Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-6: 140-147

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-6 pp. 140-147**
Journal homepage: http://www.ijcmas.com

Original Research Article

Effective Management of Leaf miner, *Aproaerema modicella* (Deventer) in Soybean Ecosystem

A.A. Motaphale*, B.B. Bhosle and F.S. Khan

Department of Entomology, College of Agriculture, VNMKV,
Parbhani-431 402, Maharashtra, India
**Corresponding author*

Keywords

Leaf miner, Percent foliage damage, Defoliator, Rynaxypyr, Chlorpyriphos, Emamectine benzoate

A B S T R A C T

The results of two applications of fourteen treatments against leaf miner infesting soybean revealed that the treatment with all the chemicals were found most effective for the control of pest. The lowest population of leaf miner was found in Emamectin benzoate 5SG@ (1.85 larvae/plant) and Indoxacarb 14.5 % (0.71 larvae/ plant) at 3 days after first and second sprays. At 7DAS, significantly lowest pest population was observed in Quinalphos 20EC (0.87larvae/plant) and Chlorpyriphos 20 EC (0.68 larvae/plant) respectively. At 14 days the population of leaf miner was observed to be lowest in Quinalphos 20EC (1.79 larvae/plant) and Rynaxypyr 20 SC (0.94 larvae/ plant) after first and second spray respectively. Per cent foliage damage due to leaf miner one day before the first and second spray ranged from 14.31to 16.96 and 8.51to 22.17 per cent. per cent respectively.

Introduction

Soybean has an important place in world's oilseed cultivation scenario, due to its high productivity, profitability and vital contribution towards maintaining soil fertility. The crop also has a prominent place as the world's most important seed legume. Soybean [*Glycine max* (L.) Merill.] is a multipurpose oilseed crop of the world which has higher content of proteins. Soybean is the third largest oil seed crop of India (Tiwari, 2003).

In India, around 20 insect pests species have been recorded infesting soybean crop (Singh and Singh, 1990). Leaf miner (*Aproaerema modicella*) is a serious pest of soyabean in Maharashtra, India, causing up to 100% damaged plants and up to 75% damaged leaflets per plant. Number of insecticidal has been recommended against insect pests of soybean. Thus the search for newer and most effective insecticides and tolerant entries for the management of major insect pests is quite essential.

Singh *et al.*, (1998) who tested efficacy of 11 insecticides (triazophos, orthene, chlorpyriphos, methomyl, ethion, profenofos, monocrotophos, endosulfan, quinalphos and deltamethrin) and reported that all the insecticides except phosphamidon and profenofos were highly toxic.

The term insect growth regulators (IGR) was designed to describe a new class of bio-rationals compound. It is necessary to study the efficacy of different IGRs, biorationals and insecticide against leaf miner pests of soybean.

Materials and Methods

The variety MAUS 71 with good germination percentage was procured from department of Agricultural Entomology, MKV, Parbhani. The line sowing of seed was done by maintaining 45cm distance between two rows and 5cm between two plants on 17.06.2010 and 11.07.2011. The field experiment was laid out in a RBD and the treatments were replicated two times with a plot size 4.5×3m in which 5 rows were planted in Kharif-2010 and 2011. The spraying was done in morning hours between 9.0 to 11.0 a.m. totally two sprayings were made 30 and 55 days after sowing respectively. The pretreatment count of insect pests was made one day before and post treatment population count was taken on 3, 7 and 14 day after the spraying. Number of larvae/plant in 10 plants, total number of leaflets and damage leaflets was recorded and percentage was worked out. As per Gomez and Gomez (1984), the data obtained on live population i.e. observations on larval population were subjected to $\sqrt{x+0.5}$ transformation i.e. Poisson formula. Whereas data on per cent infestation were transformed into arc sin transformation values before statistical analysis. **(**X=average number of pest population.)

Results and Discussion

First spraying

The data in respect of incidence of leaf miner on soybean a day before and 3,7 and 14 days after the first spray (DAS) were recorded during during *kharif* 2010-11,*kharif* 2011-12 and pool analyzed are presented below in Table 1 showed that incidence of leaf miner a day before first spray ranged from 3.41 to 4.30 larvae/plant. At 3DAS, it was observed that the lowest population of leaf miner was observed in Emamectin benzoate 5SG@ (1.85 larvae/plant) followed by Quinalphos 20EC (1.99 larvae/plant), Spinosad 45% (2.08 larvae/plant) and Rynaxypyr 20 SC (2.09 larvae/ plant) were significantly superior over rest of all the treatments and at par with each other. Next best treatment was Chlorpyriphos 20 EC (2.12 larvae/plant), Buprofezin 25 SC (2.24 larvae/plant), *Beauveria bassiana* (2.26 larvae/plant) and Indoxacarb 14.5% (2.35 larvae/plant). At 7DAS, significantly lowest pest population was observed in Quinalphos 20EC (0.87 larvae/plant) followed by Emamectin benzoate 5SG@ (0.92 larvae/plant), Chlorpyriphos 20 EC (0.98 larvae/plant), Spinosad 45% (0.92 larvae/plant) and Rynaxypyr 20 SC (1.03 larvae/plant) were significantly superior over rest of all the treatments and at par with each other. At 14 DAS, the population of leaf miner larva per plant was lowest in Quinalphos 20EC (1.79 larvae/plant) followed by Emamectin benzoate 5SG@ (1.84 larvae/plant), Rynaxypyr 20 SC (1.85 larvae/mrl) and Chlorpyriphos 20 EC (1.97 larvae/plant) were significantly superior over rest of all the treatments and at par with each other.

Second spraying

The data presented in Table 2 shown that incidence of leaf miner a day before second spraying ranged from 1.71 to 3.34 larvae/plant. At 3DAS, it was observed that the lowest population of leaf miner was observed in Indoxacarb 14.5 % (0.71 larvae/ plant) followed by Rynaxypyr 20 SC (0.92 larvae/ plant), Emamectin benzoate 5SG@ (0.96 larvae/plant), Quinalphos 20EC (0.97larvae/plant) and Spinosad 45% (0.97 larvae/plant) were significantly superior over rest of all the treatments and at par with each other. At 7DAS, significantly lowest pest population was observed in Chlorpyriphos 20 EC (0.68 larvae/plant)

followed by Rynaxypyr 20SC (0.75 larvae/ plant), Spinosad 45% (0.77larvae/plant) and Quinalphos 20EC (0.85larvae/plant) were significantly superior over rest of all the treatments and at par with each other. At 14 DAS, the population of leaf miner larvae per plant was lowest in Rynaxypyr 20 SC (0.94 larvae/ plant) followed by Emamectin benzoate 5SG@ (0.96 larvae/plant) and Spinosad 45% (1.03%) were significantly superior over rest of all the treatments and at par with each other.

Effect of insecticides and biorationals on per cent foliage damage due to leaf miner

First spraying

The data in respect of per cent foliage damage due to leaf miner on soybean a day before and 3,7 and 14, days after the first and second spray (DAS) recorded during *kharif* 2010-11, *kharif* 2011-12 and pool analyzed are presented in Table 3.

Per cent foliage damage due to leaf miner one day before the first spray ranged from 14.31to 16.96 per cent. At 3DAS, it was observed that the lowest per cent foliage damage due to leaf miner was observed in Chlorpyriphos 20 EC (9.60%) followed by Spinosad 45% (9.85%), Emamectin benzoate 5SG@ (10.03%) were significantly superior over rest of all the treatments and at par with each other.

Maximum number of larvae (20.38%) was recorded in untreated control. At 14 DAS, the foliage damage was lowest in Chlorpyriphos 20 EC(7.30 %) followed by Emamectin benzoate 5SG@ (8.08 %), Quinalphos 25 EC (8.29 %), Spinosad 45% (8.33%) and Rynaxypyr 20 SC (8.37 %) were significantly superior over rest of all the treatments and at par with each other.

Second spraying

The data in respect of per cent foliage damage due to leaf miner on soybean are presented in Table 4 and showed that per cent foliage damage due to leaf miner a day before second spray ranged from 8.51 to 22.17 per cent. At 3DAS, it was observed that the lowest per cent foliage damage due to leaf miner was observed in Spinosad 45%(7.06 %) followed by Quinalphos20EC (7.41%), Buprofezin 25SC (7.62%), Rynaxypyr 20 SC (7.71 %) and Emamectin benzoate 5SG@ (7.75 %) were significantly superior over rest of all the treatments and at par with each other. At 7DAS, significantly lowest foliage damage was observed in Spinosad 45% (6.04%) followed by Emamectin benzoate 5SG@ (6.05%), Buprofezin 25SC (6.28%), Indoxacarb 14.5 % (6.86%) and Quinalphos20EC (6.90 %) were significantly superior over rest of all the treatments and at par with each other. Maximum per cent foliage damage (23.54 %) was recorded in untreated control. At 14 DAS, the foliage damage was lowest in Emamectin benzoate 5SG@ (8.05%) followed by Chlorpyriphos 20 EC (7.30 %). These results are in line with the results reported by a team of scientist AICRP on soybean reported minimum leaf damage was recorded in plots treated with 3 sprays of triazophos 0.05 per cent (24.62 per cent) and were at par with other insecticides (Anonymous, 2000). Mangnale (2000) reported that triazophos 40 EC 800 ml/ha recorded lower incidence of leaf miner at three, seven and ten days after the spray and was significantly superior to over unprotected. Keshbhat *et al.*, (2002) studied the efficacy of different insecticide against soybean leaf miner *Aproaerema modicella*, a serious pest of soybean. Spraying with 0.05 per cent quinalphos, 0.0025 per cent decamethrin, 0.15 per cent profenophos and triazophos 40 EC 0.8 l/ha were found

effective in reducing larval population. Virkar (2004) reported that the treatment chlorpyriphos 20 EC @ 1.5 1/ha was found to be most superior in reducing per cent leaf damage due to leaf miner at 3 days after the first spray. However, it was at par with triazophos 40 EC @ 0.8 1/ha and *Bacillus thuringiensis* @ 1.0 1/ha. Ashok Kumar *et al.*, (2006) evaluated the bioefficacy of triazophos 20 EC and 40 EC along with other insecticides The data recorded that triazophos 20 and 40 EC both @ 300 g a.i./ha and triazophos 40 EC @ 250 g a.i./ha were found to be statistically at par and superior to rest of insecticides in controlling the leaf miner.

Table.1 Effect of insecticides and biorationals on larval population of leaf miner (pooled)

Sr. No	Treatments	Dose / lit.	Concentration (%)	First spraying, pooled (*kharif* 2010 and 2011)			
				No. of larvae per plant			
				1 DBS	3 DAS	7 DAS	14 DAS
1	Buprofezin 25 SC	2 ml	0.05	3.79 (3.77)	2.24 (3.23)	1.81 (2.79)	2.13 (3.01)
2	Diflubenzuron 25 WP	0.8 g	0.02	4.14 (3.82)	2.62 (3.29)	2.01 (2.90)	2.23 (3.09)
3	Azadirachtin 1500 ppm	2 ml	-	3.95 (3.91)	2.55 (3.36)	1.76 (2.96)	2.73 (3.40)
4	NSKE 5%	1 ml	-	3.41 (3.90)	2.43 (3.21)	1.74 (2.86)	2.72 (3.17)
5	*Nomuraea rileyi*	4 g	-	3.81 (3.84)	2.42 (3.31)	1.61 (2.91)	2.44 (3.19)
6	*Beauveria bassiana*	4 g	-	3.92 (3.91)	2.26 (3.32)	1.53 (3.06)	2.48 (3.27)
7	Bt 5%	100 g/ ha.	-	3.59 (3.95)	2.55 (3.46)	1.89 (2.95)	2.40 (3.05)
8	Emamectin benzoate 5 SG	0.4 g	0.002	3.87 (3.93)	1.85 (2.14)	0.92 (2.26)	1.84 (2.63)
9	Spinosad 45%	0.4 ml	0.018	3.53 (4.09)	2.08 (2.54)	1.00 (2.32)	1.91 (2.71)
10	Indoxacarb 14.5%	1 ml	0.0145	3.97 (3.92)	2.35 (2.61)	1.07 (2.31)	2.02 (2.62)
11	Rynaxypyr 20 SC	0.3 ml	0.006	4.06 (3.94)	2.09 (2.14)	1.03 (1.89)	1.85 (2.15)
12	Chlorpyriphos 20 EC	2 ml	0.04	4.30 (3.88)	2.12 (2.64)	0.98 (2.23)	2.37 (2.53)
13	Quinalphos 25 EC	2 ml	0.05	3.97 (3.85)	1.99 (2.80)	0.87 (2.39)	1.79 (2.62)
14	Untreated control	-	-	4.15 (3.92)	4.92 (4.36)	4.38 (4.71)	4.01 (4.83)
	SE+	-	-	0.03	0.03	0.04	0.04
	CD at 5%	-	-	0.09	0.10	0.11	0.12

* Figures in parentheses are $\sqrt{x + 0.5}$ transferred values

Table.2 Effect of IGRs, biorationals and insecticides on larval population of leaf miner after second spraying (pooled)

Sr. No	Treatments	Dose / lit.	Concent-ration (%)	Second spraying, (Pooled *kharif* 2010-11 & *kharif* 2011-12)			
				No. of larvae per plant			
				1 DBS	3 DAS	7 DAS	14 DAS
1	Buprofezin 25 SC	2 ml	0.05	2.82 (1.82)	1.63 (1.45)	1.00 (1.22)	1.85 (1.53)
2	Diflubenzuron 25 WP	0.8 g	0.02	3.34 (1.96)	1.86 (1.54)	1.29 (1.33)	2.40 (1.70)
3	Azadirachtin 1500 ppm	2 ml	-	2.85 (1.82)	1.66 (1.46)	1.03 (1.24)	1.39 (1.37)
4	NSKE 5%	1 ml	-	2.53 (1.73)	2.21 (1.64)	1.30 (1.35)	1.63 (1.46)
5	*Nomuraea rileyi*	4 g	-	2.67 (1.78)	1.82 (1.52)	1.12 (1.28)	1.62 (1.46)
6	*Beauveria bassiana*	4 g	-	3.01 (1.86)	1.25 (1.55)	1.00 (1.22)	1.21 (1.31)
7	Bt 5%	100 g/ ha.	-	2.61 (1.75)	1.65 (1.46)	0.95 (1.21)	1.30 (1.34)
8	Emamectin benzoate 5 SG	0.4 g	0.002	2.02 (1.59)	0.96 (1.21)	0.91 (1.19)	0.96 (1.21)
9	Spinosad 45%	0.4 ml	0.018	1.71 (1.49)	0.97 (1.21)	0.77 (1.13)	1.03 (1.24)
10	Indoxacarb 14.5%	1 ml	0.0145	2.08 (1.61)	0.71 (1.24)	0.87 (1.17)	1.06 (1.25)
11	Rynaxypyr 20 SC	0.3 ml	0.006	1.91 (1.55)	0.92 (1.19)	0.75 (1.12)	0.94 (1.20)
12	Chlorpyriphos 20 EC	2 ml	0.04	2.02 (1.59)	1.03 (1.24)	0.68 (1.09)	1.43 (1.39)
13	Quinalphos 25 EC	2 ml	0.05	1.97 (1.57)	0.97 (1.21)	0.85 (1.16)	1.38 (1.37)
14	Untreated control	-	-	2.04 (1.58)	2.09 (1.59)	1.86 (1.53)	1.73 (1.49)
	SE±	-	-	0.08	0.06	0.05	0.04
	CD at 5%	-	-	0.23	0.16	0.15	0.13

* Figures in parentheses are $\sqrt{x + 0.5}$ transferred values.

Table.3 Effect of insecticides and biorationals on per cent foliage damage due to leaf miner (pooled)

Sr. No	Treatments	Dose / lit.	Concentration (%)	First spraying, pooled (*kharif* 2010 & 2011)			
				% foliage damage			
				1 DBS	3 DAS	7 DAS	14 DAS
1	Buprofezin 25 SC	2 ml	0.05	14.31 (23.55)	11.94 (20.14)	11.45 (18.85)	11.27 (19.58)
2	Diflubenzuron 25 WP	0.8 g	0.02	16.20 (23.71)	12.52 (20.66)	10.36 (18.76)	11.62 (19.91)
3	Azadirachtin 1500 ppm	2 ml	-	16.73 (24.48)	14.68 (22.50)	11.40 (19.75)	11.91 (20.16)
4	NSKE 5%	1 ml	-	16.96 (24.31)	14.70 (22.38)	12.85 (19.46)	10.37 (20.11)
5	*Nomuraea rileyi*	4 g	-	16.92 (24.23)	17.03 (24.32)	13.99 (21.93)	11.64 (19.88)
6	*Beauveria bassiana*	4 g	-	15.75 (23.96)	13.89 (21.86)	11.08 (19.42)	11.22 (19.51)
7	Bt 5%	100 g/ ha.	-	15.40 (23.08)	14.67 (22.50)	11.73 (20.16)	11.39 (19.71)
8	Emamectin benzoate 5 SG	0.4 g	0.002	15.90 (23.46)	10.03 (18.38)	7.20 (15.54)	8.08 (16.46)
9	Spinosad 45%	0.4 ml	0.018	16.18 (23.71)	9.85 (18.10)	7.41 (15.69)	8.33 (17.09)
10	Indoxacarb 14.5%	1 ml	0.0145	16.81 (24.19)	10.94 (19.16)	7.44 (15.80)	9.55 (17.40)
11	Rynaxypyr 20 SC	0.3 ml	0.006	16.36 (23.84)	10.92 (19.17)	7.39 (15.77)	8.37 (16.77)
12	Chlorpyriphos 20 EC	2 ml	0.04	15.59 (23.23)	9.60 (17.90)	6.10 (14.27)	7.30 (15.71)
13	Quinalphos 25 EC	2 ml	0.05	16.16 (23.69)	11.55 (19.78)	7.39 (15.77)	8.29 (18.73)
14	Untreated control	-	-	16.65 (24.07)	18.69 (25.60)	20.38 (26.82)	21.55 (27.66)
	SE±	-	-	0.24	0.28	0.30	0.18
	CD at 5%	-	-	0.68	0.78	0.84	0.49

* Figures in parentheses are Arc sin transformed values.

Table.4 Effect of insecticides and biorationals on per cent foliage damage due to leaf miner (pooled)

Sr. No	Treatments	Dose / lit.	Concentration (%)	Second spraying, pooled (*kharif* 2010 and 2011)			
				% foliage damage			
				1 DBS	3 DAS	7 DAS	14 DAS
1	Buprofezin 25 SC	2 ml	0.05	11.51 (19.79)	8.69 (17.10)	6.97 (15.29)	8.60 (17.04)
2	Diflubenzuron 25 WP	0.8 g	0.02	11.30 (19.63)	9.48 (17.92)	8.09 (16.52)	9.84 (18.28)
3	Azadirachtin 1500 ppm	2 ml	-	12.85 (20.97)	11.12 (19.44)	4.67 (17.56)	10.57 (18.92)
4	NSKE 5%	1 ml	-	12.42 (20.92)	10.87 (19.23)	9.22 (17.67)	10.16 (18.56)
5	*Nomuraea rileyi*	4 g	-	13.95 (21.89)	12.27 (20.48)	10.55 (18.92)	11.56 (19.86)
6	*Beauveria bassiana*	4 gm	-	13.18 (21.26)	10.99 (19.33)	9.06 (17.65)	10.79 (19.08)
7	Bt 5%	100 g/ ha.	-	12.17 (20.38)	10.72 (19.08)	9.53 (17.88)	10.71 (19.02)
8	Emamectin benzoate 5 SG	0.4 g	0.002	12.39 (20.56)	9.13 (17.53)	7.02 (14.91)	8.05 (16.47)
9	Spinosad 45%	0.4 ml	0.018	11.12 (19.42)	8.19 (16.60)	6.95 (15.25)	8.94 (17.38)
10	Indoxacarb 14.5%	1 ml	0.0145	10.87 (19.22)	8.77 (17.19)	7.43 (15.79)	8.67 (17.10)
11	Rynaxypyr 20 SC	0.3 ml	0.006	11.13 (19.44)	8.87 (15.12)	8.17 (16.52)	9.59 (17.95)
12	Chlorpyriphos 20 EC	2 ml	0.04	10.14 (18.98)	9.00 (17.44)	8.06 (16.47)	9.61 (18.04)
13	Quinalphos 25 EC	2 ml	0.05	9.62 (18.02)	8.08 (16.47)	7.37 (15.74)	9.23 (17.64)
14	Untreated control	-	-	21.77 (27.80)	22.79 (28.50)	23.61 (29.06)	24.93 (29.95)
	SE±	-	-	0.24	0.27	0.33	0.35
	CD at 5%	-	-	0.66	0.76	0.91	0.99

* Figures in parentheses are Arc sin transformed values.

References

Anonymous, (2000), Annual report, All India Co-ordinated Research Project on Soybean, MAU, Parbhani.

Ashok Kumar, M.M., Kumawat, and Meena, N.K., (2006), Field evaluation of triazophos against insect pests of soybean and its impact on yield. *Pestology*, 30(3): 14-17.

Gomez, K.A., and Gomez, A.A, (1984), Statistical procedures for agricultural research. An International rice research Institute Book. Wiley Interscience pub. John Wiley and Sons. New York, U.S.A. pp. 139-153.

Keshbhat, S.S., Yadav, V.V., Patil, R.K., Kadam, A.S., and Kadam, R.P., (2002), Efficacy of different insecticides for control of soybean leaf miner *A. modicella*. *J. soils and crops*, 12(1): 59-61.

Mangnale, A.D. (2000), Integration of bioagents and chemical insecticides in the management of major insect pests of soybean (*Glycine max*. L.). M.Sc. (Agri.), thesis, MAU, Parbhani.

Singh, K.K., Singh, O.P., and Choudhari, A.K., (1998), chemical control of major insect pest of soybean in Madhya Pradesh. J. Insect Sci., 11(2) 145-148.

Singh, O.P., and Singh, K.J., (1990), Seasonal incidence and damage of *Melanagromyza sojae* on soybean. *Indian journal of Plant Protection*.18 (2). 271-275.

Tiwari, S.P., (2003), Improvement of yield and yield potential in soybean: An analysis and synthesis. *J. Oilseed Res*. 20 (1): 1-8.

Virkar, A.R., (2004), Studies on chemical control and economics of major insect pests of soybean (*Glycine max* L.). M.Sc. (Agri.), thesis, MAU, Parbhani.