

STUDY ON PEST COMPLEX AND CROP DAMAGE IN MAIZE IN MEDIUM ALTITUDE HILL OF MEGHALAYA

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ABSTRACT

The experiment was conducted during 2010 and 2011 at ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya to study the pest complex and assess their damage in maize. Maize variety, 'Vijay composite' was sown in the month of April during both the years in Randomized Block Design (RBD) with three replications. Two alternate middle rows out of seven rows in each plot were selected for taking observation. Total twenty four insect pests and some natural enemies including seven coccinellid beetles and two predatory bugs and thirteen spider species were recorded in maize. Among these, stem borer (*Chilo partellus* Swin.), cob borer (*Stenachroia elongella* Hamp.) and shoot fly (*Atherigona soccata* Rond.) were found to be as major pests, seventeen insects as minor pest and others considered as stray pests. Crop damaged by major pests were estimated at 8.5 and 21.75% by shoot fly, 15.67 and 13.45% by stem borer and 11.95 and 6.5% by cob borer during 2010 and 2011, respectively.

INTRODUCTION

Maize is the third most important cereal crop in India after rice and wheat with a production of 21.3 million metric tons during 2010-11 (Anonymous, 2011). It has dual importance as food and fodder in addition to industrial uses. In Meghalaya, it occupy as second most important cereals crop next to rice producing 24,424 tones grain from 16,898 ha of land with only 1.445 tones/ha productivity (Anonymous, 2009). In spite of increase in acreage, maize production in India is remained almost stagnant with constant yield level. Biotic stress on maize is one of the major constraints to achieve the attainable yield. Maize is attacked by about 139 species of insect pests with varying degree of damage; however, only about a dozen are quite serious (Sarup *et al.*, 1987, Siddiqui and Marwaha, 1993). Of these, maize stem borer (*Chilo partellus* Swin.) is a key pest causing losses to grain yield, varies between 24.3 and 36.3 % in different agro climatic regions of India (Bhanukiran and Panwar, 2000). Khan *et al.* (1997) reported that the yield losses caused by stem borers to maize vary widely in different regions and range from 25-40% according to the pest population density and phenological stage of the crop at infestation. In general, insect pest complex of a particular crop vary area to area depends on agro climatic condition of that particular region. Meghalaya is one of the biodiversity rich states of India in terms of flora and fauna. Varied altitude, topography, status of soil and climatic conditions favours high species richness and support different types of vegetation. The region is highly dynamic in case of weather, thus very suitable for multiplication of insect pests and their natural enemies. Furthermore, status of insect pest of a particular crop is shifting

under changing climate scenario. Therefore, periodical assessment on pest composite for a crop may help to know the relative economic importance of different pests on that crop. Keeping these views in mind, the present study was conducted to keep current information about pest complex of maize and their potentiality to cause damage to the crop for this region.

MATERIALS AND METHODS

The experiment was conducted at Entomology Farm, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya, India during kharif, 2010 and 2011 to study the pest complex, their status and crop loss caused by major pests. Maize variety, 'Vijay composite' was sown during second week of April in 5mX 5m with spacing of 60cm X 30cm and replicated thrice in Randomized Block Design (RBD). Recommended management practices except plant protection measures were followed for raising the crop. Insect pests were recorded following Plant Inspection Method (PIM) adopted by Subharani and Singh (2004) for pest complex study. Weekly observations were taken from two alternate middle rows out of seven rows in each plot since seedling to maturity of the crop. Stem borer and shoot fly observations were recorded on the basis of number of dead heart from each plot and converted into percent dead hearts. Plants damaged by other lepidopteran pests were recorded on the basis of number of damaged plants or plant parts out of observed plants from each replication and converted into percent infestation. Bugs, hoppers, weevils, beetles, grasshoppers and natural enemies were recorded as number basis per plant whereas number of

aphids was recorded per centimetre square area of leaf/cob sheath. Maize weevil was counted from infested cob during harvest time. Of these, some insects infested the crop continuously after their first appearance in considerable numbers were designated as major pests and insect species which appeared occasionally or in small number were designated as minor pests whereas insect species whose present was scare and population was very low were considered as stray pests and tabulated accordingly.

RESULTS AND DISCUSSION

Pest Complex

Insect pests recorded infesting maize variety 'Vijay composite' are presented Table-1. Study revealed that as many as twenty four insect pests were observed at different growth stage of the crop. Insect pests recorded belongs to five insect orders i.e., seven lepidopterans, nine hemipterans, four coleopterans, one dipteran and three orthopterans. During seedling stage maize was first infested by *Peregrinus maidis* Ashm. after one week of germination followed by *Agrotis* sp, *Atherigona soccata* Rond., *Monolepta signata* Oliv., *Nephotettix* sp. and *Cofana unimaculata* Sign.; out of which *Peregrinus maidis* Ashm., *Nephotettix* spp and *Cofana unimaculata* Sign. continued up to vegetative stage while *Monolepta signata* Oliv. was observed till maturity of the crop. At grand growth stage or knee height stage, crop was attacked by *Chilo partellus* Swin. along with overlapping infestation by *Mythimna* sp, *Marasmia trapezalis* Guen., *Myllocerus* sp, *Nezara virudula* Linn., *Cletus* sp., *Atractomorpha crenulata* Fab. and *Hieroglyphus banian* Fab.

and they remained till late vegetative stage of the crop. Four species viz. *Leptocoris* *acuta* Thun., *Dictyophora pallida* Don., *Poophilus costalis* Walk. and long horned grasshopper (Tettigoniidae) were also found during vegetative stage but their activity were as stray pests. Three lepidopteran such as caterpillar of tussock moth, *Dicrisia oblique* Walk. and *Stenachroia elongella* Hamp.; one hemipteran i.e. *Rhopalosiphum maidis* Fitch and one coleopteran i.e. *Mylabris pustulata* Thun. were infested during silking stage, though *Stenachroia elongella* Hamp. and *Rhopalosiphum maidis* Fitch continued their damage till maturity of the crop while *Mylabris pustulata* Thun. was occurred as stray pest. *Sitophilus zeamais* Mots. which only found at maturity stage of the crop. On the basis of infestation level and activities of insect pests recorded during both the years, only *Chilo partellus* Swin., *Atherigona soccata* Rond. and *Stenachroia elongella* Hamp. were found to be the major pests of maize in this region, sixteen pests maintained their minor status and rests were found to be stray pests.

Present findings are falling in line of very earlier study by Fletcher (1914) who reported more than 11 different insect pests from south India while Butani (1961) who reported maize stem borer, Bihar hairy caterpillar, hairy caterpillars and brown field cricket as important pests of maize whereas minor ones were termites, aphids, rice grasshopper and wheat stem borer. About 25 species of insects in New South Wales and more than 120 species in South U.S.S.R were recorded by Gurney (1918) which indicated a wide range of insect pest composite of maize. Rajagopal and Channabasavanna (1975) recorded 55 species of insects in maize belonged under nine orders and 29 families whereas Ahad *et al.* (2012) recorded 17 insect

Table 1: Insect pest recorded in maize at Umiam, Meghalaya during kharif, 2010 and 2011

Sl. No.	Scientific Name	Family	Stage of crop	Status
Lepidopteran				
1	<i>Agrotis spp</i>	Noctuidae	Seedling	Minor
2	<i>Chilo partellus</i> Swin.	Pyralidae	Vegetative –booting	Major
3	<i>Mythimna sp</i>	Noctuidae	Vegetative	Minor
4	<i>Unidentified</i>	Lymantriidae	Silking	Minor
5	<i>Dicrisia oblique</i> Walk.	Lymantriidae	Silking	Minor
6	<i>Stenachroia elongella</i> Hamp.	Cosmopterygidae	Silking-maturity	Major
7	<i>Marasmia trapezalis</i> Guen.	Pyraustidae	Vegetative	Minor
Hemipteran				
8	<i>Nezara virudula</i> Linn.	Pentatomidae	Vegetative	Minor
9	<i>Peregrinus maidis</i> Ashm.	Delphacidae	Seedling-vegetative	Minor
10	<i>Leptocoris acuta</i> Thun.	Alydidae	Vegetative	Stray
11	<i>Cletus sp</i>	Alydidae	Vegetative	Minor
12	<i>Rhopalosiphum maidis</i> Fitch	Aphididae	Silking-maturity	Minor
13	<i>Dictyophora pallida</i> Don.	Fulgoridae	Vegetative	Stray
14	<i>Cofana unimaculata</i> Sign.	Cicadellidae	Seedling-vegetative	Minor
15	<i>Nephotettix spp</i>	Cicadellidae	Seedling-vegetative	Minor
16	<i>Poophilus costalis</i> Walk.	Aprophoidae	Vegetative	Stray
Coleopteran				
17	<i>Monolepta signata</i> Oliv.	Chrysomelidae	Seedling-maturity	Minor
18	<i>Mylabris pustulata</i> Thun.	Meloidae	Silking	Stray
19	<i>Sitophilus zeamais</i> Mots.	Curculionidae	Maturity	Minor
20	<i>Myllocerus sp</i>	Curculionidae	Vegetative	Minor
Dipteran				
21	<i>Atherigona soccata</i> Rond.	Anthomyiidae	Seedling	Major
Orthopteran				
22	<i>Atractomorpha crenulata</i> Fab.	Pyrgomorphidae	Vegetative	Minor
23	<i>Hieroglyphus banian</i> Fab.	Acrididae	Vegetative	Minor
24	<i>Unidentified</i>	Tettigoniidae	Vegetative	Stray

Table 2: Natural enemies recorded in maize ecosystem during 2010 and 2011

Sl. No.	Scientific Name	Family	Stage of crop
Insect enemies			
1	<i>Harmonia dimidiata</i> Fab.	Coccinellidae	Vegetative-maturity
2	<i>Coelophora bissellata</i> Mul.	Coccinellidae	Vegetative-maturity
3	<i>Oenopia kirbyi</i> Mul.	Coccinellidae	Vegetative-maturity
4	<i>Oenopia sexareata</i> Mul.	Coccinellidae	Vegetative-maturity
5	<i>Micraspis discolor</i> Fab.	Coccinellidae	Vegetative-maturity
6	<i>Coccinella transversalis</i> Fab.	Coccinellidae	Vegetative-maturity
7	<i>Coccinella septempunctata</i> Lin.	Coccinellidae	Vegetative- maturity
8	<i>Podisus maculiventris</i> Say	Pentatomidae	Vegetative
9	<i>Oechalia sp</i>	Pentatomidae	Vegetative
Non-insects enemies			
1	<i>Leucauge decorate</i> Black.	Tetragnathidae	Vegetative
2	<i>Cyrtophora sp</i>	Araneidae	Vegetative
3	<i>Larinia sp</i>	Araneidae	Vegetative
4	<i>Argiope pulchella</i> Thor.	Araneidae	Vegetative
5	<i>Marpissa calcuttaensis</i> Tik.	Salticidae	Vegetative
6	<i>Marpissa sp</i>	Salticidae	Vegetative
7	<i>Phidippus sp</i>	Salticidae	Vegetative
8	<i>Lycosa pseudoannulata</i> Boes et str.	Lycosidae	Seedling-vegetative
9	<i>Lycosa sp</i>	Lycosidae	Seedling-vegetative
10	<i>Oxyopes sp</i>	Oxyopidae	Vegetative
11	<i>Oedignatha sp</i>	Oedignathidae	Vegetative
12	<i>Tetragnatha sp</i>	Tetragnathidae	Vegetative
13	<i>Clubiona pogonias</i> Simon	Clubionidae	Vegetative

pests in maize from Jammu and Kashmir (India) region which corroborate the present findings.

Natural enemies

Natural enemies found in maize during study period are presented in Table 2. Among insects enemies, seven coccinellid beetles were found viz. *Harmonia dimidiata* Fab., *Coelophora bissellata* Mul., *Oenopia kirbyi* Mul., *Oenopia sexareata* Mul., *Micraspis discolor* Fab. and *Coccinella transversalis* Fab., *Coccinella septempunctata* Lin. and two predatory bug such as *Podisus maculiventris* Say and *Oechalia sp* were recorded. All coccinellid were found at vegetative stage and sustained up to maturity of the crop while predatory bug were observed during vegetative stage of the crop. Among spider species, Araneidae and Salticidae were most prominent species in maize field. Spiders viz. *Leucauge decorate* Black., *Cyrtophora sp*, *Larinia sp*, *Argiope pulchella* Thor., *Marpissa calcuttaensis* Tik., *Marpissa sp*, *Phidippus sp*, *Lycosa pseudoannulata* Boes et str., *Lycosa sp*, *Oxyopes sp*, *Oedignatha sp*, *Tetragnatha sp* and *Clubiona pogonias*

Simon were observed in maize. Spiders were abundant in the field throughout the growth period of the crop. Some coccinellid predators such as *Brumus suturalis* Fab., *Coccinella septempunctata* Lin., *Cheilomenes sexmaculata* Fab., *C. undecimpunctata* Lin. and *Menochilus sexmaculata* F. were earlier recorded in maize field by many authors (Fletcher, 1919; Jotwani and Verma, 1969; Singh and Sandhu, 1977; Sharma, 1985; Mani and Krishnamoorthy, 1999) which is partially matched with the present findings. Several spider species of Araneidae, Lycosidae, Oxyopidae, Salticidae, Tetragnathidae and Clubionidae families were recorded from maize field by many workers (Singh and Sandhu, 1977; Jalali and Singh, 2002; Singh et al., 1975 and Sharma and Sarup, 1979) whose findings indicated the wide diversity of spider population in maize field.

Crop damage

Crop losses caused by major pests in maize are presented in Figure 1. Inconsistent loss was found by particular insect during two consecutive years. During first year, stem borer (15.67%) and cob borer (11.95%) were most destructive to the crop while shoot fly (8.5%) incidence was relatively less but in second year it was unusual in term of their incidence. In 2011, maximum damage caused by shoot fly (21.75%) followed by stem borer (13.45%) while cob borer (6.5%) incidence was comparatively less than the previous year. Highest mean damage was caused by shoot fly (15.12%) followed by stem borer and cob borer with 14.56 and 9.23%, respectively. Stem borer damage was most consistent during both the years while shoot fly and cob borer were unpredictable. Variability of damage in consecutive two years by major insect pests may be due to influence by weather condition especially intensity of rainfall during crop seasons in this region. Present findings are in close conformity with Khan and Amjad (2000) who reported 7.71 to 10.34% dead hearts by stem borer on

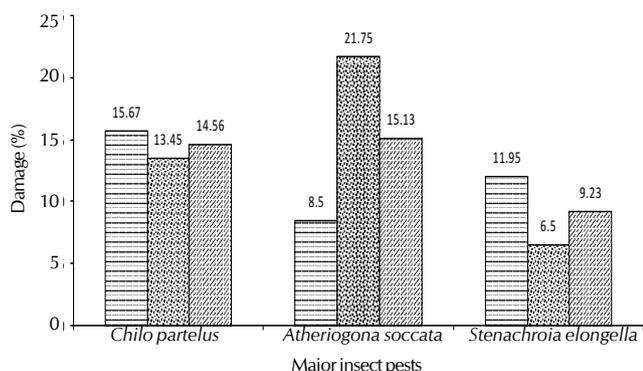


Figure 1: Crop damage by major insect pests

different maize varieties. Ahad, *et al.* (2008) who reported that mean infestation (dead heart + leaf infestation) of stem borer ranged from 0 to 23.16% during kharif season which is concurrence with the present findings. Cob borer infestation was recorded by Azad Thakur (1993) as 80.0, 66.67, 54.76 and 15.07% in 1988, 1989, 1990 and 1991, respectively, which indicated the severity of cob borer incidence on maize in this region. The results are also supported by Shylesha (1996) who recorded 5-39% cob borer damage on seven maize varieties in this region.

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