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Research Article

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Seasonal Incidence of Pod Borers and Effect of Abiotic Factors on Population of Pod Borers in Cowpea [*Vigna unguiculata* (L.) Walp.]

D. V. Muchhadiya[1*], K. G. Patel[2], J. J. Patel[3] and D. R. Patel[4]

[1]Ph.D. Scholar & Asst. Prof., [2]Dean & Principal, [3]Assoc. Prof., [4]Asst. Prof.,

Dept. of Entomology, College of Agriculture, NAU, Campus Bharuch-392 012, Gujarat, India

*Corresponding Author E-mail: dvmuchhadiya@nau.in

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ABSTRACT

Higher larval activity of M. vitrata and H. armigera was observed during 39th to 43rd SMW and peak population was observed during October month. Maximum temperature, mean temperature and evaporation showed significant positive correlation whereas, wind speed showed significant negative correlation with the larval population of M. vitrata. Maximum temperature, mean temperature, bright sunshine hours and evaporation showed significant positive correlation while, wind speed and rainy days exhibited significant negative correlation with H. armigera population in cowpea.

Keywords: *M. vitrata, H. armigera, Seasonal incidence, Correlation*

INTRODUCTION

Cowpea [*Vigna unguiculata* (L.) Walp.] is an important legume crop grown in tropical and subtropical regions both for vegetable and pulse. It has a large spectrum of uses: dried grains for human consumption (main use) but also leaves, fresh beans, fresh bean pods, as well as green manure and fodder. It is considered as the most versatile *kharif* pulse because of its drought tolerating characters, soil restoring properties and multipurpose uses. Moreover, incorporation of cowpea as a legume in crop sequences enriches soil fertility and provides a dense soil cover to check wind erosion and evapo-transpiration loss of soil water. Area under cowpea in India is 3.9 million hectares with a production of 2.21 million tonnes. In Gujarat, cowpea occupies about 30470 ha area with the production of 322.08 metric tonnes (Anonymous, 2015). As many as 21 insect pests were recorded infesting cowpea, among these, pod borers (*Maruca vitrata* and *Helicoverpa armigera*) are the most damaging pests and caused heavy yield losses. The avoidable losses in yield due to insect pests have been recorded in the range of 66 to 100 per cent in cowpea (Pandey et.al.,1991). Thus, for developing suitable management strategies for pod borers, studies on population dynamics of pod borers in relation to weather parameters is very important.

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MATERIALS AND METHODS

An experiment was carried on seasonal incidence of pod borers and their correlation with weather parameters at College of Agriculture, Navsari Agricultural University, Bharuch (Gujarat) during *kharif* 2017 and 2018. Cowpea (*cv*. GC-4) was sown during 09.08.2017 and 06.08.2018 for the year 2017 and 2018, respectively and the crop was raised successfully by adopting recommended agronomical practices. The whole plot was kept free from insecticidal application. For recording observations of larval population of pod borers, the whole experimental plot was divided into five sectors and 5 plants were randomly selected from each sector. The observations were recorded from the same selected 5 plants from each sector during morning hours. The observations were recorded at weekly interval starting from the one week after sowing till the harvesting of the crop as per standard meteorological week.

For correlation study, the data on larval population of pod borers were correlated with the different meteorological parameters *viz;* bright sunshine hours (BSSH), rainfall (RF), rainy days (RD), maximum temperature (MaxT), minimum temperature (MinT), mean temperature (MeT), morning relative humidity (MoRH), evening relative humidity (EvRH), mean relative humidity (MeRH), wind speed (WS) and evaporation (EP) recorded at Regional Cotton Research Station, Navsari Agricultural University, Bharuch.

RESULTS AND DISCUSSION

3.1 Seasonal incidence

Maruca vitrata

The results presented in Table 1 and Fig. 1 revealed that the larval population of *M. vitrata* initiated (0.52 larva/plant) during 37th SMW *i.e.* 2nd week of September and reached to the peak (3.88 larva/plant) during 42nd SMW *i.e.* 3rd week of October during 2017 and larva initiated (0.76 larva/plant) during 37th SMW *i.e.* 2nd week of September and reached the peak (3.96 larva/plant) during 41st SMW (2nd week of October) during year 2018. In average result of two years, the larval population initiated (0.64 larva/plant) during 37th SMW *i.e.* 2nd week of September and reached the peak (3.68 larva/plant) during 41st SMW (2nd week of October). Thus, the higher larval activity of *M. vitrata* was found between 39th to 42nd SMW. The peak of pest population was observed during first fortnight of October and then pest declined and disappeared at crop maturity stage. Akhauri et al. (1994) observed the incidence between mid October and end of November. Bajpai et al. (1995) also reported the incidence to commence from early September with the peak during mid October and then declined at crop maturity. Patel (2000) reported that the incidence was higher as well as throughout the *kharif* on cowpea crop with peak activity (more than 30% damage) during September and October. Ganapathy (2010) also reported the peak incidence of *M. vitrata* from 40th SMW (October) to 47th SMW (November). High incidence of *M. vitrata* was observed during 43rd SMW (4th week of October) by Soratur et al. (2017). Thus, these reports are in agreement with the present investigation.

Heliocverpa armigera

The results presented in Table 1 and Fig. 2 revealed that the larval population of *H. armigera* appeared (1.24 larva/plant) during 38th SMW *i.e.* 3rd week of September and reached peak (2.80 larva/plant) on 43rd SMW *i.e.* 4th week of October during 2017 and population appeared (0.56 larvae/plant) during 37th SMW *i.e.* 2nd week of September reached peak (2.88 larva/plant) on 42nd SMW *i.e.* 3rd week of October during year 2018. The larval population initiated (0.28 larva/plant) during 37th SMW *i.e.* 2nd week of September and reached to the peak (2.74 larva/plant) during 42nd SMW *i.e.* 3rd week of October in average result of two years. Hence, pest population started from mid of September month and reached its peak during second fortnight of

October month. After reaching peak, the pest population declined and found till crop maturity stage.

Kanhere et al. (2013) also observed the population of *H. armigera* from 5th week after sowing and the population reached peak at 10th week after sowing which support the present findings. However, Patel (1997) observed peak period of *H. armigera* during 1st week of September. Yadav et al. (2015) observed peak period during December month. These reports are not in agreement with results of present findings.

3.2 Correlation with weather parameters

Maruca vitrata

The results presented in Table 2 revealed that the maximum temperature (r= 0.712**) showed significant positive correlation with larval population of *M. vitrata* during 2017 and maximum temperature (r= 0.635*) and mean temperature (r= 0.875**) showed significant positive correlation with larval population during 2018. In average results, maximum temperature (r= 0.726**), mean temperature (r= 0.754**) and evaporation (r= 0.543*) showed significant positive correlation and wind speed (r= -0.559*) exhibited significant negative correlation with larval population of *Maruca vitrata*.

The present investigation is more or less in conformity with the earlier research done by various scientists. Panickar (2004) at Anand (Gujarat) also reported that significant positive correlation of maximum and mean temperature with per cent pod borer damage. Patel et al. (2010) at Anand (Gujarat) reported the significant negative association between the larval population of *M. vitrata* and average relative humidity (r = -0.771). Yadav et al. (2015) also reported evening relative humidity had green gram. Soratur et al. (2017) also reported significant negative correlation with minimum temperature, morning relative humidity, evening relative humidity and highly significant positive correlation with maximum temperature and pest population. Kumar et al. (2017) also reported significant positive correlation of *Maruca vitrata* with maximum temperature.

Helicoverpa armigera

The results presented in Table 2 revealed that the maximum temperature (r = 0.748**) and bright sunshine hours (r= 0.564*) exhibited significant positive correlation with larval population of *H. armigera* during 2017 and maximum temperature (r= 0.746**) and mean temperature (r= 0.856**) exhibited significant positive correlation whereas, wind speed (r= -0.605*) and rainy days (r= -0.550*) showed significant negative correlation with larval population during 2018. Maximum temperature (r= 0.818**), mean temperature (r= 0.670**) and evaporation (r= 0.535*) showed significant positive correlation with larval population whereas, wind speed (r= -0.660*) and rainy days (r= -0.543*) showed significant negative correlation with *H. armigera* population in average results of two years.

Patel (1997) and Borah (2002) also reported significant positive correlation of maximum temperature and bright sunshine hours with *H. armigera* population. Kanhere et al. (2013) also reported significant positive correlation of maximum temperature and bright sunshine hours and significant negative correlation of evening relative humidity and pest population. Yadav et al. (2015) also found significant negative correlation between evening relative humidity and minimum temperature with pod borer population. Rathore et al. (2017) reported that pod borer had positive significant correlation with mean temperature, while negative non-significant correlation with relative humidity. Thus, above reports are more or less similar to the results of present findings.

Table 1: Population of *Maruca vitrata* and *Helicoverpa armigera* on cowpea

WAS	Month and Week	SMW	*Maruca vitrata* larva/plant			*Helicoverpa armigera* larva/plant		
			2017	2018	Pooled	2017	2018	Pooled
1	Aug-II	33	0.00	0.00	0.00	0.00	0.00	0.00
2	Aug-III	34	0.00	0.00	0.00	0.00	0.00	0.00
3	Aug-IV	35	0.00	0.00	0.00	0.00	0.00	0.00
4	Sept-I	36	0.00	0.00	0.00	0.00	0.00	0.00
5	Sept-II	37	0.52	0.76	0.64	0.00	0.56	0.28
6	Sept-III	38	1.28	1.20	1.24	1.24	0.88	1.06
7	Sept-IV	39	2.52	3.04	2.78	2.12	1.76	1.94
8	Oct-I	40	2.56	3.72	3.14	2.40	2.52	2.46
9	Oct-II	41	3.40	3.96	3.68	2.44	2.68	2.56
10	Oct-III	42	3.88	2.04	2.96	2.60	2.88	2.74
11	Oct-IV	43	2.44	0.64	1.54	2.80	1.08	1.94
12	Oct-V	44	1.40	0.28	0.84	1.52	0.24	0.88
13	Nov-I	45	0.52	0.00	0.26	0.96	0.60	0.78
14	Nov-II	46	0.00	0.00	0.00	0.16	0.00	0.08
Mean			**1.32**	**1.12**	**1.22**	**1.16**	**0.94**	**1.05**

Table 2 : Correlation between weather parameters and larval population

Weather parameters	*Maruca vitrata*			*Helicoverpa armigera*		
	2017	2018	Pooled	2017	2018	Pooled
MaxT	0.712**	0.635*	0.726**	0.748**	0.746**	0.818**
MinT	-0.042	0.293	0.138	-0.216	0.147	-0.036
MeT	0.464	0.875**	0.754**	0.327	0.856**	0.670**
MoRH	0.013	0.127	0.070	-0.177	-0.004	-0.110
EvRH	-0.128	-0.302	-0.237	-0.321	-0.443	-0.389
MeRH	-0.069	-0.171	-0.123	-0.263	-0.317	-0.289
WS (km/hrs)	-0.382	-0.469	-0.559*	-0.424	-0.605*	-0.660*
BSSH	0.407	0.261	0.384	0.564*	0.389	0.527
RF (mm)	-0.303	-0.444	-0.436	-0.372	-0.512	-0.521
RD	-0.362	-0.474	-0.437	-0.473	-0.550*	-0.543*
EP(mm/day)	0.242	0.496	0.543*	0.277	0.506	0.535*

* Significant at 5% level of significance (r=0.5324)
** Significant at 1% level of significance (r=0.6614)

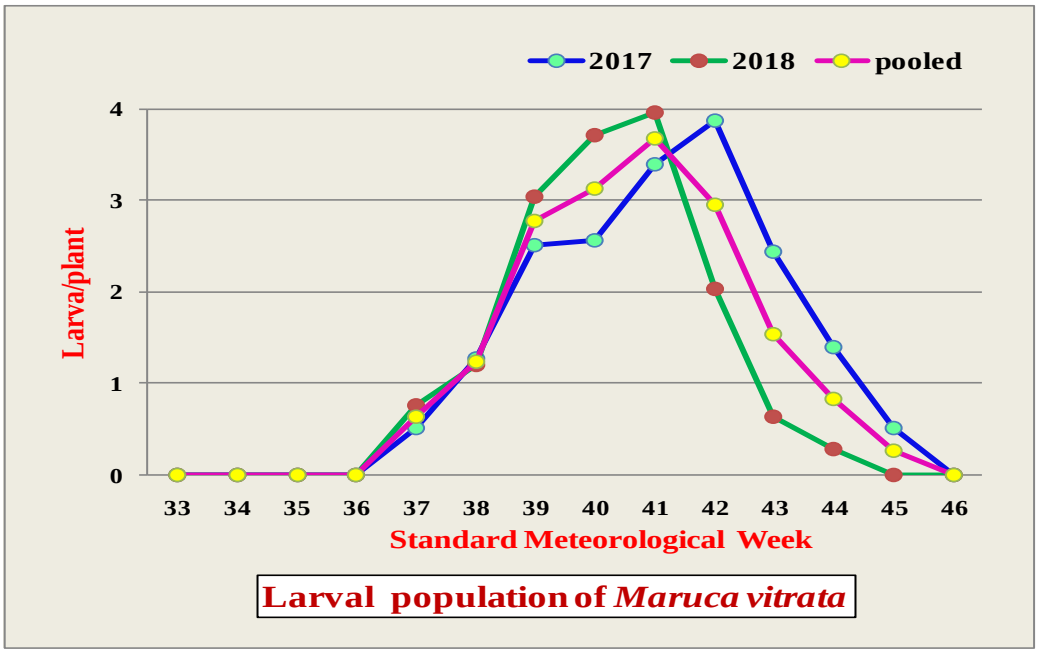

Fig. 1: Larval population of *Maruca vitrata*

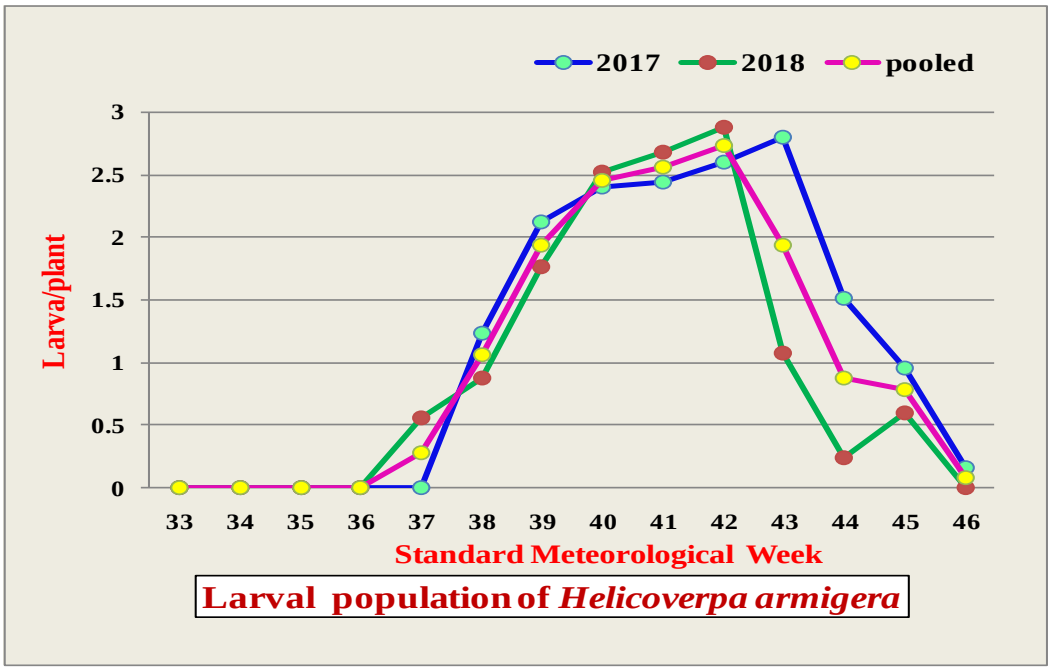

Fig. 2: Larval population of *Helicoverpa armigera*

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