Indian Journal of Entomology 84(2): 332-334 (2022) DoI No.: 10.55446/IJE.2021.59

EVALUATION OF BIORATIONAL INSECTICIDES AGAINST PIGEONPEA POD BORER

Visvash Vaibhav*, Gaje Singh and D V Singh

Department of Entomology, College of Agriculture,
Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India
*Email: visvashvaibhav@live.in (corresponding author)

ABSTRACT

A field study was carried out to evaluate the efficacy of biorational insecticides against pigeonpea pod borer *Maruca vitrata* (F.) at the Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh during kharif, 2016 and 2017. From the cumulative mean data, it was found that among the ten biorationals evaluated, spinosad 45SC @ 0.4 ml/ l led to the maximum % larval incidence reduction (90.32 and 93.61% during 2016 and 2017, respectively) and also led to maximum reduction in % pod infestation (65.31 and 65.29%) with maximum % increase in yield (77.63 and 77.37%). This treatment also gave a C:B ratio of 1:3.36 and 1:3.74. Comparably, the next best was emamectin benzoate 5SG @ 0.3 g/ l, with 86.93 and 90.89% reduction in larval incidence and 62.52 and 62.63% reduction in pod infestation, with 76.38 and 75.49% increase in yield with a C:B ratio of 1:9.80 and 1:10.34.

Key words: Pigeonpea, *Maruca vitrata*, pod borer, insecticides, efficacy, spinosad, emamectin benzoate, larval incidence, pod infestation, yield, C: B Ratio

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is an important legume crop cultivated extensively in semiarid, tropical and subtropical areas of the world. Many abiotic and biotic factors are responsible for its low productivity, and of the biotic factors, insect pests result in low yield and heavy loss. Amongst the insect pests, pod borer *Maruca vitrata* and *Helicoverpa armigera* are the key insect pests causing 80-90% of yield loss. Conventional pest management includes insecticide treatments that could lead to undesirable side effects, on non-target organisms, pesticide resistant and residue concerns (Draganova and Simova, 2010), outbreak of secondary pests (David et al., 1991), pest resurgence (Mitra et al., 1999), dermal toxicity to the labour exposed in the field (Kuttalam and Regupathy, 1995), environmental pollution through accumulation of pesticides in soil, water and air (Buttu et al., 1999). During the past three decades, there is great demand for safer and more selective insecticides that spare non-target organisms. Many conventional pesticides have been replaced by newer biorational or "low risk" insecticides. According to Hara (2000), biorational or "reduced risk" insecticides are synthetic or natural compounds that effectively control insect pests, but have low toxicity to non-target organisms (such as humans, animals and natural enemies) and the environment. This study evaluates some of these against *M. vitrata* in pirgeonpea.

MATERIALS AND METHODS

The present study was conducted at the Crop Research Center (CRC), Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh (29°08'29.8"N, 77°40'52.9"E) during kharif, 2016 and 2017. The experiment was conducted in a randomized block design with ten treatments and three replications and the plot size was 5.0x 5.0 m. The sowing of variety UPS-120 was done during June 2016 and 2017. The row to row distance 60 cm and plant to plant distance 30 cm was maintained. Ten treatments viz, diflubenzuron 25WP @ 0.6g/ l, novaluron 10EC @ 1.3 ml/ l, spinosad 45SC @ 0.4 ml/ l, emamectin benzoate 5SG @ 0.3 g/ l, NSKE 5%, neem oil 1500 ppm @ 2.5 ml/ l, achook 0.03% @ 5 ml/ l, *Bacillus thuringiensis* (Bt) *kurstaki* @ 2.5 g/ l, quinalphos 25EC @ 2.5ml/ l was used as standard check, along with untreated check. The field trials were conducted in randomised block design (RBD) with three replications. All the treatments were allocated randomly to plots in each of the three blocks in kharif, 2016 and 2017 season. The insecticides were applied as foliar spray using knapsack sprayer, with two sprays commencing first spray at pod initiation stage and second at 20 days after first spray. Pretreatment count of larvae/ plant and % pod infestation were recorded before imposing the treatments. The post treatment

Table 1. Efficacy of biorational insecticides against *M. vitrata* in pigeon pea

Treatments	2016						2017						2016			2017		
	(Mean incidence/ 10 plants)			(Mean pods infestation (%))			(Mean incidence/ 10 plants)			(Mean pods infestation (%))								
	Pre-count	Mean	% Reduction over control	Pre-count	Mean	% Reduction over control	Pre-count	Mean	% Reduction over control	Pre-count	Mean	% Reduction over control	Yield (q/ ha)	% increase over untreated check	C:B ratio	Yield (q/ ha)	% increase over untreated check	C:B ratio
Diflubenzuron 25WP @ 0.6 g/ l	13.33	7.08 (2.66)^{e}	64.15	10.22	13.77 (21.78)^{e}	42.60	10.67	5.50 (2.35)^{e}	69.99	8.66	13.05 (21.18)^{e}	42.96	9.80 (0.99)^{e}	65.30	1:4.17	10.30 (1.01)^{e}	64.07	1:4.40
Novaluron 10EC @ 1.3 ml/ l	12.67	4.33 (2.08)^{c}	78.07	9.77	11.05 (19.42)^{c}	53.93	10.00	3.33 (1.82)^{c}	81.83	8.22	10.49 (18.90)^{c}	54.15	11.90 (1.08)^{c}	71.42	1:2.89	12.70 (1.10)^{c}	70.86	1:3.17
Spinosad 45SC@ 0.4 ml/ l	12.33	1.91 (1.38)^{a}	90.32	8.00	8.32 (16.76)^{a}	65.31	10.00	1.17 (1.08)^{a}	93.61	7.11	7.94 (16.37)^{a}	65.29	15.20 (1.18)^{a}	77.63	1:3.36	16.35 (1.21)^{a}	77.37	1:3.74
Emamectin benzoate 5SG @ 0.3 g/ l	11.00	2.58 (1.61)^{b}	86.93	8.22	8.99 (17.45)^{b}	62.52	10.33	1.66 (1.29)^{b}	90.89	7.77	8.55 (17.00)^{b}	62.63	14.40 (1.16)^{b}	76.38	1:9.80	15.10 (1.18)^{b}	75.49	1:10.34
NSKE 5%	13.33	10.58 (3.25)^{h}	46.43	8.66	17.16 (24.47)^{g}	28.47	9.67	8.25 (2.87)^{h}	54.99	8.67	16.60 (24.04)^{g}	27.44	6.92 (0.84)^{h}	50.86	1:5.77	7.10 (0.85)^{h}	47.88	1:5.63
Neem oil (1500 ppm) @ 2.5 ml/ l	13.67	9.16 (3.03)^{f}	53.62	11.11	16.16 (23.70)^{f}	32.63	11.00	7.16 (2.68)^{f}	60.88	8.44	15.33 (23.05)^{f}	32.99	8.00 (0.90)^{f}	57.5	1:5.14	8.50 (0.93)^{f}	56.47	1:5.50
Achook (0.03% aza) @ 5 ml/ l	12.67	9.58 (3.10)^{g}	51.49	9.55	16.66 (24.09)^{fg}	30.55	9.00	7.67 (2.77)^{g}	58.15	7.55	15.83 (23.45)^{f}	30.81	7.45 (0.87)^{g}	54.36	1:2.09	7.85 (0.89)^{g}	52.86	1:2.21
Bacillus thuringiensis (*B.t.*) *kurstaki* @ 2.5 g/ l	12.33	13.08 (3.62)^{i}	33.77	11.11	19.44 (26.16)^{h}	18.96	10.67	10.58 (3.25)^{i}	42.22	9.11	18.49 (25.47)^{h}	19.18	6.10 (0.79)^{i}	44.26	1:2.15	6.50 (0.81)^{i}	43.07	1:2.30
Quinalphos 25EC (Check) @ 2.5 ml/ l	12.00	5.00 (2.24)^{d}	74.68	8.88	11.66 (19.97)^{d}	51.39	11.33	3.83 (1.96)^{d}	79.11	9.11	11.10 (19.46)^{d}	51.48	11.10 (1.05)^{d}	69.36	1:8.50	11.90 (1.08)^{d}	68.90	1:9.25
Control (Untreated)	12.67	19.75 (4.44)^{j}	-	11.33	23.99 (29.33)^{i}	-	11.67	18.33 (4.28)^{j}	-	9.78	22.88 (28.58)^{i}	-	3.40 (0.53)^{j}	-	-	3.70 (0.57)^{j}	-	-
SEd±	NS*	0.0279	-	NS*	0.2369	-	NS*	0.0263	-	NS*	0.2086	-	0.0105			0.0083		
CD at 5%		0.0585			0.4978			0.0552			0.4383		0.0222			0.0174		
CV%		1.25			1.30			1.32			1.17		1.38			1.05		

counts were recorded on 3rd and 9th days after each spray. The data collected was statistically analyzed as suggested by Gomez and Gomez (1984) using AGRES software and the yield and cost: nenefit economics was also calculated.

RESULTS AND DISCUSSION

The cumulative mean data revealed that spinosad 45SC @ 0.4 ml/ l led to the maximum % larval incidence reduction of *M. vitrata* (90.32 and 93.61%) and also maximum reduction in % pod infestation (65.31 and 65.29%) with maximum increase in yield (77.63 and 77.37%) and with C:B ratio of 1:3.36 and 1:3.74 (Table 1). Comparably, the next best was emamectin benzoate 5SG @ 0.3 g/ l, with 86.93 and 90.89% reduction in larval incidence, and also recorded 62.52 and 62.63% reduction in pod infestation with 76.38 and 75.49% increase in yield; and with C:B ratio of 1:9.80 and 1:10.34 during 2016 and 2017, respectively. The results obtained from the present study is in conformity with the findings of Bairwa and Singh (2015), Singh and Singh (2017) and Kumar and Pavviya (2018), who reported that the spinosad followed by emamectin benzoate was most effective in reducing the larvae of *M. vitrata*. These findings also corroborate with those of Randhawa and Saini (2015) on spinosad 45SC. The present finding also supported by Sreekanth and Seshamahalakshmi (2012), Singh et al. (2008), Khorasiya et al. (2014) on spinosad, emamectin benzoate, novaluron, quinalphos, and diflubenzuron as highly effective with more grain yield and C: B ratio. The superiority of spinosad 45SC and emamectin benzoate 5SG is due to their novel mode of action. Emamectin benzoate (avermectins) binds to multiple sites of chloride channels including gamma amino butyric acid and glutamate in insects. Emamectin benzoate is also found to be less toxic to most of the beneficial arthropods insects like honey bees, parasitoids, predators (Lasota and Dybas, 1991).

ACKNOWLEDGEMENTS

The authors thank Head of the Department, Department of Entomology, Sardar Vallahbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, India for support and encouragement.

REFERENCES

Buttu R S, Joia B S, Singh B, Kang B K, Chanel K K. 1999. Residues of -cyfluthrin in cotton seed and cotton lint. Pesticide Research Journal 11: 222-224.

David P M M, Hanifa A M, Natarajan S. 1991. Evaluation of some insecticides and neem oil against jasmine blossom midge, *Contarinia* sp. Madras Agricultural Journal 78: 82-84.

Draganova S A, Simova S A. 2010. Susceptibility of *Tetranychus urticae* Koch. (Acari: Tetranychidae) to isolates of entomopathogenic fungus *Beauveria bassiana*. Journal of Pesticides and Phytomedicine (Belgrade) 25(1): 51-57.

Gomez K A, Gomez A A. 1984. Statistical procedures for agricultural research. John Wiley and sons, New York. 207-215 pp.

Hara A H. 2000. Finding alternative ways to control alien pests- Part 2: New insecticides introduced to fight old pests. Hawaii Landscape 4(1): 5.

Khorasiya S G, Vyas H J, Jetha D M, Joshi P H. 2014. Field efficacy of *Helicoverpa armigera* (Hübner) hardwick on pigeonpea. International Journal of Plant Protection 7(2): 325-329.

Kumar A S, Pavviya A. 2018. Field evaluation of spinetoram 12 SC against *Maruca vitrata* on pigeonpea. Legume Research-An International Journal 41(3): 447-453.

Lasota J A, Dybas R A. 1991. Avermectins, a novel class of compounds: implications for use in arthropod pest control. Annual Review of Entomology 36: 91-117.

Mitra N G, Upadhya A, Sachidanad B, Agarwal G D. 1999. Contamination of pesticides in samples of milk and milk products. Pestology, 28: 36-40.

Singh N K, Thakur A, Srivastava O P. 2008. Evaluation of certain newer insecticides against insect pest complex on pigeonpea (*Cajanus cajan* (L.) Millsp.). Journal of Applied Zoological Researches 19(1): 46-49.

Singh S K, Singh P S. 2017. Bioefficacy of Certain Insecticides and Biopesticides against Spotted Pod Borer, *Maruca vitrata* Infesting Greengram. International Journal of Agriculture, Environment and Biotechnology 10(6): 785-792.

Sreekanth M, Seshamahalakshmi M. 2012. Studies on relative toxicity of biopesticides to *Helicoverpa armigera* (Hubner) and *Maruca vitrata* (Geyer) on pigeonpea (*Cajanus cajan* L.) Journal of Biopesticides 5(2): 191-195.

(Manuscript Received: January, 2021; Revised: August, 2021;
Accepted: September, 2021; Online Published: October, 2021)
Online published (Preview) in www.entosocindia.org Ref. No. e21030