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Original Research Article

Population Dynamics and Management against Budfly *Dasyneura lini* Barnes in Linseed (*Linum usitatissimum* Linn.)

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A B S T R A C T

The population dynamics of budfly *Dasyneura lini* was experimented during rabi season 2012-13 at the Student's Instructional Farm of Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.). The incidence of budfly was recorded on variety Neelum at weekly intervals from germination till the harvest of the crop. There were eight treatments, namely Imidacloprid 17.8 SL @ 0.005%, Nimbicidine 0.25%, NSKE 5%, Neem leaf extract 5%, Green chilli extract 0.5%, Garlic extract 5%, Tulsi leaf extract 5% and Control. While application of Imidacloprid (17.8 SL @ 0.005 %) was found most effective followed by Nimbicidine @ 0.25 %, NSKE @ 5 % was found as the least effective in controlling of bud fly infestation. On the basis of yield, the highest yield was obtained from Imidacloprid 17.8 SL @ 0.005 % (16.22 q ha^{-1}) followed by (14.29 q/ha^{-1}) with Nimbicidine @ 0.25 %. On the basis of overall performance of all the eight treatments Imidacloprid was isolated as the most effective treatment for the control of the linseed budfly.

Keywords

Linseed budfly, population dynamics, Imidacloprid

Introduction

Linseed, (*Linum usitatissimum* Linn.) is one of the oldest oilseed crop known as poor man's crop in India. It has got special importance amongst oilseed crop in rabi and has also been called as 'Alsi', 'Tisi', 'Mosina' and 'Arise' in India. Among all the insect of linseed, budfly is the most important insect and it affect the pods of linseed very drastically leads to reduce the crop yield. The crop is cultivated commercially for flax in the world. In India, Linseed is globally cultivated for oil production, fibers and flax. Fibres are used for the manufacture of linen and the stem yields fibres of good quality having high strength and beauty. It is utilized in making the best quality hand kerchiefs, materials of suits and dresses, bedding, napery, hand towels and other decorative articles (Gill, 1987). Every part of the linseed is utilized commercially either directly or after processing. About 80 per cent of the oil goes

to industries in various forms, major portion of linseed is used as oil industries and a very small amount is used for edible purposes. The oil cake is a good feed for milch cattle and poultries and hence priced 5% higher than rapeseed-mustard cake. It is good in taste and contains 36 per cent protein, 85 per cent of which is digestible, it is also used as organic manure. It contains about 5 percent nitrogen, 1.4 percent phosphorus and 1.8 per cent potash.

Among the oilseed crop raised during rabi, linseed is next in importance to rapeseed-mustard in areas as well as in production in technical oil production, it ranks first in the country. The oil being rich in linoleic acid (66% & above) and is a perfect drying oil. The oil content of linseed generally varies from 33 to 45 per cent. The total area, production and productivity under linseed in India is 2.628 lakh ha, 1.25 lakh tonnes, 477 kg/ha productivity, respectively (Anonymous, 2015). In Uttar Pradesh, the area under linseed is about 0.23 lakh ha and production was about 0.11 lakh tonnes with the highest productivity level of 475 kg/ha. (Anonymous, 2015). Linseed budfly is one of the most serious pests of linseed crop which occurs regularly as most destructive specific pest, not only on floral buds but also on leaf at the growing tips of the young plants. The extent of damage has been noticed from 13.6 to 75.8 per cent on flower buds (Deshmukh *et al.,* 1992, Jakhmola and Yadav, 1983, Sharma *et al.*, 1983).

Insect-pest may affect the crop plants in various way and the information about infestation of insect during the life cycle and its appropriate dynamics helps in making suitable pest management strategies. Therefore, present study on population dynamics of linseed budfly was undertaken with the main object to identify the suitable insecticide against budfly.

Materials and Methods

The experiment was conducted during rabi 2012-13, at the Research Farm of Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.). Climatic and edaphic conditions prevailing during the crop period have also been described at appropriate place.

The trial was laid out in Randimized Block Design (RBD) with three replications. Cultivar Neelum was sown in a plot of $3x4.5m^2$. The treatments were applied on the basis of ETL of budfly (7% bud infestation). The required amount of insecticide was calculated by using the formula as follows:

$$\text{Amount of insecticide required (kg)} = \frac{\text{Desired strenght of spray solution (\%) x Volume of spray solution}}{\text{\% strength of formulation}}$$

$$\text{Litres of commercial formulation} = \frac{\text{Amount of spray required x \% spray concentration}}{\text{\% active ingredient in the available insecticide}}$$

The volume of spray solution was diluted by mixing water @ 400 litre ha^{-1}. All treatments were sprayed with the help of high volume Knapsack sprayer.

The care was taken to avoid insecticidal drift from one plot to another plot by surrounding the plots with polythene sheets during spraying. Budfly population was recorded starting from initiation of flowering and treatments were applied at ETL. Data were recorded at one day before and three and seven days after treatments.

$$\text{Bud infestation (\%)} = \frac{\text{No. of infested buds}}{\text{Total no. of buds}} \text{x100}$$

Observations on per cent infestation were determined by counting the number of infested buds and total number of buds on ten randomly selected plants/plot in each treatment. The details of treatment have been presented in Table.1

Results and Discussion

The incidence of budfly was recorded as bud damage from second week of January and continued till last week of March during the year 2012-13 in variety Neelum. The bud damage varied from 0.51 per cent to 10.10 per cent. The maximum per cent damage was recorded in third week of March in variety Neelum.

Efficacy of chemicals and plant origin insecticides against linseed budfly infestation

The population was homogeneous in the experimental plots at the time of application of insecticides on the crop three days after the spraying, all the treatments were found significantly superior over control (Table 2). Imidacloprid 17.8 SL @ 0.005% performed better among the treatments, which was at par with Nimbicidine @ 0.25 followed by NSKE @5%, Green chilli extract @ 0.5%, Neem leaf extract @ 5%, Tulsi leaf extract @ 5% and Garlic extract @ 5% with 3.530, 4.350, 5.080, 6.050, 6.060, 7.149 and 7.351 mean per cent bud damage, respectively. Imidacloprid and Nimbicidine were found significantly superior over other treatments and were found significantly superior over control.

Application of Imidacloprid 17.8 SL @ 0.005% maintained superiority over rest of the treatments with mean population per cent of budfly infestation of 2.291 and at par with Nimbicidine @ 0.25%, rank second with mean per cent infestation of budfly (5.020) followed by Neem seed kernel extract @ 5% with mean infestation of budfly (5.078). The efficacy of different treatments followed the order Imidacloprid @ 0.005% > Nimbicidine @ 0.25% > NSKE @ 5% > Green chilli extract @ 0.5% > Neem leaf extract @ 5% > Tulsi leaf extract @ 5% > Garlic extract @ 5% during rabi 2012-13. The volume of spray solution was diluted by mixing water @ 400 litre ha^{-1}. All treatments were sprayed with the help of high volume Knapsack sprayer. The care was taken to avoid insecticidal drift from one plot to another plot by surrounding the plots with polythene sheets during spraying. Imidacloprid and Nimbicidine were found significantly superior over other treatments and were found significantly superior over control. Malik, (2000) and Kumar, (2005) reported that the activity of bud fly was initiated in middle of February with its peak activity during 5^{th} to 12^{th} standard week. The incidence of *Dasyneura lini* Barnes was positively correlated with minimum and maximum temperature (0.110 and 0.490), respectively and negatively correlated with relative humidity (-0.590), rainfall (-0.319) and sunshine hours (-0.363). The infestation of budfly in different treatments was significantly lower as compared to control. Application of Imidacloprid 17.8 SL @ 0.005 % resulted in minimum incidence of bud fly (3.53, 2.29) during 2012-13 on 3^{rd} and 7^{th} day after treatment followed by Nimbicidine @ 0.25 %, NSKE @ 5 %. Similar observations were also reported by different coordinating centers of linseed (Anonymous, 2011). Lower infestation of linseed bud fly with application of Imidacloprid 17.8 SL @ 0.005 % was mainly due to effective control of bud fly as compared to rest of treatments. Datkhile (1992) tested the efficacy of insecticides along with the NSKE 5 % and Nimbicidine 0.25 % and found better performance by Imidacloprid followed by NSKE, Nimbicidine for the control of budfly. Ali *et al.,* (2002) studied the bio-efficacy of Neem products against linseed bud fly and found the neem seed kernel extract and Nimbicidine gave better results for the control of bud fly than other botanical insecticides.

Table.1 Details of treatments used for the management of linseed budfly during rabi season 2012-13

S. No	Treatments	Formulation	Concentration	Source of availability
1.	T_1	Imidacloprid 17.8 SL	0.005%	Excel crop care Ltd. Registered office: 184/87, Swami Vivekananad Road, Jogeshwari (West), Mumbai – 400 102, (Maharashtra), India
2.	T_2	Nimbicidine	0.25%	M/s T Strains & Co. Ltd. 8/23-24, Race Course Road, Coimbatore, (Tamil Nadu) – 641 018
3.	T_3	NSKE	5%	Prepared in laboratory
4.	T_4	Neem leaf extract	5%	Prepared in laboratory
5.	T_5	Green chilli extract	0.5%	Prepared in laboratory
6.	T_6	Garlic extract	5%	Prepared in laboratory
7.	T_7	Tulsi leaf extract	5%	Prepared in laboratory
8.	T_8	Control		

Table.2 Efficacy of chemicals and plant origin insecticides against linseed budfly infestation during rabi season 2012-13

Treatments	Linseed budfly infested buds (%)			
	Conc. (%)	Before treatment	After treatments	
			3rd day	7th day
Imidacloprid 17.8 SL	0.005	7.122 (2.761)	3.530 (2.007)	2.291 (1.676)
Nimbicidine	0.25	7.376 (2.800)	4.350 (2.202)	5.020 ()2.349
NSKE	5.0	7.400 (2.812)	5.080 (2.362)	5.078 (2.361)
Neem leaf extract	5.0	7.240 (2.787)	6.060 (2.561)	6.590 (2.662)
Green chilli extract	0.5	7.050 (2.754)	6.050 (2.559)	6.900 (2.720)
Garlic extract	5.0	7.230 (2.780)	7.351 (2.800)	7.401 (2.810)
Tulsi leaf extract	5.0	7.101 (2.750)	7.149 (2.760)	7.240 (2.780)
Control		7.200 (2.777)	9.421 (3.151)	13.200 (3.701)
SEm±		0.22	0.26	0.26
CD at 5%		0.66	0.79	0.89

Values within parenthesis are square root transformation $\left(\sqrt{x+0.5}\right)$

Application of Imidacloprid 17.8 SL @ 0.005 % produced significantly higher grain yield of linseed (16.22 q ha^{-1}), it was due to effective control of bud fly. Gupta *et al.,* (2004) studied the efficacy of Neem products three consecutive rabi season. Neem leaf extract (in cow urine), NSKE (in cow urine) and neem oil found that the incidence of budfly decreased and grain yield increased. The incidence of budfly was lowest in Neem oil (1 %) followed by NSKE (5 %), Neem oil (0.25 %) and NSKE (2 %) with increased grain yield. admixture of Neem oil (0.25 %), NSKE (5 %) further reduced the incidence and increased the yield.

On the basis of benefit, cost ratio Imidacloprid 17.8 SL @ 0.005 % was found most economical as it gave maximum net return (12664 Rs. ha^{-1}) and maximum benefit, cost ratio (1:15.83) followed by Nimbicidine @ 0.25 % with net return of (6625 Rs. ha^{-1}) and benefit, cost ratio of 1:14.09, respectively. Imidacloprid 17.8 SL @ 0.005 % was found as the best insecticide for controlling linseed bud fly with maximum yield (16.22 q ha^{-1}) and therefore, it can be recommended against linseed budfly as it was found more effective in the present experiment. The information generated in the present study would be helpful in developing superior pest management strategies against insect pest of linseed crop for enhanced production efficiency.

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