POPULATION DYNAMICS OF POD BORER (*Helicoverpa armigera* HUBNER) INFESTING CHICKPEA IN RELATION TO ABIOTIC FACTORS

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ABSTRACT

The results of the investigation on population dynamics of chickpea pod borer (Helicoverpa armigera Hubner) in relation to abiotic factors revealed that the pest commenced from 2nd week of November, which remained till 4th week of February with its peak activity during 1st and 2nd week of December. The correlation studies indicated significant negative association between larval population of H. armigera and evaporation (-0.551). The non-significant effect was observed between larval population of H. armigera and maximum temperature, evening relative humidity, evening vapour pressure and wind speed.

KEY WORDS: Chickpea, Helicoverpa armigera, abiotic factors

INTRODUCTION

Helicoverpa armigera (Hubner) generally known as legume pod borer, is one of the most important constraint to crop production globally. It is polyphagous and attacks more than 182 plant species. Among the various pulses, chickpea is the one of the important leguminous crop. In India pulses are grown in an area of 23.47 m ha with total production of 18.45 mt with productivity of 786 kg/ha, while in Gujarat, they are grown over an area of 0.68 m ha with an annual production of 0.61 mt with the productivity of 897 kg/ha (Anonymous, 2013).

Among the various factors responsible for low yield in chickpea in India, *Helicoverpa armigera* is most important, which cause very heavy loss in yield. Excessive use of chemicals not only causes the economic restrain on farmers, but also produces the harmful side effects on the environments as well as mammals. The best way to overcome this situation is to destroy the pest at initial stage of the life cycle. This is possible if timely prediction of the incidence of the pest can be made. Hence, an attempt was made to investigate the incidence of pod borer, *Helicoverpa armigera* infesting chickpea in relation to different abiotic factors.

MATERIALS AND METHODS

The effect of abiotic factors on fluctuation in population of chickpea pod borer, *H. armigera* was carried out on variety GG 1 for two consecutive years (2013-14 and 2014-15) at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari. The crop was kept without insecticide umbrella to allow pod borer to multiply throughout the

season. It was raised in 400 m^2 plot and the larval population was recorded on fifty randomly selected plants at weekly interval on standard meteorological week basis. With a view to study the impact of different abiotic factors on pest incidence, a simple correlation between population of pest and abiotic factors was worked out using standard statistical procedure as suggested by Steel and Torrie (1980). Weekly meteorological data were obtained from meteorological observatory, Navsari Agricultural University, Navsari recorded during present experimental period.

RESULTS AND DISCUSSION

The data presented in Table 1 showed that during the first year (2013-14), the activity of *H. armigera* on chickpea crop was commenced from 46th standard week (second week of November), which was gradually increased up to 50th standard week (third week of December). The maximum larval population (2.24 larvae / 5 plants) was observed in 49th and 50th standard week (first and second week of December), whereas it was minimum (0.08 larvae / 5 plants) in 9th standard week (fourth week of February). Thus, larval population during the entire period ranged from 0.08 to 2.24 larvae / 5 plants (Table 1 and Figure 1). The correlation study indicated significant and negative association between larval population and evaporation (r=-0.487). Maximum temperature, morning and evening relative humidity, evening vapour pressure and wind speed showed non-significant effect on larval population (Table 2 and Figure 2a, 2b and 2c).

During the second year (2014-15), the activity of *H. armigera* on chickpea crop was commenced from 46th standard week (second week of November), which was gradually increased up to 50th standard week (second week of December). The maximum larval population (2.24 larvae / 5 plants) was observed in 50th standard week (second week of December), whereas it was minimum (0.08 larvae / 5 plants) in 9th standard week (fourth week of February). Thus, larval population during the entire period ranged from 0.08 to 2.24 larvae / 5 plants (Table 1 and Figure 1). The correlation study indicated significant negative association between larval population and evaporation (r=-0.646), while other weather parameters showed non-significant effects with larval population (Table 2 and Figure 2a, 2b and 2c).

Two years pooled data presented in Table 1 and illustrated in Figure 1 revealed that the activity of *H. armigera* on chickpea crop was commenced from 46th standard week (second week of November) and remained till 9th standard week (fourth week of February). Two peaks; 2.16 larvae / 5 plants and 2.24 larvae / 5 plants were observed during the period of 49th standard week (first week of December) and 50th standard week (second week of December), respectively. The population was gradually decreased from 50th standard week (second week of December). The maximum larval population (2.24 larvae / 5 plants) was observed in 50th standard week (second week of December), whereas it was minimum (0.08 larvae / 5 plants) in 9th standard week (fourth week of February). Thus, larval population during the entire period ranged from 0.08 to 2.24 larvae / 5 plants. This finding is in agreement with Jha (2003). However, Singh *et al.* (2015) reported that maximum prevalence of *H. armigera* larvae was noticed at podding stage of chickpea with abrupt temperature rise by 5^{o}C in February.

The pooled data presented in Table 2 and Figure 2a, 2b and 2c revealed that there was significant negative association between larval population and evaporation (r=-0.551). Maximum temperature, evening relative humidity, evening vapour pressure and wind speed showed non-significant effect on larval population. The findings of present investigation are in close conformity with the work of earlier scientists. Gupta and Desh (2002) reported positive correlation between *H. armigera* population with maximum temperature, relative humidity and rainfall in chickpea. Patel and Koshiya (1999) found negative association of maximum and minimum temperature as well as vapour pressure with *H. armigera*. Kumar *et al*. (2003) reported non-significant negative correlation with morning, evening and mean relative humidity. Reddy *et al*. (2001) found non-significant positive association between morning relative humidity as well as maximum and minimum temperature with *H. armigera*, while evening relative humidity, wind speed and sunshine hours showed non-significant negative correlation with larval population of *H. armigera.* Singh *et al.* (2015) reported that temperature (Max. & Min.) exhibited a significant positive role on the larval population of the pest. Explicitly, relative humidity did not play any precise function in the multiplication and parasitization of *H. armigera.* The sunshine (hrs.) revealed significant positive association with pest, and longer sunshine hours marred the parasitization.

CONCLUSION

Based on the results, it can be concluded that chickpea pod borer (*Helicoverpa armigera* Hubner) commenced from 2nd week of November, which remained till 4th week of February with its peak activity during 1st and 2nd week of December. Therefore, the spraying of insecticides during first fortnight of December may helpful in checking the pod borer attack.

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Table 1: Population of *H. armigera* infesting chickpea

Month and Week		Standard Meteorological Week	Population of *H. armigera* (Larvae/50 Plants)		
			2013-14	2014-15	Pooled
November	**I**	45	0.00	0.00	0.00
	II	46	0.56	0.36	0.46
	III	47	1.28	1.24	1.26
	IV	48	1.84	1.84	1.84
December	**I**	49	2.24	2.08	2.16
	II	50	2.24	2.24	2.24
	III	51	1.88	1.84	1.86
	IV	52	1.56	1.60	1.58
January	**I**	1	1.20	1.20	1.20
	II	2	0.96	0.92	0.94
	III	3	0.84	0.76	0.80
	IV	4	0.76	0.72	0.74
	V	5	0.64	0.72	0.68
February	**I**	6	0.40	0.44	0.42
	II	7	0.24	0.40	0.32
	III	8	0.40	0.52	0.46
	IV	9	0.08	0.08	0.08
March	**I**	10	0.00	0.00	0.00
	II	11	0.00	0.00	0.00

Table 2: Correlation coefficient between *H. armigera* and abiotic factors

Weather Parameters	*H. armigera*		
	2013-14	**2014-15**	**Pooled**
Maximum Temperature	0.197	-0.032	0.079
Minimum temperature	-0.098	-0.211	-0.152
Morning Relative Humidity	0.177	-0.420	-0.081
Evening Relative Humidity	0.283	-0.097	0.153
Morning Vapour Pressure	-0.102	-0.363	-0.253
Evening Vapour Pressure	0.406	-0.261	0.117
Bright Sunshine Hour	-0.102	-0.159	-0.130
Wind Speed	0.444	-0.107	0.132
Evaporation	-0.487*	-0.646*	-0.551*

**** Significant at 5% level***

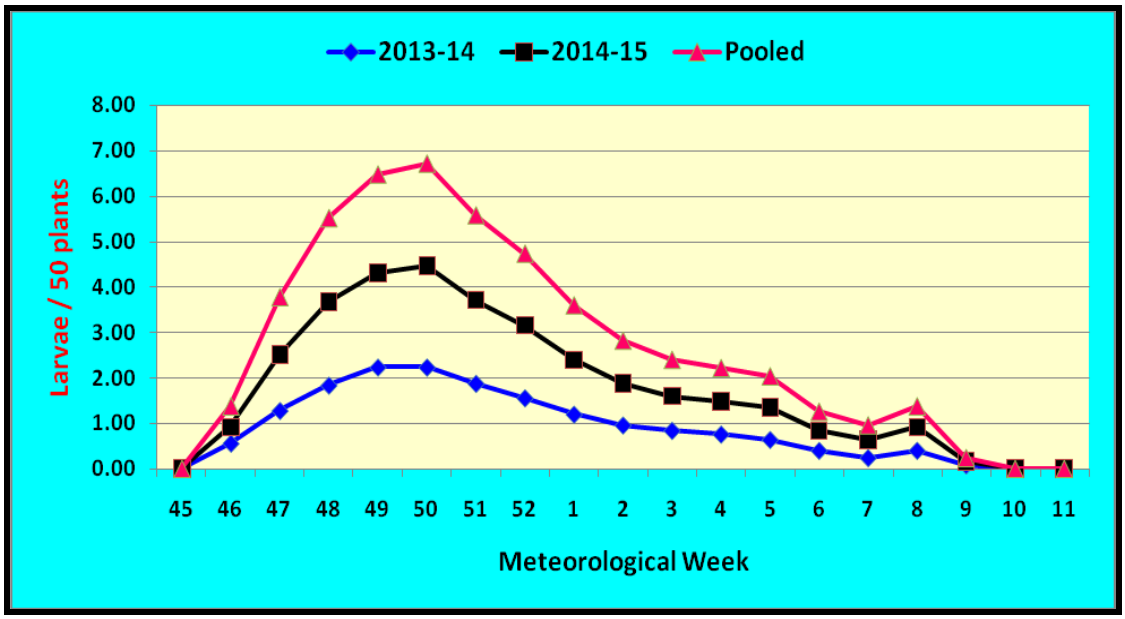

Figure 1: Mean larval population of *H. armigera* in chickpea

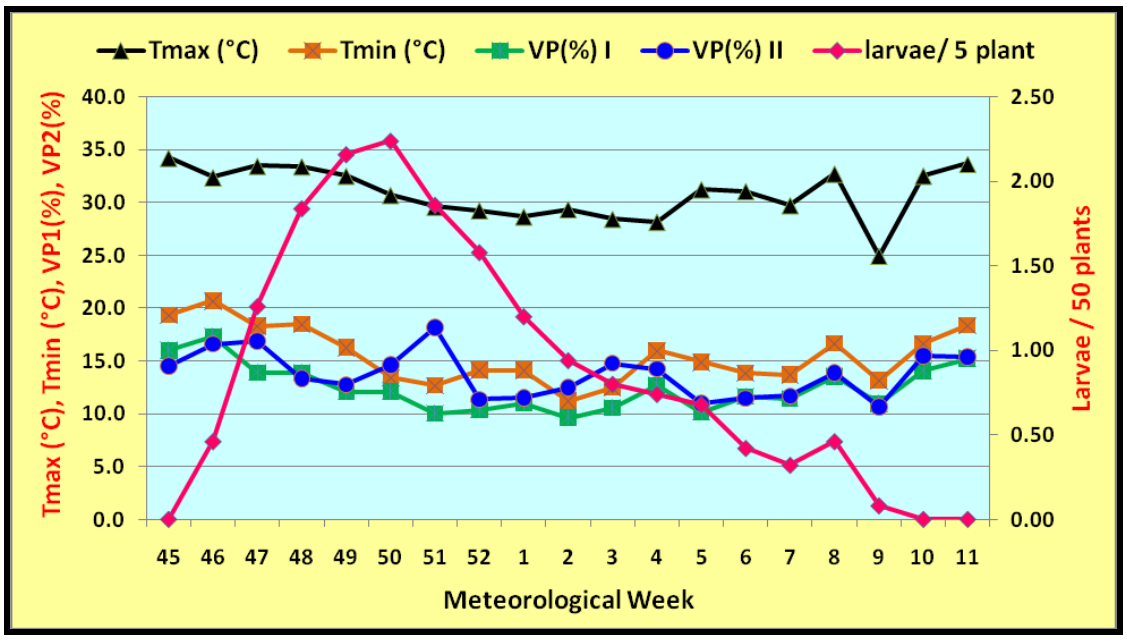

Figure 2a: Impact of *H. armigera* and weather parameters

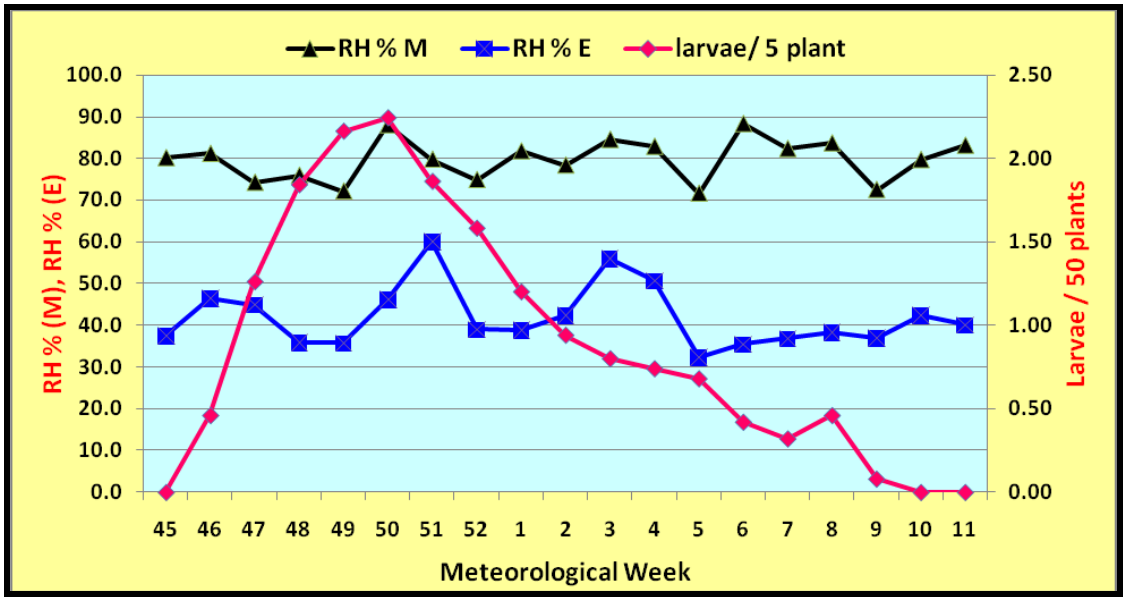

Figure 2b: Impact of *H. armigera* and weather parameters

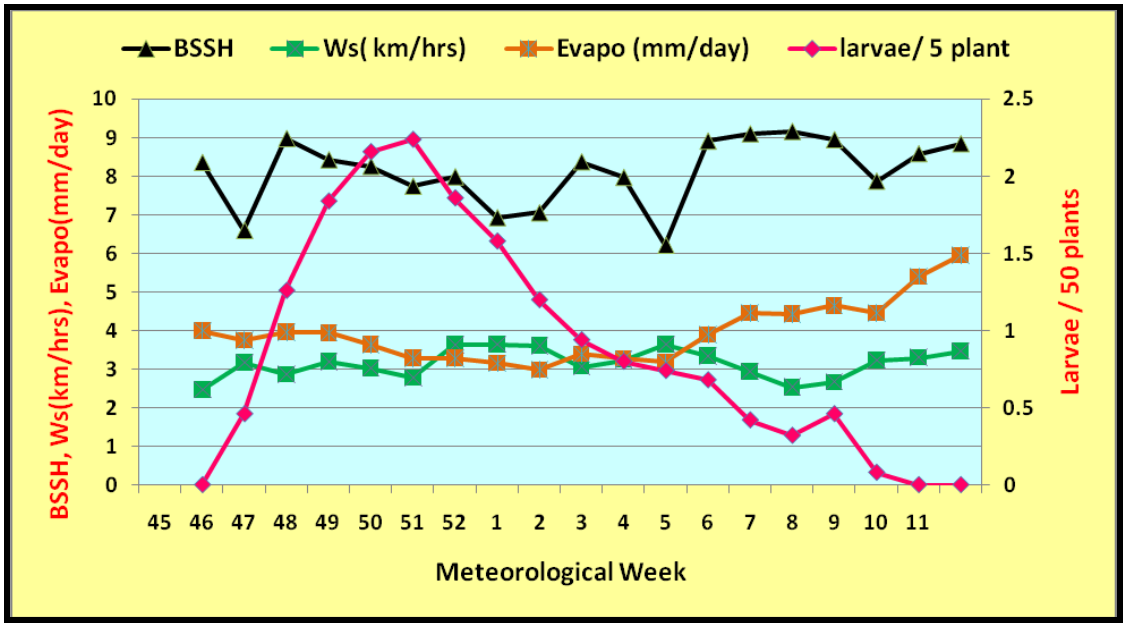

Figure 2c: Impact of *H. armigera* and weather parameters

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