Bio-efficacy of Insecticides against Sucking Insect Pests of Moth Bean, *Vigna aconitifolia*

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Abstract: - Investigations were carried out on bio-efficacy of insecticides against sucking pest of mothbean [*Vigna aconitifolia* (Jacq.) Marechal] at Pulses Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during 2017-18. The results revelead that out of Ten treatments, imidacloprid 17.8 SL @ 0.005 was found highly effective for the control of jassids and thrips at par with acetamiprid 20 SP @ 0.004% while thiomethoxam 25 WG @ 0.005 was found highly effective against white fly at par with imidacloprid 17.8 SL @ 0.005%. The control treatment of unspraying condition was found least effective for the control of jassids, white fly and thrips. The maximum yield was obtained in plots treated with thiamethoxam 25 WG @ 0.005 per cent (701 kg/ha) while minimum yield was obtained from the control treatment of unspraying condition (400 kg/ha).

Key-Words: - Bio-efficacy, Insecticides, *Vigna aconitifolia*.

1 Introduction

Mothbean, *Vigna aconitifolia* (Jacq.) Marechal commonly known as “moth” is one of the important pulse & crop well suited for arid and semi-arid regions of the country and considered to be originated from India. Among *kharif* pulses, it has the maximum drought tolerance capacity. Plants cover large area on the surface, conserve moisture and also protect soil from erosion. Mothbean belongs to family Leguminosae sub-family Papilionaceae. Mothbean is an annual plant. Its tap roots go deeper in soil which can extract moisture from lower horizons in the soil. Stem is branched with plant height of about 30 to 35 cm. Leaves are trifoliate and leaflets are lobed and divided in 3 to 5 parts. Flowers are papilionacious and mostly self pollinated. At the national level, Rajasthan state enjoys the privilege of being at the top in its production contributing about 75 to 80 per cent of the total national production. In India, mothbean covers an area of about 1.11 M ha having an annual production of about 0.31 M.T. with the productivity of 277 kg/ha (Anonymous, 2018) and Gujarat occupies an area of 0.32 M ha with an annual production of 0.15 M.T. (Anonymous, 2016-17). The crop is damaged at various stages of plant growth by a number of insect pests, such as white grub, *Holotrichia consanguinea* Hope; termite, *Odontotermes obesus* Rambur; jassid, *Empoasca motti* Pruthi; whitefly, *Bemisia tabaci* Gennadius; galerucid beetle, *Madursia obscurella* Jac; thrips, *Caliothrips indicus* Bagnall; stem fly, *Ophiomyia phaseoli* Tryon; red hairy caterpillar, *Amsacta moorei* Butler; flea beetle, *Phyllotreta cruciferae* Goeze and pod borer, *Catechrysops cnejus* Fabricius which have been reported to cause moderate to severe damage starting right from germination to maturity and thereby posing a serious threat to its cultivation (Bindra and Singh, 1969; Puttaswami *et al.*, 1977; Parihar, 1979; Satyavir, 1980 and Pareek *et al.*, 1983). Jassids and whiteflies also act as vector of yellow mosaic virus apart from causing direct damage by desaping (Satyavir *et al*., 1984).

2 Material and methods

The seed of mothbean variety "GMO-2" was sown on 4th July, 2017 in the plots measuring 4.0 x 2.7 m, keeping 45 cm row to row and 10 cm plant to plant distance. There were nine treatments including control, replicated thrice. The experiment was conducted in simple Randomized Block Design. All the insecticides were applied as foliar spray with the help of knapsack sprayer fitted with hollow cone nozzle. The sprayer was washed thoroughly prior to the application of subsequent treatments and second spray was given after fifteen days of first spray. The spray was done when sufficient population of major sucking pests had build-up. The observations on major sucking pest population were recorded from five selected and tagged plant, one leaf each from top, middle and lower portion of each tagged plants. Pre-treatment count will be taken one day before application of treatments. The post-treatment observation will be recorded on 3rd, 7th and 10th days after the application of different treatments. The second spray of insecticides/ botanicals will be given at 15 days interval. Observation of sucking pest will be taken from the appearance of pest in the above described manner and the observation thus obtained will be statistically analysed. At harvest the grain yield was recorded separately for each treatment. On the basis of yield the economics was calculated. Increase in yield over control and avoidable loss were calculated applying formula given by Khosla (1977).

$$\text{Increase in yield over control (\%)} = \frac{\text{Yield in treatment - Yield in control}}{\text{Yield in control}} \times 100 \quad (1)$$

3 Results and discussion

3.1 Jassid

The data presented in Table 1 and graphically depicted in Fig. 1 revealed that imidacloprid 17.8 SL @ 0.005 per cent was the most effective treatment in controlling jassids under field conditions followed by acetamiprid 20 SP @ 0.004 per cent and thiamethoxam 25 WG. Similar observations were recorded by Nataraja *et al.* (2013), Naga *et al.* (2015) and Suman *et al.* (2017) reported that imidacloprid most effective followed by thiomethoxam and acetamiprid against jassid on mothbean. Thus, the results obtained during present investigation are more or less similar to that reported by earlier worker for the efficacy of different insecticide against jassid on mothbean.

3.2 Whitefly

The data presented in Table 2 and graphically depicted in thiamethoxam 25 WG @ 0.005 per cent remained the best treatment over others recording lowest population of whitefly (0.79 whiteflies/leaf) on mothbean crop. Though, it was at par with imidacloprid 17.8 SL @ 0.005 per cent and Acetamiprid 20 SP @ 0.004 per cent. Jakhar *et al*. (2016) reported that seed treatment of mothbean with thiomethoxam 35 FS @ 5 g/kg seed was found highly effective for the control of whitefly. Similarly, Suman *et al.* (2017) found that acetamiprid most effective treatment against whitefly followed by imidacloprid and thiomethoxam in mothbean. Thus, the results obtained during present investigations are more or less in accordance with that reported by earlier workers for various insecticides against whitefly in mothbean.

3.3 Thrips

At the time of first spray no incidence of thrips was found in different treatments including control. The thrips population was observed at the time of flower initiation and increase after full flowering which indicated uniformly distribution of thrips population in whole experimental plot. It can be summarised from the results that the efficacy of insecticides against thrips recorded in all the treatments significantly superior over the control in term of number of thrips per flower. The treatment imidacloprid 17.8 SL @ 0.005 per cent found most effective with lowest population of thrips and it was found at par with thiamethoxam 25 WG @ 0.008 per cent and acetamiprid 20 SP @ 0.004 per cent. Similarly, Hossain (2014) recorded that spraying of imidacloprid 20 SL at the concentration of 0.5 ml/l gave the better results in reducing flower infestation and thrips population in mungbean. Naga *et al.* (2015) and Suman *et al.* (2017) reported that imidacloprid most effective followed by thiomethoxam and acetamiprid against thrips on mothbean. Thus, the findings of present investigation are in conformity with the earlier reports.

3.4 Yield

The yield of mothbean in different treatments varied from 400 kg/ha to 701 kg/ha. The highest yield of mothbean was recorded in the treatment of thiamethoxam 25 WG @ 0.005 per cent (701 kg/ha) and it was at par with imidacloprid 17.8 SL @ 0.005 per cent (697 kg/ha), acetamiprid 20 SP @ 0.004 per cent (686 kg/ha) and bifenthrin 10 EC @ 0.02 per cent (576 kg/ha). Highest Protection Cost Benefit Ratio (PCBR) was recorded in the treatment of thiamethoxam 25 WG @ 0.008 per cent (1 : 14.77). It was followed by acetamiprid 20 SP @ 0.004 per cent (1 : 14.05) and imidacloprid 17.8 SL @ 0.005 per cent (1 : 12.52).

Table 1 : Efficacy of different insecticides against jassid on mothbean

Sr. No.	Treatments	Conc. (%)	Number of Jassid/leaf						
			Before spray	First spray			Second spray		
				3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10 DAS
1	Acetamiprid 20 SP	0.004	2.22 (4.45)	1.04 (0.59)	1.09 (0.69)	1.12 (0.77)	0.92 (0.35)	0.98 (0.47)	1.08 (0.67)
2	Imidacloprid 17.8 SL	0.005	2.19 (4.30)	0.98 (0.47)	1.02 (0.55)	1.09 (0.69)	0.87 (0.27)	0.94 (0.39)	1.00 (0.51)
3	Thiamethoxam 25 WG	0.005	2.07 (3.82)	1.07 (0.65)	1.12 (0.77)	1.16 (0.86)	0.97 (0.45)	1.05 (0.61)	1.10 (0.71)
4	Dimethoate 30 EC	0.003	2.13 (4.05)	1.15 (0.83)	1.20 (0.95)	1.26 (1.11)	1.09 (0.69)	1.13 (0.79)	1.18 (0.91)
5	Bifenthrin 10 EC	0.002	2.05 (3.71)	1.12 (0.77)	1.16 (0.85)	1.22 (1.00)	1.00 (0.51)	1.07 (0.65)	1.13 (0.79)
6	Acephate 75 SP	0.005	2.03 (3.65)	1.16 (0.85)	1.22 (1.01)	1.27 (1.13)	1.11 (0.75)	1.15 (0.83)	1.20 (0.95)
7	Azadirachtin 1500 ppm	0.0006	2.10 (3.91)	1.23 (1.02)	1.30 (1.21)	1.32 (1.25)	1.14 (0.82)	1.21 (0.97)	1.26 (1.09)
8	NSKE	5 %	2.16 (4.20)	1.27 (1.12)	1.33 (1.27)	1.41 (1.49)	1.17 (0.87)	1.22 (0.99)	1.28 (1.15)
9	Control	-	2.21 (4.41)	2.33 (4.97)	2.34 (4.99)	2.37 (5.15)	2.40 (5.29)	2.45 (5.55)	2.53 (5.95)
	S.Em. ±		0.24	0.07	0.07	0.09	0.06	0.07	0.08
	C.D. at 5 %		NS	0.21	0.22	0.28	0.19	0.22	0.26
	C.V. (%)		10.12	9.44	9.34	10.66	9.97	10.12	10.53

*Figures outside parenthesis are $\sqrt{X + 0.5}$ transformed values, while those in parenthesis are retransformed value.

Table 2 : Efficacy of different insecticides against whitefly on mothbean

Sr. No.	Treatments	Conc. (%)	Mean number of whiteflies/leaf						
			Before spray	First spray			Second spray		
				3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10 DAS
1	Acetamiprid 20 SP	0.004	1.97 (3.42)	1.10 (0.71)	1.15 (0.83)	1.16 (0.85)	0.99 (0.49)	1.06 (0.63)	1.13 (0.79)
2	Imidacloprid 17.8 SL	0.005	1.96 (3.37)	1.08 (0.67)	1.13 (0.79)	1.14 (0.81)	0.96 (0.43)	1.04 (0.60)	1.10 (0.73)
3	Thiamethoxam 25 WG	0.005	1.93 (3.26)	1.01 (0.53)	1.08 (0.67)	1.13 (0.79)	0.89 (0.30)	0.96 (0.43)	1.04 (0.59)
4	Dimethoate 30 EC	0.003	1.95 (3.32)	1.21 (0.97)	1.26 (1.11)	1.30 (1.21)	1.11 (0.75)	1.17 (0.87)	1.26 (1.11)
5	Bifenthrin 10 EC	0.002	1.96 (3.36)	1.16 (0.85)	1.20 (0.95)	1.22 (1.01)	1.05 (0.61)	1.13 (0.79)	1.20 (0.95)
6	Acephate 75 SP	0.005	1.91 (3.18)	1.20 (0.95)	1.25 (1.07)	1.28 (1.15)	1.10 (0.73)	1.22 (0.99)	1.25 (1.07)
7	Azadirachtin 1500 ppm	0.0006	1.90 (3.12)	1.38 (1.43)	1.43 (1.55)	1.48 (1.70)	1.33 (1.29)	1.38 (1.41)	1.43 (1.57)
8	NSKE	5 %	1.93 (3.24)	1.41 (1.51)	1.45 (1.63)	1.53 (1.85)	1.36 (1.36)	1.42 (1.53)	1.47 (1.67)
9	Control	-	1.98 (3.45)	2.04 (3.69)	2.10 (3.91)	2.14 (4.09)	2.21 (4.41)	2.26 (4.61)	2.28 (4.91)
	S.Em. ±		0.21	0.07	0.08	0.08	0.06	0.07	0.08
	C.D. at 5 %		NS	0.21	0.23	0.24	0.19	0.22	0.24
	C.V. (%)		10.85	9.65	9.45	9.22	9.32	9.66	9.17

* Figures outside parenthesis are $\sqrt{X + 0.5}$ transformed values, while those in parenthesis are retransformed value.

Table 3 : Efficacy of different insecticides against thrips on mothbean

Sr. No.	Treatments	Conc. (%)	Number of Thrips / Flower			
			Before Spray	First spray		
				3 DAS	7 DAS	10 DAS
1	Acetamiprid 20 SP	0.004	2.13 (4.05)	1.26 (1.11)	1.31 (1.23)	1.36 (1.35)
2	Imidacloprid 17.8 SL	0.005	2.03 (3.66)	1.17 (0.87)	1.24 (1.05)	1.30 (1.19)
3	Thiamethoxam 25 WG	0.005	2.21 (4.41)	1.22 (0.99)	1.28 (1.15)	1.33 (1.29)
4	Dimethoate 30 EC	0.003	2.06 (3.75)	1.36 (1.37)	1.42 (1.53)	1.46 (1.65)
5	Bifenthrin 10 EC	0.002	2.08 (3.86)	1.30 (1.19)	1.36 (1.37)	1.42 (1.53)
6	Acephate 75 SP	0.005	2.20 (4.37)	1.41 (1.51)	1.46 (1.65)	1.49 (1.73)
7	Azadirachtin 1500 ppm	0.0006	2.17 (4.23)	1.44 (1.60)	1.50 (1.77)	1.54 (1.89)
8	NSKE	5 %	2.01 (3.55)	1.52 (1.83)	1.56 (1.95)	1.59 (2.05)
9	Control	-	2.17 (4.21)	2.23 (4.49)	2.28 (4.73)	2.35 (5.05)
S.Em. ±			0.22	0.09	0.10	0.11
C.D. at 5 %			NS	0.27	0.30	0.32
C.V. (%)			9.34	9.23	9.37	9.36

* Figures outside parenthesis are $\sqrt{X+0.5}$ transformed values, while those in parenthesis are retransformed value.

Table 4 : Yield and avoidable losses in mothbean treated with different insecticides

Sr. No.	Treatments	Concentration (%)	Quantity of insecticides (kg or l/ha)	Yield (kg/ha)	Increased yield over control (%)	PCBR
1	Acetamiprid	0.0040	0.160	686	71.69	1 : 14.05
2	Imidacloprid	0.0050	0.224	697	74.25	1 : 12.52
3	Thiamethoxam	0.0050	0.160	701	75.25	1 : 14.77
4	Dimethoate	0.0300	0.800	565	41.25	1 : 05.60
5	Bifenthrin	0.0200	1.600	576	44.00	1 : 00.22
6	Acephate	0.0500	0.534	567	41.75	1 : 07.14
7	Azadirachtin	0.0006	3.200	550	37.50	1 : 01.83
8	NSKE	5.0000	40.000	535	33.75	1 : 06.50
9	Control	0.0050		400	-	
S.Em. ±				35.25	-	
C.D. at 5 %				101.56		
C.V. %				10.57	-	

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