

STUDY ON NATURE AND EXTENT OF DAMAGE OF CORN EARWORM, *Helicoverpa zea* (BODDIE) IN MAIZE

M. A. Uddin, M. Jahan and M. M. Uddin

Department of Entomology, Bangladesh Agricultural University
Mymensingh-2202, Bangladesh

ABSTRACT

A field study was conducted on the nature and extent of damage of corn earworm, *Helicoverpa zea* (Boddie) in two maize varieties viz. BARI Hybrid Bhutta-5 and BARI Bhutta-7. The larvae caused damage by feeding on the ear tip at silk stage and then to kernel, the larvae were mainly confined to the ear tip and excreted faecal matter. It was found that the cob infestation rate was in linear progress and the mean cob infestation was 6.50% and 6.69% in BARI Hybrid Bhutta-5 and BARI Bhutta-7, respectively. The mean length of cob infestation was 24.90% and 25.07% and the mean number of kernel damage was 24.30 and 25.43 in BARI Hybrid Bhutta-5 and BARI Bhutta-7, respectively. The average yield loss was 0.016 t/ha in BARI Hybrid Bhutta-5 and 0.017 t/ha in BARI Bhutta-7. It was revealed from the results that BARI Bhutta-7 was more susceptible to this pest.

Key words : *Helicoverpa zea*, Nature, Extent, Damage, Maize

INTRODUCTION

Maize (*Zea mays* L.) is a kind of cereal crop (Family : Poaceae) and commonly known as bhutta in Bangladesh. It is the third most important cereal crop after rice and wheat. Mathur (1987) observed over 250 species of insects which were associated with maize in the field and storage conditions. Of these, 74 species have appeared recently and about a dozen were of potential economic importance (Mathur, 1992). Among them corn earworm is the most important constraint to corn production. The larva, *Helicoverpa zea* (Boddie) (formerly in the genus *Heliothis*) is a major agricultural pest and polyphagous in nature attacking more than 182 plant species, including cotton, chickpea, cowpea, pigeon pea, peas, sunflower, sorghum, groundnut, field beans, tomato, tobacco, maize and a range of vegetables, fruit crops and even tree species. Older larvae became aggressive and cannibalistic, resulting in 1 or 2 larvae per feeding site (Boyd, 2008). The larvae feed on the silk down into the kernels. This damage prevents pollination and introduces various fungi into the ear. Annual yield loss ranged from 5-7 percent in field and 10-15 percent corn for human consumption (Bell and McGeoch, 1996).

The extent of damage varied from crop to crop and season to season. *Heliothis* infested resulting in a yield loss of 0.876% in cotton and others (Williams, 2007). Sekulic *et al.* (2004) reported 93.7, 90 and 85.3% damage in maize, sunflower and soybean, respectively.

Horvath *et al.* (2004) reported 64.4% of the sunflower heads were infested with on average, more than five *Helicoverpa* larvae per head. Sannino *et al.* (2004) reported 30% of the pepper fruits and 70-80% of the pepper plants were damaged by *H. zea*. Fitt (1989) reported that the estimated annual cost of damage by *H. zea* and *H. virescens* together on all crops was more than US\$1000 million, despite an expenditure of US\$250 million on insecticide application for controlling these pests. Johnson *et al.* (1986) stated that *H. zea* and *H. virescens* caused a loss of over US\$ 1 billion on all crops. Sharma (2001) observed that *H. zea* caused an estimated loss of US\$ 927 million in chickpea and pigeonpea, and possibly US\$ 5 billion on different crops worldwide. King (1994) reported that losses caused by *Helicoverpa* were astronomical in cotton (US\$ 290 to US\$ 350 million annually) but pigeon pea, chickpea, tomato, maize and tomato were equally affected. Russel *et al.* (1999) showed that average losses on account of crop damage by *Helicoverpa* worked out to be 10 to 30%. Meenakshisundaram and Gujar (1998) stated that in maize, a single larva may damage 2 to 34 grains. Fitt (1997) stated that crops varied widely in their attractiveness to *H. zea* and in their ability to tolerate damage, either physically or economically provided an analysis of the costs of control for *H. zea* across the major field crops. Fitt (1997) also reported that maize was particularly susceptible because of its long growing season during which, 3 to 4 generations of *H. zea* might attack the crop. Archer and Bynum (1998) reported that feeding by *H. zea* and larvae lowers the quality of food maize by causing damage to kernels. *H. zea* has been a major pest in maize but so far the nature and extent of damage was not documented in Bangladesh. Therefore, the present study was undertaken to study on the nature and extent of damage by corn earworm, *H. zea*.

MATERIALS AND METHODS

The experiments were conducted in the Entomology Field Laboratory, BAU, Mymensingh during November 2008 to May 2009 to study the nature and extent of damage of corn earworm, *H. zea* using two maize varieties viz. BARI Hybrid Bhutta-5 and BARI Bhutta-7. The experiments were laid out in a randomized complete block design (RCBD) with three replications. The crop was grown following the usual recommended practices. The fertilizers viz. Urea, TSP, MoP, Gypsum and Cowdung were applied @ 300, 200, 125, 150 and 5000 kg/ha, respectively. The cultural practices like gap filling, weeding, thinning, earthing up, irrigation etc. were done properly. The nature of damage of corn earworm, *H. zea* was observed regularly from egg hatching to pre-pupal stage.

Calculation of percent cob damage

The total and mean numbers of infested cobs were counted from each plot at 3, 7, 12, 17, 21, 25 days after first occurrence of *H. zea*. The percentage of damage was determined by counting the number of total cob and infested cobs per plot. The percentage of cob damage was calculated using the following formula :

$$\% \text{ cob damage} = \frac{P_0 \times 100}{P_r}$$

Where,

P_0 = Number of infested cob/plot

P_r = Total number of cob/plot

Calculation of percent length of cob infestation

The individual plots were selected randomly when the cobs become matured. From each plot three infested cobs were selected randomly. The total length and infested part of the same cob was measured and percent length of cob infestation was calculated. From each cob total kernel and infested kernel were counted. The percent length of cob infestation was calculated using the following formula :

$$\% \text{ length of cob infestation} = \frac{I_0 \times 100}{I_r}$$

Where,

I_0 = Length of infested part /cob

I_r = Total length /cob

The recorded data were compiled and tabulated for statistical analysis. The analysis of variance was done with the help of computer package MSTAT-C. The mean differences among the treatments were analyzed as per test with Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Nature of damage of corn earworm, H. zea

The corn earworm, *H. zea* was found as a devastating pest of maize. Only the caterpillars caused the damage. The adults laid their eggs on the emerging silk. After hatching, young caterpillars crawled down the silks toward the ear. On maize, young larvae tended to feed on silks and interfered with pollination but eventually they usually gained access to the kernels. After feeding on the silks inside the husk for a few days, they began feeding on the kernels at the ear tip. Feeding was almost always confined to the top of the ear. In some cases feeding was found only at the tip, while in a very few cases injury extended to half of the length of the ear before larval development was completed. Larvae burrowed directly into the ears (Plate 2) until the ears have produced the silk. Larva usually remained feeding within a single ear of corn but occasionally abandoned the feeding site and searched for another. Larvae also can damage whorl stage maize by feeding on the young and developing leaf tissue. Faecal matter was found as large moist pellets in the silk channel and at the ear tip of maize (Plate 4). Govindan *et al.* (1981) reported that the nocturnal moths laid their eggs on the emerging silk. The newly hatched caterpillars actively fed on the growing silk, cut them into pieces and rendered the cob unfit for developing full number of grains (Plate 2). When the caterpillars appeared at a later stage of silk growth, they fed on the silk and slid along the husk tips to reach the grains in developing stage. Heavy deposition of faecal matter at the ear tip and along the crushed grains provided ideal conditions for fungal growth (Plate 3). Infestation lowered the quality of grain and the damaged grain became unfit for human

consumption. Under extreme cases, the grains rot, the ears gave out foul smell and the whole cobs loosen its utility as animal feed.



Plate 1. An earworm infested maize cob



Plate 2. A boring hole made by corn earworm



Plate 3. Deposition of earworm faecal matter on maize cob favouring secondary infection



Plate 4. Heavy deposition of faecal matter on maize cob as moist pellets



Plate 5. Healthy matured maize cobs



Plate 6. Matured maize cobs after infested

Extent of cob infestation at different time intervals in two maize varieties

The total number of healthy and *H. zea* infested cobs was recorded randomly at different days after first incidence in both the varieties. Collected data were converted into percent infestation per plot. Percent of cob damaged by *H. zea* in both varieties showed linear progress with increasing time interval (Fig. 1). In the BARI Hybrid Bhutta-5, the lowest percent of cob damage (4.40%) was at 3 days after first occurrence and the highest percent of cob damage was 7.40% at 21 days after first incidence which was 1.68 times more than that of 3 days after first incidence. After 25 days, no further infestation occurred. This was due to maturity of kernel. In the BARI Bhutta-7, the lowest percent of damaged cob was 4.45% at 3 days after first occurrence of *H. zea* and the highest infestation was 7.62% at 21 days after first incidence which was 1.71 times more than the results of 3 days after first incidence. No further infestation was occurred also in this variety at 25 days after incidence. Although there were no significant differences between the two varieties, however the BARI Bhutta-7 was found more susceptible to *H. zea* in comparison to BARI Hybrid Bhutta-5.

The results revealed that the cob damage increased gradually and the percent of cob damage ranged from 4.40% to 7.40% in BARI Hybrid Bhutta-5 and 4.45% to 7.62% in BARI Bhutta-7, respectively.

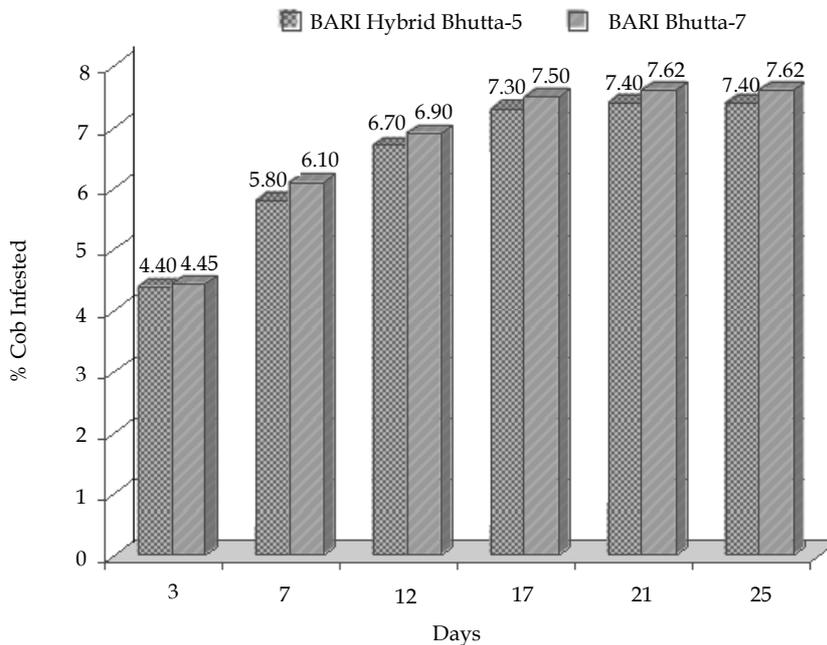


Fig. 1. Mean percentage of cob infestation by corn earworm in BARI Hybrid Bhutta-5 and BARI Bhutta-7 at different time intervals

Extent of length of cob infestation and yield loss in two varieties of maize

The extent of length of cob infestation and the yield loss in t/ha was calculated and presented in Table 1. In the BARI Hybrid Bhutta-5, the mean total cob length was 12.95 cm and in BARI Bhutta-7 this was 12.35 cm which was 1.04 times more than the BARI Bhutta-7. The average length of infested part of BARI Hybrid Bhutta-5 was 3.05cm and 3.09cm in BARI Bhutta-7. Mean percent cob length of cob infestation of BARI Hybrid Bhutta-5 and BARI Bhutta-7 were 24.90 and 25.07%, respectively. The length of cob infestation of two maize varieties was similar. In the BARI Hybrid Bhutta-5, the mean number of kernel damage was 24.30 and in BARI Bhutta-7, it was 25.43 which were slightly higher than BARI Hybrid Bhutta-5.

Table 1. Extent of cob damage and yield loss by corn earworm in two maize varieties

Parameters	Mean value with units	
	BARI Hybrid Bhutta-5	BARI Bhutta-7
Total cob length	12.95cm	12.35cm
Length of infested part of the cob	3.05cm	3.09cm
Percentage of length of infested cob	24.90%	25.07%
Mean number of kernels damaged	24.30	25.43
1000- kernel weight	301.97g	300.17g
Yield loss	0.016 t/ha	0.017 t/ha

The mean weight of 1000-kernel of BARI Hybrid Bhutta-5 and BARI Bhutta-7 were 301.97 and 300.17g, respectively. The yield loss of BARI Hybrid Bhutta-5 was 0.016 and 0.017 t/ha in BARI Bhutta-7. An identical yield loss was found in BARI Bhutta-7 and BARI Hybrid Bhutta-5.

The results of the present study revealed that the BARI Bhutta-7 was more susceptible to this pest and yield loss was also comparatively higher in BARI Bhutta-7 than that of the BARI Hybrid Bhutta-5. This might be due to pest susceptibility. The findings of the present investigation supported the results of Meenakshisundaram and Gujar (1998) who reported that in maize, a single larva of *H. zea* damaged 2 to 34 grains and more or less similar yield loss.

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