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RESEARCH ARTICLE

BIOEFFICACY OF NEW MOLECULES OF INSECTICIDES AGAINST LEAF EATING CATERPILLER, *SPODOPTERA LITURA* (FABRICIUS) INFESTING SOYBEAN

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ABSTRACT

Experiments were conducted to find out the efficacy of newer insecticides as foliar spray against leaf eating caterpillar in soybean in farmer's field during kharif season 2013-14. Foliar sprays of newer molecules of insecticides *viz.,* flubendiamide 480 SC @, spinosad 45 SC @ 187.5 ml/ha, lambda cyhalothrin 5 EC @ 40 g/ha, emamectin benzoate 1.9 EC @ 200 ml/ha, methomyl 40 SP @ 1 kg/ha, chlothianidin 50 WDG @ 250 g/ha, indoxacarb 14.5 SC @ 200 ml/ha and thiodicarb 80 DP @ 400 ml/ha offered excellent protection against leaf eating caterpillar, *S. litura* infesting soybean. Result indicated that all the treatments as foliar sprays recorded significantly higher yield as compared to untreated control. The treatment with flubendiamide 480 SC @ 200 ml/ha recorded 2100.10 kg/ha yield which is significantly superior over rest of treatments. The treatment with emamectin benzoate 1.9 EC @ 200 ml/ha, spinosad 45 SC @ 187.5 ml/ha, lambda cyhalothrin 5 EC @ 40 g/ha, methomyl 40 SP @ 1 kg/ha, chlothianidin 50 WDG @ 250 g/ha, thiodicarb 80 DP @ 400 ml/ha and indoxacarb 14.5 SC @ 500 ml/ha were next in order of yield. And also indicated that new molecules of insecticides as seed dressers as well as foliar sprays did not have any detrimental effect on natural enemies of soybean ecosystem.

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INTRODUCTION

In India, 20 insect species have been recorded infesting soybean crop (Singh and Singh, 1990). Among them, tobacco leaf eating caterpillar, *Spodoptera litura* Fabricius are important, serious and polyphagous pest. It's reproductive capacity and migration ability over long distance has made it an economically important pest of many agricultural crops consequently damaging 30 to 100 per cent to the pods (Chari *et al.*, 1985; Ahmad *et al.,* 2006; Anonymous, 2011) Deshmukh (2008) reported that 99 thousands ha. area in Chandrapur Bhandara was infested with *Spodoptera litura* resulted into complete failure of crop. Government of Maharashtra sanctioned Rs. 600 Crores as a compensation to farmer. The use of conventional insecticides for the management of *S. litura* has mainly attributed for the rapid population build up of these pest. The augmented problems associated with modern agriculture, the management of *S. litura* was experienced to be difficult with the existing organophosphorous compounds, upon which long run reliance was shown by farming community which leads to the development of resistance.

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Under such conditions use of new group of insecticides as seed dressers or as spray formulations emerged most promising, low cost, less polluting with least interference in natural equilibrium. Newer group of insecticides offer great scope as they maintain high toxicity to insects at lower doses and are not persistent as conventional group of insecticides.

MATERIALS AND METHODS

The insecticidal sprays were applied with the help of manually operated knapsack sprayer. The quantity of spray fluid required for treating the crop per plot was calculated by spraying untreated control plot with water. The quantity of each insecticidal formulation was worked out and mixed in required quantity of water. Care was taken to cover all plant parts thoroughly while spraying and to avoid drift of the neighboring plots. Care was taken to wash the pump with water while switching on from one insecticide to another. Five plants per plot were selected randomly and were tagged for recording observations. The pre count and post larval count were recorded a day before treatment and 3rd, 7th and 10th day's after the application of the treatment, respectively. The data on survival populations of larvae were subjected to square root transformation and then subjected to statistical analysis.

Table 1. Efficacy of new molecules of insecticides as foliar sprays against *S. litura*

Sr. No.	Treatment	Dose / ha	Pre count	Mean survival population of larvae / plant						Average larval count	Yield (kg/ha)
				First spray			Second spray				
				3 DAT	7 DAT	10 DAT	3 DAT	7 DAT	10 DAT		
1	Chlothianidin 50 WDG	250 g	1.50 (1.41)	0.62* (1.05)**	0.59 (1.04)	0.56 (1.03)	0.53 (1.01)	0.48 (0.99)	0.42 (0.96)	0.53 (1.01)	1650.7
2	Lambda cyhalothrin 5 EC	40 g	1.33 (1.35)	0.53 (1.01)	0.45 (0.97)	0.40 (0.95)	0.37 (0.93)	0.31 (0.90)	0.25 (0.87)	0.39 (0.94)	1730.4
3	Spinosad 45 SC	187.5 ml	1.30 (1.34)	0.51 (1.00)	0.43 (0.96)	0.38 (0.94)	0.32 (0.91)	0.27 (0.88)	0.22 (0.85)	0.36 (0.92)	1810.5
4	Indoxacarb 14.5 SC	500 ml	1.41 (1.38)	0.94 (1.20)	0.58 (1.04)	0.53 (1.01)	0.48 (0.99)	0.41 (0.95)	0.35 (0.92)	0.55 (1..02)	1593.3
5	Flubendiamide 480 SC	200 ml	1.42 (1.39)	0.45 (0.97)	0.37 (0.93)	0.31 (0.90)	0.27 (0.88)	0.22 (0.85)	0.18 (0.82)	0.30 (0.89)	2100.1
6	Methomyl 40 SP	1 kg	1.47 (1.40)	0.64 (1.07)	0.59 (1.04)	0.54 (1.02)	0.49 (0.99)	0.43 (0.96)	0.40 (0.95)	0.52 (1.01)	1690.2
7	Emamectin benzoate 1.9 EC	200 ml	1.59 (1.45)	0.52 (1.01)	0.48 (0.99)	0.43 (0.96)	0.38 (0.94)	0.32 (0.91)	0.28 (0.88)	0.40 (0.95)	1933.6
8	Thiodicarb 80 DP	400 ml	1.45 (1.40)	0.65 (1.07)	0.63 (1.06)	0.59 (1.04)	0.52 (1.01)	0.46 (0.98)	0.41 (0.95)	0.54 (1.02)	1638.8
9	Untreated control	-	1.61 (1.45)	2.80 (1.82)	3.76 (2.06)	4.63 (2.26)	5.67 (2.48)	6.38 (2.62)	7.52 (2.83)	5.13 (2.37)	945.1
	SE ±	-	0.027	0.019	0.020	0.022	0.026	0.027	0.024	0.023	24.11
	CD@5%	-	NS	0.057	0.061	0.066	0.078	0.082	0.072	0.069	72.29

DAT: Days after treatment
*Mean of three replications
**Figures in parentheses are $\sqrt{X + 0.5}$ transformed values.

RESULTS AND DISCUSSION

The larval population of *S. litura* in all the treatments was uniform a day prior to the imposition of treatments as indicated by the non significant difference among various treatments, indicating the uniform population throughout experimental field. However, *S. litura* population ranged from 1.30 to 1.61 larvae/plant. After three days of imposition of the treatments, the *S. litura* population was varied from 0.45 larvae/plant in flubendiamide 480 SC @ 200 ml/ha to 2.80 larvae/plant in untreated control. All the treatments found significantly superior over untreated control. The treatment with flubendiamide 480 SC @ 200 ml/ha was significantly superior over all other treatments. However, it was on par with spinosad 45 SC @ 187.5 ml/ha. Significant difference did not exist among rest of the treatments.

At 7 days after application, the treatment with flubendiamide 480 SC @ 200 ml/ha recorded significantly low survival of *S. litura* larvae as compared to other treatments. The *S. litura* population was reduced to 0.37 larvae/plant in the treatment with flubendiamide 480 SC @ 200 ml/ha. The treatment with spinosad 45 SC, lambada cyhalothrin 5 EC and emamectin benzoate 1.9 EC were next in order of efficacy in reducing the survival population of *S. litura* larvae. The treatment with flubendiamide 480 SC @ 200 ml/ha found to be consistently superior over rest of the treatments when observations were recorded 10 days after application. The larval population density of *S. litura* varied from 0.31 to 4.63 larvae/plant. Significantly minimum population of *S. litura* (0.31 larvae/plant) was recorded in the treatment with flubendiamide 480 SC @ 200 ml/ha.

A similar trend in the efficacy of different chemicals was maintained as that of 7 days after spraying. Similar trend of result was obtained when observation were recorded 3rd, 7th and 10th after second spray. The superiority of flubendiamide 480 SC @ 200 ml/ha was in close agreement with Jat and Ameta (2013) who reported that flubendiamide 480 SC at 200 ml/ha was found significantly most effective, which caused highest mean reduction of population of tomato fruit borer larvae, *Helicoverpa armigera* and fruit damage, 89.94 and 3.10 per cent. It was followed by spinosad 45 SC @ 200 ml/ha and Beta-cyfluthrin 2.5 SC, was found moderately effective treatment against fruit borer.

Tatagar *et al.* (2009) reported that among various dosages flubendiamide 20 WG @ 60 g a.i./ha recorded highest yield of 7.48 q/ha with lowest fruit damage of 3.45 per cent followed by flubendiamide 20 WG @ 40 g a.i./ha (6.72 q/ha), emamectin benzoate 5 SG @ 11 g a.i./ha (7.22 q/ha) and spinosad 45 SC @ 75 g a.i./ha (7.32 q/ha). The yield recorded in the various treatment indicated that all the treatments recorded significantly higher yield as compared to untreated control. The treatment with flubendiamide 480 SC @ 200 ml/ha recorded 2100.10 kg/ha yield which is significantly superior over rest of treatments. Significant differences did not existed among rest of the treatment. In untreated control 945.10 kg/ha yield of soybean is recorded.

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