DOI: 10.15740/HAS/AU/12.4/610-614
Agriculture Update
Volume **12** | Issue 4 | November, 2017 | 610-614
Visit us : *www.researchjournal.co.in*
e ISSN-0976-6847

RESEARCH ARTICLE :

Estimation of avoidable yield losses against *Sesamia inferens* in promising maize hybrid with endosulfan spraying

V. SAILAJA, K. VIJAYA LAKSHMI AND K. LOKA REDDY

ARTICLE CHRONICLE :
Received :
14.08.2017;
Revised :
09.09.2017;
Accepted :
26.09.2017

SUMMARY : Artificial infestation of *Sesamia inferens* larvae at 2 leaf stage (7 DAE) of the crop growth (Table 1) recorded significantly lowest mean grain yield of 47.59 q ha^{-1} than infested at 4 (53.44 q ha^{-1}), 6 (59.84 q ha^{-1}) and 8 (67.34 q ha^{-1}) leaf stage of the crop. Artificial infestation of the maize crop with different larval densities (0, 5, 10, 15 and 20 larvae per plant) (Table 2) indicated that release of 20 larvae per plant adversely affected the grain yield and recorded 49.97 q ha^{-1} which was significantly less than the grain yield obtained with 15 larval density (54.12 q ha^{-1}) and 10 larval density per plant (57.32 q ha^{-1}). Estimation of avoidable yield losses in maize crop against *S. inferens* (Table 3) indicated that among the different stages of the crop growth, 2 leaf stage of the crop protected with endosulfan recorded maximum avoidable yield loss with different larval densities (18.17%, 22.45%, 35.12%, 37.62% and 45.39% with 0, 5, 10, 15 and 20 larval density per plant, respectively), than the other stages of crop and hence spraying of endosulfan at early stages of crop growth was found highly effective for controlling *S. inferens* and for obtaining higher yields.

How to cite this article : Sailaja, V., Lakshmi, K. Vijaya and Reddy, K. Loka (2017). Estimation of avoidable yield losses against *Sesamia inferens* in promising maize hybrid with endosulfan spraying. *Agric. Update*, **12**(4): 610-614; **DOI : 10.15740/HAS/AU/12.4/610-614.**

KEY WORDS :
Sesamia inferens, Maize, Avoidable yield loss

Author for correspondence :
V. SAILAJA
Department of Entomology, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, HYDERABAD (TELANGANA) INDIA
Email:sailajavallabuni@gmail.com

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Recently pink borer is appearing as a serious pest limiting the production of maize grown under post rainy (*Rabi*) season. The yield losses due to *S. inferens* varied from 25 to 80 per cent in India (Butcheswera, 1983). Yield loss is mainly due to dead heart formation in maize crop (Siddiqui and Marwaha, 1993). Identifying the critical stages of crop growth period to pink borer infestation is important to initiate management practices at appropriate time so as to avoid economic damage and minimizing the use of insecticides.

RESOURCES AND METHODS

The larvae and pupae of *S. inferens* collected from maize fields of college farm and ARI, Rajendranagar, Hyderabad were kept separately in glass jars (10 x 15 cm) for the emergence of adults under laboratory conditions. The moths (male and female in equal numbers) after emergence kept in

wooden ovipositional cages and were allowed to lay eggs on potted maize plants (10 day old). Four days after the release of moths, the plants were removed and the leaf sheath containing egg portion were cut and kept at 27 ±2ºC for incubation. These eggs were used as nucleus culture for mass rearing of *S. inferens*

A field experiment was conducted during *Rabi*, 2008-09 at college farm, Rajendranagar, Hyderabad to estimate the avoidable yield losses due to *S. inferens* infestation in a susceptible single cross hybrid HQPM-1. The experiment was laid in Factorial Randomised Block Design consisting of 24 treatments and three replications. Inter and intra row spacing was kept at 75 and 20 cm, respectively in a 2.25 x 2.5m plot size. A gap of 0.75 and 1.0m was maintained in between treatments and replications, respectively. All the normal agronomical practices were followed as per recommendations of Directorate of Maize Research, Rajendranagar, Hyderabad.

Four densities of newly hatched larvae *viz*., 0, 5, 10, 15 and 20 (here after called L_1, L_2, L_3, L_4 and L_5, respectively) were released along with chemical control (L_6 - sprayed with endosulfan 35EC @ 0.01%) at four different leaf stages of crop growth *viz*., 2 leaf (7 days after emergence (DAE)), 4 leaf (14 DAE), 6 leaf (21 DAE) and 8 leaf (28 DAE) stages (hereafter called A_1, A_2, A_3 and A_4, respectively) into the leaf whorl. A total of 24 treatments were formed with the combination of 4 different leaf stages of the crop with five larval densities including the chemical control.

The number of dead hearts in the unprotected plot artificially infested with different larval densities of *S. inferens* at different stages of the crop growth period were recorded at 30 days after infestation. Grain yield recorded at harvest was adjusted at 15 per cent moisture level and subjected to statistical analysis. Avoidable yield loss was calculated with the following formula suggested by Pradhan (1969).

$$\text{Avoidable yield loss (\%)} = \frac{\text{Yield in protected plot - Yield in unprotected plot}}{\text{Yield in protected plot}} \times 100$$

OBSERVATIONS AND ANALYSIS

The effect of larval densities of *S. inferens* during different stages of crop growth (Table 4) under unprotected conditions indicated that the dead hearts appeared only at 2 leaf stage (7 DAE) of the crop irrespective of the larval densities and artificial infestation of larvae at 4, 6 and 8 leaf stage of the crop did not show dead hearts. Release of 0, 5, 10, 15 and 20 larval densities of *S. inferens* at 2 leaf stage recorded 0, 6.67, 11.07, 11.07 and 11.07 per cent dead hearts, respectively. The results are in conformity with the findings of Reddy (2001). He reported that the per cent dead hearts formed due to release of 5, 10, 15 and 20 larvae per plant on 7 day old crop was 0, 16.67, 13.33 and 16.67 per cent, respectively during 1998-99 and 3.33, 10.00, 6.67 and 10.00 per cent, respectively during 1999-2000 season. The most critical damage was found to be the destruction of growing point which results in dead heart formation. Based on the findings, maize crop at 2 leaf stage is considered as the most critical stage for *S. inferens* infestation.

Artificial infestation of *S. inferens* larvae at 2 leaf stage (7 DAE) of the crop growth (Table 5) under unprotected conditions recorded significantly lowest mean grain yield of 47.59 q ha^{-1} than infested at 4 (53.44 q ha^{-1}), 6 (59.84 q ha^{-1}) and 8 (67.34 q ha^{-1}) leaf stage of the crop. Artificial infestation of the maize crop with different larval densities per plant indicated that release of 20 larvae per plant adversely affected the grain yield and recorded 49.97 q ha^{-1} which was significantly less than the grain yield obtained with 15 larval density (54.12 q ha^{-1}) and 10 larval density per plant (57.32 q ha^{-1}). The interaction effect of crop growth stages and larval density on yield of maize crop under unprotected conditions showed that the plants infested with different larval densities at 2 leaf stage (7 DAE) of crop resulted in maximum reduction in grain yield irrespective of the larval densities (50.79, 47.52, 45.69 and 40.00 q ha^{-1} with 5, 10, 15 and 20 larval density per plant, respectively) than the other growth stages of the crop. Godbole, 1983 reported that the losses in maize grain yield were more in 7 and 10 day old infested plants and losses in yield reduced as the crop growth increased to 15, 20 and 25 days. According to Siddiqui and Marwaha (1993), the yield loss is mainly due to dead heart formation in maize crop.

Avoidable yield losses of maize (HQPM 1) due to *S. inferens* were worked out at different stages of the crop infested with different larval densities. The results (Table 3) indicated that among the different stages of the crop growth, 2 leaf stage (7 DAE) of the crop protected with endosulfan recorded maximum avoidable yield loss with different larval densities (18.17%, 22.45%, 35.12%, 37.62 % and 45.39% with 0, 5, 10, 15 and 20

larval density per plant, respectively) than the other stages of the crop. The avoidable yield loss observed at 8 leaf stage (28 DAE) of the crop was less when compared with all the other treatments and it recorded 4.85%, 6.79%, 6.95%, 11.96% and 9.71% avoidable yield loss with 0, 5, 10, 15 and 20 larval density per plant, respectively.

Chatterji *et al*. (1969) did not find any significant difference between four applications of endrin and six applications of endrin with regard to the number of

Table 1 : Avoidable yield losses in maize by *Sesamia inferens* at different stages of crop growth by spraying with endosulfan

Leaf stage	Mean grain yield* (q/ha) unprotected	Mean grain yield* (q/ha) protected	Avoidable yield loss due to endosulfan spray (%)
2 leaf stage (7 days after emergence)	47.59	73.42	35.18
4 leaf stage (14 days after emergence)	53.44	73.24	27.03
6 leaf stage (21 days after emergence)	59.84	73.24	18.30
8 leaf stage (28 days after emergence)	67.34	73.24	8.06

* at 15 % moisture content of the grain

Table 2 : Avoidable yield losses in maize infested with different larval densities of *Sesamia inferens* by spraying with endosulfan

Larval density	Mean grain yield (q/ha)	Avoidable yield loss due to endosulfan spray (%)
0	62.86 *	14.17
5	60.99 *	16.73
10	57.32 *	21.74
15	54.12 *	26.11
20	49.97 *	31.77
Endosulfan spray	73.24 **	-

* under unprotected conditions ** under protected conditions

Table 3: Effect of endosulfan spraying on avoidable yield loss of maize by *Sesamia inferens*

Leaf stage	Larvae/plant	Grain yield (q/ha)	Avoidable loss(%)
*	0	59.93	18.17
2 leaf stage	5	50.79	22.45
(7 days after emergence)	10	47.52	35.12
	15	45.69	37.62
	20	40.00	45.39
*	0	60.86	16.90
4 leaf stage	5	59.79	18.36
(14 days after emergence)	10	52.03	28.95
	15	50.78	30.67
	20	43.73	40.29
*	0	66.96	8.57
6 leaf stage	5	65.12	11.09
(21 days after emergence)	10	61.57	15.93
	15	55.53	24.18
	20	50.02	31.70
*	0	69.69	4.85
8 leaf stage	5	68.27	6.79
(28 days after emergence)	10	68.15	6.95
	15	64.48	11.96
	20	66.13	9.71
Endosulfan spray	(uninfested)	73.24	-

* under unprotected conditions

Table 4 : Effect of larval densities of *Sesamia inferens* on occurrence of dead hearts at different stages of crop growth in maize under unprotected conditions

Leaf stage	Larval density/plant Dead hearts (%)					
	0	5	10	15	20	Mean
2 leaf stage (7 days after emergence)	0.00	6.67	11.07	11.07	11.07	7.54
4 leaf stage (14 days after emergence)	0.00	0.00	0.00	0.00	0.00	0.00
6 leaf stage (21 days after emergence)	0.00	0.00	0.00	0.00	0.00	0.00
8 leaf stage (28 days after emergence)	0.00	0.00	0.00	0.00	0.00	0.00

Table 5 : Effect of crop growth stages and larval densities of *Sesamia inferens* on grain yield of maize under unprotected conditions

Leaf stage	Larval density/plant Grain yield at 15% moisture (q/ha)					
	0	5	10	15	20	Mean
2 leaf stage (7 days after emergence)	59.93	50.79	47.52	45.69	40.00	47.59
4 leaf stage (14 days after emergence)	60.86	59.79	52.03	50.78	43.73	53.44
6 leaf stage (21 days after emergence)	66.96	65.12	61.57	55.53	50.02	59.84
8 leaf stage (28 days after emergence)	69.69	68.27	68.15	64.48	66.13	67.34
Mean	62.86	60.99	57.32	54.12	49.97	

	S.E.±	C.D. (P=0.05)
Crop age	0.58	1.67
Larval density	0.65	1.86
Crop age X larval density	1.23	3.53

infested plants and grain yield in most of the trials while evaluating the avoidable losses caused by insect pests of maize with particular reference to stem borers. Thus, the average avoidable yield loss as calculated by the difference of plots treated with four applications of endrin over untreated plots, was found to vary from 24.3 to 36.3 per cent. Godbole (1983) reported that endosulfan 35EC @ 0.1% spray application ten days after germination of maize crop followed by an application of endosulfan granules (4%) in the whorls of the plant at a reduced dosage of 5 kg/ha was found to be effective in reducing stalk borer *S. inferens* infestation. Reddy (2001) estimated the avoidable yield losses of maize (DHM-103) due to *S. inferens* and observed that 1998-99 and 1999-2000 *Rabi* season protected plot yielded 4974 and 6210 kg ha^{-1}, respectively, while unprotected plot yielded 4838 and 5910 kg ha^{-1}, respectively. Reddy *et al*. (2004) evaluated the bio efficacy of five insecticides against pink borer *S. inferens* during *Rabi* season of 1998-99 and 1999-2000 in maize hybrid (DHM- 103). Among the insecticidal treatments, endosulfan spray + carbofuran soil application and endosulfan spray alone were found significantly effective over rest of the treatments in suppressing the pink borer damage. The per cent increase in grain yield over control amongst the treatments, ranged from 12.86 to 42.68. Sekhar *et al*. (2008) reported that three sprayings of endosulfan at 7, 14 and 21 days after plant emergence recorded the lowest plant infestation by *Spodoptera exigua* (15.60%) as against untreated control (31.70%). The per cent avoidable loss in grain yield due to *S. exigua* infestation ranged between 13.20 per cent and 22.60 per cent over untreated control by using endosulfan. The maximum loss in yield which could be avoided by spraying endosulfan at 14 and 21 days after plant emergence was 42.00%.

Based on the above findings it was evident that 2 leaf stage (7 DAE) of the crop is the most critical period for taking up plant protection measures. Spraying of endosulfan at 7 days after plant emergence was found highly effective in managing *S. inferens* and for obtaining higher grain yields in maize crop.

Authors' affiliations :

K. VIJAYA LAKSHMI AND K. LOKA REDDY, Department of Entomology, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, HYDERABAD (TELANGANA) INDIA

REFERENCES

Butcheswera, Rao A. (1983). Techniques of scoring for

resistance to maize stalk borer, *Sesamia inferens.* 25th Annual silver jubilee (1957-1982) workshop held at the Indian Agricultural Research Institute, New Delhi in April 1983. 395-400 pp.

Chatterji, S.M., Young, W.R., Sharma, G.C., Sayi, I.V., Chahal, B.S., Khare, B.P., Rathore, Y.S., Panwar, V.P.S. and Siddiqui, K.H. (1969). Estimation of loss in yield of maize due to insect pests with special reference to borers. *Indian J. Entomol.*, **3**(2): 109-115.

Godbole, S.D. (1983). A review of work done on the maize stalk borer, *Sesamia inferens* Walker under Co-ordinated Maize Improvement Project pp 421-429 in Joginder Singh (compiled) Twenty-five years of maize research in India (1957-1982) Silver Jubilee workshop of the All India Co-ordinated Maize Improvement Project, Indian Agricultural Research Institute, New Delhi, 21-26 April, 1983.

Pradhan, S. (1969). Increase in India's pest problem. Span, UK 12:2.

Reddy, Lavakumar (2001). Bio-ecology and management of *Sesamia inferens* (Walker) on maize. Ph.D. Thesis Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad (Karnataka) India.

Reddy, M.L., Babu, T.R., Reddy, D.D.R. and Sreeramulu, M. (2004). Bio-efficacy of some insecticides against pink borer *Sesamia inferens* (Walker) in maize. *Indian J. Entomol.*, **66**(3): 209-211.

Sekhar, J.C., Kumar, Pradyumn and Sharma, R.K. (2008). Avoidable losses due to *Spodoptera exigua* Hubner in grain yield of maize sown in *Rabi* season. *Indian J. Entomol.*, **70**(4): 402-403.

Siddiqui, K.H. and Marwaha, K.K. (1993). *The vistas of maize Entomology in India*. Kalyani Publishers, Ludhiana, Punjab, India 184 pp.