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Field evaluation of biopesticides and synthetic insecticide against leaf miner, *Aproaerema modicella* population in soybean

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ABSTRACT

Soybean (*Glycine max* L.) is an important leguminous crop native of Asia. Leaf miner is major insect pest of soybean causing serious damage results in yield loss. Field experiment was carried out to study the integration of bipesticides, Biobit (*Bacillus thuringiensis),* Dispel (*Beauveria bassiana*) and synthetic insecticide Hostathion 40EC (Triazophos) against leaf miner. All treatments were superior over control in reducing leaf miner. The treatment Triazophos 800 ml/ha recorded less leaf miner at all three, seven and ten days after spraying. *Bacillus thuringiensis* @ 1000ml/ha, *Beauveria bassiana* @ 1000g/ha were also at par with Triazophos 800 ml/ha.

Key words: Leaf miner**,** crop pest, *Bacillus thuringiensis, Beauveria bassiana,* Triazophos

INTRODUCTION

Soybean (*Glycine max* (L.) Merril) is an important leguminous crop. It emerged as a domesticated crop around the eleventh century BC in china (Hymowitz, 1970). During early 1900s, soybean was grown as a subsistence food crop in Asia. Now it has spread to all over the world. The present production of soybean in the world is about 212 million tonnes (Mt). The five major soybean producing countries in the world are USA, Brazil, China, Argentina and India. India contributes about 3.5 per cent of total world soybean production and it stands at 5th position. Soybean was promoted in the mid 80's in India, as one of the strategies to boost edible oil production in the country (Andole, 1984). In the recent years, interest in the cultivation of soybean, increased mainly on account of its dietic, industrial and agricultural importance. The national production of soybean has not been able to meet its domestic requirement due to poor average yield. Among the various factors responsible for poor include, yield non replacement of old cultivars with new improved ones and insect pest damage (Anonymous, 1988). Soybean is reported to be attacked by 273 species of insects (Rawat and Kapoor, 1968) and in India, 20 insect pest species have been recorded infesting soybean crop (Singh and Singh, 1990). The insect pests caused severe damage and consequent reduction in yield (Sharma, 1999), among them leaf miner (*Aproaerema modicella* Devanter), Stem fly (*Melanagromyza sojae* Zehnter), girdle beetle (*Obereopsis brevis* Swedenboard), and sucking insect pests such as whitefly (*Bemisia tabaci* Gennadius) are important.

Leaf miner causes leaf damage reducing the photosynthetic area of the plant and stem fly causes stem tunneling at reproductive stage of the crop. Leaf miner causes 30-50% losses in grain yield and 75% loss in the leaflets (Shetgar and Thombre, 1984). Conventional method of pest control has number of limitations in its usage such as suppression of natural enemies, environmental pollutions, outbreaks of secondary pests, health hazards etc. It is sought to replace conventional method pf pest control with new pest management strategy which employs use of eco friendly, safe to use, host specific, non chemical insecticides. Hence an attempt has been made to use bio pesticides and compatible insecticides to control leaf miner in soybean.

MATERIALS AND METHODS

Field experiment was carried out with soybean cultivar, MAUS-2 (Puja), to study the effect of combination of bioagents and chemical insecticides against soybean leaf miner and stem fly, at the research farm of Marathwada Agricultural University, Parbhani (Maharashtra). There were eight treatments which included spraying of Triazophos, Dispel (*Beauveria bassiana*) and Biobit (*Bacillus thuringiensis*) with an untreated control. The trial was planted in a randomized block design with three replications and a spacing of 45 x 5 cm was maintained. Two sprays of insecticides were done at 30 days after sowing and 20 days after the first spray. Observations on leaf miner were recorded as number of larvae per plant and number of leaflets infested from each plot from ten randomly selected plants. The data pertaining to larval count was subjected to square root transformation and percent infestation subjected to angular transformation (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

There was no significant differences in the number of leaf miner larvae and percent leaf infestation due to leaf miner before commencement of spray among all the treatments including untreated control but significant differences

Table 1. Effect of biopesticides and synthetic insecticide on the population of soybean leaf miner

Treatments	Leaf miner larval population			
	Pre-Treatment	3 DAS	7 DAS	10 DAS
Bacillus thuringiensis 1L/ha (Two sprays)	1.53(1.42)	0.83(0.90)	0.20(0.83)	0.33(0.9)
Beauveria bassiana 1L/ha (Two sprays)	1.66(1.46)	0.46(0.67)	0.16(0.81)	0.36(0.93)
Bacillus thuringiensis 1L/ha followed by triazophos 40 EC 800 ml/ha	1.43(1.38)	0.43(0.65)	0.20(0.83)	0.30(0.89)
Beauveria bass 1L/ha followed by triazophos 40 EC 800 ml/ha	1.40(1.37)	0.50(0.68)	0.13(0.79)	0.26(0.87)
Triazophos 40 EC 800 ml/ha followed by *Bacillus thuringiensis* 1L/ha	1.26(1.32)	0.50(1.00)	0.10(0.77)	0.23(0.85)
Triazophos 40 EC 800 ml/ha followed by *Beauveria bassiana* 1L/ha	1.46(1.40)	0.16(0.81)	0.06(0.75)	0.16(0.81)
Triazophos 40 EC 800 ml/ha (Two sprays)	1.46(1.40)	0.13(0.79)	0.01(0.71)	0.13(0.79)
Control (Unsprayed)	1.43(1.38)	2.06(1.43)	2.50(1.7)	2.80(1.81)
P-Value	0.683	0.0001	0.0001	0.0001
Significance	NS	**	**	**

DAS – Days after sowing; Values in parentheses correspond to square root transformed values. Values followed by the same letter in the same row are not significantly different (LSD, P = 0.05), ** and * represents statistical significance at 1% & 5% level, respectively; and NS represents non-significant differences.

Table 2. Effect of biopesticides and synthetic insecticide on leaf infestation due to leaf miner

Treatments	Percent Leaf Infestation			
	Pre-Treatment	3 DAS	7 DAS	10 DAS
Bacillus thuringiensis 1L/ha (Two sprays)	14.52(22.39)	12.01(20.26)	7.33(15.57)	8.32(16.68)
Beauveria bassiana 1L/ha (Two sprays)	14.19(22.11)	11.55(19.76)	8.51(16.94)	7.34(15.65)
Bacillus thuringiensis 1L/ha followed by triazophos 40 EC 800 ml/ha	14.03(21.9)	10.86(19.20)	8.37(16.76)	7.47(19.84)
Beauveria bass 1L/ha followed by triazophos 40 EC 800 ml/ha	14.14(22.08)	11.25(19.56)	7.78(16.15)	7.17(15.53)
Triazophos 40 EC 800 ml/ha followed by *Bacillus thuringiensis* 1L/ha	15.65(23.30)	11.04(19.36)	7.48(15.84)	5.75(13.86)
Triazophos 40 EC 800 ml/ha followed by *Beauveria bassiana* 1L/ha	14.11(22.04)	9.77(18.08)	6.29(14.47)	5.34(13.37)
Triazophos 40 EC 800 ml/ha (Two sprays)	14.31(22.22)	9.15(17.61)	4.03(11.50)	5.18(13.15)
Control (Unsprayed)	15.17(22.92)	20.17(26.64)	24.31(29.53)	26.34(30.87)
P-Value	0.515	0.0001	0.0001	0.0001
Significance	NS	**	**	**

DAS – Days after transplanting; Values in parentheses correspond to square root transformed values. Values followed by the same letter in the same row are not significantly different (LSD, P = 0.05), ** and * represents statistical significance at 1 and 5% level, respectively; and NS represents non-significant difference between various treatments was observed after three, seven and ten days of spraying. All treatments were superior over control in reducing number of leaf miner larvae and percent leaf infestation due to leaf miner. Spraying Triazophos twice @ 800 ml/ha recorded less number of leaf miner larvae and reduced leaf infestation due to leaf miner at three, seven and ten days after spraying. All the treatments were at par with Triazophos twice @ 800 ml/ha three days after spraying. The treatments *Bacillus thuringiensis* @ 1000ml/ha, *Beauveria bassiana* @ 1000g /ha, *Bacillus thuringiensis* @ 1000ml / ha followed by Triazophos @ 800 ml/ha and *Beauveria bassiana* @ 1000g /ha followed by Triazophos @ 800 ml/ ha were at par with each other at seven and ten after spraying. The field based pesticidal action on the reduviid predator *Rhynocoris marginatus* has also affected its population, growth has been studied by Sahayaraj *et al.* (2003).

It was reported that all biopesticides reduce the leaf miner infestation significantly over control, but *Bacillus thuringiensis* and *Beauveria bassiana* pesticides were at par with triazophos and significantly superior to the remaining microbial agents (Anonymous, 1997). Sahayaraj *et al.* (2008) root of *Pedalium murex* has its action on the groundnut pest, *Spodoptera litura.* Results of the present are in study confirmation with Narayanwal (1998) who reported that triazophos kept the low level of leaf miner followed by *Beauveria bassiana* and *Bacillus thuringiensis.* The research work carried out on soybean has been primarily production technology oriented. Both the bio pesticides alone and in integration with synthetic insecticide have proved to have a vital importance in controlling soybean leaf miner, the major pest of soybean.

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