



SEASONAL INCIDENCE OF INSECT PESTS FAUNA IN MAIZE

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ABSTRACT

An experiment was conducted to study the insect pest faunal complex of maize at the Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur, during *kharif* 2014. Maize variety, Pratap Makka-5 was sown in the second week of July in plots size of 3.0m x 3.0m replicated four times. A total of ten insect pests were recorded of which the major happened to be the maize stem borer, *Chilo partellus* (Swinhoe); armyworm, *Mythimna separata* Walker; maize aphid, *Rhopalosiphum maidis*; cob worm, *Helicoverpa armigera* (Hubner); grey weevil, *Myloccerus discolor* Bohemann; and the phadka grasshopper, *Hieroglyphus nigrorepletus* Bolivar; besides, three different natural enemies including four species of coccinellid beetles, the green lacewing and *Cotesia flavipes* Cameron, the larval parasitoid of stem borer were observed and could be collected.

Key words: Maize, major insect pests, incidence, natural enemies

INTRODUCTION

Maize (*Zea mays* L.) is an important cereal crop grown all over world as food for human consumption, animal feed, fodder and industrial products. Besides being a cereal crop, maize is also an important source of oil. In India, it is cultivated in an area of 9.09 M ha with the production and productivity of 23.29 MT and 2563 kg per hectare, respectively (Anonymous, 2013-14). In Rajasthan, it is being grown an area of 9.09 lakh hectares with the production of 15.67 lakh tons and productivity of 1724 kg per hectare (Anonymous, 2014-15). Despite taking due care of the production components, insect pests cause significant damage to the crop leading to low yields. In India, Sarup *et al.* (1987) reported that as many as 130 species of insect pests damage the crop from sowing till harvest. Bhagat (2012) recorded seventeen species of insect pests, among which *C. partellus*, *Agrotis ipsilon* (Hufnagel) and *Holotrichia* species were the major. The insect pest complex of a particular crop varies from area to area that depends on agro-climatic condition of that particular region; further, the status of insect pests of a particular crop has been shifting under changing climate scenario. Periodical assessment on insect pests and their natural enemies may help to know the relative economic importance of different pests on the crop; thus the present investigation was carried out. Keeping these in view, the present study was carried out to study the objective “Study on pest faunal complex along with their natural enemies in maize ecosystem” were under taken.

MATERIALS AND METHODS

The present investigation was carried out at the Instructional Farm, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during *kharif*, 2014 (July to October). The variety Pratap Makka-5 was sown in well prepared field on 11th July, 2014. The plot size maintained was 3.0 m x 3.0 m (9 sq m.) with the row to row and plant to plant spacing maintained at 65cm and 25cm, respectively. All agronomic practices were followed as per recommendations given in the package of practices for raising a good and healthy crop. The insect pest complex infesting the crop and various natural enemies was recorded from 7th day after germination till harvest of crop at weekly intervals. Stem borer was recorded on the basis of number of dead hearts from each plot. Plants damaged by other lepidopteran pests were recorded on the basis of number of damaged plants or plant parts. Weevils, beetles, grasshoppers and natural enemies were recorded visually per plant; whereas, number of aphids was recorded visually from three leaves (top, middle and lower leaf) of each selected plant.

RESULTS AND DISCUSSION

The study revealed ten insect pests at different growth stages of the crop, belonging to four insect orders (Lepidoptera, Hemiptera, Coleoptera and Orthoptera). At early vegetative stage, the crop was attacked by *Chilo partellus* (Swinhoe) along with infestation of *Mythimna*

separata Walker, *Mylocerus discolour* Bohemann, *Hieroglyphus nigrorepletus* Bolivar and *Rhopalosiphum maidis* Fitch and they remained till late vegetative stage of the crop. The infestation of *Helicoverpa armigera* (Hubner) was recorded during cob formation to cob maturity stage of the crop. On the basis of infestation level and activities of insect pests recorded during kharif 2014, only *C. partellus*, *M. separata*, *R. maidis*, *H. armigera*, *M. discolour* and *H. nigrorepletus* were the major pests of maize.

The data recorded on incidence of stem borer in maize (Table 1) reveal that the stem borer incidence initiated with 4.61 per cent plants showing dead hearts and 6.29 per cent plants showing leaf injury rating of 1.4 in second week of August (33rd SMW) and continued up to second week of September (37th SMW). The infestation gradually increased and touched its peak of 16.53 per cent dead hearts and 15.56 per cent plants showing leaf injury rating of 7.2 in first week of September (36th SMW); thereafter, no further increase in infestation was recorded. The mean temperature, relative humidity and rainfall during the peak period of infestation were 25.95°C, 82.70 per cent and 165.2 mm, respectively. The grey weevil was active from the second week of August with a mean population of 1.3 weevils/plant (33rd SMW) and continued up to first week of October (40th SMW) with 0.85 weevils/plant. The pest population reached to its maximum (3.1 weevil/plant) in the third week of September (38th SMW) and then gradually declined. The mean temperature, relative humidity and rainfall during the peak period of infestation were 26.15°C, 68.05 per cent and 0.00 mm, respectively. The incidence of armyworm began from third week of August (34th SMW) with an initial mean population 0.75 larvae/plant, which remained active till first week of October with mean population 0.85 larvae/plant (40th SMW). The population gradually increased in third week of August and touched its peak of 4.4 larvae/plant in the third week of September (38th SMW) and thereafter declined gradually. The mean temperature, relative humidity and rainfall during the peak period of activity were 26.15°C, 68.05 per cent and 0.00 mm, respectively. *The kharif grasshopper* was observed in third week of August (34th SMW) with a mean population of 1.65 grasshoppers/3-meter row and continued up to first week of October (40th SMW) with mean population of 5.85 grasshoppers/3-meter row. The population increased up to 5.85 grasshoppers/3-meter row in the second week of September (37th SMW) and then gradually declined. The mean temperature, relative humidity and total rainfall during the peak period of infestation were 25.05°C, 87.65 per cent and 94.8 mm, respectively. The cob worm was observed on the crop from last week of August (35th SMW) with 0.75 larvae/plant to first week of October (40th SMW) with

0.95 larvae/plant. The population gradually increased and touched its peak with mean population of 3.40 larvae/plant in the second week of September (38th SMW) and then gradually declined. The mean temperature, relative humidity and rainfall during the peak infestation were 26.15°C, 68.05 per cent and 0.00 mm, respectively (Table 1). Incidence of maize aphid was observed from third week of August (34th SMW), which remained active till first week of October (40th SMW). Their mean population ranged from 21.60 to 110.25 aphids/3 leaves (Table 2). The population gradually increased and reached its maximum of 110.25 aphid/3 leaves in the second week of September (37th SMW), thereafter declined gradually. The mean temperature, relative humidity and rainfall during the peak period of activity were 25.05°C, 87.65 per cent and 94.8 mm, respectively.

Rajagopal and Channabasavanna (1975) recorded 55 species of insects in maize belonged to 9 orders and 29 families. Patra et al. (2013) recorded 24 insect pests belonging to 5 insect orders at different growth stages of the crop. They also observed that the stem borer (*C. partellus*), cob borer (*Stenachroia elongella* Hamp.) and shoot fly (*Atherigona soccata* Rond.) were found as major pests and 17 insects as minor pests in maize crop. Singh and Singh (2013) observed that the infestation of stem borer (*C. partellus*) was highest in the 38th standard meteorological week at a temperature of 29.5°C and relative humidity of 85 per cent, while the lowest infestation was noted in 34th standard meteorological week at a temperature of 31.2°C and relative humidity at 75 per cent. Chavan et al. (2006) recorded the incidence of *Mylocerus* weevil that ranged from 2 to 4 adults/plant. Sharma (1983) reported that armyworm (*M. separata*) fed on young leaves, but their migration towards the whorls, tassel and cobs were apparent with the growth of the plants, appearing on 10, 50 and 70 day-old crops, the population differed significantly i.e., initial population of armyworms were higher in the local and monsoon sown crops, but it lowered down on 50th day and 70th day of monsoon sown crop. Rana (1998) reported that the activity of *R. maidis* started when maximum temperature and minimum temperature ranged between 25.6 to 27.2°C and 6.9 to 8.2°C, respectively. Azad Thakur (1993) recorded maize cob borer infestation to be 80.0, 66.67, 54.76 and 15.07 per cent in 1988, 1989, 1990 and 1991, respectively, which indicated the severity of cob borer incidence on maize.

Six natural enemies were recorded on different pests of maize during the study period that were *Coccinella septempunctata* L., *Cheilomenes sexmaculata* (Fabricius), *Illeis cincta* (Fabricius), *Brumoides suturalis* Fabricius and green lacewing *Chrysoperla carnea* Stephen feeding on aphids; *Cotesia flavipes* Cameron as the larval parasitoid of stem borer, *C. partellus*. The larval

Table 1: Influence of abiotic factors of the environment on the incidence of insect pests of maize during *kharif*, 2014

SMW	Dates of Observation	Abiotic factors				Stem borer infestation			Mean population of other insect pests			
		Mean Atmospheric Temperature (°C)	Mean Relative Humidity (%)	Total Rainfall (mm)	Mean Dead Hearts (%)	Plants showing leaf injury symptoms (%)	Grey weevils (No./plant)	Armyworm (No./plant)	Grasshopper (No./3-m row)	Cob worm (No./plant)		
33	14/8/2014	26.55	72.7	0.2	4.61	1.4 (6.29)	1.30	-	-	-	-	
34	21/8/2014	28.15	76.35	40.8	6.92	1.8 (7.71)	1.85	0.75	1.65	-	-	
35	28/8/2014	27.40	77.35	31.6	13.07	5.2 (13.18)	2.75	1.65	2.55	0.75	0.75	
36	04/9/2014	25.95	82.70	165.2	16.53	7.2 (15.56)	1.55	3.50	3.45	1.55	1.55	
37	11/9/2014	25.05	87.65	94.8	16.53	7.2 (15.56)	2.25	3.80	5.85	2.15	2.15	
38	18/9/2014	26.15	68.05	0.0	-	-	3.10	4.40	4.60	3.40	3.40	
39	25/9/2014	25.60	64.25	0.0	-	-	1.95	1.80	2.75	2.00	2.00	
40	02/10/2014	26.95	59.55	0.0	-	-	0.85	0.85	1.95	0.95	0.95	
Seasonal Mean		26.47	73.57	41.57	11.53	2.85 (7.29)	1.95	2.39	3.25	1.80	1.80	

SMW- Standard meteorological week

Table 2: Seasonal incidence of maize aphid and its natural enemies on maize crop during *khurif*, 2014

SMW	Dates of Observation	Abiotic factors			Mean Aphid Population	Mean Predator Population/plant	
		Mean Atmospheric Temperature (°C)	Mean Relative Humidity (%)	Total Rainfall (mm)		Coccinellids	<i>Chrysoperla</i> sp.
33	14/8/2014	26.55	72.7	0.2	-	-	-
34	21/8/2014	28.15	76.35	40.8	21.60	0.85	0.90
35	28/8/2014	27.40	77.35	31.6	62.45	1.75	1.35
36	04/9/2014	25.95	82.70	165.2	51.75	1.55	1.10
37	11/9/2014	25.05	87.65	94.8	110.25	3.65	1.50
38	18/9/2014	26.15	68.05	0.0	93.65	2.70	1.20
39	25/9/2014	25.60	64.25	0.0	67.85	2.45	0.80
40	02/10/2014	26.95	59.55	0.0	15.40	0.9	0.40
Seasonal Mean		26.47	73.57	41.57	60.42	1.97	1.03

parasitoid, *C. flavipes* was recorded from field collected larvae of *C. partellus*. The data have been presented in Table (3) indicating that parasitisation by *C. flavipes* started from second week of August (33rd SMW) and continued up to third week of September (38th SMW), which ranged from 10.00 to 37.50 per cent. The highest parasitisation (37.50%) was recorded in the first week of September (36th SMW). The coccinellids were observed from third week of August (34th SMW) to first week of October (40th SMW) ranging from 0.85 to 3.65 adults/plant. The population gradually increased and touched its peak of 3.65 adult/plant in the second week of September (37th SMW) when the aphid population was also at its peak of 110.25 aphid/3 leaves, thereafter declined gradually. The mean temperature, relative humidity and rainfall during the peak period of activity were 25.05°C, 87.65 per cent and 94.8 mm, respectively (Table 2). *Chrysoperla carnea* Stephen was observed in the third week of August (34th SMW) with mean population of 0.90 adult/plant and continued up to first week of October (40th SMW) with mean population of 1.50 adults/plant. The population increased and reached its peak of 1.50 adults/plant in the second week of September (37th SMW) when the aphid population was also at its peak of 110.25 aphid/3 leaves. The mean temperature, relative humidity and rainfall during the peak period of activity were 25.05°C, 87.65 per cent and 94.8 mm, respectively.

Asin and Pons (1998) observed that *coccinellids* (*Coccinella septempunctata* Lines, *Adonia variegata* (Goeze) and *Propylaea quatuordecimpunctata* Linnaeus) were the most common aphid predators. Similarly, Tank et al. (2007) recorded four species of coccinellids in maize, *Coccinella septempunctata* Lines, *Illeis cincta* (Fabricius), *Cheilomenes sexmaculata* Fabricius and *Anegleis cardoni* (Weise). Green lacewing *C. carnea* (Neuroptera, Chrysopidae) and spiders (Araneida) were reported as predators of aphid by Psota and Hula (2008). Some natural enemies including 7 coccinellid beetles, 2 predatory bugs and 13 spider species in maize were recorded by Patra et al. (2013). Jiang et al. (2006) observed that parasitism of *C. flavipes* increased to about 20 per cent during the short rainy season; while, Kfir et al. (2002) reported that a parasitoid, *C. flavipes*, was introduced from Pakistan for biological control of *C. partellus* and caused a 32-55 per cent decrease in stem borer densities. El-Heneidy and Abbas (2005) concluded that *Paederus alferii* Fabricius dominated in August, *Oruis* spp. and *C. undecimpunctata* mainly occurred in September and October in maize fields

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