STUDIES ON INCIDENCE OF EARHEAD WORM, *Helicoverpa armigera* ON RAIN FED SORGHUM

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ABSTRACT

Studies on incidence of earhead worm, Helicoverpa armigera infesting sorghum was made during rabi 2006-07, 2007-08 and kharif 2007-08, 2008-09 season at Agricultural Research Station, Navsari Agricultural University, Tanchha, Dist. Bharuch. Incidence of earhead worm was more in kharif grown sorghum then rabi sorghum. The incidence was also more at milky stage of grain then dough stage of grain. None of the weather parameters significantly influenced on incidence of earhead worm population during rabi season, During kharif season, minimum temperature (-0.680*), mean temperature (-0.487*), morning relative humidity (-0.773*), evening relative humidity (-0.668*), mean relative humidity (-0.717*) and rainy days (-0.410*) significantly and negatively correlated with earhead worm population, however, sunshine hours (0.605*) and evaporation rate (0.567*) had positive and significant correlation with earhead worm. A stepwise regression coefficient study showed that impact of weather parameters on earhead worm in kharif season was high (75.61%) as compared to rabi season.

KEY WORDS: *Correlation, earhead worm, Helicoverpa armigera, kharif, rabi, sorghum, weather parameters*

INTRODUCTION

Several lepidopteron species of head worms feed on developing sorghum grain, and are assuming major status in areas, where compact-panicle sorghum cultivars have been introduced. Among them, *Helicoverpa armigera* feeds predominantly on sorghum. Being a cosmopolitan and polyphagous pest, *H. armigera* has a range of 41 host-plant species (Singh and Balan, 1986). Early larval instars feed on the anthers, while late stadia destroy the ovaries of maturing grain of sorghum. The frass and webs produced by the larvae help in retaining dew and rain drops over longer periods, thus promoting mold growth and loss in grain quality. Non-uniform crop growth is favorable for the increased incidence of *H. armigera*, and since the newly released sorghum cultivars flowers early and grain ripening occurs under high humidity conditions, pest development and infestation are greatly favored (Rana and Singh, 1995). In view of these, an experiment was conducted to the seasonal population fluctuation and thereby, to implement the accurate schedule for better management of earhead worm, so as to minimize yield losses.

MATERIALS AND METHODS

The study on incidence of earhead worm was carried out for two consecutive years (*rabi* 2006-07, 2007-08 and *Kharif* 2007-08, 2008-09) on sorghum variety GJ 38 at Agricultural Research Station, Navsari Agricultural University, Tanchha, under rainfed condition. The crop was grown in 400 m^2 areas. All the recommended agronomic

practices were followed for raising the crop. Experimental area was kept free from insecticidal spray throughout the season. In order to record the population of earhead worm, 100 plants were randomly selected from field. Observations on ear head worm were recorded after the emergence of panicles till the maturity of grains on 100 plants at weekly interval. Mean population of earhead worm per panicle was worked out. The data on earhead worm population recorded in the experimental plot of population dynamics study were correlated with the different meteorological parameters [Temperature (Maximum, Minimum and Mean), Relative Humidity (Morning, Evening and Mean), Rainfall, Rainy Days, Sunshine Hours, Wind Velocity and Evaporation Rate] at standard meteorological weeks. The correlation and multiple/simple regression were worked out by standard statistical procedure (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Rabi season

During *rabi* 2006-07, earhead worm incidence (Table 1) on sorghum crop commenced with 0.04 earhead worms per panicle from 3rd SMW (third week of January) and reached to a peak level (0.06 earhead worms per panicle) on next week i.e., 4th SMW (fourth week of January). After that the earhead worm population declined gradually and then disappeared at the grain maturity stage. The similar result was obtained during *rabi* 2007-08. The earhead worms commenced with 0.06 earhead worm per panicle from 3rd SMW (third week of January) and reached to a peak level (0.07 earhead worms per panicle) on next week i.e., 4th SMW (fourth week of January) and then gradually declined the earhead worm population and disappeared at the grain maturity stage. A close perusal of pooled data (2006-07 and 2007-08) showed that incidence of this pest (Table 1 and Figure 1) on crop commenced during third week of January (3rd SMW) and reached to a peak level (0.07 earhead worms per panicle) on next week i.e., 4th SMW (fourth week of January) and then population gradually decreased up to end of season.

Kharif season

During *kharif* 2007-08, population of earhead worm (Table 2) on sorghum commenced with 0.10 earhead worms per panicle from 42nd SMW (third week of October). The number of earhead worm per plant increased and reached to a peak level 0.11 earhead worm per panicle on 43rd SMW (fourth week of October) and declined in succeeding week then after disappeared at the maturity of grain. In 2008-09, the incidence of earhead worm (0.02 earhead worms per panicle was commenced from the 41st SMW (second week of October). The earhead worm population increased gradually and reached to a peak (0.16 earhead worms per panicle) during 42nd SMW (third week of October). Population of earhead worm appeared earlier in 2008-09 and in higher form. The pooled data of two years revealed that the earhead worm population was initiated from the second week of October (Table 2 and Figure 2). The average number of earhead worm ranged between 0.01 to 0.13 earhead worm per panicle during the second week of October to last week of October. Thus, maximum population was found during milky stage of crop and population was not found during grain hardening stage. Results also indicated that more infestation of *Helicoverpa* found during *kharif* sorghum. Mital *et al*. (1980) reported that larval density of heliothis was highest during the first week of October, when the grain was in the milk stage. They also reported that the numbers of this pest declined as the grain hardened and it was not collected from mature grain, while Natarajan and Sundara Babu (1988) also reported that among the two stages of earhead, the larval population was always higher in the early stage then on dough stage.

Correlation studies

To understand the role of different weather factors in causing the fluctuation of the population of this pest, correlation study was carried out. The correlation studies (Table 3) indicated that none of the weather parameters significantly influenced the incidence of earhead worm population during *rabi* season. During *kharif* season, the pooled analysis (Table 4 and Figure 2) revealed that minimum temperature (-0.680*), mean temperature (-0.487*), morning relative humidity (-0.773*), evening relative humidity (-0.668*), mean relative humidity (-0.717*) and rainy days (-0.410*) negatively and significantly correlated with earhead worm population. The results indicated that as unit increase in above parameters, the incidence of earhead worm population decreased or vice versa. However, sunshine hours (0.605*) and evaporation rate (0.567*) had significant and positive correlation with earhead worm population, indicated that unit increase in bright sunshine hours and evaporation rate, the incidence of earhead worm population increased or vice versa. The correlation between earhead worm population and maximum temperature, rain fall and wind velocity was non-significant, indicated negligible influence of these parameters on incidence of earhead worm. A stepwise regression coefficient study was attempted by considering the weather element, which showed significant correlation with earhead worm population, the following regression equation was fitted.

Y= 0.4472 + 0.0169 Min. Temperature - 0.0156 Av. Temperature – 0.0080 MoRH + 0.0005 EvRH + 0.0030 AvRH + 0.0038 RD + 0.0079 SSH - 0.0022 EP (R^2=0.7561)

The multiple regression coefficient (R^2) was 0.7561 explained that there was 75.61 per cent variation in the dependent variable (Y) due to various independent variables. Thus, impact of weather parameters on earhead worm was high in *kharif* season (75.61%) as compared to *rabi* season.

CONCLUSION

The peak incidence of earhead worm was noticed during fourth week of January in *rabi* season. In kharif season, a peak incidence of earhead worm per panicle was noticed during fourth and third week of October during *kharif* 2007-08 and 2008-09, respectively. The correlation studies indicated that none of the weather parameters significantly influenced on incidence of earhead worm population during *rabi* season. During *kharif* season, minimum temperature, mean temperature, morning relative humidity, evening relative humidity, mean relative humidity and rainy days significantly negatively correlated with earhead worm population. However, sunshine hours and evaporation rate significantly and positively correlated with earhead worm population. The multiple regression coefficient (R^2) was 0.7561 explained that there was 75.61 per cent variation in the dependent variable (Y) due to various independent variables.

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Table 1: Earhead worm population on sorghum plant during *rabi* season

Sr. No.	Met. Week	Date	WAS	Mean Earhead Worm Population Per Panicle		
				2006-07	2007-08	Pooled
1	45	5-11 Nov.	2	0	0	0
2	46	12-18 Nov.	3	0	0	0
3	47	19-25 Nov.	4	0	0	0
4	48	26 Nov. -2 Dec.	5	0	0	0
5	49	3-9 Dec.	6	0	0	0
6	50	10-16 Dec.	7	0	0	0
7	51	17-23 Dec.	8	0	0	0
8	52	24-31 Dec.	9	0	0	0
9	1	1-7 Jan.	10	0	0	0
10	2	8-14 Jan.	11	0	0	0
11	3	15-21 Jan.	12	0.04	0.06	0.05
12	4	22-28 Jan.	13	0.06	0.07	0.07
13	5	29 Jan.- 4 Feb.	14	0.05	0.03	0.04
14	6	5-11 Feb.	15	0	0	0

Table 2: Earhead worm population on sorghum plant during *kharif* season

Sr. No.	Met. Week	Date	WAS	Mean Earhead Worm Population Per Panicle		
				2007-08	2008-09	Pooled
1	31	30 July -5 Aug.	2	0	0	0
2	32	6-12 Aug.	3	0	0	0
3	33	13-19 Aug.	4	0	0	0
4	34	20-26 Aug.	5	0	0	0
5	35	27 Aug.-2 Sept.	6	0	0	0
6	36	3-9 Sept.	7	0	0	0
7	37	10-16 Sept.	8	0	0	0
8	38	17-23 Sept.	9	0	0	0
9	39	24-30 Sept.	10	0	0	0
10	40	1 Sept.-7 Oct.	11	0	0	0
11	41	8-14 Oct.	12	0	0.02	0.01
12	42	15-21 Oct.	13	0.1	0.16	0.13
13	43	22-28 Oct.	14	0.11	0.15	0.13
14	44	29 Oct.-4 Nov.	15	0.07	0.05	0.06
15	45	5-11 Nov.	16	0	0	0

Table 3: Correlation coefficient between earhead worm and weather parameter during *rabi* season

Year	weather parameter								
	Temperature^{0}C			Humidity %			Sunshine Hours	Wind Velocity	Evaporation
	Max.	Min.	Mean	Morn.	Even.	Mean			
2006- 07	0.024	-0.277	-0.168	-0.327	-0.290	-0.360	0.074	0.273	0.804
2007-08	-0.526	-0.447	-0.503	-0.270	-0.280	-0.290	0.402	0.370	-0.045
Pooled	-0.345	-0.364	-0.369	-0.273	-0.254	-0.285	0.280	0.256	0.380

Table 4: Correlation coefficient between earhead worm and weather parameter during *kharif* season

Year	weather parameter										
	Temperature^{0}C			Humidity %			Rain fall	Rainy days	Sun shine hours	Wind velocity	Evaporation
	Max.	Min.	Mean	Morn.	Even.	Mean					
2007-08	0.647	-0.823*	-0.604*	-0.852*	-0.695*	-0.768	-0.400	-0.430*	0.644*	-0.309	0.600*
2008-09	-0.002	-0.590*	-0.470	-0.735*	-0.662*	-0.695*	-0.320	-0.405*	0.598*	-0.416	0.603*
Pooled	0.215	-0.680*	-0.487*	-0.773*	-0.668*	-0.717*	-0.345	-0.410*	0.605*	-0.334	0.567*

Significant at 5 % level

Figure 1: Population of earhead worm on sorghum in relation to weather parameters during *rabi* season (pooled)

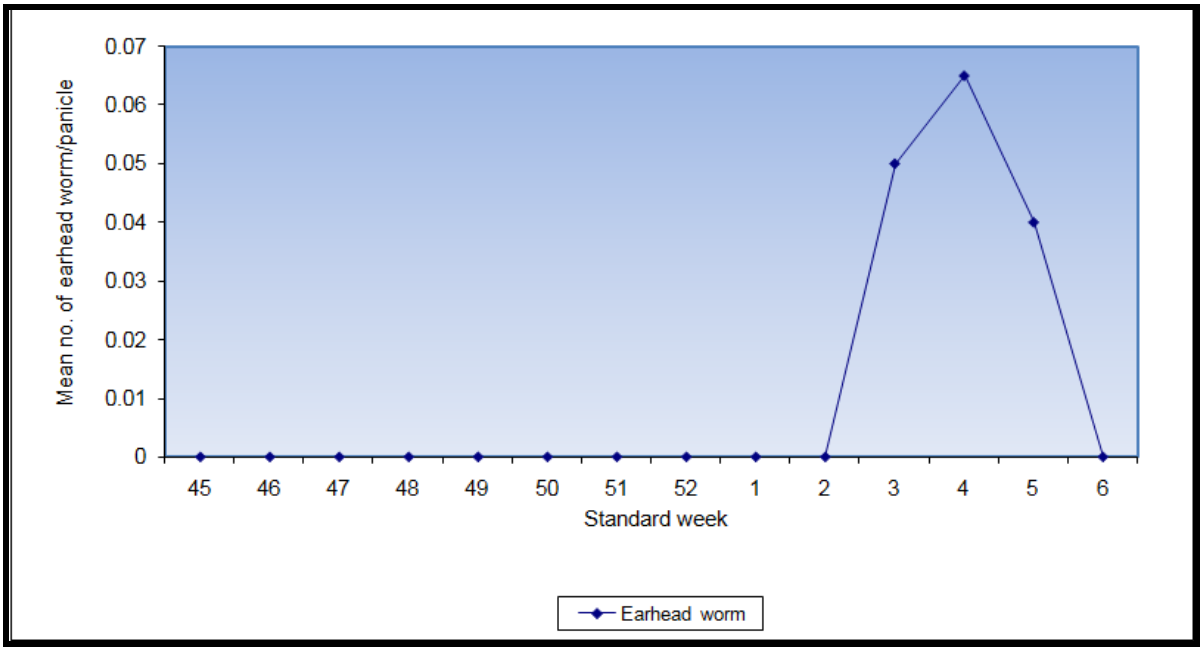
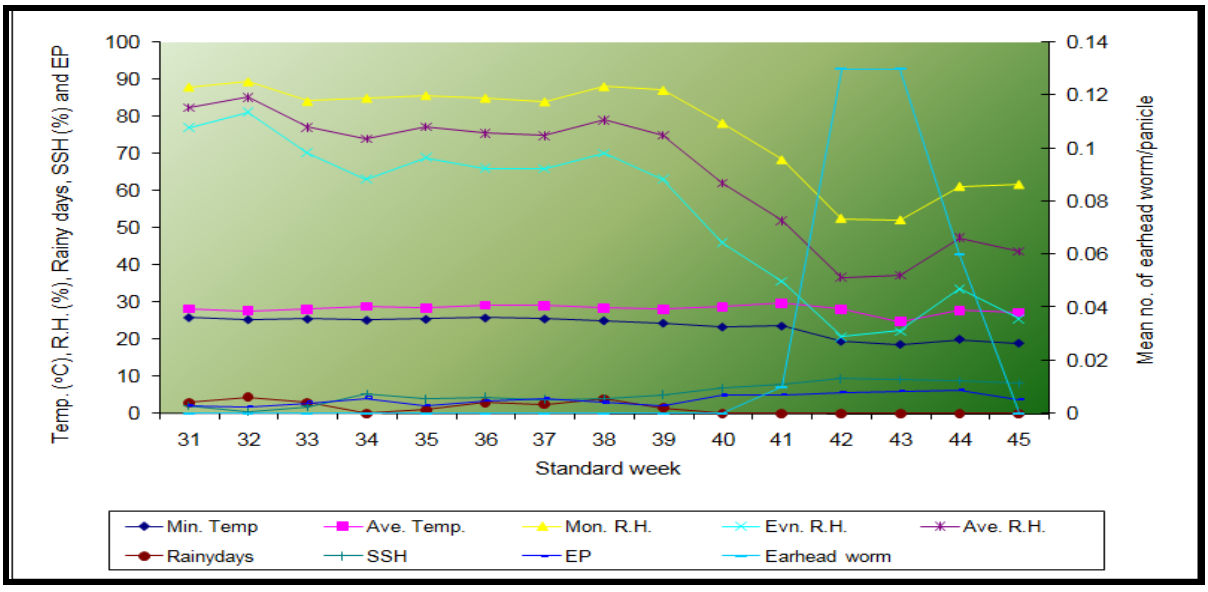


Figure 2: Population of earhead worm on sorghum in relation to weather parameters during *kharif* season (pooled)



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