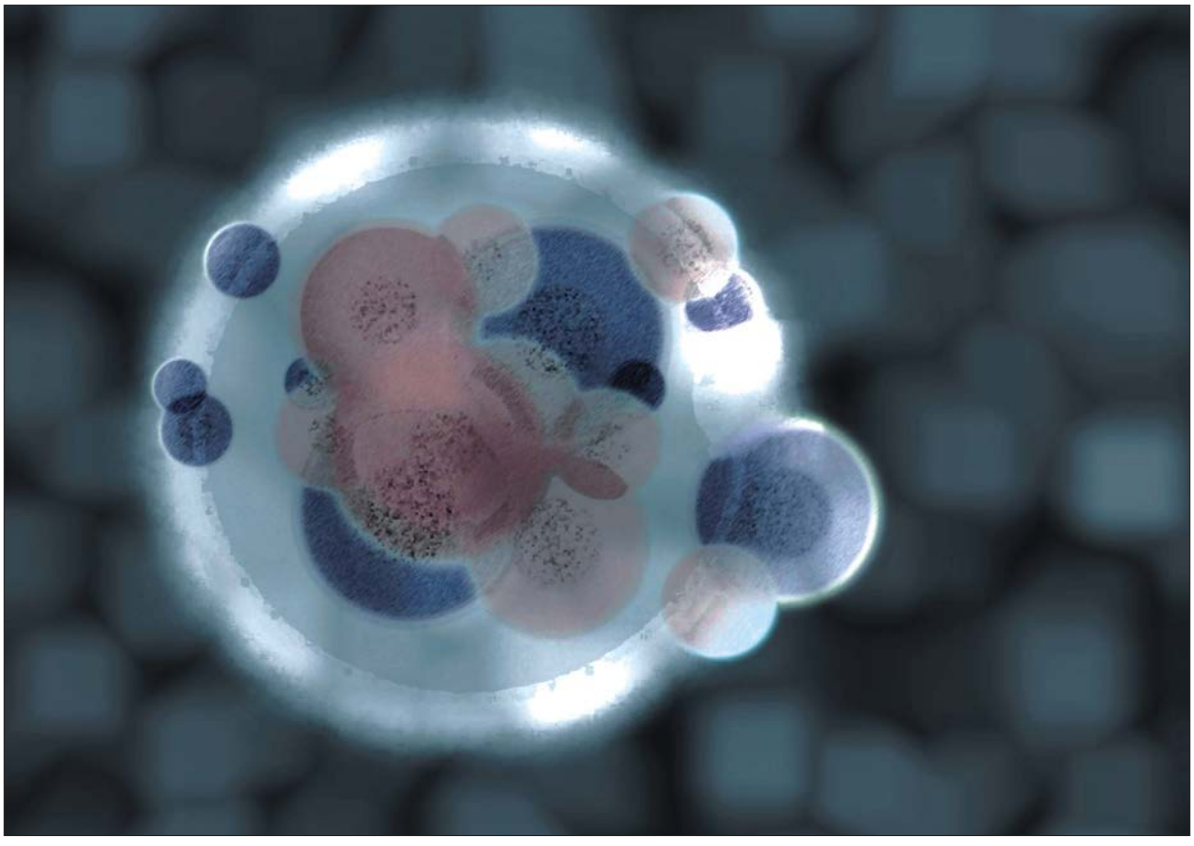

Journal of Biological Sciences

ISSN 1727-3048

science alert

ANSInet
an open access publisher
http://ansinet.com

Journal of Biological Sciences 7 (8): 1545-1547, 2007
ISSN 1727-3048

Relative Performance of Insecticides and Multineem Schedules for Management of Pod Borer, *Helicoverpa armigera* (Hubner) in Pigeon Pea

Nazrussalam, Arshad Ali, Tufail Ahmad and Haidar Ali
Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, India

Abstract: A field experiment was carried out to find out relative efficacy of spray schedules of six insecticides and Multineem along with Multineem alone against *Helicoverpa armigera* (Hubner) in pigeon pea. The minimum pod damage (13.67 and 9.33%) was recorded in spray schedule of Multineem followed by Endosulfan with highest grain yield (17.36 and 19.19 q ha^{-1}) and the maximum (26.00 and 25.33%) in spray of Multineem alone with lowest grain yield (13.59 and 13.67 q ha^{-1}) as compare to control, pod damage (28.67 and 37.00%) and yield (10.27 and 10.00 q ha^{-1}) in two successive years 2004 and 2005, respectively. Among all spray schedules, the foliar spray of Multineem (0.5%) at 50% flowering stage followed by Endosulfan (0.07%) after 15 days of first spray given relatively excellent performance for the management of pod borer in pigeon pea.

Key words: Endosulfan, monocrotophos, chlorpyriphos, methyl demeton, multineem, *Cajanus cajan*, *Helicoverpa armigera*

INTRODUCTION

Pigeon pea, *Cajanus cajan* (L.) Millsp. is an important pulse crop in India. The productivity of this crop is much low (558 kg ha^{-1}) due to high incidence of insect pest, particularly *Helicoverpa armigera* causing damage 20-57% pod in both early and late varieties, ensuring the losses in seed yield up to 28% (Sahoo and Senapati, 2000). Damage potential of this pest is so great that an average infestation of one larva per plant may cause a yield loss of 10-15 kg ha^{-1} (Chandurkar *et al*., 2005). Though chemical insecticides are generally preferred for its control due to their easy availability and applicability but excessive and indiscriminate use has resulted in the development of environmental pollution and hazardous effects to human and beneficial organisms. In recent years, this pest has caused serious threat to agriculture due to development of resistance towards commonly used insecticides viz., Cypermethrin, Carbaryl, Quinalphos etc (Undirwade and Nimbalkar, 2005) and 300 times towards synthetic pyrethroids (Chandurkar *et al*., 2005). Keeping the view in mind, present investigation was therefore, aimed to find out the relative performance of insecticides and Multineem schedules for management of *Helicoverpa armigera* (Hubner) in pigeon pea.

MATERIALS AND METHODS

The field experiment was carried out at Zonal Research Station, Darisai under Birsa Agricultural University, Kanke, Ranchi, during Kharif season of year 2004 and 2005. Healthy seeds of pigeon pea (Birsa Arhar-1) were sown in first week of July, in a gross plot size of 6×4.2 m^2 and each plot was replicated thrice in Randomized Block Design (RBD). The spacing in row-to-row and plant-to-plant was maintained 60 and 30 cm, respectively. To ensure pod damage, observations were taken on five randomly selected plants in each replica till harvesting the crop and percent pod damage calculated by using following formula:

$$\text{Pod damage (\%)} = \frac{\text{No. of damaged pods}}{\text{Total No. of pods examined}} \times 100$$

Six spray schedules viz., Endosulfan followed by Monocrotophos, Monocrotophos followed by Chlorpyriphos, Chlorpyriphos followed by Methyl demeton, Multineem followed by Monocrotophos, Multineem followed by Endosulfan, Multineem followed by Chlorpyriphos and Multineem alone were examined against pod borer and a control simultaneously run to ensure the relative effectiveness of these schedules. First spray was done at 50% flowering stage and second spray was followed after 15 days of first spray and the amount of insecticides used were Endosulfan at the rate of 1.2 Lt ha^{-1}, Monocrotophos at the rate of 0.67 Lt ha^{-1}, Chlorpyriphos at the rate of 1.5 Lt ha^{-1}, Methyl demeton at the rate of 0.72 Lt ha^{-1} and Multineem at the rate of 3.0 Lt ha^{-1}, respectively. The effectiveness of above treatments were assessed on the basis of produced yield

Corresponding Author: Arshad Ali, Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, India Tel: +919897095205 Fax: +91571-2703516

and the data were subjected to analysis of variance (ANOVA) for the significance of study at 0.05 level and the mean values were compared in accordance to Duncan's Multiple Range Test (DMRT). To get the economics of different schedules against pod borer yield of pigeon pea were calculated after harvesting the crop and Cost Benefit Ratio (CBR) also computed in accordance to market price of the pigeon pea.

RESULTS AND DISCUSSION

Among the various insecticidal schedules, the highest pod damage (26.00 and 25.33%) was recorded on spray of Multineem alone and the minimum (13.67 and 9.33%) on spray schedule of Multineem followed by Endosulfan at two successive years 2004 and 2005, respectively and the control was inferior (28.67 and 37.00%) pod damage in both the years (2004 and 2005, respectively). Whereas, the value of pod damage obtained by schedule of Multineem followed by Monocrotophos (15.33 and 14.33%) showed the second lowest after Multineem followed by Endosulfan in year 2004 and 2005, respectively. While, calculated grain yield of pigeonpea with respect to control, it was documented highest (17.36 and 19.19 q ha^{-1}) on treatment schedule of Multineem followed by Endosulfan and the lowest on Multineem alone (13.59 and 13.67 q ha^{-1}) in 2004 and 2005, respectively (Table 1).

It was evident from Table 2 that the spray schedule of Multineem followed by Endosulfan, however, gave the highest benefit of cost Rs. 11648.00 ha and the schedule of Endosulfan followed Monocrotophos gave the highest cost benefit ratio of 9.84:1. Whereas, among the various insecticidal schedule, Multineem alone was inferior in terms of both cost and cost benefit ratio. Although, Multineem with the combination of chemical insecticide were effective schedule to manage the pod borer, *Helicoverpa armigera* but the cost benefit ratio was low due to its high price.

The overall study revealed that among all schedules of insecticides and Multineem, the schedule of Mutineem (0.5%) followed by Endosulfan (0.07%) was significantly superior ($p \leq 0.05$) and the schedule of Multineem (0.5%) followed by Monochrotophos (0.04%) also provide significant value after this in both the years 2004 and 2005, in terms of low pod damage and high yield. The

Table 1: Percentage pod damage and grain yield reduction in pigeon pea by pod borer, *H. armigera* with respect to insecticidal schedules

		2004		2005	
Insecticidal schedules	Doses (%)	Pod damage (%)	Grain yield (q ha^{-1})	Pod damage (%)	Grain yield (q ha^{-1})
Endosulfan followed by monocrotophos	0.07 and 0.04	16.00b	15.91c	15.33b	15.83c
Monocrotophos followed by chlorpyriphos	0.04 and 0.05	18.33c	14.52b	17.00c	15.42c
Chlorpyriphos followed by methyl demeton	0.05 and 0.03	21.33d	13.89b	22.33d	15.28c
Multineem followed by monocrotophos	0.5 and 0.04	15.33b	16.38c	14.33b	17.55d
Multineem followed by endosulfan	0.5 and 0.07	13.67a	17.36d	09.33a	19.19e
Multineem followed by chlorpyriphos	0.5 and 0.05	23.67e	13.69b	24.33e	14.16b
Multineem	0.5	26.00f	13.59b	25.33e	13.67b
Control	--	28.67g	10.27a	37.00f	10.00a
CD ($p \leq 0.05$)	--	1.05	0.95	1.41	0.74

Different alphabet denoted significance and same alphabet showed non-significance between the treatments as per suggestion of Duncan's multiple range test

Table 2: Economics of schedules of insecticides and Multineem for managing *H. armigera* on pigeon pea

Insecticidal schedules	Doses (%)	Grain yield (q ha^{-1})	Increased yield over control (q ha^{-1})	Increased return (Rs ha^{-1})	Cost of treatment (Rs ha^{-1})	Benefit for treatment (Rs ha^{-1})	Benefit cost ratio
Endosulfan followed by monocrotophos	0.07 and 0.04	15.87	5.73	9168.00	846.00	8322.00	9.84:1
Monocrotophos followed by chlorpyriphos	0.04 and 0.05	14.97	4.83	7728.00	970.00	6758.00	6.97:1
Chlorpyriphos followed by methyl demeton	0.05 and 0.03	14.59	4.45	7120.00	1110.00	6010.00	5.41:1
Multineem followed by monocrotophos	0.5 and 0.04	16.97	6.83	10928.00	1270.00	9658.00	7.60:1
Multineem followed by endosulfan	0.5 and 0.07	18.28	8.14	13024.00	1376.00	11648.00	8.47:1
Multineem followed by chlorpyriphos	0.5 and 0.05	13.93	3.79	6064.00	1500.00	4564.00	3.04:1
Multineem	0.5	13.63	3.49	5584.00	1800.00	3784.00	2.10:1
Control	--	10.14	--	--	--	--	--

q = Quintal, h = Hectare, Rs = Rupees;
Cost of pigeon pea Rs = 1600.00/q
No. of labour required/spray = two
Total labour charges (4) + Rent of spray + Misc. = 300.00
Water required/ha/spray = 600 lit/ha

Cost of insecticides/pesticides used in experiment (Rs):
Endosulfan = 136.00/500 mL
Monocrotophos = 82.00/250 mL
Chlorpyriphos = 30.00/100 mL
Methyl demeton = 53.00/100 mL
Multineem = 30.00/100 mL

possible threat behind this is the spray of neem based insecticides were relatively safe than the insecticides during the flowering stage because insecticides could be ensure hazardous effect on the plant at flowering (pod forming) stage and after completion of pod formation application of insecticides gave the best result (Yadava and Chaudhary, 1993).

In view of environmental safety, the use of bio-pesticides providing effective, eco-friendly and economic management of the pod borer under field condition, on the other hand chemical pesticides exhibited ill effect in plants and human (Rao and Reddy, 2003; Mandal *et al*., 2003). Recently study made by Sahayaraj and Amalraj (2005) was complete corroboration with the present findings, who reported that the use of combination neem oil and Monocrotophos were significantly superior for managing defoliator population in groundnut. Similar findings also made by Balikai (2005), who reported that the use of combination of Cypermethrin at 50% flowering followed by Acephate after 15 days were gave the best result against *H. agmigera* in chickpea and combination, whereas, Singh *et al*. (2000) suggested the use of bio-pesticide also provide significant control in IPM of chickpea. However, Rawale *et al*. (2002) advocated that the use of neem oil also gave satisfactory result against cotton bollworm in cotton field.

From present investigations, it is concluded that the application of neem based insecticides (Multineem) at 50% flowering stage followed by Endosulfan after 15 days is the best schedule of combination in terms of yield and cost benefit but the CBR (cost benefit ratio) was superior on Endosulfan followed by Monocrotophos in the management of *Helicoverpa armigera* in pigeon pea field.

ACKNOWLEDGMENTS

The authors are grateful to Dr. Toppo, Associate Director Research, Zonal Research Station, Darisai and Dr. Prasad, Chairman, Entomology, BAU, Kenke, Ranchi for providing all the necessary facilities for the experiment.

REFERENCES

Balikai, R.A., 2005. Efficacy of newer insecticidal formulations against chickpea pod borer, *Helicoverpa armigera* (Hubner). Legume Res., 28: 22-25.

Chandurkar, P.S., J.N. Thakur and R.M. Shukla, 2005. Indian scenario of plant protection with special reference to *Helicoverpa armigera*: Past, present and future. Recent advances in *Helicoverpa* management. Indian Soc. Puls. Res. Dev., pp: 1-10.

Mandal, S.M.A., B.K. Mishra and P.R. Mishra, 2003. Efficacy and economics of some bio-pesticides in managing *Helicoverpa armigera* (Hubner) on chickpea. Ann. Plant Prot. Sci., 11: 201-203.

Rao, M.S. and K.D. Reddy, 2003. IPM of pod borers in long duration pigeonpea. Ann. Plant Prot. Sci., 11: 26-30.

Rawale, B.N., P.P. Kausale, A.T. Munde, P.B. Kedar, M.M. Sonkamble and D.B. Waghmode, 2002. Efficacy of insecticides and neem seed extract against cotton bollworms on NHH-44. J. Soils Crops, 12: 75-77.

Sahayaraj, K. and A. Amalraj, 2005. Impact of monochrotophos and neem oil mixture on defoliator management in groundnut. J. Food Agric. Environ., 3: 313-315.

Sahoo, B.K. and B. Senapati, 2000. Efficacy and economics of synthetic insecticides and plant products for the control of pod borer incidence in pigeonpea. Indian J. Entomol., 62: 346-352.

Singh, V., R.K. Mathur, R.K. Kalya, A. Hussain and G.K. Sharma, 2000. Evaluation of some IPM modules against *Helicoverpa armigera* on chickpea. Indian J. Entomol., 62: 24-27.

Undirwade, D.B. and S.A. Nimbalkar, 2005. Effect of host plants on development of insecticide resistance in *Helicoverpa armigera* (Hubner). J. Soils Crops, 15: 115-117.

Yadava, L.S. and J.P. Chaudhary, 1993. Evaluation of insecticidal spray schedule for the control of *Heliothis armigera* Hubner on pigeon pea. Indian J. Entomol., 55: 380-384.