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EFFICACY AND ECONOMIC OF SOME GRANULAR INSECTICIDE AGAINST WHITEFLY *BEMISIA TABACI*, (HOMOPTERA: ALEYRODIDAE) IN URD BEAN [*VIGNA MUNGO* (L.) HEPPER]

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Abstract

The present investigation was carried out on urdbean during *Kharif* 2013. The application of treatments at the time of sowing + hoeing the insecticides has its superiority over other method. Maximum (12.60 q/ha) yield was obtained in the plot treated with Carbofuran 3G (Check), applied the time of sowing + hoeing and was found significantly higher in comparison to other treatments. Highest cost loss ratio (1 : 2.15) was obtained from the plots treated with Emamectin benzoate 5 SG 8g a.i./ha applied at the time of sowing + hoeing and applied at the time of hoeing followed by Phorate 10 G applied at the time of Hoeing (1 : 1.37). The minimum cost loss ratio of (1:0.29) was recorded in the plots treated with Phorate 10 G @ 1.5kg.a.i./ha applied at the time of sowing.

Key words : Whitefly, *Bemisia tabaci*, granular insecticides, cost benefit ratio.

Introduction

Blackgram (*Vigna phaseolus mungo* L. Hepper) commonly known as urdbean, belongs to family Leguminoseae, sub family Papilionaceae. These grain legumes contain about 25 per cent protein and richest in phosphoric acid among pulses, and established itself as a highly valuable with ability to improve the soil by fixing atmospheric nitrogen. The area under urdbean cultivation in India is about 3.30 m ha with production of 1.83 m tonnes and productivity 555 kg per ha during the year 2011-12. The area in U.P. under urdbean is 524224 ha and production is about 347341m.tones with an average yield of 663 kg/ha (Anonymous, 2012). Black gram is attacked by more than twenty insect pest species in India. (Nayer *et al*., 1976). Keeping this in view, the present study was under taken to know the population dynamics of Whitefly and their correlation with abiotic factors.

Materials and Methods

Find out economic effective and safer granular insecticides with method of applications acceptable to farmers against the whitefly on urdbean, experiment was laid out in randomized block design at student's instructional farm, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.), India in the *Kharif* season of 2013. The urdbean variety NDU-1 was sown in 10 rows in each net plot size of $12m^2$. There were 9 treatments including control with three replications. The details of the granular insecticidal treatments and method of applications used in experiment have been given in table 1. The procurement of these insecticides were done from the market. All the granular insecticides were applied by three methods *i.e.* at the time of sowing, at the time of hoeing and at the time of sowing + hoeing. Observations on whitefly count were recorded on five randomly selected plots from each net plot of 12 m^2 by using rectangular cage. Incidence of yellow mosaic virus (YMV) was also recorded in each plot once at 50% flowering stage. The values were transformed into angular transformation and subjected to analysis of variance. The yield of different plots was recorded and the economics of different treatments were worked out. Economics of various treatments were calculated under following heads by using formula.

i. Total cost of treatment application (Rs/ha) = Cost of incidence + labour charge + sprayer rent.

$$\text{ii. Per cent increase in yield} = \frac{\text{Yield of protected plot} - \text{Yield of unprotected plot}}{\text{Yield of protected plot}}$$

iii. Gross income (Rs/ha) = Sole Price of Product × Total yield.

iv. Additional income (Rs/ha) = Value of yield saved by insecticide – Total cost

$$\textbf{v. Cost benefit ratio} = \frac{\text{Value of yield saved due to insecticide}}{\text{Total cost of control}}$$

Results and Discussion

Effect of treatments on whitefly incidence

Table 1 reveals that data on the effects of various treatments on population of whitefly recorded twenty days after application indicated that all treatments were effective and significantly superior in reduction of population of white fly. At 20 DAS, populations of white fly 11.80/plant, 11.93/plant and 10.46/plant were recorded with Phorate 10 G applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing, respectively. Populations of white fly 11.06/plant, 12.13/ plant and 10.56/plant were recorded with Emamectin benzoate 5 SG applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing, respectively and 10.13/plant, 11.80/plant and 8.13/plant were recorded with Carbofuran 3 G (Check) applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing, respectively. Minimum population of white fly 8.13/ plant was observed when Carbofuran 3G (Check), applied the time of sowing + hoeing and maximum population 12.13/ plant with Emamectin benzoate 5 SG, applied at the time of hoeing at 20 DAS. At 40 DAS minimum population of white fly 8.46/ plant was observed when crop was treated with Carbofuran 3G (Check), applied the time of sowing + hoeing and maximum population 14.46/ plant with Emamectin benzoate 5 SG, applied at the time of hoeing. At 60 DAS decreasing trend was observed and reached its minimum population 5.20/ plant when crop was treated with Carbofuran 3G (Check), applied the time of sowing + hoeing and maximum population 9.60/plant was observed with Emamectin benzoate 5 SG applied at the time of hoeing. At 80 DAS decreasing trend was continuously observed and maximum population 2.32/plant was observed with Emamectin benzoate 5 SG applied at the time of hoeing and Carbofuran 3G (Check) treated crop was free from white fly infestation applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing

Effect of treatments on grain yield

Table 1 reveals that the whitefly (*Bemisia tabaci*) was observed as a serious pest of urdbean which by sucking the cell sap from under surface of leaves caused reduction in urdbean yield. Various formulations of granular insecticides used in the experiment were responded to manage the population of whitefly and resulted increase urdbean yield. Maximum (12.60 q/ha) yield was obtained in the plot treated with Carbofuran 3G (Check), applied the time of sowing + hoeing and was found significantly higher in comparison to other treatments followed by Phorate 10 G applied at the time of sowing + hoeing (11.32 q/ha). Table 1 reveals that all the treatments gave lower yield in comparison to control. Phorate 10 G treated plots yielded 10.67, 10.32 and 11.32q/ha applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing, respectively. 10.60, 10.30 and 11.20 q/ha. yield were obtained with plot treated with Emamectin benzoate 5 SG applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing and 11.05, 11.00 and 12.60 q/ ha yield were recorded in Carbofuran 3 G treated plots applied at the time of sowing, at the time of hoeing and at the time of sowing + hoeing. The least effective treatment was Phorate 10 G and Emamectin benzoate 5 SG applied at the time of hoeing (10.30 q/ha).

Economics of treatments

The economics of all the treatments were worked out in order to know the economic feasibility of treatment. To assess the profitability/losses of treatments, the economic yield over the check. Additional income (Rs./ ha) obtained on the investments of each rupee *i.e.* cost-loss ratio is depicted in table 2 reveal that the maximum net loss (Rs. 4300.00) was obtained in Emamectin benzoate 5 SG 8g a.i./ha treated plot applied at the time of sowing + hoeing followed by Phorate 10 G @ 1.5 kg a.i./ha treated plot applied at the time of sowing + hoeing (Rs. 3110.00). In Emamectin benzoate 5 SG applied at the time of hoeing, Phorate 10 G applied at the time of Hoeing, Emamectin benzoate 5 SG applied at the time of sowing and Phorate 10 G applied at the time of sowing plots Rs. 2150.00, Rs. 1825.00, Rs. 1025.00 and Rs. 385.00/ ha net loss were recorded, respectively. Highest cost loss ratio (1 : 2.15) was obtained from the plots treated with Emamectin benzoate 5 SG 8g a.i./ha applied at the time of sowing + hoeing and applied at the time of hoeing followed by Phorate 10 G applied at the time of Hoeing (1 : 1.37). The minimum cost loss ratio of (1:0.29) was recorded in the plots treated with Phorate 10 G @ 1.5kg.a.i./ha applied at the time of sowing.

Conclusion

Minimum population of white fly 8.13/plant were observed when crop was treated with Carbofuran 3G

Table 1 : Effect of Insecticides & method of applications on the population of white fly on Urdbean during *Kharif*, 2013.

S.no.	Treatment	Mean population/ plant/20days intervals				Yield q/ha
		20	40	60	80	
Phorate 10 G@ 1.5kg.a.i./ha						
1	At the time of sowing	11.80 (3.51)	12.0 (3.54)	6.20 (2.59)	1.20 (1.30)	10.67
2	At the time of hoeing	11.93 (3.53)	13.46 (3.74)	8.00 (2.92)	2.00 (1.58)	10.30
3	At the time of sowing + hoeing	10.46 (3.31)	11.26 (3.43)	7.40 (2.81)	0.00 (0.71)	11.32
Emamectin benzoate 5 SG 8g a.i./ha						
4	At the time of sowing	11.06 (3.40)	12.06 (3.54)	6.03 (2.56)	2.22 (1.65)	10.60
5	At the time of hoeing	12.13 (3.55)	14.46 (3.87)	9.60 (3.18)	2.32 (1.68)	10.30
6	At the time of sowing + hoeing	10.53 (3.32)	10.35 (3.29)	7.86 (2.89)	1.00 (1.22)	11.20
Carbofuran 3 G (Check) @ 1.5kg.a.i./ha						
7	At the time of sowing	10.13 (3.26)	10.15 (3.26)	5.85 (2.52)	0.00 (0.71)	11.05
8	At the time of hoeing	11.80 (3.51)	12.0 (3.54)	7.12 (2.76)	0.00 (0.71)	11.00
9	At the time of sowing + hoeing	8.13 (2.94)	8.46 (2.99)	5.20 (2.39)	0.00 (0.71)	12.60
SEm ±		**0.175**	**0.180**	**0.143**	**0.062**	
CD at 5 %		**0.526**	**0.541**	**0.430**	**0.186**	

Table 2 : Economics of granular insecticide for the control of whitefly during *Kharif*, 2013.

Treatment	Cast of treatment (Rs/ha)	Yield (q/ha)	Loss yield due to treatment (q/ha)	Loss due to treatment (Rs/ha)	Net loss (Rs/ha)	Cost : loss ratio
Phorate 10 G@1.5kg.a.i./ha						
At the time of sowing	1325	10.67	0.38	1710	385	1:0.29
At the time of hoeing	1325	10.30	0.70	3150	1825	1:1.37
At the time of sowing + hoeing	2650	11.32	1.28	5760	3110	1:1.17
Emamectin benzoate 5 SG 8g a.i./ha						
At the time of sowing	1000	10.60	0.45	2025	1025	1:1.02
At the time of hoeing	1000	10.30	0.70	3150	2150	1:2.15
At the time of sowing + hoeing	2000	11.20	1.40	6300	4300	1:2.15
Carbofuran 3 G (Check) @1.5kg.a.i./ha						
At the time of sowing	4850	11.05	-	-	-	-
At the time of hoeing	4850	11.00	-	-	-	-
At the time of sowing + hoeing	9700	12.60	-	-	-	-

(Check) at 20DAS and later stages. The effect of insecticides x application of methods was very clear at 20DAS and later stages upto 80 DAS when pest infestation was significantly lower in plots treated with Carbofuran 3G applied at the time of sowing + hoeing. Maximum (12.60 q/ha) yield was obtained in the plot treated with Carbofuran 3G (Check), applied a the time of sowing + hoeing and was found significantly higher in comparison to other treatments. Highest cost loss ratio (1 : 2.15) was obtained from the plots treated with Emamectin benzoate 5 SG 8g a.i./ha applied at the time of sowing + hoeing and applied at the time of hoeing.

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