Bio-efficacy of different insecticides againstsoybean leaf folder, *Omiodesindicata* (Fabricius, 1775)(Lepidoptera: Crambidae)

ABSTRACT

A study was conducted at the Agricultural Research Station (UAS, Dharwad), Sankeshwar, Karnataka during *Kharif*2022-23 to assess the effectiveness of differentinsecticides against soybean leaf folder, *Omiodes indicata*. Among five treatments, lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC @ 0.4 ml l^{-1} exhibited the lowest mean population of soybean leaf folder, *Omiodesindicata*on5th and 10th day after spray with 2.12 and 0.98 larval population per meter row length, respectively which was followed by emamectin benzoate 5 % SG @ 0.3 g l^{-1} (3.03 and 1.83 larvae per meter row length). Lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC was found to be the best effective treatment with 81.97 %reduction over control followed by emamectin benzoate 5 SG (71.61 %).

KEYWORDS: Insecticides, Legume,Leaf folder, Soybean

1. INTRODUCTION

Soybean, scientifically known as *Glycine max* (L. Merrill) (Fabaceae) has been recognized as a remarkable crop and given various titles such as wonder crop and golden bean in the 20th century [1]. Soybean seeds contain over 40 % protein and 20 % oil[2] with 6.4 % lysine, 19.5 % fat and 20.9 % carbohydrates [3].As it's having several nutrition values mentioned above, soyabean also contributes about 25 % global edible oil and 2/3rdof world's protein concentrates for livestock feeding, poultry, fish feed and soybean meal as human diet supplements for protein [4]. In addition to theabove,its oil is used in preparation of varnishes, paints, lubricants, antibiotics, adhesives *etc*.It is also abundant in mineral salts and essential amino acids, making it a promising crop for combating acute malnutrition [5].

Soybean is a significant oilseed crop in the rainfed agroecosystems of central and peninsular India.It is cultivated over a vast area of 132.26 million ha in the world. Total production is around 385.52 million tonand average productivity is about 2.88 metric ton ha^{-1}. India is the fifth-largest producing country of soybean behind China, United States, Argentina and Brazil. In India, soybean is grown on 11.44 million ha of land, yielding a total of 12.03 million ton with an average productivity of 1051 kg ha^{-1}. The prominent states in India for soybean production are Madhya Pradesh, Maharashtra, Rajasthan, Andhra Pradesh, Karnataka and Gujarat. In Karnataka, soybean is cultivated on 0.43 million ha of land, resulting in an output of 0.44 million ton and a productivity rate of 1005 kg ha^{-1} [6].

Globally, there are more than 380 species of insect pests affecting the soybean crop. In India, the number of species increased from 12 in the 1970's to 270 species, including mites, millipedes,

vertebrates and snails. In Karnataka alone, 65 insect species have been found to infest soybean from its early stages to harvest[7]. Among themSoybean leaf webber, *Omiodesindicata* (Fab.) (Lepidoptera: Crambidae) is an emerging pest on leguminous plants, commonly known as bean leaf webworm moth, soybean leaf folder or roller, lablab leaf webber and soybean webworm.

Leaf webbers, including *Omiodes indicata*, are major insect pests in both tropical and temperate regions of the world. *O. indicata*is distributed across various regions, *viz*., Africa, India, China, Japan, Hong Kong and New Guinea. It causes direct damage to the crops and it may occasionally become a serious pest on soybean, black gram, green gram, cowpea and it has been recently recorded in various regions of China and India but there is a lack of quantitative data regarding the impact of this pest on crops in these areas. The young leaves are spun together and larger leaves are rolled, starting from the tip. The larvae of *O. indicata* feed inside these rolled-up leaves [8]. Under severe infestations, the final-instar larvae can completely skeletonize the leaves.Recently, there has been a significant increase in the infestation of soybean leaf folder, causing concern to soybean farmers. With the view to manage this pest, a research study was conducted to assess the effectiveness of different insecticides in managing the soybean leaf folder.

2. MATERIALS AND METHODS

The experiment was conducted at Agricultural Research Station located at Sankeshwar, Dharwad. (16.14N,74.30E and 698 m asl)during*Kharif* from June to October (2022). Field experiment followed a Randomized Block Design with three replications and five treatments. Plotarea of 23.4 m^2(6× 3.9 m) and spacing of 30×10 cm was followed. The objective of the present studywas to assess effectiveness of different insecticides against soybean leaf folder. The treatment includes emamectin benzoate 5 % SG @ 0.3 g l^{-1}, quinalphos 20 % EC @ 2 ml l^{-1}, lambda cyhalothrin 5 % EC @ 0.5 ml l^{-1}, lambda cyhalothrin 4.6 % + Chlorantraniliprole 9.3 % ZC @ 0.4 ml $l^{-1}$and an untreatedcontrol.

Periodical observations were conducted to monitor the occurrence of soybean leaf folder per meter row length (mrl). Treatments were imposed when the pests crossed Economic Threshold Level (ETL). Observations were recorded 24 hours before spray (pre-treatment) and on 5thand 10th days after spray (post-treatment). The mean data recorded during the field trialwas statistically analyzed[9] and the % reduction in treatments over control plots was estimated by using the formula[10].

$$\text{Population reduction over control (\%)} = \frac{\text{Population in untreated check - Population in treatment}}{\text{Population in untreated check}} \times 100$$

3. RESULTS AND DISCUSSION

At one day before spray, there was no significant difference between the treatments regarding the mean population of leaf folder larvaeand themean population ranged from 5.21 to 6.02larvae mrl^{-1}.But there was a substantial difference between the treatments onfive days after the spray. The mean

population of leaf folder larvae after five days of sprayvaried from 2.12 to 8.23 larvaemrl^{-1}. Out of different treatments imposed, the treatment lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC recorded the least population of 2.12 larvae mrl^{-1}which was followed by emamectin benzoate 5 % SG (3.03 larvaemrl^{-1}), quinalphos 20 % EC (4.01 larvae mrl^{-1}) which is on par with lambda cyhalothrin 5 % EC (4.46 larvae mrl^{-1}).

A similar trend was noticedon the10th day after spray. The data (Table1) showed that the mean population varied from 0.98 to 8.96 larvaemrl^{-1} among different treatments.Out of different treatments imposed, the treatment lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC recorded the least mean population of 0.98 larvae mrl^{-1}which was followed by emamectin benzoate 5 % SG (1.85 larvae mrl^{-1}), quinalphos 20 % EC (2.69 larvae mrl^{-1}) which is on par with lambda cyhalothrin 5 % EC (2.93 larvae mrl^{-1}).

Among different treatmentsimposed lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC was recorded superior to other treatments with 81.97 % reduction over control followed by emamectin benzoate 5 % SG (71.61 %), quinalphos 20 % EC (61.02 %) which is on par with lambda cyhalothrin 5 % EC (57.01 %)over control. The results of the present investigation are supported by Divya et. al [11]revealed that lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC was effective treatment against *Antigastra catalaunalis* in sesamum by recording the lowest larval population (1.30 plant^{-1}) and lowest capsule damage (1.25 %) compared to all other treatments. Similarly, Swathi et al [12] reported that lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC @ 0.5 ml l^{-1} was found to be very effective by recording 75.91 % overall mean reduction in *Maruca vitrata* larval population with lowest pod damage (7.04 %) over control (60.58 %) and also recorded highest grain yield (8.31 qha^{-1}) followed by chlorantraniliprole 18.5 % SC at 0.0037 % and flubendiamide at 39.35 % SC 0.00787 % with 72.04 and 67.30 % overall reduction in mean larval population, respectively of *Maruca vitrata* over untreated control in black gram.Similarly, Jakhar et al [13] reported that two sprays of chlorantraniliprole 18.5 % SC @ 0.15 ml l^{-1} gave maximum control of *Maruca vitrata* (3.33 %) in pigeon pea with maximum grain yield (1817 kg ha^{-1}) followed by indoxacarb 15.8 EC @ 0.5 ml l^{-1} (pod borers damage of 3.83 % and grain yield 1758 kg ha^{-1}).

4. CONCLUSION

The combi product lambda cyhalothrin 4.6 % + chlorantraniliprole 9.3 % ZC was found effective in managing soybean leaf folder infestation potentially due to their complementary mode of action or synergistic effect and followed by emamectin benzoate 5 % SG.

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Table 1. Efficacy of different insecticides against soybean leaf folder (*Omiodesindicata)*

Tr.No.	Treatments	No. of larvae mrl^{-1}				
		1 DBS	5 DAS	10 DAS	Mean	ROC (%)
T_1	Emamectin benzoate 5 % SG @ 0.3 g l^{-1}	5.33 (2.31)	3.03 (1.74)^{b}	1.85 (1.36)^{b}	2.44 (1.56)^{b}	71.61
T_2	Quinalphos 20 % EC @ 2 ml l^{-1}	5.82 (2.41)	4.01 (2.00)^{c}	2.69 (1.64)^{c}	3.35 (1.83)^{c}	61.02
T_3	Lambda cyhalothrin 5 % EC @ 0.5 ml l^{-1}	5.96 (2.42)	4.46 (2.11)^{c}	2.93 (1.71)^{c}	3.70 (1.92)^{c}	57.01
T_4	Lambda cyhalothrin 4.6 % + Chlorantraniliprole 9.3 % ZC @ 0.4 ml l^{-1}	5.98 (2.44)	2.12 (1.46)^{a}	0.98 (0.99)^{a}	1.55 (1.24)^{a}	81.97
T_5	Control	6.02 (2.45)	8.23 (2.87)^{d}	8.96 (2.99)^{d}	8.60 (2.92)^{d}	-
	S.Em ±	NS	0.05	0.06	0.06	-
	C.D. (p = 0.05)		0.15	0.17	0.16	-
	C.V. (%)	9.98	8.99	9.56	8.32	-

Note: - Figures in parentheses are √x + 0.5 transformed values; Means in the columns followed by the same alphabet do not differ significantly by DMRT (p =0.05); DBS-Day before spray; DAS-Days after spray; ROC- Reduction over control; mrl- meter row length.