The Pharma Innovation Journal 2023; 12(12): 3311-3313

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(12): 3311-3313

www.thepharmajournal.com
Received: 08-09-2023
Accepted: 11-10-2023

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Efficacy of insecticides against blue beetle, *Leptispa pygmaea* Baly infesting rice

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Abstract
An experiment was conducted at Instructional Farm, Department of Agronomy, College of Agriculture, Dapoli, Dist. Ratnagiri, during the *Kharif* 2022. The trial was set up in randomized block design with three replications using rice variety Karjat 8. The cumulative mean percent infestation of six insecticide treatments after two sprays revealed that, the treatment Spinosad 45 SC @ 0.2 ml lit^{-1} was found most effective in controlling the blue beetle infestation (2.69%). The next best treatment was Emamectin benzoate 5 SG @ 0.25 gm lit^{-1} with 3.87 percent blue beetle infestation and was at par with Flubendiamide 39.35 SC @ 0.1 ml lit^{-1} (4.01%), Indoxacarb 14.5 SC @ 0.5 ml lit^{-1} (4.89%) and Lambda cyhalothrin 5 EC @ 0.5 ml lit^{-1} (5.02%). The treatment Quinalphos 25 EC @ 4.0 ml lit^{-1} recorded 5.47 percent blue beetle infestation. The maximum infestation was noticed in the untreated control (14.30%).

Keywords: Blue beetle, rice, infestation, insecticides, efficacy

1. Introduction
Rice (*Oryza sativa* L.) belongs to the family Poaceae and sub-family Oryzoideae. It is one of the most important food crops in the world, also referred to as the "global grain". Rice is consumed by an estimated 3.5 billion people globally (Gadal *et al*. 2019) [1]. In Asia, where 92 percent of the world's rice is produced and consumed, rice represent the most prominent food crop (Wilson and Tabot, 2009) [7]. India is the largest rice producing country accounting for about one third of the world acreage under the crop. The rice plant is an ideal host for large number of insects and pathogens right from nursery to harvest (Mohapatra *et al*. 2018) [4]. The rice crop is attacked by more than 100 insect species. Out of these stem borer, brown plant hopper, gall midge, armyworm etc., are considered as major pests causing significant yield losses (Pathak and Khan, 1994) [6]. In recent days some pests of minor importance emerging as major issues in rice production. The rice blue beetle is one of these pests attained major pest status in recent years in some parts of Konkan region from Maharashtra. The adults and larvae of the blue beetle cause damage to the rice leaves by feeding and scrapping the upper surface of the leaves, which adversely affect the grain yield. The study shows that pest damaging during vegetative phase (50%) contributes more to the yield reduction than the reproductive (30%) or ripening phase (20%) (Gupta and Raghuraman, 2003) [2]. As the incidence of pests causes considerable yield loss and chemical insecticides has proven their positive effects in targeting the insect pests and controlling the damage, there is need to check the efficacy of some insecticides against blue beetle. Since the blue beetle has been so far considered as a minor pest, no much research work conducted in Maharashtra on this pest and very little information is available from elsewhere also. The blue beetle is a recent emerging problem of considerable importance for some parts of rice growers in Konkan region. Hence, the present investigation was carried out on ‘Efficacy of insecticides against blue beetle, *Leptispa pygmaea* Baly infesting rice’ with a view to test the effect of insecticides against blue beetle.

2. Material and Methods
An experiment was conducted at Instructional Farm, Department of Agronomy, College of Agriculture, Dapoli, Dist. Ratnagiri, during the *Kharif* 2022 on rice variety Karjat 8. The trial was set up in randomized block design with three replications and seven treatments *viz.*, Emamectin benzoate 5 SG @ 0.25 gm lit^{-1}, Spinosad 45 SC @ 0.2 ml lit^{-1}, Flubendiamide 39.35 SC @ 0.1 ml lit^{-1}, Lambda cyhalothrin 5 EC 0.5 ml lit^{-1}, Indoxacarb 14.5 SC 0.5 ml lit^{-1}, Quinalphos 25 EC @ 4.0 ml lit^{-1} and untreated control, respectively. The observations were

recorded on five randomly selected and marked hills in each treatment. Total two sprays were taken at 15 days interval. The observations were recorded on 1 day before, 7th and 14th days after spraying. The number of infested leaves per hill and total number of leaves per hill were counted and converted into percent infestation by using formula,

$$\text{The percent leaf infestation} = \frac{\text{Total number of infested leaves per hill}}{\text{Total number of leaves per hill}} \times 100$$

The data thus obtained was subjected to appropriate transformation and was analysed statistically.

3. Results and discussion

The data pertaining to the efficacy of different insecticides against blue beetle at pre-count, 7th and 14th days after first and second sprays are presented in the Table 1 and delineated in the Figure 1. The data recorded at fourteenth day after first spray indicated that all the treatments recorded significantly less blue beetle infestation as compared to untreated control. The infestation was ranged from 4.89 to 14.18 percent. The insecticide Spinosad 45 SC @ 0.2 ml lit^{-1} was found to be most effective treatment which recorded 4.89 percent infestation and was at par with the Emamectin benzoate 5 SG @ 0.25 gm lit^{-1} (5.91%) and Flubendiamide 39.35 SC @ 0.1 ml lit^{-1} (6.07%). The treatment indoxacarb 14.5 SC 0.5 ml lit^{-1} recorded 7.21 percent blue beetle infestation and was at par with the treatment Lambda cyhalothrin 5 EC 0.5 ml lit^{-1} (7.23%) and Quinalphos 25 EC @ 4.0 ml lit^{-1} (8.18). The maximum (14.18%) blue beetle infestation was found in untreated control.

At fourteenth day after second spray the blue beetle infestation was ranged from 0.62 to 15.70 percent. The most effective treatment was Spinosad 45 SC @ 0.2 ml lit^{-1} which recorded 0.62 percent infestation of blue beetle. The treatment Emamectin benzoate 5 SG @ 0.25 gm lit^{-1} recorded 1.87 percent infestation and was at par with Flubendiamide 39.35 SC @ 0.1 ml lit^{-1} (1.94%). The treatment indoxacarb 14.5 SC 0.5 ml lit^{-1} recorded 2.38 percent infestation of blue beetle and was at par with Lambda cyhalothrin 5 EC 0.5 ml lit^{-1} (2.46%). The treatment Quinalphos 25 EC @ 4.0 ml lit^{-1} recorded 2.76 percent infestation. The maximum (15.70%) blue beetle infestation was found in untreated control.

The results regarding cumulative mean percent leaf infestation of blue beetle after two sprays indicated that all the treatments were recorded significantly lower infestation of blue beetle as compared to untreated control. The mean blue beetle infestation ranged from 2.69 percent to 14.30 percent. The treatment Spinosad 45 SC @ 0.2 ml lit^{-1} was most effective which recorded least (2.69%) blue beetle infestation. The treatment Emamectin benzoate 5 SG @ 0.25 gm lit^{-1} was found to be the next best treatment recording 3.87 percent blue beetle infestation and was at par with Flubendiamide 39.35 SC @ 0.1 ml lit^{-1} (4.01%), Indoxacarb 14.5 SC 0.5 ml lit^{-1} (4.89%) and Lambda cyhalothrin 5 EC 0.5 ml lit^{-1} (5.02%). The treatment Quinalphos 25 EC @ 4.0 ml lit^{-1} recorded 5.47 percent blue beetle infestation. The maximum infestation of blue beetle was noticed in the untreated control (14.30%).

The current results are in close conformity with the Japur (2012) [3], who observed that Spinosad 45% SC @ 0.2 ml/l recorded 4.24 percent leaf damage was effective in reducing the blue beetle infestation followed by Emamectin benzoate 5 SG @ 0.25 g/l (5.16%), Flubendiamide 39.35 SC @ 0.2 ml/l (5.28%), Indoxacarb 14.5 SL @ 0.5 ml/l (6.15%) and Lambda cyhalothrin 5 EC @ 2 ml/l (6.43%). The present results are supported by the findings of Navale (2013) [5], who recorded that both Flubendiamide 20 EC (0.05%) and Lambda cyhalothrin 5 EC (0.003%) are effective in reducing the overall mean percent infestation of blue beetle by 5.13 percent and 6.81 percent, respectively as compared to the untreated control (13.41%).

Table 1: Cumulative efficacy of different insecticides on against infestation of blue beetle, *L. pygmaea* on rice

Sr. No.	Treatments	Dose per Lit. (ml or g)	Mean percent infestation of blue beetle					Cumulative mean percent infestation
			Pre count	First spray		Second spray		
				7 DAS**	14 DAS	7 DAS	14 DAS	
1	Emamectin Benzoate 5 SG	0.25	10.90 (19.28) *	4.65 (12.44)	5.91 (14.05)	3.03 (10.00)	1.87 (7.85)	3.87 (11.09)
2	Spinosad 45 SC	0.2	11.97 (20.23)	3.18 (10.27)	4.89 (12.77)	2.08 (8.25)	0.62 (4.52)	2.69 (8.95)
3	Flubendiamide 39.35 SC	0.1	11.41 (19.72)	4.92 (12.81)	6.07 (14.25)	3.09 (10.10)	1.94 (8.00)	4.01 (11.29)
4	Lambda Cyhalothrin 5 EC	0.5	13.30 (21.38)	6.34 (14.58)	7.23 (15.57)	4.04 (11.43)	2.46 (9.02)	5.02 (12.65)
5	Indoxacarb 14.5 SC	0.5	12.12 (20.35)	5.94 (14.10)	7.21 (15.51)	4.04 (11.51)	2.38 (8.87)	4.89 (12.50)
6	Quinalphos 25 EC	4	13.21 (21.27)	6.68 (14.97)	8.18 (16.61)	4.28 (11.94)	2.76 (9.56)	5.47 (13.27)
7	Untreated control	-	11.11 (19.46)	12.38 (20.36)	14.18 (22.12)	14.92 (22.71)	15.70 (23.24)	14.30 (22.11)
SEm (±)			0.52	0.98	0.69	0.75	0.19	0.65
CD (p=0.05)			NS	3.01	2.14	2.30	0.59	2.01

*Figures in the parenthesis are Arc sine transformed values
**DAS: Days after spraying

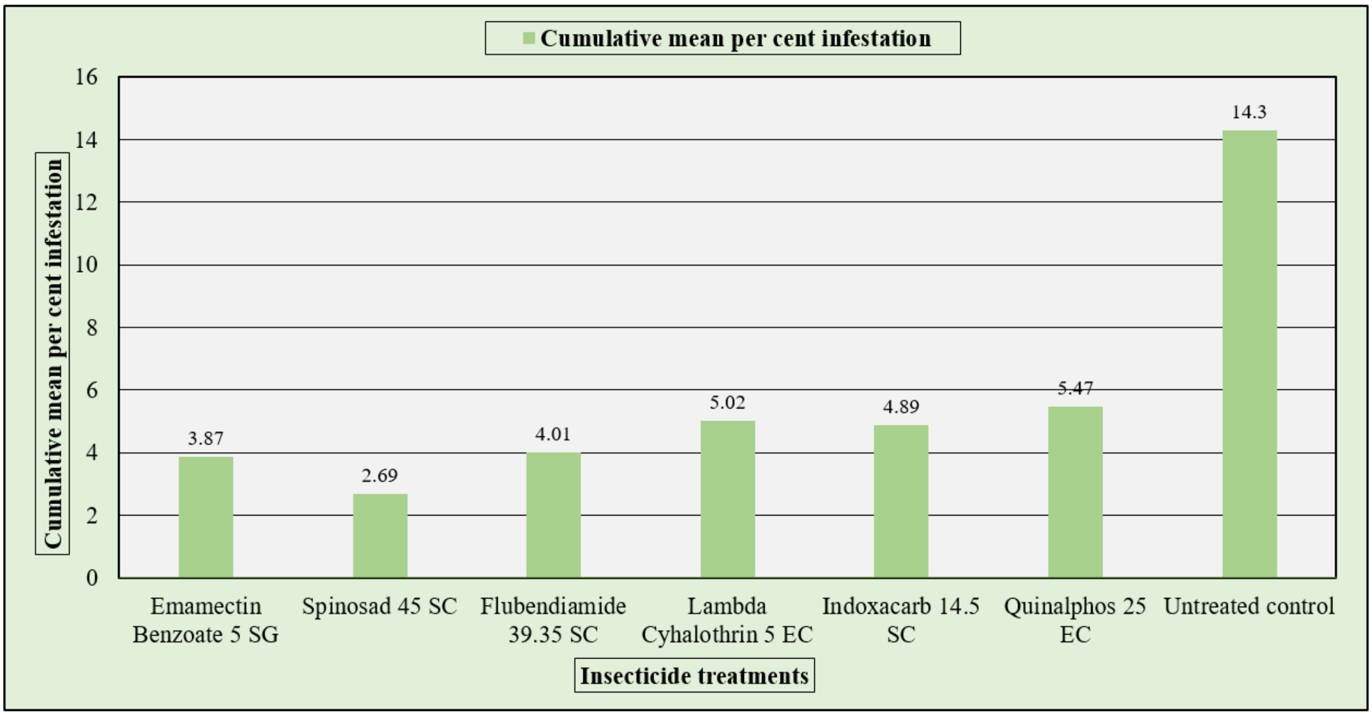

Fig 1: Cumulative efficacy of different insecticides against infestation of blue beetle, *L. pygmaea*

4. Conclusion

On the basis of the results of the present investigation, it can be concluded that among the insecticide treatments, Spinosad 45 SC @ 0.2 ml lit^{-1} was found superior and most effective in controlling infestation of blue beetle followed by Emamectin benzoate 5 SG @ 0.25 gm lit^{-1}, Flubendiamide 39.35 SC @ 0.1 ml lit^{-1} and Indoxacarb 14.5% SC 0.5 ml lit^{-1}.

5. Acknowledgement

Authors are thankful to Department of Agronomy, College of Agriculture, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli-415712, Dist-Ratnagiri, Maharashtra (India) for providing necessary facilities and help during investigation.

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