J. Biol. Control, 11: 33-36, 1997

Safety of neem formulations and insecticides to *Microvelia douglasi atrolineata* Bergroth (Heteroptera: Veliidae), a predator of planthoppers in rice ecosystem

V. JHANSI LAKSHMI, G. KATTI and N. V. KRISHNAIAH
Directorate of Rice Research
Rajendranagar, Hyderabad 500 030, Andhra Pradesh, India

ABSTRACT: A glasshouse study carried out to know the relative safety of neem formulations and insecticides to *Microvelia douglasi atrolineata* Bergroth revealed that Neemax (2 and 4%) and Rakshak (0.2 and 0.5%) were the safest neem formulations while among insecticides, phorate and carbofuran (1 kg a.i./ha) granular application and quinalphos spray (0.05%) were relatively safer.

KEY WORDS: Insecticides, *Microvelia douglasi atrolineata*, neem formulations, planthoppers, predator, rice ecosystem

Microvelia are small, black coloured, fast moving ripple bugs found on water surface in flooded rice fields. Both nymphs and adults of *Microvelia* congregate at the base of the rice plant and feed on planthopper nymphs falling in water. These are very active predators on small sized nymphs of planthoppers and can consume 4-7 hoppers per day (Shephard *et al.*, 1987).

Insecticides applied to rice canopy as sprays or broadcast as granules in standing water invariably contaminate water in rice paddies which provide ecological niches for these predators. In recent times use of botanicals particularly the commercial neem formulations as safer alternatives for conventional insecticides has assumed importance in rice pest management. However, information on safety of these neem formulations *vis-à-vis* insecticides to *Microvelia* is lacking. Hence, the present study was conducted under glasshouse condition at this Directorate.

MATERIALS AND METHODS

Eight neem formulations *viz.*, Neemax,

Achook, Fortune Aza, Neem Azal T/S, Econeem, Neemgold, Rakshak and NG 4 along with two crude neem derivatives, neem oil and neem seed extract (NSE) were included in the study at different dosages depending on azadirachtin content. The commonly used insecticides *viz.*, quinalphos, monocrotophos, chlorpyriphos, carbofuran and phorate were tested in the study at recommended doses for comparison. The details of dosages of the formulations are given in Table 1.

For spray formulations, the quantity of spray fluid falling on water surface when the rice plants were sprayed up to run-off stages was estimated by selecting a single 30 day old rice plant raised in a 3 litre pot and sprayed up to run-off stage with an atomizer. The run-off liquid was collected in a tray which measured to be 20 ml. Hence, 20 ml of neem formulation/ insecticide fluid was added to one litre of water in a plastic bucket of 2 litres capacity (top diam. 17 cm, base diam. 15 cm , height 15 cm) in each treatment. Then, ten *Microvelia* adults were exposed to the treated water in each bucket and observations were recorded on mortality after one and 24 h of exposure.

In case of granules, required quantity was applied in plastic buckets containing known quantity of puddled soil. Then water was poured into the buckets till 2.5 cm layer of water remained on top surface of soil. Ten adult *Microvelia* bugs were released on water surface in each bucket and their mortality was recorded after one and 24 h of exposure. The insecticidal granules were applied 12 h prior to release of adult *Microvelia* bugs. Care was taken to maintain 2.5 cm water layer above the soil till the completion of observations.

The treatments were replicated thrice and the mortality data were subjected to statistical analysis after transformation and LSD (P=0.05) values were worked out.

RESULTS AND DISCUSSION

The mortality data after 1 h exposure (Table 1) revealed that all commercial neem formulations and neem seed extract (NSE) were safe to *Microvelia* at tested dosages recording 0 to 10 per cent mortality. However, neem oil was observed to be highly toxic to the predator killing all the exposed adults within 1 h. Among the insecticides, phorate and carbofuran granules (0 to 16% mortality) and quinalphos spray (10 to 18% mortality) were less toxic. Chlorpyriphos and monocrotophos recorded 100 per cent and 40 to 52 per cent mortality, respectively.

The observations recorded after 24 h exposure showed that Neemax (2 to 4% kill) and Rakshak (0 to 2% kill) were the safest neem formulations followed by Fortune Aza (10 to 14% kill) and Econeem at lower dosage (8% kill). However, Neem Azal T/S, Neemglod, and NG 4 treatments resulted in high mortality of *Microvelia* (80 to 100%). Among the insecticides, phorate (6 to 8% kill) was safer than other insecticides. There was no mortality in control treatment.

Heinrichs *et al.* (1984) reported low

Table 1. Effect of botanicals and insecticides on *Microvelia douglasi atrolineata*

Treatment	Azadirachtin content / propritary formulation	Dosage (g or ml/lt)	Adult mortality (%)			
			1 h		2 h	
Neemax	300 ppm	20	2.0	(3.68)	2.0	(3.68)
Neemax	300 ppm	40	2.0	(3.68)	4.0	(7.37)
Achook	300 ppm	20	2.0	(3.68)	38.0	(37.31)
Achook	300 ppm	40	0.0	(0.00)	30.0	(32.89)
Fortune Aza	1500 ppm	2	2.0	(3.68)	14.0	(14.31)
Fortune Aza	1500 ppm	5	0.0	(0.00)	10.0	(16.36)
Neem Azal	10000 ppm	2	2.0	(3.68)	80.9	(94.00)
Neem Azal	10000 ppm	5	6.0	(8.99)	1900.0	(89.96)
Econeem	3000 ppm	2	0.0	(0.00)	8.0	(12.68)
Econeem	3000 ppm	5	0.0	(0.00)	34.0	(32.42)
Neemgold	300 ppm	2	4.0	(5.31)	100.0	(89.96)
Neemgold	300 ppm	5	2.0	(3.68)	100.0	(89.96)
Rakshak	1500 ppm	2	0.0	(0.00)	0.0	(0.00)
Rakshak	1500 ppm	5	0.0	(0.00)	2.0	(3.68)
NG 4	300 ppm	1	10.0	(16.36)	90.0	(73.59)
NG 4	300 ppm	2	10.0	(16.37)	90.0	(73.59)
Neem oil	-	20	100.0	(89.96)	100.0	(89.96)
Neem oil	-	40	100.0	(89.96)	100.0	(89.96)
Neem seed extract	-	1	0.0	(0.00)	70.0	(57.01)
Neem seed extract	-	2	2.0	(3.68)	76.0	(61.17)
Quinalphos	25 EC	2	10.0	(14.30)	100.0	(89.96)
quinalphos	25 EC	5	18.0	(22.15)	100.0	(89.96)
Monocrotophos	36 WSC	1.5	40.0	(39.16)	60.0	(50.79)
Monocrotophos	36 WSC	2.5	52.0	(46.13)	92.0	(77.3)
Chlorpyriphos	20 EC	1.25	100.0	(89.96)	100.0	(89.96)
Chlorpyriphos	20 EC	2.5	100.0	(89.96)	100.0	(89.96)
Carbofuran	3 G	30	2.0	(3.68)	70.0	(62.98)
Carbofuran	3 G	60	16.0	(20.65)	84.0	(69.31)
Phorate	10 G	10	2.0	(3.68)	8.0	(12.68)
Phorate	10 G	20	0.0	(0.00)	6.0	(11.05)
Control	-	-	0.0	(0.00)	0.0	(0.00)
SEM ±			4.09		5.61	
LSD 0.05			12.24		16.8	

* Figures in parentheses are arcsine transformed values

toxicity of carbofuran to *Microvelia* adults up to 6 days after treatment through Potter's tower spray method. In another study, Fabellar and Heinrichs (1984) found that cypermethrin and deltamethrin were highly toxic to *M. atrolineata* causing cent per cent mortality after 48 h, whereas acephate, carbophenothion and endosulfan were not toxic (0-3% mortality). However, there is no report in literature on the relative toxicity of neem formulations to *M. douglasi atrolineata*. The present study highlights the scope of utilizing those neem formulations or insecticides which are less toxic to *Microvelia* to strengthen the integrated pest management programme against planthoppers in endemic areas. However, these formulations need to be evaluated for their safety to other important predators like mirid bugs, spiders and egg parasitoids like *Trichogramma* spp. which play an important role in maintaining the pest populations below economic threshold levels in rice ecosystem.

ACKNOWLEDGEMENT

The authors are grateful to Dr. K. Krishnaiah, Project Director for encouragement and providing facilities for the study.

REFERENCES

Fabellar, L. T. and Heinrichs, E. A. 1984. Toxicity of insecticides to predators of rice brown planthopper, *Nilaparvata lugens* (Stal) (Homoptera: Delphacidae). *Environmental Entomology*, **13**: 832-837.

Heinrichs, E. A., Basilio, R. P. and Valencia, S. L. 1984. Buprofezin, a selective insecticide for the management of rice planthoppers (Homoptera: Delphacidae) and leafhoppers (Homoptera: Cicadellidae). *Environmental Entomology*, **13**: 515-521.

Kareem, A. A., Saxena, R. C. and Malayba, M. T. 1988. Effect of sequential neem treatment on green leafhoppers (GLH), rice tungo virus (RTV) infection and predatory mirids and spiders in rice. *International Rice Research Newsletter*, **13** (6): 37.

Shephard, B. M., Barrion, A. T. and Litsinger, J. A. 1987. Friends of the Rice Farmer : Helpful insects, spiders and pathogen. International Rice Research Institute, Los Banos, Laguna, Philippines, 136 pp.