



## Efficacy of neem-based formulations against bud fly *Dasyneura lini* Barnes on inseed *Linum usitatissimum* L

A. K. Gupta and S. S. Rao

### ABSTRACT

An experiment was conducted during 2007-2008 and 2009-2010 to evaluate the efficacy of neem-based formulation against linseed bud fly, *Dasyneura lini* Barnes for three consecutive *rabi* seasons. Bud fly incidence was found low in Neem Seed Kernel Extract (NSKE) @ 5% than by Neem Seed Extract (NSE) @ 5%. Mean grain yield was high in NSKE@ 5% treated crop with (1287.20 kg/ha) than NSE@ 5% (1271.74 kg/ha). The higher seed yield in treated plots might have been obtained due to reduced incidence of the pest. Maximum net profit was gained from the plot treated with NSKE @ 5% (Rs. 9150.33) followed by NSE @ 5% (Rs. 8763.75) and Nimbolin @ 0.5% (Rs. 6690.25). Similarly, Incremental Cost Benefit Ratio (ICBR) earned highest with NSKE @ 5% (16.34) closely followed by NSE@ 5% (15.65) and Nimbolin @ 0.5% (13.94).

**Key words:** Linseed bud fly, *Dasyneura lini* Barnes, neem-based formulations.

### INTRODUCTION

Linseed, *Linum usitatissimum* Linn is one of the most important industrial oilseed crops of India. In India, linseed is cultivated in about 4.26 lakh hectares with a total linseed production of 1.67 lakh tonnes and 392 kg/ha productivity. Chhattisgarh is one of the important linseed growing states of India, which accounts for nearly 19.05 per cent area and 16.21 per cent production of the country. In Chhattisgarh, linseed is cultivated over 70 thousand hectare area with a production of 16.19 thousand tonnes and productivity of 231.31 kg/ha. Maximum area of this crop is grown as 'utera' during *rabi* season. The important linseed growing districts of Chhattisgarh are Rajnandgaon, Durg, Bilaspur, Kabirdham, Raipur, Dhamtari, Surguja, Kanker and Raigarh (Chhattisgarh Sandharb, 2007). Linseed crop is attacked by a number of insect pests at various phases of its growth. Linseed bud fly *Dasyneura lini* Barnes with 88 per cent grain yield losses, is a key pest of this crop (Mukherji *et al.*, 1999; Malik *et al.*, 2000).

Chemical insecticides have been recommended for the effective control of bud fly incidence in linseed. However, there are serious residual problems and ecological consequences of the insecticides. The need to phase out the use of chemical pesticides is now being felt and the use of plant products of plant protection are catching momentum of late. Plant products derived from neem *Azadirachta indica* A. Juss. contain biologically active components that may act as toxicant, repellent, antifeedant and growth disrupting

substance on insect pests and are not only ecologically safe but also free from residual problems (Kaul *et al.* 1990 and Gujar, 1992). All the parts of neem like seed, seed coat, kernel and leaf can be used to produce high quality product. Product derived from neem tree also act as powerful Insect Growth Regulator (IGR) (Subbalakshmi *et al.*, 2012). Keeping these facts in view, studies on the efficacy of neem products against the bud fly in linseed crop were undertaken.

### MATERIALS AND METHODS

The trial was laid out in Randomized Complete Block Design (RBD) with three replications for three consecutive *rabi* seasons beginning 2007-2008 to 2009-2010. Plot size was kept 5x4 m<sup>2</sup> and distance from row to row and plant to plant were maintained at 30 cm and 8-10 cm, respectively. Linseed variety 'Neelum' was sown in November during each season. There were ten treatments, viz., Neem Leaf Extract (NLE) 2% and 5%, Neem Seed Kernel Extract (NSKE) 2% and 5%, Neem Seed Extract (NSE) 2% and 5%, Neem Seed Coat Extract (NSCE) 2% and 5%, commercial neem product (Nimbolin@ 0.5%) and untreated control. Neem leaf extract was prepared by chopping 2 kg neem leaves soaked in 5 L water for 24 hrs. Thereafter, the leaves were pressed between the palms and remains were thrown out. The extract was filtered and the volume made up to 5 L. Similarly, dry neem seeds, kernels and coats were crushed individually into powder and then 100 g of each powder was soaked in 5 liter water. The extract was filtered and volume was made up to 5 L as usual. The

treatments were applied twice first at bud initiation stage and second after 15 days of first spray.

Incidence of bud fly was recorded 24 hrs before and after 2, 7 and 15 days of each spray. Per cent bud infestation was recorded on 10 plants selected at random from each plot before the harvest. Bud fly infestation was recorded as per the standard method of AICORP on linseed (Anonymous, 2006). The data on per cent bud infestation recorded were transformed to arc sine. Net plot yield was recorded at harvest which was converted to kg per hectare. The data on bud fly infestation and yield was subjected to statistical analysis for critical differences. Economics of different treatments were also worked out.

## RESULTS AND DISCUSSION

### Incidence of bud fly

All the neem plant product formulations including the commercial product significantly reduced the per cent incidence of bud fly during all three seasons of testing (Table 1). Based on three years of study, bud fly infestation ranged from 14.78 to 26.20 per cent in different neem based formulations as against 33.79 per cent bud damage in untreated control. NSKE when applied at the rate of five per

cent at bud initiation stage was most effective against the bud fly with minimum 14.78 per cent bud damage. It was at par with NSE @ 5 per cent with 15.81 per cent bud damage, but differed significantly from the rest of the treatments. Next best treatment in order to reduce bud damage was NSKE @ 2 per cent with 19.83 per cent bud damage followed by NSE @ 2 per cent, NSCE @ 5 per cent, Nimbolin @ 0.5 per cent and NLE @ 5 per cent with 19.87, 21.76, 21.50 and 22.21 per cent bud damage, respectively. NLE @ 2 per cent with significantly highest bud damage of 26.20 per cent was least effective against bud fly among neem based formulations as against 33.79 per cent bud damage in untreated control.

### Grain Yield and Net Profit

The data (Table 1) on grain yield indicated that NSKE when applied at a concentration of 5 per cent was most effective against bud fly with highest grain yield of 1287.20 kg/ha. It was significantly followed by NSE @ 5 per cent with grain yield of 1271.74 kg/ha. The latter was at par with Nimbolin @ 0.5 per cent (1185.60 kg/ha) but differed significantly from NSKE @ 2 per cent, NSCE @ 5 per cent and NSE @ 2 per cent with grain yield of 1166.19, 1153.59 and 1134.45 kg/ha, respectively. NLE @ 2 per cent with 991.56 kg/ha grain yield was least effective against bud fly and at par with NLE @ 5

**Table 1.** Effect of neem based formulations on incidence of bud fly *Dasyneura lini* on linseed (*Linum usitatissimum*)

Name of Treatment	Bud fly infestation (%)			Mean bud damage (%)	Mean grain yield (Kg/ha)
	2007-08	2008-09	2009-10		
Neem Leaf Extract (NLE) @ 2%	28.87	25.99	23.76	26.2 <sup>c</sup>	991.56 <sup>ef</sup>
Neem Leaf Extract (NLE) @ 5%	26.53	18.23	21.87	22.21 <sup>b</sup>	1045.11 <sup>e</sup>
Neem Seed Kernel Extract (NSKE) @ 2%	26.03	16.25	17.23	19.83 <sup>b</sup>	1166.19 <sup>c</sup>
Neem Seed Kernel Extract (NSKE) @ 5%	15.30	14.15	14.90	14.78 <sup>a</sup>	1287.20 <sup>a</sup>
Neem Seed Extract (NSE) @ 2%	21.82	19.00	18.80	19.87 <sup>b</sup>	1134.45 <sup>c</sup>
Neem Seed Extract (NSE) @ 5 %	15.44	16.71	15.28	15.81 <sup>a</sup>	1271.74 <sup>ab</sup>
Neem Seed Coat Extract (NSCE) @ 2%	22.37	24.83	21.69	22.96 <sup>b</sup>	1066.31 <sup>de</sup>
Neem Seed Coat Extract (NSCE) @ 5%	25.67	21.57	18.04	21.76 <sup>b</sup>	1153.59 <sup>cd</sup>
Nimbolin @ 0.5%	32.62	16.36	15.52	21.50 <sup>b</sup>	1185.60 <sup>bc</sup>
Control	40.37	30.69	30.32	33.79 <sup>d</sup>	898.79 <sup>f</sup>
SE m±	1.42	0.63	0.68	0.91	46.69
C.D.(5%)	4.24	1.9	2.02	2.72	94.03

Values in parenthesis are transformed value

**Table 2.** Effect of neem based formulations on grain yield and net returns (2007-08 to 2009-10) in linseed

Name of Treatment	Yield kg/ha			Mean yield (kg/ha)	Additional yield	profit over control	Additional cost	Net profit	ICBR
	2007-08	2008-09	2009-10						
Neem leaf extract 2%	999.80	964.30	1010.57	991.56	92.77	2319.25	480	1839.25	<b>3.83</b>
Neem leaf extract 5%	1027.04	1056.50	1051.42	1045.11	146.20	3655.00	560	3095.00	<b>5.53</b>
Neem seed kernel extract (NSKE) @ 2%	1030.7	1165.98	1301.9	1166.19	267.41	6685.17	480	6205.17	<b>12.93</b>
Neem seed kernel extract (NSKE) @ 5%	1163.59	1247.73	1450.28	1287.20	388.41	9710.33	560	9150.33	<b>16.34</b>
Neem seed extract (NSE) @ 2%	1118.42	1117.31	1167.61	1134.45	235.66	5891.50	480	5411.50	<b>11.27</b>
Neem seed extract (NSE) @ 5 %	1162.27	1236.28	1416.66	1271.74	372.95	9323.75	560	8763.75	<b>15.65</b>
Neem seed coat extract (NSCE) @ 2%	1111.11	1026.49	1061.33	1066.31	167.52	4188.08	480	3708.08	<b>7.73</b>
Neem seed coat extract (NSCE) @5%	1154.96	1115.29	1190.52	1153.59	254.80	6370.08	560	5810.08	<b>10.38</b>
Nimbolin @ 0.5%	968.56	1175.86	1412.37	1185.60	286.81	7170.25	480	6690.25	<b>13.94</b>
Control	910.08	862.47	923.81	898.79					
<b>SE m±</b>	<b>31.6</b>	<b>41.07</b>	<b>67.16</b>	<b>46.69</b>					
<b>C.D.(5%)</b>	<b>93.89</b>	<b>88.70</b>	<b>99.5</b>	<b>94.03</b>					

per cent and untreated control with 1045.11 and 898.79 kg/ha grain yield respectively.

Table 2 revealed that NSKE @ 5 per cent with maximum net profit of Rs. 9150.33 was most economical against bud fly. It was followed by NSE @ 5%, Nimbolin @ 0.5 per cent and NSKE @ 2 % with the net profit of Rs. 8763.75, 6690.25 and 6205.17 respectively. NLE @ 2 per cent with minimum net profit of Rs. 1839.25 was least economical against bud fly. Incremental cost benefit ratio was the highest with NSKE@ 5 per cent closely followed by NSE @ 5 per cent and Nimbolin @ 0.5 per cent.

Prasad and Prasad (2003) recorded minimum 6.48 per cent bud damage by linseed bud fly and 1.96 per cent damage by capsule borer and maximum seed yield of 1288.06 Kg/ha and net monetary return of Rs. 9467/ha at Ranchi when crop was treated with sprays of NSKE 5 per cent at ten days interval. In the present studies, NSKE @ 5 per cent when applied at bud initiation stage was most effective against the bud fly with minimum of bud damage, highest grain yield and maximum net profit. Similar finding was reported by Humayun (2008) that NSKE @ 5 per cent when applied twice at 15 days interval starting with bud initiation stage was most effective against linseed bud fly with the lowest bud damage of 14.15 per cent and the highest grain yield of 1309.325 kg/ha and maximum net profit of Rs. 11106.6. Ali (2002) also reported NSKE better than other botanical insecticides against linseed bud fly at Faizabad. On the other hand, Prasad (2003) recorded the lowest bud infestation of 14.6 per cent with Achook @ 1.0 per cent at Ranchi when sprayed twice at fifteen days interval starting with bud initiation stage. The next best treatment was NSKE@ 5 per cent. He further reported that neem based insecticides were significantly superior in reducing the incidence of *D. lini* and enhancing the seed yield.

On the contrary, Mamta (2007) reported that commercial neem product (Ozoneem @ 0.5%) when applied twice at 15 days interval starting with bud initiation stage was the most effective against linseed bud fly with the lowest bud damage of 15.44 per cent and the highest grain yield of 1162.7 kg/ha as against 40.37 per cent bud damage and 910.08 kg/ha grain yield in untreated control. While, in present investigation NSKE @ 5 per cent was most effective against the bud fly with minimum 14.78 per cent bud damage with the highest grain yield of 1287.20 kg/ha as against 33.79 per cent bud damage and 898.79 kg/ha grain yield in untreated control.

From the present findings it was concluded that NSKE @ 5 per cent was the best treatment to give minimum bud fly infestation with a maximum net profit and incremental cost benefit ratio followed by NSE@ 5 per cent and Nimbolin @ 0.5 per cent.

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