

# Efficacy of Neem in combination with cow urine against mustard aphid and its effect on coccinellid predators

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### Abstract

Neem leaf extracts (NLE) and neem kernel extracts (NKE) in cow urine, neem oil, insecticides Phosphamidon, Dimethoate and their combinations were evaluated against the mustard aphid, *Lipaphis erysimi* Kalt. along with their impact on the activity of predator, coccinellid beetles. The treatments significantly reduced incidence of mustard aphid and increased the grain yield of mustard. Combination treatments of Dimethoate 0.03% either with NKE 3% or NLE 3% followed by Dimethoate 0.045% and Phosphamidon 0.04% were most effective in reducing the aphid incidence. Grain yield was maximum in Phosphamidon 0.04% followed by neem oil 1% + Dimethoate 0.03% and NKE 3%. Net profit was also maximum in phosphamidon (Rs. 9246/ha) and NKE 3% (Rs. 5938/ha). Whereas, incremental cost benefit ratio was highest in NKE 2% (15.5) and NKE 3% (15.1).

The results conclude that the incidence of mustard aphid can be safely and successfully managed by adopting 3 or 4 foliar sprays of neem kernel extract (in cow urine) 3% either alone or in combination with reduced dose of Dimethoate 0.03%.

**Keywords:** Neem kernel extract, Neem leaf extract, Cow urine, Mustard aphid, *Lipaphis erysimi*, Coccinellid beetles.

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Neem products have been recently recommended for suppressing the ravages of budfly in linseed (Gupta *et al*, 2000) with neem oil (0.5-1%), NSKE (neem seed kernel extract, 2%) and NLE (40%), mustard aphid (Singh & Sachan, 2000) and safflower aphid (Singh, 2001) with NSKE. According to Ayurved, extract of any plant drug in cow urine increases the potency of drug to many folds.

Keeping these facts in view and to reduce the consumption of neem leaves and kernels efficacy of neem leaf and kernel extracts in cow urine, neem oil and their combinations with insecticides were evaluated against the incidence of mustard aphid along with their impact on the activity of aphidophagous coccinellid beetles (biocontrol agents of mustard aphid) (Mathur, 1983) at JNKVV-Zonal Agricultural Research Station, Tikamgarh, Madhya Pradesh.

### Introduction

Aphid, *Lipaphis erysimi* Kalt. is the most serious pest of mustard crop in North India causing yield losses up to 93% (Verma & Singh, 1987). The use of insecticides, viz. Phosphamidon, Dimethoate, Methyl demeton, etc. have been recommended for the effective control of this pest (Upadhyay & Agrawal, 1993; Sinha *et al*, 1997; Prasad, 1997).

But, there are serious residual problems and ecological consequences of these insecticides. 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 considered free from residual problems (Koul *et al*, 1990; Gujar, 1992).

### Materials and Methods

The trial was laid out in randomized block design for two consecutive *rabi* seasons of 1999-2000 and 2000-2001. Plot size was kept 4m × 2.4m and distances from row to row and plant to plant were maintained at 30cm and 10-15cm, respectively. Mustard variety, 'Pusa bold' was sown in the first



Mustard plant and aphids

(5 litre cow urine+1.250 kg neem leaves/ha), T<sub>2</sub> – NLE-2% (10 litre cow urine+2.500 kg neem leaves/ha), T<sub>3</sub> – NLE-3% (15 litre cow urine + 3.750 kg neem leaves/ha), T<sub>4</sub> – Neem kernel extract (in cow urine)-1% (5 litre cow urine + 500 gm neem kernels/ha), T<sub>5</sub> – NKE-2% (10 litre cow urine + 1 kg neem kernels/ha), T<sub>6</sub> – NKE-3% (15 litre cow urine + 1.500 kg neem kernels/ha), T<sub>7</sub> – Neem oil-1% (5 litre neem oil/ha), T<sub>8</sub> – Phosphamidon 0.04% (Phosphamidon 85 EC-240 ml/ha) and T<sub>9</sub> – Untreated. These treatments were framed on the basis of preliminary studies conducted at this station during 1998-99 (Gupta, 1998-99). During 2000-01, Dimethoate 0.045% was taken in place of Phosphamidon 0.04% due to its vain for use in field crops. Three combination treatments were added i.e. NLE (in cow urine) - 3% + Dimethoate 0.03%, NKE (in cow urine)- 3%+ Dimethoate 0.03% and neem oil 1% +

kernel extract was prepared by soaking 100 g powder of neem kernels in one litre cow urine. In neem formulations liquid detergent (Ezee) was mixed @ 0.5 ml per litre of water in preparing the spray solution. Treatments were applied three times at 50, 60 and 70 days after sowing during 1999-2000 and four times at 50, 60, 70 and 80 days after sowing during 2000-2001.

Population of mustard aphid was recorded



Neem kernels



Neem with fruits

Dimethoate 0.03%.

Neem leaf extract was prepared by soaking 250 g chopped neem leaves per litre cow urine for 10-15 days. Thereafter, the leaves were pressed between the palms, remains were thrown out and the extract was filtered. Similarly, neem

on 5 cm central upper twig of 10 plants selected randomly. For this purpose, aphids were gently brushed out on a white paper and counted. Number of coccinellid beetles and their grubs were also recorded on these 10 plants from each plot. Observations were recorded before and after 2 and 7 days of each spray. Observations of aphid incidence of all the sprays were pooled and only mean values are given in Table 1. Grain yield from each plot was also recorded.

## Results and Discussion

### *Incidence of Mustard aphid*

— All Neem preparations and insecticide Phosphamidon/Dimethoate and their combination treatments significantly reduced the aphid population during both years. With the increase in the concentrations of NLE and NKE, the incidence of aphid was reduced in all the observations during both seasons. Among

all the eight treatments during 1999-2000, incidence of aphid was minimum in Phosphamidon treated plots followed by neem kernel extract (in cow urine)-3%, neem leaf extract (in cow urine)-3% and neem oil-1%. During 2000-01 and also in pooled mean values, the population of aphid was markedly reduced in neem products which was further reduced to minimum in combination treatments, NKE-3% + Dimethoate 0.03%, NLE 3% + Dimethoate 0.03% and neem oil-1%+ Dimethoate 0.03% and also in Dimethoate 0.045%/Phosphamidon 0.04% as alone. Similar efficacy of neem products was also reported by Singh and Sachan (2000) against mustard aphid, by Gupta *et al* (2000) against linseed budfly and Singh (2001) against safflower aphid.

**Population of coccinellids** — Coccinellid beetles (*Coccinella septempunctata*, *C. transversalis*, *Cheilomenes sexmaculata*) appeared during middle half of February when aphid population was at peak and the crop was

at third spraying stage during both seasons. The population of coccinellids varied significantly among the treatments during both seasons being negligible in Phosphamidon 0.04%/Dimethoate 0.045% treated plots and maximum in untreated and neem oil 1% alone treated plots. As compared to insecticidal treatments the population of beetles was significantly higher in NLE and NKE treatments. However, there was a slow declining trend with the increase in concentration of NLE and NKE and in their combination treatments with Dimethoate 0.03%. Negligible toxicity of neem products and neem products + insecticides to aphidophagous coccinellids was also reported by Singh (2001) and Rizvi and Naqvi (2001).

**Grain yield** — Significantly higher grain yield was obtained from all the treated plots as compared to untreated during both the seasons. Among NLE and NKE treatments, yield was increased with the increase in concentration mean yield

being higher in NKE 3% during both the seasons. However, grain yield was recorded highest in Phosphamidon treated plots followed by NKE 3% and neem oil 1% during 1999-2000. Whereas, during 2000-2001, it was highest in neem oil 1% + Dimethoate 0.03%, NKE 3% + Dimethoate 0.03%, Dimethoate 0.045% and NKE 3%. Similar increase in grain yield by controlling aphid in mustard (Singh & Sachan, 2000), budfly in linseed (Gupta *et al*, 2000) and aphid in safflower (Singh, 2001) has been reported with neem products.

Net profit was received maximum from Phosphamidon 0.04% (Rs. 9246/ha) followed by NKE 3% (Rs. 5938/ha), NKE 3% + Dimethoate 0.03% (Rs. 5370/ha), neem oil 1% + Dimethoate 0.03% (Rs. 5366/ha), NKE 2% (Rs. 5340/ha) and Dimethoate 0.045% (Rs. 5185/ha). Incremental cost benefit ratio (ICBR) was maximum in NKE 2% (15.5), NKE 3% (15.1), Phosphamidon 0.04% (13.8) and NLE 3% (13.6).

**Table 1 : Effect of Neem preparations on mean populations of mustard aphid and coccinellid beetles**

Treatments	Mean no. of aphid per 5 cm upper twig		Pooled mean	Mean no. of coccinellids per 10 plants		
	1999-2000	2000-2001		1999-2000	2000-2001	Mean
T <sub>1</sub> (NLE in cow urine,1%)	19.9 (4.4)	14.3 (3.8)	17.1 (4.1)	0.8 (1.1)	1.3 (1.3)	1.1 (1.2)
T <sub>2</sub> (NLE in cow urine, 2%)	17.7 (4.1)	12.0 (3.5)	14.9 (3.8)	0.7 (1.0)	1.3 (1.3)	1.0 (1.2)
T <sub>3</sub> (NLE in cow urine, 3%)	15.0 (3.8)	10.9 (3.3)	12.6 (3.6)	0.6 (1.0)	0.7 (1.1)	0.7 (1.1)
T <sub>4</sub> (NKE in cow urine, 1%)	21.1 (4.5)	15.3 (4.0)	18.2 (4.3)	1.1 (1.3)	1.3 (1.3)	1.2 (1.3)
T <sub>5</sub> (NKE in cow urine, 2%)	17.3 (4.1)	12.0 (3.5)	14.7 (3.8)	0.9 (1.2)	1.0 (1.2)	1.0 (1.2)
T <sub>6</sub> (NKE in cow urine, 3%)	12.9 (13.5)	10.6 (3.3)	11.8 (3.4)	0.8 (1.1)	0.7 (1.1)	0.8 (1.1)

Treatments	Mean no. of aphid per 5 cm upper twig		Pooled mean	Mean no. of coccinellids per 10 plants		
	1999-2000	2000-2001		1999-2000	2000-2001	Mean
T <sub>7</sub> (Neem Oil , 1%)	15.4 (3.9)	10.0 (3.2)	12.7 (3.6)	1.1 (1.3)	1.5 (1.4)	1.3 (1.4)
T <sub>8</sub> (Phosphamidon, 0.04%)	5.2 (2.2)	-	5.2 (2.2)	0.2 (0.8)	-	0.2 (0.8)
T <sub>9</sub> (Dimethoate, 0.045%)	-	2.9 (1.8)	2.9 (1.8)	-	0.1 (0.8)	0.1 (0.8)
T <sub>10</sub> (NLE-3%+Dimethoate-0.03%)	-	2.0 (1.5)	2.0 (1.5)	-	0.7 (1.0)	0.7 (1.0)
T <sub>11</sub> (NKE-3% +Dimethoate-0.03%)	-	1.7 (1.4)	1.7 (1.4)	-	0.5 (1.0)	0.5 (1.0)
T <sub>12</sub> (Neem oil-1%+Dimethoate-0.03%)	-	1.8 (1.5)	1.8 (1.5)	-	0.1 (0.8)	0.1 (0.8)
T <sub>13</sub> (Untreated)	78.6 (8.9)	26.4 (5.2)	52.5 (7.1)	1.6 (1.5)	2.0 (1.6)	2.0 (1.6)
<b>S.Em. ±</b>	<b>(0.22)</b>	<b>(0.22)</b>	<b>(0.16)</b>	<b>(0.06)</b>	<b>(0.1)</b>	-
<b>L.S.D. (p=0.05)</b>	<b>(0.63)</b>	<b>(0.62)</b>	<b>(0.49)</b>	<b>(0.18)</b>	<b>(0.32)</b>	-

NLE=Neem leaf extract; NKE=Neem kernel extract  
 Figures in parenthesis denote transformed values.

**Table 2 : Effect of Neem preparations on grain yield of mustard**

Treatments	Grain yield kg/ha			Mean addl. cost on sprays (Rs/ha)	Mean net profit (Rs/ha)	ICBR
	1999-2000	2000-2001	Mean			
T <sub>1</sub> (NLE in cow urine, 1%)	1153	1208	1181	298	2463	9.3
T <sub>2</sub> (NLE in cow urine, 2%)	1240	1297	1269	333	3396	11.
T <sub>3</sub> (NLE in cow urine, 3%)	1326	1444	1385	368	4637	13.6
T <sub>4</sub> (NKE in cow urine, 1%)	1243	1370	1307	315	3832	13.2
T <sub>5</sub> (NKE in cow urine, 2%)	1490	1408	1449	368	5341	15.5
T <sub>6</sub> (NKE in cow urine, 3%)	1552	1463	1508	420	5938	15.1
T <sub>7</sub> (Neem Oil , 1%)	1500	1437	1469	875	5054	6.8
T <sub>8</sub> (Phosphamidon, 0.04%)	1836	-	1836	720	9246	13.8
T <sub>9</sub> (Dimethoate, 0.045%)	-	1485	1485	920	5185	6.6
T <sub>10</sub> (NLE-3%+Dimethoate-0.03%)	-	1452	1452	848	4894	6.8
T <sub>11</sub> (NKE-3% +Dimethoate-0.03%)	-	1500	1500	900	5370	7.0
T <sub>12</sub> (Neem oil-1% + Dimethoate-0.03%)	-	1541	1541	1355	5366	5.0
T <sub>13</sub> (Untreated)	823	1037	930	-	-	-
<b>S.Em. ±</b>	<b>84</b>	<b>53</b>	<b>51</b>	-	-	-
<b>L.S.D. (p=0.05)</b>	<b>252</b>	<b>160</b>	<b>153</b>	-	-	-

**ICBR = Incremental Cost Benefit Ratio**

### Conclusion

Incidence of mustard aphid can be managed safely and successfully by adopting 3 or 4 foliar sprays of neem kernel extract (in cow urine)-3% either alone or in combination with reduced dose of Dimethoate 0.03%. The population of beetles was significantly higher in NLE and NKE treatments. However, there was a slow declining trend with the increase in concentration of NLE and NKE and in their combination treatments with Dimethoate 0.03%.

### References

1. Gujar GT, Biological effects of azadirachtin and plumbagin on *Helicoverpa armigera*, *Indian J Entomol*, 1992, **59**(4), 415-422.
2. Gupta MP, Efficacy of cow urine, neem leaf and neem kernel extracts for the management of aphid incidence in karan rai. In : Annual Progress Report (1998-99), National Agricultural Research Project, JNKVV, Zonal Agricultural Research Station, Tikamgarh (M.P.) pp. 86-87.
3. Gupta MP, Chourasia, SK and Rai HS, Efficacy of neem plant products against the budfly (*Dasyneura lini*) on linseed, *Indian J Agric Sci*, 2000, **70**(11), 762-764.
4. Koul O, Isman MB and Ketkar CM, Properties and use of neem, *Azadirachta indica*, *Can J Bot*, 1990, **68**, 1-11.
5. Mathur KC, Aphids of agricultural importance and their natural enemies at Jallundhar, Punjab, 229-233, In: BK Behura (Ed.). The aphids. The Entomological Society of Orissa, Utkal University, Bhubaneswar, India, 1983.
6. Prasad SK, Efficacy of some neem products vis-a-vis oxydemeton methyl against *Lipaphis erysimi* Kalt. on rapeseed crop under field condition, *Indian J Entomol*, 1997, **59**(2), 147-150.
7. Rizvi PR and Naqvi NA, Relative performance of different insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) and their impact on potential predators, In: Abstracts, National Symposium on plant protection strategies for sustainable Agri-Horticulture, held at SKUAS, Jammu, 12-13 Oct, 2001, p. 38.
8. Singh CP and Sachan GC, Bioefficacy of some neem formulations against *Lipaphis erysimi* (Kalt.) and effects on yield parameters of *Brassica juncea*, In: *Extended Summaries of National Seminar on "Oilseeds and Oil research and development needs in the millenium"* held at Directorate of Oilseeds Research Hyderabad, 2-4 Feb, 2000, pp. 213-214 & 283-284.
9. Singh Vijay, Management of safflower aphid through botanical insecticides, In : *Proceedings of Symposium on "Biocontrol based pest management for quality crop protection in the current millenium"* held at Punjab Agricultural University, Ludhiana, July, 18-19, 2001 pp.147.
10. Sinha RP, Yazdani SS, Kumari K and Homeed SE, Evaluation of different spray schedule for control of mustard aphid, *Indian J Entomol*, 1997, **59**(2), 179-186.
11. Upadhyay S and Agrawal RK, Efficacy of different insecticides on incidence of mustard aphid (*Lipaphis erysimi*) on Indian mustard (*Brassica juncea*) and its economics, *Indian J Agric Sci*, 1993, **63**(8), 522-525.
12. Verma SN and Singh OP, Estimation of avoidable losses to mustard by the aphid, *Lipaphis erysimi* Kalt. in Madhya Pradesh, *Indian J Plant Prot*, 1987, **15**(1), 87-89.