworm *Diparopsis custanea* Hampson.

According to Gupta and Khurana (1971) and Sukhija *et al.*, (1985). PBW moth activity was proportional to atmospheric Relative Humidity (RH). In the present study also trap catches of PBW was positively related to both morning and evening RH. On the other hand, Regupathy (1985) observed negative association with these two factors. Negative relationship though not significant was observed between trap

TABLE 2

Correlation coefficient (r) between trap catches of cotton bollworms and weather factors at ARS, Dharwad during 1989-91.

Year	Bollworm species	Weather factors					
		Minimum Temp. °C	Maximum Temp. °C	Morning R. H.(%)	Evening R. H. (%)	Rainfall (mm.)	Wind speed km/hr
1989-90	*Pectinophora gossypiella*	+0.294	–0.188	+0.128	+0.455	+0.487	–0.127
	Heliothis armigera	–0.824	+0.477	–0.832	–0.830	–0.287	–0.641
	Earias spp.	+0.349	–0.076	–0.625	+0.069	+0.274	–0.080
1990-91	*Pectinophora gossypiella*	++	–0.111	+0.052	+0.143	+0.127	–0.109
	Heliothis armigera	++	–0.140	–0.096	+0.036	–0.334	–0.024
	Earias spp.	++	–0.014	–0.454	–0.162	–0.263	–0.587

++ Minimum temperature data not available.

* : [P < 0.05]

** : [P < 0.01]

catches of *H. armigera* and morning RH is in agreement with the findings of Sundarmurthy (1985).

In present study, highe rainfall resulted in increased activity of PBW moths. Highly positive and significant (r=+0.726**) correlation was evident between weekly total rainfall and trap catches at MRS, Dharwad during the second year of study (Table 1). This finding strongly agreed with the report of Sukhija *et al.*, (1985). However, Naik (1988) failed to notice any influence of rainfall on the activity of three species of bollworm moths.

Wind velocity exhibited negative influence on trap catches of all the three species as is evident from the results of two seasons and two locations (Table 1 & 2). However, statistically the relationship was not significant. This finding is in conformity with Marks (1977), Rothschild *et al.*, (1981), Wardhaugh *et al.*, (1981) and Sundarmurthy (1985).

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