Integrated Approach in the Management of Corn Cob Borers

Anuradha,M., D.Srilatha, and R.Ranga Reddy

Maize Research Centre, ANGRAU, Hyderabad, A.P, India

ABSTRACT. An experiment was conducted in farmers field in Tenali village, Guntur District of Andhra Pradesh, India during winter 2010-11 and 2011-12 to evaluate three modules in 3500 sq.m area each against cob borer complex whose incidence was found to be higher in corn (hybrid- 30V92) grown in rice fallows under no-till condition. First module comprised of soil application of Carbofuran 3G @ 8 kg/ac, spraying of Chlorantriniliprole 20 SC @ 60 ml/ac, pheromone traps with Helilure @ 6/ac & with Litlure @ 6/ac at silking stage. Second module comprised of soil application of Chlorantriniliprole 0.4 G @ 4 kg/ac, spraying of Flubendiamide 480 SC @ 30 ml/ac, pheromone traps with Helilure @ 6/ac & with Litlure @ 6/ac at silking stage. These two modules were compared with the farmers practice (third module) where in no control measures were adopted. Data on percent damaged cobs, undamaged cobs and insect-wise damaged cobs were recorded randomly in all modules at grain hardening stage. Data was subjected to one way analysis. Among the two modules, first module was found to be more effective than the second one with 74.39% and 55.82% undamaged cobs, respectively. Both modules were effective than the untreated control (31.86% undamaged cobs). Cobs with live larvae of *Spodoptera litura*, *Sesamia inferens*, *Helicoverpa armigera* and *Euproctis sp* in the first module was 3.46%, 9.86%, 1.42% and 0.04% respectively compared to 12.65%, 16.02%, 8.25% and 1.95% respectively in control.

Key words: *Sesamia inferens, Spodoptera litura, Helicoverpa armigera, Euproctis spp*

Introduction

In India corn is the third important food crop grown on 8.6 M ha. Owing to congenial climatic conditions though corn can be grown in all of the seasons, it is mainly grown as a major crop during rainy season in Andhra Pradesh. Corn grown during winter contributes to more than 25% of annual production, with less than 10% of corn area in India. Winter corn area is increasing in non-traditional districts of Andhra Pradesh where productivity of no-till corn in rice fallows is also higher i.e, 9-10 t/ha. Major hybrid seed production by the private seed companies is also being done during winter in coastal districts of Andhra Pradesh.

During recent years incidence of cob borers is noticed especially in no-till corn under rice fallows. *Sesamia inferens*, *Chilo partellus*, *Spodoptera litura*, *Helicoverpa armigera* and *Euproctis spp*, were found to attack the corn cobs between silking to grain hardening stage.

Though cob damage due to *Helicoverpa armigera* has been reported, decrease in grain yield is only a minor one (Darvas et al. 2011). Female moths prefer silk, since neonates feed first on silk and then penetrate the cob through apical side, where at beginning eat tip of the cob and then grains. Around 2-5 numbers of just hatched larvae are seen on silk and they prefer milk grains. Irrespective of initial egg density on silks, population of final instar larvae per infected cob rarely exceeded one, because of the protection afforded by tight husks around cob, migration to other cobs/plants and intraspecific competition (cannibalism) among the younger instar larvae (Twine 1975). Keszthelyi et al. 2011 reported of 14.03% weight loss in grains and 13.74% weight loss in cobs of sweet corn. Loss of corn due to *H.armigera* has been estimated at 262 kg/ha and if larvae damage early silks, pollination will be reduced resulting in even greater yield reductions. Control has generally not been practiced because of high cost associated with repeated insecticide application required during silking. In most years it is a case of forsaking the top of cob to larval damage (Anonymous 2010). Non chemical methods like release of the egg parasitoid, *Trichogramma chilonis* and erection of pheromone traps at silking stage could be the best alternatives, provided availability of good quality parasitoid and pheromone lures in time are not a constraint. Domotor et al. (2007) reported the results of synchrony between pheromone trap captures of *H.armigera* and appearance of freshly emerged larvae on developing cobs of corn hybrids. Cost of controlling earworm showed that the net income do not significantly differ among treatments (Javier et al. 2005).

Hence, an integrated approach using chemical and non-chemical methods was evaluated against cob borers in Guntur district of Andhra Pradesh.

Material and Methods

A field experiment was conducted in corn (30V92) grown in zero tillage situation on rice fallows at farmer's field in Tenali, Guntur district of Andhra Pradesh during winter 2010-11 and 2011-12. Three plots of 3500 sq.m area

each were selected and three modules were imposed in each plot when the crop was at tasseling stage on 26 Feb 2011 and 24 March 2012. Each plot was demarcated into seven strips which serve as replications.

Module 1 (M_1)
Soil application of Carbofuran 3G @ 8 kg/ac
Spraying of Chlorantrinilprole 20 SC @ 60 ml/ac
Pheromone traps with Helilure @ 6/ac
Pheromone traps with Litlure @ 6/ac

Module 2 (M_2)
Soil application of Chlorantrinilprole 0.4G @ 4 kg/ac
Spraying of Flubendiamide 480 SC @ 30 ml/ac
Pheromone traps with Helilure @ 6/ac
Pheromone traps with Litlure @ 6/ac

Module 3 (M_3)
Farmer's practice as control

Granules were applied in moist soil. Spraying was done during evening hours using Taiwan sprayer. Pheromone traps and lures supplied by Pheromone Chemicals, Nacharam, Hyderabad were erected at a height of 2.5 cm above the crop. Weekly observations on trap catches were recorded. Data on percent damaged cobs and insect-wise damaged cobs were recorded randomly in all modules at grain hardening stage and subjected to one way analysis.

Results and Discussion

During 2010-11, significant differences were found among the three modules with respect to cob infestation. Only 27% cobs were damaged in M_1 while 47% in M_2 and 69% in M_3. Highest percent of undamaged cobs to the tune of 73% were observed in M_1 and least (31%) in M_3. Percent of damaged cobs with live larvae of *S.litura, S.inferens, H.armigera and Euproctis sp* in M_1 were significantly on par with those in M_2 but not with those in M_3. At the time of recording observations few cobs were damaged but the larva causing the damage was not present on it and such cobs were less in M_1 and almost equal in M_2 and M_3.

During 2011-12, significant differences were found among the three modules with respect to cob infestation. Only 25% cobs were damaged in M_1 while 41% in M_2 and 67% in M_3. Highest percent of undamaged cobs to the tune of 75% were in M_1 and least 33% in M_3. Percent of damaged cobs with live larvae of *S.litura, S.inferens, H.armigera and Euproctis sp* in M_1 were significantly on par with those in M_2 but not with those in M_3. Per cent damaged cobs without any live insect at the time of observation were significantly different in all the three modules.

Pooled data of the two years showed that damaged cobs percent (26%) was found to be least in M_1 followed by 44% in M_2 and 68% in M_3. Percentage of undamaged cobs was highest in M_1 (74%) followed by M_2 (56%) and 32% in M_3. Percent damaged cobs by *S.litura* (3.46, 4.22), *H.armigera* (1.42,1.48) and *Euproctis sp* (0.04,0.0) were similar in M_1 and M_2 but not in M_3. Cobs with *S.inferens* larvae (10%, 11%, 16%) and damaged cobs without any live insect at the time of observation (11%, 27%, 32%) were significantly different in all the three modules.

Population of *S.litura* and *H.armigera* was less in M_1 and M_2 due to erection of pheromone traps. Number of *H.armigera* male moths trapped during the experimental period was more than that of *S.litura*. Therefore cob damage due to *H.armigera* was more compared to that of *S.litura*.

Conclusion

First module comprising of soil application of Carbofuran 3G @ 8 kg/ac, Chlorantrinilprole 20 SC @ 60 ml/ac and pheromone traps with helilure and litlure @ 6/ac each was found to be better than the second module in terms of percent undamaged cobs. Earworm damage is mostly confined to the last 2-3 rows of the cob. It is not yet really high to cause significant yield reduction and implementation of control strategy like insecticide application was unnecessary.

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Insect wise percent damaged and undamaged cobs (out of total cobs).

Module	*S.litura* number			*S.inferens* number			*H.armigera* number			*Euproctis sp* number			unknown number			Total damaged (cob)			Undamaged (cob)		
	2010-11	2011-12	Mean	2010-11	2011-12	Mean	2010-11	2011-12	Mean	2010-11	2011-12	Mean	2010-11	2011-12	Mean	2010-11	2011-12	Mean	2010-11	2011-12	Mean
M1	3.25	3.67	3.46	8.96	10.77	9.86	1.17	1.67	1.42	0.08	0	0.04	13.12	8.54	10.83	26.58	24.64	25.61	73.42	75.36	74.39
	10.07	10.88	10.66	17.35	19.1	18.25	5.03	7.32	6.69	0.61	0	0.43	21.07	16.96	19.15	30.98	29.72	30.39	59.02	60.28	59.6
M2	4.43	4.02	4.22	11.46	11.06	11.26	1.46	1.49	1.48	0	0	0	29.81	24.63	27.22	47.16	41.21	44.18	52.84	58.79	55.82
	12.06	11.54	11.83	19.73	19.42	19.59	6.37	6.42	6.89	0	0	0	32.97	29.74	31.41	43.36	39.93	41.65	46.64	50.07	48.35
M3	13.74	11.56	12.65	17.13	14.91	16.02	8.14	8.37	8.25	2.24	1.67	1.95	28.66	34.38	31.52	69.1	67.19	68.14	30.89	32.81	31.86
	21.74	19.87	20.83	24.4	22.7	23.58	16.54	16.78	16.67	8.5	7.32	8	32.31	35.86	34.13	56.26	55.07	55.65	33.74	34.93	34.35
CD	2.25	1.49	1.44	1.93	1.29	1.26	3.33	2.31	1.44	1.39	0.86	0.89	3.99	2.23	2.24	3.84	2.04	1.78	3.84	2.04	1.78

Italicised numerical values are angular transformed values