The Pharma Innovation Journal 2022; SP-11(5): 764-767

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(5): 764-767

www.thepharmajournal.com
Received: 28-03-2022
Accepted: 30-04-2022

Vijay Kumar
Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Hemant Swami
Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Lekha
Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Beerendra Singh
Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Corresponding Author
Vijay Kumar
Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Bio-efficacy of bio-rational insecticides against sucking pests on black gram

Vijay Kumar, Hemant Swami, Lekha and Beerendra Singh

Abstract
An experiment on the bio-efficacy of bio-rational insecticides against insect pests infesting black gram was conducted at Agronomy farm, Rajasthan College of Agriculture, Udaipur during *Kharif*, 2018. The experiment was laid out in a randomized block design with three replications in uniformly sized plots measuring 5x4.5 m with three replications. The Variety PU-31 of black gram was sown during last week of June with row to row and plant to plant spacing of 45x15 cm^2, respectively. Among different treatments, spinosad 45 SC @ 50 g a.i/ha caused maximum reduction in the population of aphid, jassid, thrips and whitefly. Next effective treatments were emamectin benzoate 5 SG @ 12g a.i./ha and indoxacarb 14.5 SC a.i./ha.

Keywords: Bio-rational insecticides, sucking pests, black gram

Introduction
Pulses occupy a unique position in the agriculture economy of our nation, being the major source of plant proteins. The major pulses crop under cultivation includes black gram, chickpea, cowpea, green gram, pigeon pea, lentil, moth bean, and pea. Black gram (*Vigna mungo* L.) Is the fourth most important short-duration pulse crop grown in India due to its nutritional and industrial values? Seeds of a black gram are very rich in protein (24 per cent) and phosphoric acid (385 mg 100 g-1) among pulses. Black gram is used in different food items all over the world. Its green fodder is very nutritive and specially fed to milch cattle (Jeswani and Baldev, 1990) [4]. In India, the total area under pulses cultivation is 25.23 million hectares with a production of 22.14 million tonnes and productivity of 764 kg per hectare (Anonymous, 2017) [2]. The black gram is one of the important pulse crops grown throughout the country. The area under black gram cultivation in our country is 44.93 lakh hectares with a production of 29.26 lakh tonnes and productivity of 651 kg/ ha during 2016-2017 (Anonymous, 2017) [2]. In Rajasthan, black gram is cultivated over 2.61 lakh hectares with a production of 1.35 lakh tonnes and productivity of 576 kg/ha (Anonymous, 2017) [2]. The major districts of Rajasthan producing black gram are Bhilwara, Chittorgarh, Udaipur, Rajsamand, Banswara, Dungarpur, Bundi, Baran and Tonk.
Several insecticide recommendations have been made from time to time for the management of these pests in black gram, but the indiscriminate use of these toxic pesticides have created problems of resistance, resurgence and are also hazardous for environment, human and animal health (Rao *et al.* 1999) [7]. To reduce the ill effects of these hazardous chemicals, efforts have been made by many researchers to find out alternative approaches for the management of these pests in black gram. There are many insecticides of biological origin that are not only effective in managing the pest population but also safer to human beings, animal and environment health. Among bio-rational insecticides, several compounds have been proved to be very effective in reducing the pest infestations and losses caused by them in various crop ecosystems. Neem based products (neem oil, NSKE) have been reported to be effective in managing the population of whiteflies, jassids, aphids, and thrips in mungbean (Hussaian *et al.*, 2001) [3]. Some biorational insecticides originated from microbes viz., Emamectin benzoate, Spinosad, and insect growth regulator Novaluron are also reported to be effective against lepidopteran and coleopteran insect pests in pulse crops (Shinde, 2016) [8].

Materials and Methods
The experiment was laid out in a randomized block design with three replications in uniformly sized plots measuring 5x4.5 m with three replications.

The Variety PU-31 of black gram was sown during last week of June with row to row and plant to plant spacing of 45x15 cm^2, respectively. The seven treatments comprising of different bio-rational insecticides were applied in each replication when the pest population reaches economic threshold level (ETL). The observations on the population of jassids, aphids and whitefly were recorded from five randomly selected and tagged plants in each replication. The observations of insect pests were recorded before spraying and 3, 7 and 10 days after each spray. The population data thus recorded was converted into per cent reduction.

$$\text{Percent reduction in population} = 100 \left[1 - \frac{T_a \text{ X } C_b}{T_b \text{X } C_a} \right]$$

Where,
T_a= Number of insects after treatment in treated plot
T_b = Number of insects before treatment in treated plot
C_a=Number of insects in untreated check after treatment
C_b= Number of insects in untreated check before treatment

Result and Discussion
The field experiment to evaluate the relative bio-efficacy of different biorational insecticide *viz;* emamectin benzoate 5 SG @ 12 g a.i./ha, spinosad 45 SC@ 50 g a.i/ha, indoxacarb 14.5 SC a.i./ha, novaluron 10EC @ 75 g a.i./ha, NSKE 5% and neem oil 2% against sucking insect pests was conducted during *Kharif* 2018 to find out the most effective treatment against insect pest infesting the black gram.

Aphid *Aphis craccivora* (Koch)
The result of the experiment on bioefficacy against insect pest infesting blackgram and reveals that among different treatments tested, Spinosad 45 SC @ 50 g a.i/ha recorded maximum reduction mean per cent population at first and second spray, respectively which was significantly superior over other treatments in reducing aphid populations during *Kharif* 2018 and was followed by spray of emamectin benzoate 5 SG @ 12 g a.i./ha recorded reduction mean per cent population at first and second spray, respectively. Emamectin benzoate 5 SG was found at par with Indoxacarb 14.5 SC a.i./ha with reduction mean per cent population at first and second spray, respectively. Spray of neem oil 2%, NSKE 5% was found least effective among all the treatments with reduction mean per cent population at first and second spray, respectively. The present findings are in conformity with Parmar, *et al*. (2015) [6] that they found spinosad and emamectin benzoate were highly effective in suppressing the aphids population on black gram.

Jassid Amrasca Kerri (Pruthi)
The bioefficacy against insect pest infesting blackgram and reveals that among different treatments tested, Spinosad 45 SC @ 50 g a.i/ha recorded maximum reduction mean per cent population at first and second spray, respectively which was significantly superior over other treatments in reducing jassid populations during *Kharif* 2018 and was followed by spray of Indoxacarb 14.5 SC @ 75 g a.i./ha recorded reduction mean per cent population at first and second spray, respectively. Indoxacarb 14.5 SC was found at par with emamectin benzoate 5 SG @ 12 g a.i./ha with reduction mean per cent population at first and second spray, respectively. Parmar, *et al*. (2015) [6] tested eleven different insecticidal treatments against *Empoasca kerri* in black gram and found that emamectin benzoate 5 SG and Novaluron were effective treatments for the control of jassid.

Whitefly, *Bemisia tabaci* (Genn.)
The result of the experiment on bioefficacy against insect pest infesting blackgram and reveals that among different treatments tested, Spinosad 45 SC @ 50 g a.i/ha recorded maximum reduction mean per cent population at first and second spray, respectively which was significantly superior over other treatments in reducing whitefly populations during *Kharif* 2018 and was followed by spray of indoxacarb 14.5 SC @ 75 g a.i./ha recorded reduction mean per cent population at first and second spray, respectively. Indoxacarb 14.5 SC was found at par with emamectin benzoate 5 SG @ 12 g a.i./ha with reduction mean per cent population at first and second spray, respectively. The present investigation supports from the findings of Parmar, *et al*. (2015) [6] who determined the efficacy of new insecticides against whitefly (*B. tabaci*) in mung bean cultivar and found that treatments *viz.*, spinosad (0.93 whitefly/leaf), novaluron (1.02 whitefly/leaf), and emamectin benzoate (1.18 whitefly/leaf) were least effective in reducing whitefly population after seven days of spray schedule. However, in the present studies observed that these chemicals were significantly found superior in controlling whitefly population. The variations between their and findings and the in the present investigation could be related to other factors such as pesticides concentrations, dose and frequency of application and other environmental factors.

Thrips, *Caliothrips indicus* (Bagnall)
The result of the experiment on bioefficacy against insect pest infesting blackgram and reveals that among different treatments tested, Spinosad 45 SC @ 50 g a.i/ha recorded maximum reduction mean per cent population at first and second spray, respectively which was significantly superior over other treatments in reducing thrips populations during *Kharif* 2018 and was followed by spray of Indoxacarb 14.5 SC @ 75 g a.i./ha recorded reduction mean per cent population at first and second spray, respectively. Indoxacarb 14.5 SC was found at par with emamectin benzoate 5 SG @ 12 g a.i./ha with reduction mean per cent population at first and second spray, respectively. The present observation corroborates with findings of Mishra *et al.* (2015) [5] evaluated the efficacy of spinosad 45 SC against thrips in green gram (*Vigna radiata* L.) cultivar and revealed that foliar spray of spinosad 45 SC @ 0.07 kg a.i. /ha was found effective and recorded low population of thrips. Similarly, Altaf (2015) [1] found that thrips population in green bean (*Vigna radiata* L.) was managed with emamectin benzoate.

Table 1: Bio-efficacy of bio-rational insecticides against aphid on black gram during *Kharif*, 2018

Sl. No.	Treatment	Dose (a.i./ha)	Reduction (%) in aphid population day after sprays						
			I Spray				II Spray		
			PTP	3DAS	7DAS	10DAS	3 DAS	7 DAS	10 DAS
1	NSKE 5%	5%	22.00 (4.72)	37.19 (36.54)	43.68 (47.70)	40.99 (43.02)	39.06 (39.71)	45.70 (51.23)	40.38 (41.97)
2	Neem oil 2%	2%	23.67 (4.91)	39.46 (40.40)	48.36 (55.86)	44.54 (49.20)	40.83 (42.74)	56.79 (60.04)	47.25 (53.92)
3	Indoxacarb 14.5SC	75g	24.67 (4.97)	49.42 (57.69)	55.10 (67.27)	46.61 (52.80)	51.33 (60.97)	58.99 (73.46)	51.92 (61.55)
4	Spinosad 45SC	50g	23.33 (4.87)	51.60 (61.41)	57.67 (71.40)	53.33 (64.33)	53.77 (65.07)	59.68 (74.52)	53.48 (64.59)
5	Novaluron 10EC	75g	24.00 (4.92)	32.29 (28.53)	50.01 (58.71)	43.94 (48.15)	36.09 (34.70)	54.02 (62.13)	45.36 (50.67)
6	Emamectin benzoate 5SG	12g	24.33 (4.94)	49.62 (58.03)	55.17 (67.37)	48.11 (55.53)	52.74 (63.35)	55.37(70.89)	51.06 (60.50)
	Control		25.33 (5.04)	-	-	-	-	-	-
	S.Em.±		0.39	2.76	2.70	2.95	2.59	2.46	2.31
	C.D at 5%		1.20	8.69	8.51	9.30	8.15	7.74	7.28

* PTP- Pre-treatment population, *DAS- Days after spray, * Figures in the parenthesis are retransformed per cent values

Table 2: Bio-efficacy of bio-rational insecticides against whitefly on black gram during *Kharif*, 2018

Sl. No.	Treatment	Dose (a.i./ha)	Reduction (%) in whitefly Population day after sprays						
			I Spray				II Spray		
			PTP	3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10DAS
1	NSKE 5%	5%	21.00 (4.63)	37.33 (36.78)	43.57 (47.51)	41.30 (43.56)	39.21 (39.96)	46.91 (53.33)	42.81 (46.17)
2	Neem oil 2%	2%	24.00 (4.94)	38.04 (37.96)	45.41 (50.71)	42.82 (46.20)	41.99 (44.76)	48.80 (56.61)	45.55 (50.97)
3	Indoxacarb 14.5 SC	75 g	24.67 (4.97)	47.28 (53.98)	53.67 (64.90)	51.81 (61.77)	48.64 (56.34)	56.19 (69.03)	53.12 (63.99)
4	Spinosad 45 SC	50 g	23.33 (4.86)	51.92 (61.95)	57.89 (71.75)	49.81 (58.02)	53.12 (63.98)	60.86 (76.29)	51.60 (61.41)
5	Novaluron 10 EC	75 g	24.00 (4.92)	29.67 (24.51)	48.49 (56.08)	42.15 (45.04)	33.86 (31.04)	51.14 (60.63)	45.76 (51.32)
6	Emamectin benzoate 5 SG	12g	24.67 (4.98)	43.08 (46.65)	51.94 (61.99)	46.29 (52.26)	49.92 (58.54)	54.28 (65.92)	48.33 (55.79)
7	Control		26.00 (5.11)	-	-	-	-	-	-
	S.Em.±		0.38	2.92	2.11	2.59	2.88	2.52	2.61
	C.D at 5%		1.16	9.20	6.66	8.17	9.09	7.95	8.21

* PTP- Pre- treatment population,*DAS- Days after spray, * Figures in the parenthesis are retransformed per cent values

Table 3: Bio-efficacy of bio-rational insecticides against thrips on black gram during *Kharif*, 2018

Sl. No.	Treatment	Dose	Reduction (%) in thrips Population day after sprays						
			I Spray				II Spray		
			PTP	3 DAS	7 DAS	10 DAS	3 DAS	7 DAS	10 DAS
1	NSKE 5%	5%	7.00 (2.73)	39.67 (40.75)	45.81 (51.41)	44.84 (49.72)	41.17 (43.34)	47.50 (54.37)	44.84 (49.72)
2	Neem oil 2%	2%	6.67 (2.65)	42.83 (46.22)	48.42 (55.95)	48.48 (56.06)	44.36 (48.89)	50.92 (60.26)	48.48 (56.06)
3	Indoxacarb 14.5 SC	75g	5.33 (2.40)	51.55 (61.34)	53.55 (64.71)	52.52 (62.97)	47.69 (54.69)	56.52 (69.57)	52.52 (62.97)
4	Spinosad 45 SC	50g	6.67 (2.67)	53.91 (65.30)	61.29 (76.92)	57.24 (70.72)	48.19 (55.56)	60.27 (75.40)	51.18 (60.70)
5	Novaluron 10 EC	75g	6.33 (2.61)	36.57 (36.17)	49.40 (57.66)	42.93 (46.39)	35.22 (33.26)	55.18 (67.39)	42.93 (46.39)
6	Emamectin benzoate 5 SG	12g	4.67 (2.27)	48.38 (55.88)	53.92 (65.32)	49.35 (57.57)	46.37 (52.39)	55.31 (67.60)	49.35 (57.57)
7	Control		5.33 (2.41)						
	S.Em.±		0.16	2.34	2.79	2.66	3.00	2.77	2.66
	C.D at 5%		0.48	7.38	8.80	8.38	9.45	8.72	8.37

* PTP- Pre treatment population, *DAS- Days after spray, * Figures in the parenthesis are retransformed per cent values

Table 4: Bio-efficacy of bio-rational insecticides against jassid on black gram during *Kharif*, 2018

Sl. No.	Treatment	Dose (a.i./ha)	Reduction (%) in Jassid Population day after sprays						
			I Spray				II Spray		
			PTP	3DAS	7DAS	10DAS	3 DAS	7 DAS	10 DAS
1	NSKE 5%	5%	12.33 (3.58)	37.83 (37.62)	44.37 (48.91)	42.77 (4611)	41.01 (43.06)	45.25 (50.43)	44.79 (49.64)
2	Neem oil 2%	2%	12.00 (3.53)	40.03 (41.37)	46.49 (52.60)	43.77 (47.86)	42.96 (46.45)	49.03 (57.00)	46.77 (53.09)
3	Indoxacarb 14.5SC	75g	13.33 (3.71)	47.80 (54.88)	52.20 (62.44)	51.16 (60.67)	51.34 (60.97)	66.65 (66.67)	52.94 (63.69)
4	Spinosad 45SC	50g	12.00 (3.53)	49.18 (57.27)	57.09 (70.48)	53.30 (64.29)	52.16 (62.36)	58.47 (72.66)	55.30 (67.60)
5	Novaluron 10EC	75g	12.33 (3.57)	32.26 (28.49)	49.60 (57.99)	41.30 (43.57)	35.45 (33.64)	51.90 (61.93)	42.37 (45.42)
6	Emamectin benzoate 5SG	12g	11.33 (3.44)	44.81 (49.66)	51.22 (60.78)	46.03 (51.80)	45.95 (51.65)	53.86 (65.22)	48.15 (55.49)
7	Control		11.67 (3.48)						
	S.Em.±		0.12	2.85	2.64	2.43	2.30	2.74	2.49
	C.D at 5%		0.38	8.97	8.33	7.66	7.26	8.62	7.86

* PTP- Pre treatment population, *DAS- Days after spray, * Figures in the parenthesis are retransformed per cent values

Reference

1. Altaf Hossainmd. Efficacy of some insecticides against insect pests of mung bean (*Vigna radiata* L.). Bangladesh Journal Agricultural. Research. 2015;40:657-667.
2. Anonymous. Area, production, productivity of black gram in India. Directorate of Economics and Statistics, second advance estimates, 2017.
3. Hussaian DM, Rizvi PQ, Nagvi NA. Evaluation of neem for management of pest complex of mungbean, in: Proceedings of symposium on bio-control based pest management for quality crop production in the current millennium held at P.A.U., Ludhiana, 2001 July, 18-19,

202-203.
4. Jeswani LM, Baldev B. Advances in pulse production technology. Publication and information division. Indian Council of Agricultural Research, 1990, 190p.
5. Mishra IOP, Mukherjee SK. Field efficacy of newer molecules on sap feeders of green gram *Vigna radiate* (L.) Wilzeck. Journal of Ecofriendly Agricultural. 2015;10:155-156.
6. Parmar SG, Naik MM, Pandyazl HV, Rathod NK, Patel SD, Dave PP, *et al*. Bio-efficacy of some insecticides against pest complex of black gram [*Vigna mungo* (L.) Hepper]. International Journal of Plant Protection. 2015;8:162-168.
7. Rao MS, Raman GV, Srimannarayana G, Venkatesh B. Evaluation of some IPM packages in the management of pod borer complex of pigeonpea. Pestology. 1999;23:41-43.
8. Shinde DS. Studies on seasonal abundance, field life-tables and management of major insect pests of soybean. Ph.D. thesis submitted to College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth University, Parbhani, 2016.