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Field evaluation of novel insecticides against *Mylabris phalerata* in Nagaland

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ABSTRACT

A field experiment was conducted in School of Agricultural Science and Rural Development (SASRD), Medziphema (Nagaland) to evaluate the efficacy of new insecticide molecules against Mylabris phalerata in soybean crop. The treatments consisted of Imidacloprid 48 FS @ 1.25ml/kg seed, Thiamethoxam 30 FS @ 10ml/kg seed, Chlorantraniliprole 18.5 SC @ 100ml/ha, Indoxacarb 15.8 EC @ 333ml/ha, Quinalphos 25 EC @ 1500ml/ha, Thiacloprid 21.7 SC @ 650ml/ha, Triazophos 40 EC @ 800ml/ha and a control plot. The occurrence of the insect pest was absent during first spray at initial development of the crop. However during flowering stage, the second spray was initiated after the occurrence of the adults. The plot treated with Quinalphos 25 EC @ 1500ml/ha recorded the highest mean reduction percentage of 67.27 % of adult population, this was followed by Thiacloprid 21.7 SC @ 650ml/ha with a mean per cent reduction of 65.99 which was significantly at par with plot treated with Imidacloprid 48 FS @ 1.25ml/kg seed with mean reduction per cent of 64.

1. Introduction

Soybean is the leading oilseed crop cultivated over an area of 118.13 million hectares with a production of 319.55 million metric tons. The United State of America is the largest soybean producer in the world, followed by Brazil, Argentina, China and India. In India, soybean is cultivated in an area of around 10.91 million hectares with a production of 8.70 million metric tons. (Anonymous, 2014-2015). Soyabean are grown with less hindrance in North Eastern part of India due to its adaptability and prevailing factors conducive for its growth. It grows well on slopes, lands, Jhum terraces and plains as a pure crop as well as intercrop with maize, paddy, arhar *etc*. (Anonymous, 2012). The area under soybean cultivation in Nagaland is around 24,750 ha with a total production of 31,060 metric ton and productivity of 1,255 kg/ha (Anonymous, 2014).

It is one of the most popular food items for majority of the people of Nagaland and is utilized as a fermented product locally known as "Axone or Akhuni". Blister beetle, *Mylabris* sp (Coleoptera: Meloidae) is one of the destructive pests of pulse crops and other agricultural crops. Among biotic constraints for productivity in subsistence crop protection pattern, it is one of the most detrimental insect pests. In pigeonpea, soybean, mungbean *etc.* owing to the introduction of short duration, photo-insensitive and determinate varieties with compact floral clusters, damage by blister beetles tends to be manifold. Blister beetle is a voracious feeder of the flower, the adults becomes active during the flowering stage of the crop and thereby, directly affects the grain yield. An adult can feed around 16-19 flowers/day and can result in 60-80 per cent damage to the crop. It is highly polyphagous, voracious feeder, high mobility, robustness, high fecundity and the immature stage completes their life cycle in soil and mostly feeds on the soil pests therefore the larvae's are beneficial organism. Adult blister beetles are also migratory in nature. The adult beetles appear in swarms when Hibiscus blossoms in the rainy season.

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In North India, the beetle is on wing at the beginning of July and may be found till October. In South India, the beetles are noticeable almost throughout the year. The beetles are also recorded on the flowers of red gram, groundnut, cowpea, lab-lab, wild Ipomea, prickly pear, roses, *Calotropis* sp. Kumar *et al.* (2010) recorded the population of *M. pustulata* as flower feeders from 4th week of August and till first week of October in all varieties of sesame. Sharma (2011) reported that *M. phalerata*, commonly known as banded blister beetle, is known to attack the flowers of pigeonpea crop, *Hibiscus rosa-sinensis* and other plants from July to September and devours them completely. Therefore, by understanding the seasonal occurrence of the insect pest, an experiment was conducted to evaluate various newer molecules in managing this insect pest.

2. Materials and Method

The present investigation was carried out in the Entomology Research Farm, School of Agricultural sciences and Rural Development, Nagaland University, Medziphema, Nagaland during *kharif* season 2016. The experimental site is located at Medziphema, Nagaland having an elevation of 310m above mean sea level (MSL) with a geographical location of 23045‟‟43” N latitude and 93053‟‟04” E longitudes. The experimental site lies in humid and sub-tropical region with an average rainfall from 2000-2500 mm annually. The mean temperature ranges from 21^{O} C to 32^{O} C during summer and rarely goes below 8^{O} C. The soil is sandy loam, acidic in nature with it ranging from 4.5- 6.5. Two treatments *i.e.* imidacloproid 48 FS and thiamethoxam 30 FS were used as seed treatments before sowing and the remaining five treatments as foliar spray. The cultivar used was JS-335. The field experiment was laid out in Randomized Block Design (RBD) with 8 treatments (7 insecticides and 1 untreated control) each replicated thrice. The experimental plot was divided into 3 equal blocks. Again each block was divided into 8 equal blocks measuring 5 m X 2.7 m with interspacing of 1 m in between plots. The treatments were randomly distributed within the plots. The total number of plots was 24. The observation of blister beetle was recorded at weekly intervals at three places and mean was recorded in numbers per meter by counting the number of beetles per meter and the per cent reduction of insect pest population was calculated using the formula:

$$\% \text{ reduction} = \frac{\text{Pretreatment count - Post treatment count}}{\text{Pretreatment count}} \times 100$$

3. Result and Discussion

Results of the data pertaining to percentage reduction of the mean population of *Mylabris phalerata* one day before spraying (DBS) and three and seven days along with respective CD values are given in Table 1 and illustrated in Figure 1. First spraying at the time of first spray, there was no incidence of blister beetle. Therefore, data could not be collected. The population of Blister beetle, *Mylabris phalerata* Thunb appeared only after initiation of flowering in soybean. The initial mean population of blister beetle on one day before second spraying ranged from 2.67 – 5.67 beetles per meter. After three days of spraying the highest per cent reduction of 64.29% was recorded in plots treated with Quinalphos 25 EC followed by Thiacloprid 21.7 SC (62.64%) and Imidacloprid 48 FS (61.33%) having no significant differences, then it was followed by Thiamethoxam 30 FS (47.78%), Chlorantraniliprole 18.5 SC (38.33%) and Triazophos 40 EC (23.37%). The lowest per cent reduction was recorded in Indoxacarb 15.8 EC (11.10%). After seven days of spraying, the highest per cent reduction in population of Mylabris phalerata was recorded in the plots treated with Quinalphos 25 EC. (70.24%) followed by Thiacloprid 21.7 SC (69.44%) having no significant differences, it was followed by Imidacloprid 48 FS (66.67%), Thiamethoxam 30 FS (62.78%) and Chlorantraniliprole 18.5 SC (30.33%). The lowest percent reduction was recorded in Indoxacarb 15.8 EC (16.57%) and Triazophos 40 EC, (15.89%) which were at par with each other. It is evident from percentage of infestation data of the present findings that Quinalphos 25 EC and Thiacloprid 21.7 SC were superior among all treatments in reducing the population of *Mylabris phalerata*. Shabana (2016) also reported that Quinalphos showed the best result in controlling blister beetle which is accordance to the present findings. Maximum cumulative mortality (100%) was observed in thiodicarb followed by quinalphos (95.7%), cypermethrin (95.7%) and chlorpyriphos (91.6%), while minimum in novaluron and deltamethrin. It was concluded from the studies that among the different insecticidal treatments thiodicarb (0.09%) proved most effective which brought 99.75 % mortality even 24 hours after the treatment (Rolania *et al*., 2014).

3.1 Effect of insecticides on grain yield (Kg/ha) of soybean:

The results pertaining to the influence of different treatments on grain yield of soybean (q/ha) are presented in Table 2. There were significant differences in grain yield among the treatments. Highest grain yield was recorded in Indoxacarb 15.8 EC treated plots (31.07 q/ha), followed by Thiacloprid 21.7 SC (29.55 q/ha), Thiamethoxam 30 FS (29.22 q/ha),

Table 1. Efficacy of different treatments against Blister beetle, *Mylabris phalerata* Thunb

Treatments	***First spray***				***Second spray***			
	Pre-treatment count	***Percent (%) reduction***			***Pre-treatment count***	***Percent (%) reduction***		
		3 DAS	***7 DAS***	***Mean***		***3 DAS***	***7 DAS***	***Mean***
Imidacloprid 48 FS @ 1.25ml/kg seed	-	-	-	-	2.67 (1.77)	61.33 (51.73)	66.67 (54.91)	64.00
Thiamethoxam 30 FS @ 10ml/kg seed	-	-	-	-	4.00 (2.12)	47.78 (43.72)	62.78 (52.41)	55.28
Chlorantraniliprole 18.5 SC @ 100ml/ha	-	-	-	-	3.67 (2.04)	38.33 (38.22)	30.33 (33.40)	34.33
Indoxacarb 15.8 EC @ 333ml/ha	-	-	-	-	3.67 (2.04)	11.10 (19.45)	16.57 (24.01)	13.835
Quinalphos 25 EC @ 1500ml/ha	-	-	-	-	4.33 (2.20)	64.29 (53.88)	70.24 (57.27)	67.27
Thiacloprid 21.7 SC @ 650ml/ha	-	-	-	-	5.67 (2.48)	62.54 (52.34)	69.44 (56.76)	65.99
Triazophos 40 EC @ 800ml/ha	-	-	-	-	4.67 (2.26)	23.37 (28.72)	15.89 (23.42)	19.63
Untreated control	-	-	-	-	6.67 (2.64)	8.70 (16.88)	6.70 (14.96)	7.70
SEm±	-	-	-	-	NS	3.32	2.45	-
CD (p=0.05)	-	-	-	-	NS	10.07	7.43	-

Chlorantraniliprol 18.5 SC (28.44 q/ha), Triazophos 40 EC (27.83 q/ha) and Imidacloprid 48 FS (27.81 q/ha). The lowest yield was recorded in Quinalphos 25 EC (26.29 q/ha). The grain yield was recorded higher compared to the untreated control (19.87 q/ha). This is in line with Kumar *et al.* (2009) who also stated that all the insecticide treatments registered significantly increases grain yield compared to the untreated control. The present findings are in close conformity with Shabana (2016) who reported that Thiacloprid 21.7 SC recorded the highest grain yield (36.q/ha).

3.2 Economics of treatments

The results of benefit cost ratio of different insecticide treatments are given in Table 2

3.3 Profit due to treatments (Rs/ha):

Among the different treatments, highest profit due to treatment was registered in Indoxacarb 15.8 EC @ 333 ml/ha (64695/ha), this was followed by Thiacloprid 21.7 SC @ 650 ml/ha (56546/ha), Thiamethoxam 30 FS @10ml/kg seed (53490/ha), Chlorantraniliprole 18.5 SC @ 100ml/ha (48604/ha), Imidacloprid 48 FS @ 1.25ml/kg seed (46063/ha), Triazophos 40 EC @ 800ml/ha 45760/ha) and Quinalphos 25 EC @1500ml/ha (36190/ha).

4. Benefit Cost Ratio

The benefit cost ratio (BCR) of different treatments varied from 15.41 – 36.86. Thiacloprid 21.7 SC showed the maximum benefit cost ratio (36.86) followed by Imidacloprid 48 FS (29.20), Indoxacarb 15.8 EC (25.82), Triazophos 40 EC (22.6), Thiamethoxam 30 FS (20.49), Chlorantraniliprole 18.5 SC (17.25) and Quinalphos 25 EC (15.41). Patil *et al.* (2014) reported that Chlorantraniliprole showed the highest benefit cost ratio which is in close conformity with the present findings. The result of benefit cost ratio support the observation of Bhadauria and Singh (2014) who reported Triazophos as most economical against major insect pests of soybean.

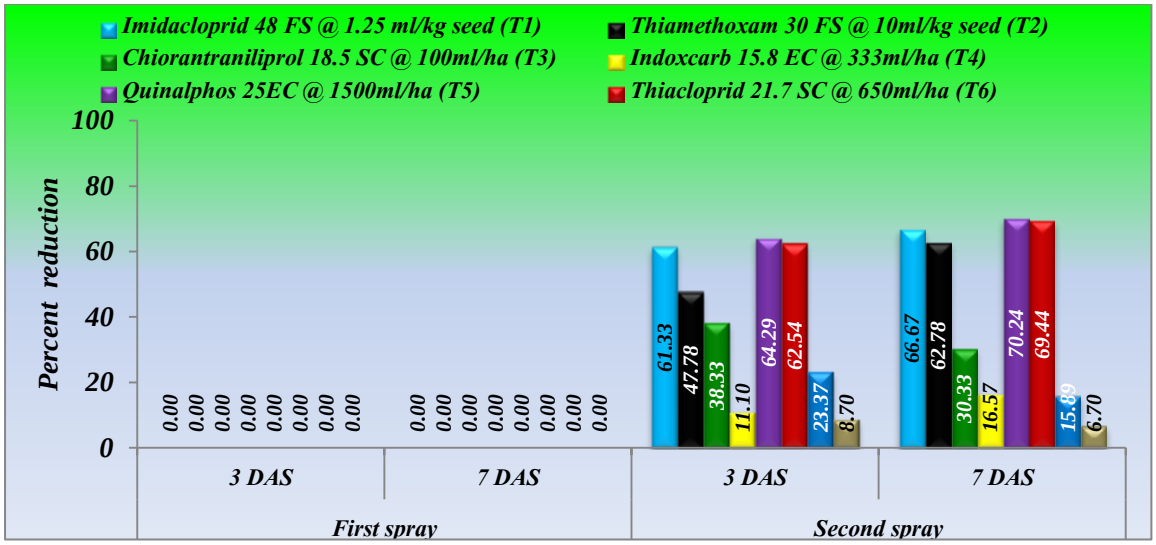

Figure 1. Effect of different insecticides against blister beetle, Mylabris phalerata on soybean during July to October 2016

1. Cost of insecticides:- Imidacloprid 40 FS Rs.258/100ml, Thiamethoxam 30 FS Rs.2200/1liter, Chlorantraniliprol 18.5 SC Rs.850/60ml, Indoxacarb 15.8 EC Rs.664/200ml, Quinalpho 25 EC Rs.62/100ml, Thiacloprid 21.7 SC Rs.236/100ml, Triazophos 40EC Rs. 75/100ml.
2. Labour Charge @ Rs. 300/day (2 men/day/ha/spray)
3. Rental charge of sprayer @ Rs.50/day
4. Cost of Soybean @ Rs.6000/qt

Treatments	Dose (ml or g/ha)	No. of spray	Gross yield (qt/ha)	Additional yield over control (qt/ha)	Value of additional yield(Rs./ha)	Cost of insecticides treatments (Rs)	Profit due to treatments (Rs/ha.)	Benefit Cost Ratio
Imidacloprid 48 FS	1.25ml/kg seed	2	27.81	7.94	47640	1577	46063	29.20
Thiamethoxam 30 FS	10ml/kg seed	2	29.22	9.35	56100	2610	53490	20.49
Chlorantraniliprol 18.5 SC	100ml/ha	2	28.44	8.57	51420	2816	48604	17.25
Indoxacarb 15.8 EC	333ml/ha	2	31.07	11.2	67200	2505	64695	25.82
Quinalphos 25 EC	1500ml/ha	2	26.29	6.42	38520	2330	36190	15.41
Thiacloprid 21.7 SC	650ml/ha	2	29.55	9.68	58080	1534	56546	36.86
Triazophos 40 EC	800ml/ha	2	27.83	7.96	47760	2000	45760	22.6
Untreated control	-	-	19.87	-	-	-	-	-

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