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INFLUENCE OF ABIOTIC FACTORS OF THE ENVIRONMENT ON MAJOR INSECT PESTS OF MAIZE

K.L. JEENGAR*, A.K. SRIVASTAVA AND O.P. AMETA

*KVK, Bhilwara and Department of Entomology
Rajasthan College of Agriculture, Maharana Pratap University of Agriculture & Technology
Udaipur, Rajasthan (INDIA)

ABSTRACT

Studies on the seasonal incidence of the insect pests of maize were conducted during 2003-2004 at the Krishi Vigyan Kendra (MPUAT, Udaipur), Bhilwara, Rajasthan. The stem borer [*Chilo partellus* (Swinhoe)], the armyworm (*Mythimna separata* Walker), maize aphid (*Rhopalosiphum maidis* Fitch) and the *kharif* grasshopper (*Hieroglyphus nigrorepletus* Bolivar) were recorded as the major pests. The infestation of stem borer began in the last week of July (30th standard meteorological week) and reached to its peak in second week of August (32nd standard meteorological week), that of army worm began in the second week of August (32nd standard meteorological week) and reached to its peak in last week of August (35th standard meteorological week). The infestation of aphid and grasshopper began in the first week of August (31st standard meteorological week). The peak of aphid population was recorded during the 36th standard meteorological week in either year. The *kharif* grasshoppers were in significant numbers during 34th and 35th standard meteorological weeks. The abiotic factors of the environment did not show any significant influence on the major insect pests.

Keywords: *Zea maize, C. partellus, M. separata, H. nigrorepletus*, *R. maidis*

INTRODUCTION

Maize (*Zea mays* L.) is an important cereal crop grown all over the world. In Rajasthan, it is grown in Udaipur, Rajsamand, Bhilwara, Chittorgarh, Ajmer, Sirohi, Banswara and Dungarpur districts mainly during *kharif* season. During 2003, the area under maize was 9.83 lac hectares with a production of 8.70 lakh tons and productivity of 885 kg/ ha. Bhilwara district alone accounts for 1, 81, 000 hectares with a production of 3, 01, 000 tons and productivity of 1663 kg/ha (Anonymous, 2004). The stem borer, [*Chilo partellus* (Swinhoe)], armyworm (*Mythimna separata* Walker), maize aphid (*Rhopalosiphun maidis* Fitch) and grass hopper are the major pests. Therefore, an experiment was conduced during kharif 2003 & 2004 to study the incidence of insect pests of maize along with effects of abiotic factors on their incidence.

MATERIALS AND METHODS

Maize (variety *Mahi Kanchan*), was sown in 20 plots each measuring 5 m x 3.6 m (18 sq. m.). Standard insect sampling procedures were followed depending upon the type of pest. After taking all the observations, the meteorological data recorded were correlated with the pest incidence.

Observations on the stem borer [*Chilo partellus* (Swinhoe)] infestation, manifested as dead hearts, were taken from the two central rows (each row comprised 15 plants) of each plot at weekly intervals. The data were expressed as dead heart percentage. The incidence of the armyworm (*Mythimna separata* Walker), was recorded on 5 plants selected at random from each plot and the absolute numbers of caterpillars located in the leaf whorls were counted at weekly intervals. Maize aphid (*Rhopalosiphum maidis* Fitch) was also recorded from 5 plants selected at random at weekly intervals. With the help of a fine camelhair brush the aphid nymphs as well as adults were dislocated from the flag leaf portion of the plant) on a piece of white paper and counted. The estimate of the *kharif* grasshopper (*Hieroglyphus nigrorepletus* Bolivar) was initially done by net-sweep method (six sweeps per 5-m row length). Later, after the knee-high stage of the crop, the line-transect method (in vogue for locust counts) was used and visual count of the disturbed grasshoppers was made while walking along the central row in each plot at weekly intervals.

RESULTS AND DISCUSSION

Stem borer, *Chilo partellus* (Swinhoe) : During *kharif* 2003 and 2004, the incidence of stem borer initiated at the seedling stage of the crop in the 4th week of July (30th standard meteorological week). The infestation reached its peak in the 2nd week of August (32nd standard meteorological week) with 13.99 and 17.61 per cent plants

showing dead hearts during 2003 and 2004, respectively. Correlation coefficients (r) worked out between the atmospheric temperature/ relative humidity/ rainfall and the stem borer infestation were not significant because of the fact that the stem borer infestation lasted only for 3-4 standard meteorological weeks, during this period also been reported between 31-68 days after sowing by Kandalkar *et al*. (2002). Earlier, Kandalkar *et al*. (2000) reported that only minimum temperature showed a significant negative correlation with stem borer infestation (r = - 0.734). Maximum temperature, morning and evening relative humidity and the total rainfall did not influence

Table 1. Incidence of major insect pests of maize during 2003 at Bhilwara

Std. weeks	Abiotic factors of Environment			Mean population of major insect pests			
	Average temperature (ºC)	Average relative humidity (%)	Rainfall (mm)	*Chilo partellus*	*Mythimna separata*	*Rhopalosiphum maydis*	*Hieroglyphus nigrorepletus*
30	28.30	78.00	23.40	4.06	-	-	-
31	26.90	79.50	10.20	7.85	-	107.80	1.55
32	28.35	79.00	49.00	13.99	0.99	226.00	10.75
33	28.35	67.50	0.00	13.99	4.36	236.60	12.25
34	26.75	72.50	19.40	13.99	3.99	232.20	13.70
35	26.10	84.00	57.00	-	4.37	283.50	14.75
36	26.95	71.00	8.00	-	1.61	87.00	11.60
37	27.50	65.50	5.00	-	0.59	-	11.20
38	28.75	71.50	7.60	-	-	-	5.20
r (*C. partellus*)	0.02	-0.55	0.097				
r (*M. separata*)	-0.172	0.262	0.111				
r (*R. maidis*)	0.088	0.269	0.589				
r (*H. nigrorepletus*)	-0.294	-0.091	0.380				

significant variations in the mean temperature/ humidity usually do not occur. Choudhary and Sharma (1992) observed that maize sown in early or late June suffers heavier infestation by *C. partellus* as compared to that sown in mid June. Peak infestation of *C. partellus* has stem borer incidence significantly. In the present investigation, increase in stem borer infestation showed an inverse relation with the average temperature and a positive relation with the relative humidity, however, the correlation coefficient was not significant. Raigar *et al.*

Table 2. Incidence of major insect pests of maize during 2004 at Bhilwara

Std. weeks	Abiotic factors of Environment			Mean population of major insect pests			
	Average temperature (ºC)	Average relative humidity (%)	Rainfall (mm)	*Chilo partellus*	*Mythimna separata*	*Rhopalosiphum maydis*	*Hieroglyphus nigrorepletus*
30	28.30	78.00	23.40	4.06	-	-	-
30	29.75	67.00	12.60	4.62	-	-	-
31	27.15	88.20	83.60	8.93	-	89.40	5.25
32	27.00	89.80	242.20	17.61	0.85	142.80	13.55
33	26.20	91.60	276.00	17.61	4.00	220.70	15.20
34	26.65	86.80	20.80	17.61	4.44	310.30	22.65
35	26.10	77.65	0.00	-	4.20	221.20	23.70
36	28.30	64.20	0.00	-	1.41	89.50	17.40
37	27.50	71.35	22.40	-	0.83	-	11.70
38	29.00	65.65	0.00	-	-	-	6.85
r (*C. partellus*)	-0.86	0.81	0.61				
r (*M. separata*)	-0.764	0.432	0.044				
r (*R. maidis*)	0.705	0.350	-0.037				
r (*H. nigrorepletus*)	-0.554	0.086	0.136				

(2002) also reported that the incidence in terms of leaf injury started in third week of August and dead heart formation took place a week later. The infestation continued to increase up to third week of September. The increase in the infestation of shoot infesting insect pests showed positive correlation with the mean relative humidity, but negative correlation with the mean temperature.

Armyworm (*Mythimna separata* Walker) : The armyworm incidence began in the 2nd week of August (32nd standard meteorological week) during both years with mean larval population of 0.99 and 0.85 per plant, respectively. The population exhibited its peak in the 34th and 35th standard meteorological week during 2003 & 2004, respectively. Among the biotic factors of the environment the atmospheric temperature exhibited negative correlation with the mean population; however, the correlation was non-significant (Table 1-2). Sharma (1983) observed that armyworm (*Mythimna separata* Walker) fed on young leaves, but appeared on 10, 50 and 70 day-old crop, the population differed significantly *i.e*., initial population of armyworms were higher in the local and monsoon sown crops, but it lowered down on the 50th day and 70th day of the monsoon sown crop. Rathore (1984) reported *M. separata* remained active throughout the crop season from June to October and that it could complete 2 to 3 life cycles.

Maize aphid (*R. maidis* Fitch.) : The aphid population varied considerably during both the years. Their numbers were stable in *kharif* 2003 ranging from 226 to 283 per plant, but in the subsequent year the population varied from 89 to 310 per plant. It was quite likely that during *kharif* 2003 the natural enemies of the aphid were more active and kept the aphid population under check as compared to the next year's crop season. However, the peak aphid numbers were recorded during the 36th standard meteorological week in either year. In the present investigation, the average temperature had a negative correlation with the increase in aphid population. Our findings conform to those of Sarangdevot and Ashok Kumar (2005), who recorded that *A. gossypii* and *M. persicae* infesting tomato had a significant negative correlation with temperature (r = - 0.847 and – 0.908 during 2000-01 and 2001-02, respectively).,

***Kharif* grasshopper (*Hieroglyphus nigrorepletus* Bolivar):** The *kharif* grasshoppers infested the crop during both years from the 31st standard meteorological week; and were in significant numbers in the 34th and 35th standard meteorological weeks. *H. nigrorepletus* did not exhibit any significant correlation with mean atmospheric temperature, mean relative humidity and the total rainfall.

REFERENCES

Anonymous. (2004). *Vital Agriculture Statistics, Directorate of Agriculture, Pant Krishi Bhavan, Jaipur* (Rajasthan).

Choudhary, R.N. and Sharma, V.K. (1992). Incidence and abundance of maize stalk borer, *Chilo partellus* (Swinhoe) in kharif season. *Indian Journal of Agriculture Research*, **16**:25-29.

Kandalkar, H.G., Men, U.B., Atale, S.B. and Kadam, P.S. (2000). Studies on correlation between sorghum shoot fly, *Atherigena soccata* infestation and some ecological factors. *Journal of Entomological Research*, **25**:77-79.

Kandalkar, H.G., Men, U.B., Atale, S.B. and Kadam, P.S. (2002). Effect of meteorological factors on incidence of sorghum stem borer, *Chilo partellus* (Swinhoe). *Journal of Applied Zoology Research*, **13**:69-70.

Raiger, R.A., Ameta, O.P., Sharma, K.C. and Rana, B.S. (2002). Incidence of shoot infesting insect pests of sorghum. *Indian Journal of Applied Entomology*, **16**:47-50.

Rathore, M.S. (1984). Effect of the date of sowing and chemical treatment on insect pests of maize. Thesis for award of M.Sc. Agriculture degree under the guidance of Dr. R.S. Gupta in Sukhadia Univ., Udaipur.

Sarangdevot, S.S. and Kumar Ashok. (2005). Population dynamics of *Aphis gossypii* GLOVER and *Myzus persicae* SULZER of tomato in relation to biotic and abiotic factors. *National Conference on Applied Entomology*, pp. 69-70.

Sharma, O.P. (1983). Effect of time of sowing of maize and chemical control schedule against its insect pests. *M.Sc. Ag. Thesis Submitted to the University of Udaipur*.