Available online at www.scholarsresearchlibrary.com

Scholars Research Library

European Journal of Zoological Research, 2013, 2 (4): 98-102
(http://scholarsresearchlibrary.com/archive.html)

Scholars Research Library

ISSN: 2278–7356

Evaluation of efficacy of different insecticides and bioagents against *Sesamia inferens* Walker in maize.

T Pavani, T UmaMaheswari, J.C. Sekhar

Department of Entomology, College of Agriculture, Rajendranagar, Hyderabad, Andhra Pradesh, India

---

ABSTRACT

Green house experiment was conducted during rabi, 2010-11 at College of Agriculture, Rajendranagar, Hyderabad to evaluate efficacy of different insecticides against Sesamia inferens Walker with susceptible single cross hybrid, DHM 117 where each plant was infested with 10 larvae. There were five treatments including endosulfan, carbofuran, Beauveria bassiana Balsamo and Bacillus thuringiensis Berliner and untreated control. Data was recorded on leaf injury rating (LIR) at 40 days after germination (DAG) and on percent dead hearts, stem tunneling, number of live larvae recovered, % larval mortality and number of exit holes at 14 and 28 DAG. Among the treatments, endosulfan was found to be more effective with 4.55 leaf injury rating, 26.25 per cent dead hearts, 0.33 cm per metre stem tunneling, 0.45 exit holes per plant, and 41.66 percentage of live larval recovery followed by carbofuran, B. bassiana and B. thuringiensis.

Keywords: *Sesamia inferens*, Insecticides, Biopesticides, Efficacy.

INTRODUCTION

The pink stem borer, *Sesamia inferens* is one of the major insect pests of maize that causes wide damage to the crop in peninsular India during *rabi* season. In India, it is reported as a pest in Andhra Pradesh, Karnataka, Tamilnadu, Madhya Pradesh, Maharastra, Orissa, West Bengal, Bihar, Assam, Uttar Pradesh, Delhi and Punjab. (Reddy *et al.*, 2003. In addition to maize it was reported to attack finger millet, Krishnamurthy and Usman 1952, sorghum (Ajayi *et al.*, 1996), rice (Tiwary *et al.*, 1988 and Khan and Khaliq 1989), sugarcane (Sikchi *et al.*,1989., Easwaramoorthy *et al.*, 1992 and Tanwar and Bajpai, 1993), wheat (Singh *et al.*, 1990 and Godhani and Koshiya, 1991), fodder maize, Jalali and Singh (2002), cotton Rishi Kumar (2004) and oil palm Jacob and Kochu Babu (1995).

Larvae of the pink borer cause damage by feeding on all parts of the plant except roots. On hatching, the larvae remain concealed behind the leaf sheath in groups and feed on the epidermal layer of the leaf sheath, preferably on first three leaf sheaths leading to gummy oozing with water soaked lesions. Some larvae migrate to the neighboring leaf sheaths, while others penetrate in to the stem. Whorl feeding of the larvae result in the formation of rows of oblong and elongated holes in unfolded leaves. The larvae bore into the central shoot resulting in drying up of the growing tissue/flag leaf and formation of dead hearts in young plants. The larvae also form circular or "S" shaped tunnels filled with excreta inside the stem and, also show exit holes on the surface. Severe damage results in breaking of the stem. Larvae are found feeding on immature cobs, silks and tassel and severe infestation result in stunted plant growth and appearance of cob and tassel at one place (Reddy *et al.*, 2003).

MATERIALS AND METHODS

Artificial infestation of maize genotypes with *S. inferens* in the field was done by using laboratory reared insect population. 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) under laboratory conditions. In the initial stage, pieces of immature cobs and green husk were provided as food for the developing larvae and the later instars were fed with stem portions of older maize plants. The top of each jar (10 x 15 cm) containing larvae and pupae was covered with muslin cloth and secured with rubber bands. The larvae were transferred to another clean jar containing fresh food for every 2-3 days, until all the larvae enter into the pupal stage. The pupae thus collected from each jar were kept separately for the emergence of moths. The moths (male and female in equal numbers) after emergence were transferred into the wooden ovipositional cages and were allowed to lay eggs on potted 10 day old maize plants. Four days after release of moths, the plants were removed and the leaf sheaths containing egg portion were cut and kept at 27 ± 2 ºC for incubation (Plate 3.3). These eggs were used as nucleus culture for mass rearing of *S. inferens.*

Green house experiment was conducted during *rabi*, 2010-11 at College of Agriculture, Rajendranagar, Hyderabad to evaluate the efficacy of different insecticides against *S. inferens* by using susceptible single cross hybrid, DHM 117 where each plant was infested with 10 larvae. There were five treatments including endosulfan 35EC, carbofuran 3G, *Beauveria bassiana* Balsamo and *Bacillus thuringiensis* Berliner and untreated control. Data was recorded on leaf injury rating at 40 DAG. The data on percent dead hearts, stem tunneling, number of live larvae recovered, % larval mortality and number of exit holes were recorded on 14 and 28 DAG. The five treatments were T1-*Beauveria bassiana* @ 1x107 spores T2-*Bacillus thuringiensis* @ 200g/acre T3-Carbofuran@ 3kg/acre T4-Endosulfan @ 400ml/acre T5- untreated control replicated four times.

Maize plants were grown in pots and at 2-3 leaf stage, 10 neonate larvae were manually released within the whorls of the plant with the help of a camel hair brush. Plants were inoculated with *B. bassiana* into the space between the stem and 3rd leaf sheath by spraying with an inoculum level of 1x10^7 spores in 100 µl. Similarly an aliquot of 100µl of *B. thuringiensis* was also sprayed @ 1.0 g per litre. Whorl application of Carbofuran 3G granules and spraying of endosulfan 35 EC @ 0.07% was done.

RESULTS AND DISCUSSION

Leaf Injury Rating

Endosulfan was found to be highly effective with lowest LIR of 4.55 followed by carbofuran (5.65). Among the biopesticides, the fungal pathogen *B. bassiana* resulted in an LIR of 5.75 whereas bacterial pathogen, *B. thuringiensis* recorded LIR of 6.30 and it was found to be maximum of 8.50 in untreated control. More efficacy of endosulfan spray might be due to its toxicity that acted as a stomach poison when the larvae have fed on treated plant tissue. However, whorl application of carbofuran has resulted in slightly more LIR (5.65) compared to endosulfan (4.55). This might be due to the reason that carbofuran being systemic granular insecticide take time to dissolve and release the toxicant to have deleterious effect on the larvae of *S. inferens* with a reduction of LIR up to 33.52 %. Neonate larvae have to ingest the bacterial spores of *B. thuringiensis* and multiply with in the gut to release endotoxin and this might have resulted in more LIR compared to *B. bassiana*. Similar observations were made by Ravindar Pal *et al*. (2009) with respect to *C. partellus* where application of *B. bassiana* has resulted in low LIR of 5.0 and 5.4 at 20 DAS and 40 DAS, respectively followed by *B. thuringiensis* with high LIR of 6.2 and 6.5 at 20 DAS and 40 DAS, respectively.

Percent dead hearts

Endosulfan was found to be more effective resulting in 26.25 per cent dead hearts as compared to 85.00 per cent in untreated control at 14 days after germination followed by Carbofuran (33.75%). Among biopesticides, percent dead hearts of *B. bassiana* and *B. thuringiensis* were 36.25 % and 41.25 % respectively. Similar trend was observed at 28 days after germination.

Stem tunneling

Endosulfan spray resulted in lowest stem tunneling of 0.33 cm per metre stem which was on par with whorl application of carbofuran recording 0.35 cm per metre stem tunneling at 14 DAG. The bio pesticide, *B. bassiana* has resulted in 0.43 cm per metre stem tunneling followed by *B. thuringiensis* with 0.42 cm at 14 DAG where as untreated control has resulted in stem tunneling of 0.47 cm.

Efficacy of different insecticides on leaf injury rating, deadhearts, stem tunneling, live larval recovery, exit holes infested by pink stem borer, *S. inferens* Walker

	LIR		Dead hearts				Stem tunneling				Live larval recovery				Exit holes			
Treatments	**40 DAG**		**14DAG**		**28DAG**		**14DAG**		**28DAG**		**14DAG**		**28DAG**		**14DAG**		**28DAG**	
	LIR	**% reduction**	**% dead hearts**	**% reduction**	**% dead hearts**	**% reduction**	**Stem tunneling (cm/m stem)**	**% reduction**	**Stem tunneling (cm/m stem)**	**% reduction**	**Live larvae recovered (%)**	**% reduction**	**Live larvae recovered (%)**	**% reduction**	**Number of exit holes per plant**	**% reduction**	**Number of exit holes per plant**	**% reduction**
T_{1}- *B.bassiana*	5.75	32.35	36.25 (36.93)	57.33	38.75 (38.41)	55.71	0.43	8.50	0.21	74.39	48.33	51.67	37.50	62.50	1.1	24.13	0.61	49.16
T_{2}-*B. thuringiensis*	6.30	25.88	41.25 (39.76)	51.45	43.75 (41.31)	50.00	0.42	10.63	0.18	78.00	58.33	41.67	50.84	49.16	1.15	20.68	0.70	41.66
T_{3}- Carbofuran	5.65	33.52	33.75 (35.46)	60.27	36.25 (36.50)	58.57	0.35	25.50	0.12	85.30	49.16	50.84	36.66	63.34	0.80	44.82	0.55	54.16
T_{4}- Endosulfan	4.55	46.47	26.25 (30.55)	69.12	28.75 (32.30)	67.10	0.33	29.78	0.11	86.50	41.66	58.34	32.50	67.50	0.45	68.96	0.20	83.33
T_{5}-Control	8.50		85.0 (67.38)		87.50 (69.50)		0.47		0.82		90.42		87.91		1.45		1.20	
CD at 5%	8.06																	
Treatments(F_1)			5.13				0.03				5.01				0.21			
Crop age(F_2)			N.S				0.02				3.17				0.13			
$F_1 \times F_2$			N.S				0.06				N.S				N.S			
SE m±	0.26																	
Treatments(F_1)			1.77				0.01				1.73				0.07			
Crop age(F_2)			1.12				0.01				1.10				0.05			
$F_1 \times F_2$			2.51				0.02				2.45				0.10			

Endosulfan and carbofuran treatments have resulted in 0.11 and 0.12 cm per metre stem tunneling at 28 DAG followed by *B. bassiana* 0.21 cm per metre stem tunneling and *B. thuringiensis* 0.18 cm per metre stem. Untreated control resulted in 0.82 cm per metre stem tunneling.

Number of exit holes

From data on exit holes it was clear that Endosulfan could cause 0.45 holes per plant at 14 DAG that was reduced to 0.20 holes per plant by 28 DAG, followed by carbofuran recording 0.80 holes per plant at 14 DAG and 0.55 holes per plant at 28 DAG. Similarly *B. bassiana* has recorded 1.1 holes per plant at 14 DAG that were reduced to 0.61 at 28 DAG followed by *B. thuringiensis* showing 1.15 at 14 DAG and 0.70 at 28 DAG.

Larval survival

Untreated control has resulted in 90.42 % of larval recovery of the larvae of *S. inferens* after 14 DAG. When endosulfan was sprayed, minimum of 41.66 % larvae were recovered causing mortality of *S. inferens* to an extent of 58.34 % by 14 DAG and 32.50 % recovery and 67.50 % mortality by 28 DAG. Similarly carbofuran has resulted in about 49.16 % recovery with 50.84 % mortality of larvae at 14 DAG and 36.66 % recovery with 63.34 % mortality. Among the biopesticides, with application of *B. bassiana*, there was 48.33 % of larval recovery and 51.67 % mortality at 14 DAG and 37.50 % and 62.5% mortality at 28 DAG. However *B. thuringiensis* has resulted in 58.33 % larval recovery and 41.67 % mortality at 14 DAG and 50.84 % larval recovery and 49.16% mortality were recorded at 28 DAG.

.

Similar observations were made by Ravindar Pal *et al*. (2009) with respect to *C. partellus* where application of *B. bassiana* has resulted in low LIR of 5.0 and 5.4 at 20 DAS and 40 DAS, respectively followed by *B. thuringiensis* with high LIR of 6.2 and 6.5 at 20 DAS and 40 DAS, respectively. They also observed reduction in dead hearts by spraying *B. bassiana* and *B. thuringiensis* against *C. partellus* in maize. Lavakumar Reddy *et al*. (2001) reported that as the age of the crop increased there was a reduction in stem tunneling.

CONCLUSION

Experiments conducted on evaluation of different management practices for *S. inferens* with maize single cross hybrid, DHM 117 under green house conditions clearly indicated endosulfan as the most effective with 4.55 LIR, 26.25 percent dead hearts, 0.33 cm per metre stem tunneling, 0.45 number of exit holes per plant, and 41.66 percentage of live larval recovery followed by carbofuran with 5.65 leaf injury rating, 33.75 percent dead hearts, 0.35 cm per metre stem tunneling, 0.80 number of exit holes per plant, and 49.16 percentage of live larval recovery. Among the biopesticides *B. bassiana* was more effective with 5.75 leaf injury rating, 36.25 percent dead hearts, 0.43 cm per metre stem tunneling, 1.10 number of exit holes per plant and 48.33 percentage of live larval recovery compared to *B. thuringiensis* with 6.30 LIR, 41.25 percent dead hearts, 0.42 cm per metre stem tunneling, 1.15 number of exit holes per plant and 58.33 percentage of live larval recovery. Growth of *B. bassiana* was confirmed as white mycelial growth on infected larvae.

Acknowledgement

We thank the staff of entomology and all other friends who helped for carrying out the experiments.

REFERENCES

[1]Ajayi, O., Tabo, R and Ali, D. **1996**.. *International Sorghum and Millets Newsletter*. 37 : 58-59.
[2][Krishnamurthy, B and Usman, S.**1952**. The ragi stem borer *Sesamia inferens* Walker. *Bulletin of the Department of Agriculture*, Mysore state. Entomology series no 15, 70.
[3]Easwaramoorthy. S., David, H., Shanmugasundaram, M., Santhalakshmi, G and Kumar, R. **1992**. *Entomophaga*. 37 (4): 613-619.
[4]Jalali, S. K and Singh, S. P. **2002**. *Entomon*. 27 (2): 137-146.
[5]Tanwar, R. K and Bajpai, P. K. **1993**. *Indian Sugar* 43 (4): 243-248.
[6]Rishi Kumar Sucheta Khokhar K S **2004** *Journal of Cotton Research and Development* .18 (1): 99-101.
[7]Singh, Y. P., Baba, Z. A., Singh, B and Pandey, N. D. **1990**. *Indian Journal of Entomology* 52 (3): 431-434.
[8]Godhani, P. H and Koshiya, D. J. **1991**. *Gujarat Agricultural University Research Journal*. 17 (1) : 136-139.
[9]Jacob, S. A and Kochu Babu, M. **1995**. *Planter*. 71: 831, 265-266.

[10]Reddy, M. L., Babu, T. R., Reddy, D. D. R and Sreeramulu, M. **2003**. *International Pest Control* 45 (5): 260-263.
[11]RavindraPal., Singh, G., Prasad, C. S., Ali, N., Kumar, A and Dhaka, S.S.**2009**. *Annals of plant protection sciences* 17 (2): 325-327.
[12]Lavakumar Reddy, M. **2001**.Bio-ecology and management of *Sesamiainferens* (Walker) on maize.*Ph.D. Thesis*Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad, India.