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EVALUATION OF CERTAIN INSECTICIDES AND BIOPESTICIDES AGAINST *HELICOVERPA ARMIGERA* IN PIGEON PEA

Yogesh & Rajnish Kumar
Department of Entomology, B.R.D.P.G. College, Deoria, U.P., India, Mob. 09450685136, 09453031744

ABSTRACT
A field experiment was conducted during 2010-11 and 2011-12 at the Agricultural Research farm of B.R.D.P.G College, Deoria to evaluate biopesticides and insecticides against *Helicoverpa armigera***.** There were 10 insecticidal treatments (4 biopesticides, 4 synthetic insecticides and one combination of both) including untreated check. Application of two sprays of NPV 250 LE with one spray of Imidacloprid 17.8 SL was found most effective against pod borer in all respects. The investigation revealed that biopesticides *i.e.* Neem oil, Ajooba, Answer and NPV were quite effective in managing *H. armigera* population in pigeonpea, reducing their pod damage ultimately increase yield potential. It is therefore biopesticides should be encouraged as ecofriendly insecticides.

KEYWORDS: Biopesticides, Ecofriendly management, *Helicoverpa armigera,* Insecticide, Pigeonpea.

INTRODUCTION

Pigeonpea is most preferred pulse in Utter Pradesh particularly in the eastern part of the state. Now a day more emphasis is being given to increase the area and productivity of pigeonpea to meet the dietary requirement. Despite showing enough interest to grow pigeonpea, farmers got disappointment at the later stage of crop growth particularly after pod formation. Pods are severely damaged by pod borer **(***Helicoverpa armigera)*. Sometimes their infestation level is so high that farmers do not get return even whatever they expended on seed. The pod damage due to *H. armigera* in pigeonpea could vary from 55 to 100% (Thakur *et al*., 1989). This pest is present throughout the year in India completing 7 generations by feeding on over 200 cultivated and wild plants (Sarode, 1999). In order to reduce the menace of this pest large number of conventional insecticides is being used with least success by ignorant farmers. The excessive and indiscriminate use of such insecticides leads to develop resistance against insecticides by the pest (Rao *et al.,* 2000), adversely affect the crop ecosystem and increase the total cost of production. In recent past more emphasis given on safer and ecofriendly management of pests. For the adoptability of the same needed comparison with traditional insecticides in both respects were effective and economical. Thus attempts were made in present investigation to study the efficacy of certain insecticides (Conventional as well as newer molecules), biopesticides and their combination against *H. armigera*.

MATERIALS AND METHODS

The field trial was conducted for two consecutive years (2010-11 and 2011-12) on agricultural farm of B.R.D.P.G. College, Deoria (U.P.).The trial was laid out in randomized block design with three replications. The pigeonpea variety Bahar was grown with all suitable package of agronomical practices. There were 10 insecticidal treatments including untreated check (4 biopesticides, 4 Synthetic insecticides and 1 combination). First sprays of insecticidal treatments were given at pod initiation stage and subsequent two sprays at 10 days interval. Observations on pod borer larvae were recorded from five randomly selected plants from each treatment at one day before and 1, 3, 7 and 10 days after each spray. The data thus obtained of all the consecutive sprays were pooled together and analysed statistically.

Pod damage per cent was estimated by counting the total number of pods and affected ones on five randomly plants in each treatment. At harvest, the pods from individual plots were thrashed separately and the yield was recorded from the net plot area. The yield data were computed to quintals per hectare and subjected to statistical analysis. Considering the present cost of various inputs of all the treatments and the yield of pigeonpea the C: B ratio value for each treatment was worked out.

RESULT & DISCUSSION

A perusal of data in table-1 and table-2 indicated that all the treatments significantly reduced larval population of pod borer over untreated check after 1, 3, 7 and 10 days after spraying. Among the synthetic insecticides Cypermethrin 25 EC was most effective but statistically at par to Coragen 18.5 SC and Imidacloprid 17.8 SL in both the years. When biopesticides were compared, the application of three spray of NPV, Ajooba, Answer and neem oil at 250 LE, 0.5 ml, 0.5 ml and 4 ml/lit. of water, respectively showed nonsignificant variation to each other in their effectiveness in larval reduction. The combination of two sprays of NPV 250 LE with one spray of Imidacloprid 17.8 SL proved best treatment in reducing borer population. The commercial formulations of NPV had already been recommended by Jeyarani and Karuppuchamy, (2010) against *H. armigera*.

TABLE 1: Effect of Insecticides on Larval Population of Pod Borer, Pod Damage and Yield of Pigeon pea (2010-11)

Treatment	Dose of insecticide per liter water	Before Spray*	After spray*				Pod Damage** (%)	Yield (q. /ha.)
			1DAS	3 DAS	7 DAS	10 DAS		
Monocrotophos 36 EC	1.25 ml	7.66 (2.84)	3.10 (1.89)	2.21 (1.63)	1.44 (1.38)	0.77 (1.12)	31.27 (35.58)	9.52
Cypermethrin 25 EC	0.5 ml	6.66 (2.66)	1.88 (1.53)	1.33 (1.33)	0.99 (1.21)	0.44 (0.96)	18.95 (30.89)	16.84
Imidacloprid 17.8 SL	1 ml	7.66 (2.78)	3.11 (1.88)	2.66 (1.77)	1.44 (1.38)	1.00 (1.22)	21.52 (31.61)	11.73
NPV 250 LE+Imidaclop rid 17.8 SL	0.5 ml +1 ml	8.00 (2.90)	1.77 (1.48)	1.66 (1.46)	1.10 (1.61)	0.99 (1.21)	18.89 (30.43)	18.91
NPV 250 LE	0.5 ml	8.33 (2.96)	2.44 (1.71)	2.10 (1.60)	1.44 (1.38)	0.88 (1.17)	24.58 (32.97)	11.43
Neem oil	4 ml	7.00 (2.72)	2.55 (1.74)	1.77 (1.48)	1.22 (1.30)	0.66 (1.07)	23.29 (32.43)	11.42
Ajooba	0.5 ml	8.00 (2.90)	1.77 (1.48)	1.21 (1.29)	0.99 (1.21)	0.55 (1.01)	25.50 (33.37)	10.88
Answer	0.5 ml	7.33 (2.69)	1.99 (1.57)	1.55 (1.41)	0.99 (1.21)	0.77 (1.12)	26.72 (33.88)	10.87
Coragen 18.5 SC	0.25ml	6.33 (2.56)	1.99 (1.56)	1.55 (1.42)	0.88 (1.17)	0.77 (1.12)	20.50 (31.19)	12.73
Untreated check		7.66 (2.82)	5.66 (2.45)	8.33 (2.96)	7.10 (2.72)	6.22 (2.56)	59.17 (45.42)	6.84
SE±		0.45	0.14	0.42	0.08	0.08	2.00	0.47
CD @ (0.05)		NS	0.29	0.89	0.17	0.17	4.20	1.00

* = Figures in parenthesis are square root transformed value
** = Figures in parenthesis are angular transformed value

TABLE 2: Effect of Insecticides on Larval Population of Pod Borer, Pod Damage and Yield of Pigeon pea (2011-12)

TREATMENT	Dose of insecticide per liter water	Before Spray*	After spray*				Pod Damage** (%)	Yield (q. /ha.)
			1DAS	3 DAS	7 DAS	10 DAS		
Monocrotophos 36 EC	1.25 ml	7.66 (2.85)	4.55 (2.24)	2.99 (1.85)	2.10 (1.60)	1.66 (1.46)	26.07 (33.59)	9.56
Cypermethrin 25 EC	0.5 ml	7.00 (2.72)	3.33 (1.95)	2.22 (1.64)	1.77 (1.49)	1.21 (1.28)	19.26 (30.60)	15.98
Imidacloprid 17.8 SL	1 ml	9.66 (3.18)	3.66 (2.03)	2.99 (1.86)	1.88 (1.52)	1.22 (1.28)	201.43 (31.19)	12.72
NPV 250 LE + Imidacloprid 17.8 SL	0.5 ml+1 ml	7.66 (2.84)	2.77 (1.92	2.00 (1.63)	1.33 (1.52)	0.99 (1.29)	18.83 (30.39)	19.04
NPV 250LE	0.5 ml	8.00 (2.90)	3.22 (1.80)	2.22 (1.58)	1.87 (1.35)	1.24 (1.20)	22.84 (32.21)	11.78
Neem oil	4ml	7.33 (2.78)	3.99 (2.11)	2.55 (1.74)	2.33 (1.67)	1.66 (1.46)	21.66 (31.74)	12.03
Ajooba	0.5 ml	8.00 (2.90)	3.99 (2.11)	2.55 (5.21)	1.88 (1.53)	1.77 (1.50)	24.05 (32.78)	10.89
Answer	0.5 ml	7.33 (2.73)	3.88 (2.08)	2.11 (1.60)	1.66 (1.46)	1.44 (1.38)	21.84 (31.81)	11.02
Coragen 18.5 SC	0.25 ml	6.00 (2.49)	3.55 (1.91)	2.99 (1.85)	1.66 (1.46)	1.00 (1.22)	19.65 (30.73)	13.22
Untreated check		7.66 (2.82)	9.66 (3.18)	10.55 (3.31)	9.66 (3.18)	9.44 (3.13)	54.65 (43.66)	7.30
SE±		0.24	0.16	0.11	0.11	0.44	1.56	0.56
CD @(0.05)		NS	0.34	0.24	0.24	0.93	3.28	1.18

* = Figures in parenthesis are square root transformed value
** = Figures in parenthesis are angular transformed value

Pod damage per cent was significantly reduced by all the treatments over untreated check in both the years. Minimum pod damage (18.99% and 18.33%) was observed in treatment NPV 250 LE + Imidacloprid 17.8 SL in both the years, respectively followed by Cypermethrin 25 EC (19.26% and 18.95%). Application of Coragen 18.5 SC @ 0.25ml/lit. Of water was found equally effective in reducing pod damage per cent, remained at par to NPV 250 LE + Imidacloprid 17.8 SL and Cypermethrin 25 EC. Srivastava and Sechgal (2002) also found Cypermethrin among the synthetic pyrethroids significantly overcome the losses caused by *H. armigera*.

All the chemical insecticides, except monocrotophos 36 EC were significantly superior to biopesticides in reducing pod damage percentage in both the years. Our findings are in close confirmity with the findings of Kathuria *et al.* (2005) who had reported monocrotophas 36 EC as ineffective among the insecticides tested against pod borer. The biopesticides evaluated remained statistically at par to each other in reducing pod damage. Significantly higher yield obtained under each insecticidal treatment over untreated check in both the years. Although,highest grain yield i.e. 18.91 and 19.04 q/ha. respectively obtained in both the years with treatment NPV 250 LE + Imidacloprd 17.8 SL which was followed by Cypermethrin 25 EC, Coragen 18.5 SC, Imidacloprid 17.8 SL and NPV 250 LE. It is evident from pooled data presented in table-3 that all the insecticidal treatments under investigation were economical. The most profitable treatment was Cypermethrin 25 EC in which got Rs.41.45 per rupee invested followed by NPV 250 LE + Imidacloprid 17.8 SL (1:23.54). In the rest of the insecticidal treatment in was in the range of 1:4.41 (Answer) to 1:11.08 (Neem oil). Maximum monetary return due to insecticidal treatment is attributed to their effectiveness against the pest and relatively cheaper cost. The quantum of monetary benefit expected from insecticidal applications depends on several factors like effectiveness of compound, cost of insecticides, crop produce, labour charge, weather conditions *etc.* that prevail in the locality. So variation is possible over space and time with monetary benefit in different places and seasons /years even from the use of same compound. Thus, considering the overall results of the insecticidal treatments, 3 sprays of Cypermethrin 25 EC and two spray of NPV 250 LE with 1 spray of Imidacloprid 17.8 SL can be recommended for the control of pod borer in pigeon pea in this area. For judicious use of such synthetic insecticides it is advocated to alter it with biopesticides for their prolong action, economical and ecofriendly.

TABLE 3: Economics of Insecticidal Spray Schedules for Control of *H. armigera* (Pooled, 2010-11 and 2011-12)

Treatment	Dose of insecticide (per liter water	Cost of Insecticide (Rs. /ha.)	Total cost of treatment Application (Rs. /ha.)	Gross Realisation (Rs. /ha.)	Net Realisation (Rs. /ha.)	Net profit (Rs. /ha.)	C:B ratio (Rs. Per rupee invested)
Monocrotophos 36 EC	1.25 ml	340	1635	57240	14820	13185	1 : 8.06
Cypermethrin 25 EC	0.5 ml	500	1320	98460	56040	54720	1 : 41.45
Imidacloprid 17.8 SL	1.00 ml	1000	2670	73350	30930	28260	1 : 10.57
NPV 250 LE + midacloprid 17.8 SL	0.5 ml+1 ml	2400+1000	2910	113850	71430	68520	1 : 23.54
NPV 250 LE	0.5 ml	2400	3030	69630	27210	24180	1 : 7.97
Neem oil	4.00 ml	200	2310	70350	27930	25620	1 : 11.08
Ajooba	0.5 ml	3500	4020	65310	22890	18870	1 : 4.68
Answer	0.5 ml	3800	4290	65670	23250	18960	1 : 4.41
Coragen	0.25 ml	12000	5400	77850	35430	30030	1 : 5.56
Untreated check	-	-	-	42420	-	-	-

* 1. Labour charge @ Rs. 120/ day
2. Sprayer rent @ Rs. 50/day
3. Sale price of product @ Rs. 6000/ q.
4. Amount of water used @ 600 lit. / ha. / spray

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REFERENCES

Jeyarani, S. and Karuppuchamy, P. (2010) Investigations on the enhancing efficacy of granulovirus on nucleopolyhedrovirus of *Helicoverpa armigera. Journal of biopesticides*, 3 (1):172-176

Kathuria,V., Saini, R. K. and Palaram (2005) Shift in baseline-susceptibility of *Helicoverpa armigera* to insecticides. Indian J. Ent., 67(2):119-123.

Sarode, S.V. (1999) Sustainable management of *Helicoverpa armigera*. *Pestology*. *Special issue feb*. 1999 (279-284).

Srivastava, R.M. and sehgal, V. K. (2002) Efficacy of various insecticides against *Helicoverpa armigera* in chickpea. *Indian J. Ent.,* 64(1):17-20.

Thakur, R.C., Neema, K.K. and Singh, O.P. (1989) Losses caused by pod fly (*M. obtusa)* and pod borer (*H. armigera)* to pigeonpea in Madhaya Pradesh. *Bhartiya Krishi Anusandhan patrika*, 4:107-111.