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Weather based relationship of adult moth catches of pink bollworm (*P. gossypiella*) and leaf eating caterpillar (*S. litura*) in cotton growing area of Anand, Gujarat

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ABSTRACT

The data pertaining to adult moth catches of pink bollworm (*Pectinophora gossypiella*) and leaf eating caterpillar (*Spodoptera litura*) recorded for nine years (2006-2014) using the light trap installed at College Agronomy Farm, Anand were analysed in terms of weather parameters obtained from the agrometeorological observatory, Anand. Both the insects were found to be active throughout the year, however their populations were minimum during April to September. The correlation analysis indicated that the most of the weather parameters had negative and significant association except sunshine hours, which has significant positive correlation. The stepwise regression analysis revealed that wind speed and morning vapour pressure could explain 87 per cent variation in pink bollworm, while wind speed and afternoon vapour pressure could explain 65 per cent variation in leaf eating caterpillar.

Key words: *Pectinophora gossypiella, Spodoptera litura,* adult moth catches, light trap, cotton, weather parameters.

Cotton, being a major agricultural cash crop in India, has a major impact on overall Indian agriculture sector. *P. gossypiella* commonly known as pink bollworm damages squares and bolls of cotton. Larvae burrow into bolls through the lint and feed on seeds. As the larva burrows within a boll, lint is cut and stained, resulting in severe quality loss. Under the dry conditions, yield and quality losses are directly related to the percentage of bolls infested and the numbers of larvae per boll. If application of remedial measures does not apply at proper time, it will result in reducing the yield at large extend. *S. litura* commonly known as leaf eating caterpillar is also polyphagous in habit, feeds on variety of host plants and survives throughout the year in a given agro-eco system (Gedia *et al.*, 2008). For management of these pests, one must have prior knowledge of the time and severity of the outbreak of pests. Climatic parameters have direct relationship with the development and population of *S. litura* (Pandey *et al.*, 2015). Forewarning system can help in this direction. The study was carried with objective to (i) monitoring the insect through light trap (ii) the relationship among trap catches and weather parameters to build up regression model to predict the pest abundance.

MATERIALS AND METHODS

The present study was carried out for the occurrence and activity of different pests in cotton crop and their relationship with weather parameters. The light trap was installed in the cotton growing area at college farm, B. A. College of Agriculture, AAU, Anand. The light trap was operated throughout the year during 2006 to 2014. The adult moth catches were collected every week and brought to the laboratory for identification. Identified insects were grouped into their order and species based on their morphological characters. Nine years catches data were averaged out over standard meteorological weeks (SMW) for both the pests. These data were subjected to correlation and regression analysis. The multiple regression equation were fitted by step-wise regression technique using all the weather parameters and both the pests to develop forewarning models.

RESULTS AND DISCUSSION

Population dynamics of P. gossypiella and S. litura

The yearly variation of adult moth catches of pink bollworm (*P. gossypiella)* and leaf eating caterpillar (*S. litura*) are given in Fig. 1. It is seen that pink bollworm catches were more during 2006 to 2010, whereas leaf eating caterpillar were observed in all the years. The annual variation in these insects/pests are depicted in Fig. 2. The

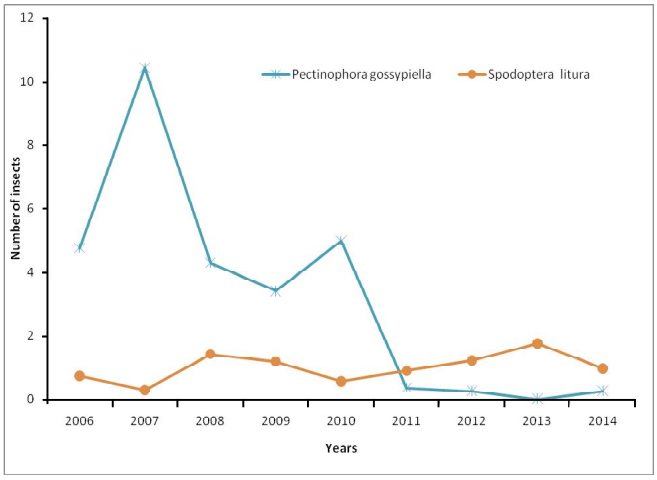

Fig. 1: Number of catches of different insects during 2006-2014

Table 2: Correlation coefficients between numbers of catches of ***P. gossypiella*** and ***S. litura*** with weather parameters

Parameters	*P. gossypiella*	*S. litura*
Maximum temperature (Tmax)	-0.323*	-0.190NS
Maximum temperature (Tmin)	-0.884**	-0.533**
Morning relative humidity (RH-1)	-0.295*	0.192NS
Afternoon relative humidity (RH-2)	-0.633**	-0.325*
Wind speed (WS)	-0.683**	-0.776**
Evaporation (EP)	-0.15NS	-0.346*
Rain fall (RF)	-0.574**	-0.471**
Sunshine humidity (BSS)	0.561**	0.292*
Morning vapour pressure (VP1)	-0.925**	-0.518**
Aftrenoon vapour pressure (VP2)	-0.863**	-0.467**

*, ** significant at 0.05 and 0.01 level of probability, respectively. NS –non significant

incidence of *P. gossypiella* started from 37th SMW (September), gradually increased and reached at peak during 5th SMW (February) and pest remained active till 15th SMW(April). Thereafter, pest population suddenly decreased and no pest activity was observed during 31st to 36th SMW (Fig. 2).

Spodoptera litura incidence was very low during the period of 19th SMW to 32nd SMW (Fig.2). Population built

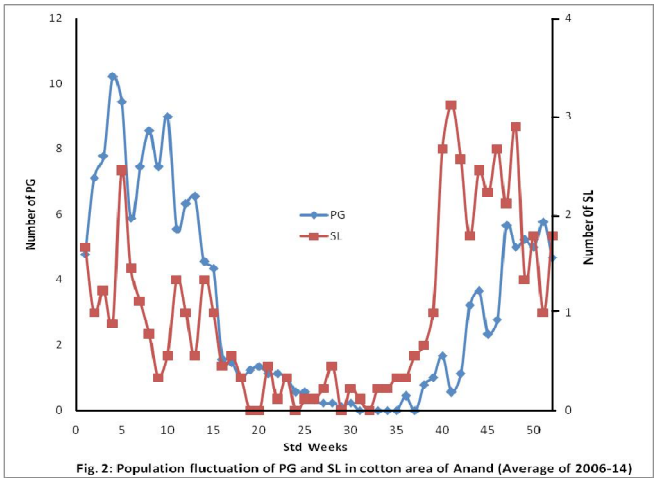

Fig. 2: Population fluctuation of PG and SL in cotton area of Anand (Average of 2006-14)

up from 33rd SMW and it reached at peak during 41st SMW. Rameshbabu *et al*. (2015) have reported that male moth populations of *S. litura* were active from August to mid-October and decreased sharply in late October. Peak period of *S. litura* male moths was observed during the rainy season (July- October) in groundnut and soybean crop area (Singh and Sachan, 1993).

Relationship with weather parameters

The correlation coefficient between insects population and weather parameters are presented in Table 2. The results indicated that all the weather parameters played an important role in development of both the insects. Most of the weather parameters significantly but negatively correlated with the population of both the insects. *Spodoptera litura* showed positive significant correlation with BSS and significant negative correlation with minimum temperature, morning humidity, wind speed and vapour pressure. Prasad *et al*. (2008) observed that all the weather parameters except morning relative humidity had highly significant negative influence on the pheromone trap catch of tobacco caterpillar.

Development of forewarning model

The stadard week wise data of average catches of both the insects and weather parameters were subjected to regression analysis by using stepwise regression technique for selection of varibles to develop forewaring model. These are;

P. gossypiella = 11.860+0.285WS*-0.567VP1** (R^2=0.87)

S. litura = 2.071-0.425WS**+0.057VP2* (R^2=0.65)

Among all the variables put in the regression equation

only two variable viz wind speed and vapour pressure were found to contribute significantly in explaining the variation the insects population. The model for *P. gossypiella* explained 87per cent of the total variation while that for *S. litura* explained 65 per cent of the variation in population. The models can be used for predicting their population.

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