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Field Evaluation of Different Insecticides against Blister beetle, *Mylabris pustulata* (Thunberg) on Pigeon pea

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Abstract

A field experiment was conducted during Kharif, 2018 to evaluate the efficacy of different insecticides against blister beetle, *Mylabris pustulata* (Thunberg) in pigeon pea. Among the seven treatments tested, Flubendiamide 480SC @ 30 g a.i ha^{-1} was found to be effective and recorded 2.67 and 3.56 numbers plant^{-1}, respectively at 3 and 7 DAT after first spray followed by the treatment Indoxacarb 15.8 SC @ 73 g a.i ha^{-1} which recorded 2.78 and 3.56 numbers plant^{-1}. The third treatment proved to be effective was Deltamethrin 2.8 EC @ 12.5 g a.i ha^{-1} with the population of 3.22 and 3.78 numbers plant^{-1}. The similar trend of efficacy was noticed even after the second spray also. The order of efficacy of treatments in the population reduction of blister beetles was Flubendiamide 480 SC @ 30 g a.i ha^{-1} > indoxacarb 15.8 SC @ 73 g a.i ha^{-1} > Deltamethrin 2.8 EC @ 12.5 g a.i ha^{-1} > Cypermethrin 25 EC @ 25 g a.i ha^{-1} > Lambda cyhalothrin 5 EC @25 g a.i ha^{-1} > NSKE 5%. As that of results on the efficacy of insecticides, the reduction per cent in the blister beetle population also follows the similar trend of different treatments tested. This effectiveness also reflected in the highest grain yield of 1140.20 kg ha^{-1} in Flubendiamide 480 SC @ 30 g a.i ha^{-1} with a yield increase of 36.47 % over untreated check. This was followed by indoxacarb 15.8 SC @ 73 g a.i ha^{-1} (1102.3 kg ha^{-1}) > Deltamethrin 2.8 EC @ 12.5 g a.i ha^{-1} (1072.0 kg ha^{-1}) > Cypermethrin 25 EC@ 25 g a.i ha^{-1} (996.4 kg ha^{-1}) > Lambda cyhalothrin 5 EC @ 25 g a.i ha^{-1} (991.7 kg ha^{-1}) > NSKE 5% (951.70 kg ha^{-1}) .

1. Introduction

Pigeonpea (*Cajanus cajan* L.) is one of the most important pulse crop cultivated in more than 25 countries and in Asia, it was grown on 5.69 million ha and producing 3.88 million tones during 2014 (FAO, 2016). The economic loss due to biotic factors alone has been estimated to $8.48 billion in the world (Sarika *et al*., 2013). Among the biotic constraints, affecting pigeonpea cultivation, blister beetle, *Mylabris pustulata* (T.) is one of the most detrimental insect pest during flowering stage. During the recent years, in pigeonpea owing to the introduction of short-duration, photo-sensitive as well as determinate varieties with compact floral structures with shortened internodes damage due to blister beetle is at the alarming stage.

Blister beetle is a voracious flower feeder and in turn affects the grain yield directly. Among all pulse crops, pigeonpea seems to be the most preferred host for blister beetle at reproductive phase (Durairaj, 2000 and Dasbak *et al*., 2012). Durairaj and Ganapathy, 1996 reported the damaged pigeonpea flowers with maximum beetle density of 19.4 numbers plant^{-1}. It has a greater significance due to its characteristics *viz*., polyphagous, voracious feeder, high mobility, robustness, high fecundity and subterranean nature of immature stage. Adults are migratory in nature and therefore all the insecticides may not be effective (Blodgett *et al*., 2010). With respect to its biology and behavior, its management is very hard. Several management options were tested towards the suppression of blister beetle population but none of them could overcome the menace (McBride, 2012). Unfortunately, various insecticides do not effectively suppress their population due to its behavioral ability also. Inspite of all these, chemical management strategies show greater promising effects with various potentials *viz*., practical management, cost effectiveness, farmers reliance and rapid responses to overcome their damage. Hence, the present investigation was carried out to unravel the bio-efficacy of contact, knock-down as well as with deterrent nature based insecticides against *M. pustulata* in pigeonpea.

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2. Materials and Methods

A field experiment was conducted at Agricultural Research Station, Virinjipuram during Kharif 2018. The experiment was laid out in a randomized block design (RBD) using pigeonpea *var*. CO (Rg) 7 consisted of seven treatments as mentioned below with three replications in a plot size of 5.0 m x5.0 m with spacing of 90 x 30 cm. The crop was raised with recommended agronomic practices. Totally two sprays were given one at 50 % flowering stage and second spray at 15 days interval using hand operated knapsack sprayer with a spray volume of 500L ha^{-1}. The population of blister beetles was collected by sweeping of nets in each plot at pre-count, 3 and 7 days after treatment (DAT). The podborer complex *viz*., gram pod borer, *Helicoverpa armigera* (Hub.) and spotted pod borer, *Maruca vitrata* (Gey.) in red gram were managed by three round of application of chemical insecticide, flubendiamide 480 SC @ 30 g a.i ha^{-1} at flowering, pod formation and maturation phase. All the pods from each treatment were then threshed and grain yield per plot was recorded and arrived for hectare. The per cent reduction of population over untreated which is expressed as per cent efficacy of insecticides was calculated by using Henderson and Tilton's formula as given below.

$$\text{Per cent efficacy} = \left[1 - \frac{T_a}{T_b} \times \frac{c_b}{c_a}\right] \times 100$$

The efficacy data thus obtained were transformed in to square root transformation and subjected to RBD analysis using AGRES package (Gomez and Gomez, 1983). The productivity of grain yield was recorded per plot and obtained grain yields were converted in to kg ha^{-1}.

S.No	Treatments	Dose g a.i ha^{-1}
1.	Deltamethrin 2.8 EC	12.5
2.	NSKE	5 %
3.	Flubendiamide 480 SC	30
4.	Cypermethrin 25 EC	25
5.	Lambda cyhalothrin 5 EC	25
6.	Indoxacarb 15.8 EC	73
7.	Untreated check	-

3. Results and Discussion

The results on the trend in the reduction of population of blister beetles after the application of treatments were presented in Table 1. During Kharif 2018, the precount population of blister beetles was taken from each treatment before the application and ranged from 4.11 – 4.33 numbers plant^{-1}. Among the seven treatments tested, Flubendiamide 480 SC @ 30 g a.i ha^{-1} was found to be effective and recorded 2.67 and 3.56 numbers plant^{-1}, respectively at 3 and 7 DAT after first spray and the efficacy was followed by the treatment Indoxacarb 15.8 SC @ 73 g a.i ha^{-1} which recorded 2.78 and 3.56 numbers plant^{-1} at 3 and 7 DAT. The third treatment proved to be effective was Deltamethrin 2.8 EC @ 12.5 g a.i ha^{-1} with the population of 3.22 and 3.78 numbers plant^{-1}. The similar trend of efficacy was noticed even after the second spray also. The order of efficacy of treatments in the population reduction of blister beetles is Flubendiamide 480 SC @ 30 g a.i ha^{-1} > indoxacarb 15.8 SC @ 73 g a.i ha^{-1} > Deltamethrin 2.8 EC @ 12.5 g a.i ha^{-1} > Cypermethrin 25 EC@ 25 g a.i ha^{-1} > Lambda cyhalothrin 5 EC @ 25 g a.i ha^{-1} > NSKE 5%. At the end of two sprays, the mean population of blister beetle population ranged from 2.80 – 4.64 numbers plant^{-1} in different treatments with the lowest in Flubendiamide 480SC @ 30 g a.i ha^{-1} treated plots which resulted in 39.45 % reduction over untreated check. As that of results on the efficacy of insecticides, the reduction % in the blister beetle population also follows the similar trend of different treatments tested. This effectiveness also reflected in the highest grain yield of 1140.20 kg ha^{-1} in Flubendiamide 480 SC @ 30 g a.i ha^{-1} with a yield increase of 36.47 % over untreated check. This was followed by indoxacarb 15.8 SC @ 73 g a.i ha^{-1} (1102.3 kg ha^{-1}) Deltamethrin 2.8 EC @ 12.5 g a.i ha^{-1} (1072.0 kg ha^{-1}) > Cypermethrin 25 EC @ 25 g a.i ha^{-1} (996.4 kg ha^{-1}) > Lambda cyhalothrin 5 EC @ 25 g a.i ha^{-1} (991.7 kg ha^{-1}) > NSKE 5% (951.70 kg ha^{-1}).

The proven efficacy of flubendiamide against podborers, bollworm complex in cotton was very well studied by Deshmukh *et al*., 2010. Dhakla *et al*., 2010 reported that indoxacarb, lambda cyhalothrin, endosulfan, neemarin and *Bt* which gave 93.56 and 79.42 q ha^{-1} yield, respectively when sprayed against *Etiella Zinckenella*. Studies on the efficacy of different insecticides on blister beetle population reduction were mostly restricted to the pyrethroid compounds and supporting evidences for the efficacy of pyrethroids are discussed hereunder. Singh, 2017 reported that minimum population abundance of *M. pustulata* and maximum % efficacy in reducing their population was obtained from Bifenthrin which was at par with Lambda-cyhalothrin, Cypermethrin, Chlorpyriphos + Cypermethrin and Permethrin with all these treatments were significantly effective over Chlorpyriphos, Neem oil and control plots. The efficacy of synthetic pyrethroids are also in confirmation with Shende *et al*., 2013 who reported that pyrethroids *viz*., Cypermethrin and Lambda-cyhalothrin were most effective than the other groups of insecticides against blister beetles. The Cypermethrin and Chlorpyriphos+Cypermethrin were promising with consistently lower blister beetle population (Pawar *et al*., 2013). Likewise, Dikshit *et al*., 2001 also reported that there was a significant difference in % efficacy on sixth day after sprays of all pyrethroids based pesticides in comparison to Chlorpyriphos and Neem oil. At high doses, residues of Bifenthrin persisted up to 15 days in leguminous crop (Mukherjee *et al*., 2010). The maximum yield was observed in Flubendiamide and Indoxacarb treated plots. The yield up to some extent might be varied due to the damage of reproductive parts as flowers by blister beetle. Kemal and Kochak, 2008 also reported that blister beetle reduces crop yield through direct feeding of flowers. Apart from the newer insecticides *viz*., Flubendiamide and Indoxacarb, the higher yield in case of synthetic pyrethroids was also in conformity with the findings of Pawar *et al*., 2013).

Table 1: Efficacy of different insecticides for the management of blister beetle in pigeon pea

Treatments	Dose g a.i ha^{-1}	I spray			II spray		Mean	Reduction (%)	Yield (kg/ha)	Increase over check (%)
		Precount	3 DAT	7 DAT	3 DAT	7 DAT				
Deltamethrin 2.8 EC	12.5	4.33	3.22 (1.79)[c]	3.78 (1.94)[b]	3.00 (1.73)[c]	2.89 (1.70)[c]	3.97	21.55	1072.0	32.43
NSKE	5 %	4.22	4.00 (2.00)[f]	4.33 (2.08)[e]	3.78 (1.94)[f]	3.56 (1.89)[f]	3.9	15.7	951.7	23.89
Flubendiamide 480 SC	30	4.11	2.67 (1.63)[a]	3.56 (1.89)[a]	2.56 (1.59)[a]	2.44 (1.56)[a]	2.80	39.65	1140.2	36.47
Cypermethrin 25 EC	25	4.11	3.56 (1.89)[d]	3.89 (1.97)[c]	3.33 (1.82)[d]	3.33 (1.82)[d]	3.44	25.86	996.4	27.30
Lambda cyhalothrin 5 EC	25	4.33	3.67 (1.91)[e]	4.00 (2.00)[d]	3.44 (1.85)[e]	3.11 (1.76)[e]	3.55	23.49	991.7	26.96
Indoxacarb 15.8 EC	73	4.22	2.78 (1.67)b	3.56 (1.88)[a]	2.78 (1.66)[b]	2.56 (1.60)[b]	2.92	37.06	1102.3	34.29
Untreated check	-	4.33	5.00 (2.24)[g]	4.67 (2.16)[f]	4.56 (2.13)[g]	4.33 (2.08)[g]	4.64	-	724.3	-
SED			0.19	0.23	0.23	0.27			30.52	
CD<0.5%			0.43	0.50	0.50	0.59			65.48	

Values in parantheses are square root transformed

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