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Research Article

EFFICACY OF DIFFERENT INSECTICIDES AGAINST *Helicoverpa armigera* (HUBNER) IN WHEAT

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Abstract- A field experiment was carried out to evaluate eleven insecticides against *Helicoverpa armigera* on wheat. The results on the relative efficacy of different treatments against *Helicoverpa armigera* after two sprays showed that all the treatments were significantly superior over untreated control. Minimum *H. armigera* larval population was recorded in the treatment with spinosad 73g a.i./ha (0.02 larva/ ear head), however, it was at par with bifenthrin 80g a.i./ha (0.06 larva/ ear head) and flubendiamide 50g a.i./ha (0.10 larva/ ear head).

Keywords- *Helicoverpa armigera*, insecticides, wheat.

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Introduction

Wheat *(Triticum aestivum* L.) is the world most widely cultivated food crop. It is eaten in various forms by more than 1000 million human beings in the world. In India wheat is second important staple food crop. Wheat is rich source of carbohydrates, dietary fibers, fat, protein and manganese, it also contains minerals like calcium, iron, magnesium, phosphorous, potassium and zinc. Wheat crop has wide adaptability. It can be grown not only in the tropical and sub-tropical zones but also in the temperate zone and the old tracts of the far north. *Helicoverpa armigera* (Hubner) is considered as most destructive and polyphagous insect that attacks various legumes as a pod border [3]. It is seen damaging wheat ear heads at grain development stage when major hosts are not available. However, the damage is below economic threshold level. It is found mostly in northern and central parts of India. Wheat can serve as a bridge host for carryover of this polyphagous pest. In crops where the grain is mature and drying down, larvae tend to graze on the grains and in crops where the grain is still filling or milky-soft, larvae have the potential to burrow into the grain and consume most it. Thus, attempts were made in the present investigation to study the efficacy of certain insecticides and bio-pesticides against *H. armigera*.

Materials and Methods

Field experiment was conducted at Agronomy Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar. The wheat variety, GW-496 was sown in randomized block design during *Rabi* 2011. Eleven treatments *viz.,* Profenofos 0.05 %, Endosulfan 0.07%, Bifenthrin 80g a.i./ha, Spinosad 73g a.i./ha, Flubendamide 50g a.i./ha, Methomyl 0.05 %, Lamda cyhalothrin 15g a.i./ha, NSKE 5 %, Neem Oil 1500 ppm 0. 50 %, *B. bassiana* 1x10^8 cfu/gm, NPV 450 LE per ha were applied twice. The first application of insecticidal treatment was made at infestation occurs in field. The second spray was given at fifteen days interval after first spray. The treatment fluid was sprayed with the help of knapsack sprayer provided with hollow cone nozzle. The observations were recorded on five randomly selected spikes from net plot before application of insecticides and 3 and 7 days after sprayings. Numbers of ear head worm per spike were recorded in each treatment. The data, obtained were subjected to statistical analysis for drawing meaningful conclusion.

Results and Discussion

Field experiment was conducted to study the efficacy of various insecticides, botanicals and bio-pesticides for the management of ear head worm in wheat crop during *Rabi*, 2011. Results obtained on efficacy of different treatments are presented in [Table-1].

Larval population

First spray

Looking to the data on larval population after three days of first spray, all the treatments had significantly lower over untreated control (0.27 larva/ear head) except NPV 450 LE (0.21 larva/ ear head). The lowest larval population (0.02 larva/ ear head) was found in the treatment of spinosad 73g a.i. /ha which was statistically at par with bifenthrin 80g a.i./ha (0.06 larva/ ear head). However, the second effective group of insecticides were flubendiamide 50g a.i. /ha (0.10 larva/ ear head), methomyl 0.05 per cent (0.11 larva/ ear head) and lamda cyhalothrin 15g a.i./ha (0.11 larva/ ear head) and all remained at par with each other in efficacy. Both the botanicals i.e. NSKE 5 per cent (0.14 larva/ ear head) and Neem oil 1500 ppm 0.50 per cent (0.14 larva/ ear head) as well as bio-pesticide *B. bassiana* 1 x 10^8 cfu/gm (0.14 larva/ ear head) also found as effective as chemical pesticides *viz*., flubendiamide 50g a.i./ha, methomyl 0.05 per cent, lamda cyhalothrin 15g a.i./ha, profenofos 0.05 per cent and endosulfan 0.07 per cent. The chronological order of superiority of various treatments based on the number of larvae per plant was spinosad 73g a.i./ha> bifenthrin 80 g a.i./ha > flubendiamide 50g a.i./ha> methomyl 0.05 per cent = lamda cyhalothrin 15g a.i./ha > profenofos 0.05 per cent = NSKE 5 per cent = Neem oil 1500 ppm 0.50 per cent = *B. bassiana* 1 x 10^8 cfu/gm > endosulfan 0.07 per cent > NPV 450 LE > control. After seven days of application, all the treatments were significantly superior over untreated control (0.35 larva/ ear head). The lowest larval population was found in the treatment of spinosad 73g a.i. /ha (0.02 larva/ ear head) which was statistically at par with bifenthrin 80g a.i./ha (0.05 larva/ ear head), flubendiamide 50g a.i./ha

(0.06 larva/ ear head) and methomyl 0.05 per cent (0.06 larva/plant). The other next better group of treatments were lamda cyhalothrin 15g a.i./ha (0.10 larva/ ear head), profenofos 0.05 per cent (0.11 larva/ ear head), endosulfan 0.07 per cent (0.11 larva/ ear head) and *B. bassiana* 1 x 10^8 cfu/gm (0.11 larva/ ear head) and all remained at par with each other. NSKE 5 per cent (0.16 larva/ ear head) and Neem oil 1500 ppm 0.50 per cent (0.16 larva/ ear head) both the botanicals exhibited statistically similar efficacy as synthetic pesticides and bio-pesticides *viz*., lamda cyhalothrin 15g a.i./ha, profenofos 0.05 per cent, endosulfan 0.07 per cent and *B. bassiana* 1 x 10^8 cfu/gm. [4] Flubendiamide 0.007 per cent, indoxacarb 0.0075 per cent, spinosad 0.009 per cent and emamectin benzoate 0.0015 per cent were found the most effective in reducing the *H. armigera* population and pod damage of chickpea. The chronological order of superiority of various treatments based on the number of larvae per plant was spinosad 73g a.i./ha > bifenthrin 80g a.i./ha > flubendiamide 50g a.i./ha = methomyl 0.05 per cent > lamda cyhalothrin 15g a.i./ha > profenofos 0.05 per cent = endosulfan 0.07 per cent = *B. bassiana* 1 x 10^8 cfu/gm > NSKE 5 per cent = Neem oil 1500 ppm 0.50 per cent > NPV 450 LE > control.

Table-1 *Efficacy of different insecticides against H. armigera in wheat*

Sr. No.	Treatments	Before spray	Mean larval population / ear head			
			Days after spray			
			1st spray		2nd spray	
			3	7	3	7
1	Untreated	0.84 (0.21)*	0.88 (0.27)	0.92 (0.35)	0.90 (0.31)	0.91 (0.33)
2	Profenofos 0.05 %	0.81 (0.16)	0.80 (0.14)	0.78 (0.11)	0.80 (0.14)	0.80 (0.14)
3	Endosulfan 0.07%	0.81 (0.16)	0.81 (0.16)	0.78 (0.11)	0.80 (0.14)	0.80 (0.14)
4	Bifenthrin 80g a.i./ha	0.81 (0.16)	0.75 (0.06)	0.74 (0.05)	0.75 (0.06)	0.74 (0.05)
5	Spinosad 73g a.i./ha	0.82 (0.17)	0.72 (0.02)	0.72 (0.02)	0.74 (0.05)	0.72 (0.02)
6	Flubendamide 50g a.i./ha	0.81 (0.16)	0.77 (0.10)	0.75 (0.06)	0.75 (0.06)	0.75 (0.06)
7	Methomyl 0.05 %	0.82 (0.17)	0.78 (0.11)	0.75 (0.06)	0.77 (0.09)	0.77 (0.09)
8	Lamda cyhalothrin 15g a.i./ha	0.80 (0.14)	0.78 (0.11)	0.77 (0.10)	0.80 (0.14)	0.77 (0.09)
9	NSKE 5 %	0.78 (0.11)	0.80 (0.14)	0.81 (0.16)	0.80 (0.14)	0.80 (0.14)
10	Neem Oil 1500 ppm 0. 50 %	0.81 (0.16)	0.80 (0.14)	0.81 (0.16)	0.82 (0.17)	0.82 (0.17)
11	*B. bassiana* 1x10^8 cfu/gm	0.81 (0.16)	0.80 (0.14)	0.78 (0.11)	0.78 (0.11)	0.77 (0.09)
12	NPV 450 LE	0.81 (0.16)	0.84 (0.21)	0.82 (0.17)	0.82 (0.17)	0.82 (0.17)
S.Em.±		0.02	0.01	0.01	0.01	0.01
C.D. at 5%		NS	0.04	0.04	0.04	0.04
C.V. %		3.24	2.78	3.13	2.68	3.12

*Figures in parentheses are retransformed values, while outside are $\sqrt{x+0.5}$ transformed value

Second spray

Looking to the data on larval population after three days of second spray, all the treatments were significantly superior over untreated control (0.31 larva/ ear head). The least larval population (0.05 larva/ ear head) was found in the treatment of spinosad 73g a.i. /ha which was statistically at par with bifenthrin 80g a.i. /ha (0.06 larva/ ear head), flubendiamide 50g a.i./ha (0.06 larva/ ear head), methomyl 0.05 per cent (0.09 larva/ ear head) and *B. bassiana* 1 x 10^8 cfu/gm (0.11 larva/ ear head). The next better group of treatments were profenofos 0.05 per cent (0.14 larva/ ear head), endosulfan 0.07 per cent (0.14 larva/ ear head), lamda cyhalothrin 15g a.i./ha (0.14 larva/ ear head) and NSKE 5 per cent (0.14 larva/ ear head), which remained statistically at par with each other. Neem oil 1500 ppm 0.50 per cent (0.17 larva/ ear head) and NPV 450 LE (0.17 larva/ ear head) exhibited similar efficacy as synthetic pesticides *viz*., profenofos 0.05 per cent, endosulfan 0.07 per cent, lamda cyhalothrin 15g a.i./ha as well as non chemicals *i.e.* NSKE 5 per cent and *B. bassiana* 1 x 10^8 cfu/gm. The chronological order of superiority of various treatments based on the number of larvae per plant was spinosad 73g a.i./ha > bifenthrin 80g a.i./ha = flubendiamide 50g a.i./ha > methomyl 0.05 per cent > *B. bassiana* 1 x 10^8 cfu/gm > profenofos 0.05 per cent = endosulfan 0.07 per cent = lamda cyhalothrin 15g a.i./ha = NSKE 5 per cent > Neem oil 1500 ppm 0.50 per cent = NPV 450 LE > control. After seven days of second application, all the treatments were significantly superior over untreated control (0.33 larva/ ear head). The lowest larval population was found in the treatment of spinosad 73g a.i./ha (0.02 larva/ ear head) which was statistically at par with bifenthrin 80g a.i./ha (0.05 larva/ ear head) and flubendiamide 50g a.i./ha (0.06 larva/ ear head). The second effective group of treatments was methomyl 0.05 per cent (0.09 larva/ ear head), lamda cyhalothrin 15g a.i./ha per cent (0.09 larva/ ear head) and *B. bassiana* 1 x 10^8 cfu/gm (0.09 larva/ ear head) and all the treatments remained at par with each other. Neem oil 1500 ppm 0.50 per cent (0.17 larva/ ear head) and NPV 450 LE (0.17 larva/ ear head) exhibited comparatively less efficacy but at par with profenofos 0.05 per cent (0.14 larva/ ear head), endosulfan 0.07 per cent (0.14 larva/ ear head), and NSKE 5 per cent (0.14 larva/ ear head). The chronological order of superiority of various treatments based on the number of larvae per plant was spinosad 73g a.i./ha > bifenthrin 80g a.i./ha > flubendiamide 50g a.i./ha > methomyl 0.05 per cent = lamda cyhalothrin 15g a.i./ha = *B. bassiana* 1 x 10^8 cfu/gm > profenofos 0.05 per cent = endosulfan 0.07 per cent = NSKE 5 per cent > Neem oil 1500 ppm 0.50 per cent = NPV 450 LE > control. Spinosad (0.009 %) and indoxacarb (0.0075 %) were found most effective in reducing the damage of *Helicoverpa* in pigeon pea [1]. HaNPV and botanical pesticide (Neem seed kernal extract) were tested against *H. armigera* and found significantly superior over other insecticides [2].

Conclusion

The treatment of spinosad 73g a.i./ha was found to be the most effective followed by bifenthrin 80g a.i./ha and flubendiamide 50g a.i./ha against *H. armigera* which would help the farmers in managing this pest.

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