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Safety of combination products and single compound insecticides to *Microvelia douglasi atrolineata* Bergroth, a predator of planthoppers in rice

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ABSTRACT: **Greenhouse studies were carried out on relative safety of insecticides to veliid bug, *Microvelia douglasi atrolineata*, a predator of planthoppers in rice. The results indicated that four combination products, *viz.*, chlorpyriphos 50% + cypermethrin 5% at 344 ppm; betacyfluthrin 1.25% + chlorpyriphos 25% at 393 ppm; acephate 45% + cypermethrin 5% at 500 ppm and imidacloprid 5% + betacyfluthrin 5% at 30 ppm and two single compounds, *viz.*, betacyfluthrin at 12.5 ppm and thiacloprid at 120 ppm were more toxic than monocrotophos (500 ppm) and acephate (750 ppm).**

KEY WORDS: Combination products, *Microvelia douglasi atrolineata*, relative safety

INTRODUCTION

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 on to the water. These are very active predators and can consume 4-7 hoppers per day (Shephard *et al.*, 1987).

Although cultural practices and varietal resistance are employed to check the damage by brown planthopper (BPH), the major planthopper pest of rice, use of insecticides is one of the major tactics practiced to check the damage by this insect pest. Insecticides applied to the rice crop canopy as sprays or broadcast as granules in standing water invariably contaminate water, which provide ecological niches for the veliid predators.

Krishnaiah *et al.* (2001) assessed the initial and residual toxicity of thiamethoxam, imidacloprid and fipronil to *M. douglasi atrolineata* in comparison with standard insecticide acephate under controlled glasshouse conditions and reported that fipronil at 100 ppm, acephate at 1200 ppm and thiamethoxam at 12 ppm were safer than imidacloprid at 50 ppm and thiamethoxam at 50 ppm. Other workers also reported that acephate spray was safe to *Microvelia* under glasshouse conditions (Heinrichs *et al.*, 1980; Mochida *et al.*, 1982; Fabellar and Heinrichs, 1984; Kumar and Velusamy, 2001). However, the information on the

safety of combination products and a few newer molecules to *Microvelia* is lacking in literature. Hence, the present studies were undertaken at Directorate of Rice Research, Hyderabad.

MATERIALS AND METHODS

Rice plants of TN1 variety were raised in the greenhouse and were maintained according to their age. Brown planthopper was reared on 40-day-old rice plants in the wooden cages. *M. douglasi atrolineata* were collected from the water in the trays used for rearing planthoppers. Rice plants and all the insects were maintained in the greenhouse at 30 ± 5^0 C and 60 ± 10 percent relative humidity. There were nine treatments in the experiment, namely, i) chlorpyriphos (50%) + cypermethrin (5%) (Nurelle D 505) at 344 ppm a. i. in spray, ii) betacyfluthrin (12.5 g) + chlorpyriphos (250g) (Bulldock star 262.5 EC) at 393 ppm of a. i., iii) acephate (45%) + cypermethrin (5%) (Upacy 50DF) at 500 ppm of a. i., iv) imidacloprid (50 g) + betacyfluthrin (50g) (Confidar Ultra 100 EC) at 30 ppm a. i., v) betacyfluthrin (Bulldock 25 EC) at 12.5ppm a. i., vi) thiacloprid (Calypso 240 SC) at 120 ppm a. i., vii) monocrotophos at 500ppm a. i., viii) acephate (Starthene 75 WP) 750 ppm a. i. in spray fluid and ix) untreated control. All treatments were replicated four times.

The methodology of exposing *Microvelia* to insecticide spray fluid essentially remained similar to Krishnaiah *et al.* (2001). Ten ml of the spray fluid was added to 1 litre of water contained in a 2 litre capacity plastic pot. Ten *Microvelia* adults were released on the water surface and covered with muslin cloth to prevent escape of bugs and also to prevent contamination from outside. Brown planthopper nymphs were provided as prey. *Microvelia* were released at 1, 7, 14, 21 and 28 days after treating with insecticide and mortality was recorded at 24, 48 and 72 hours after every release.

Persistent toxicity (PT) values were calculated for each exposure period, *viz.*, 24, 48 and 72 hours separately according to Pradhan (1967). PT value is the product of average per cent mortality and the period in days up to which the insecticide persisted. The mortality percentages were transformed into angular values for statistical analysis. PT values were subjected to square root transformation. All data were analyzed in Randomized Complete Block Design and means separated by Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Initially, all the insecticide treatments exhibited 95-100 percent mortality of *Microvelia* within 24 hours as compared to 0 percent mortality in untreated control (Table 1 and 2). By 7th day after insecticide application, all the combination products, as well as betacyfluthrin and thiacloprid were proved to be more toxic (80 to 100 % mortality within 24 hours after release) than standard checks monocrotophos (33 % mortality) and acephate (28 % mortality). No mortality was recorded in untreated control. More or less similar trend continued throughout the experimental period. All the combination products as well as betacyfluthrin were proved to be toxic recording high PT values of 2604 to 2800 at 24 hours exposure while thiacloprid was slightly better (PT value of 2044 at 24 hours exposure). The standard checks, namely, monocrotophos and acephate were relatively more safe to *Microvelia* recording PT values 1260 and 604, respectively.

Relatively, lesser toxicity, of acephate to *Microvelia* was reported by other workers also (Heinrichs *et al.*, 1980; Mochida *et al.*, 1982; Fabellar and Heinrichs, 1984; Kumar and Velusamy, 2001; Krishnaiah *et al.*, 2001).

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Table 1. Toxicity of selected combination products and single compound insecticides to *M. douglasi atrolineata* under greenhouse conditions

Treatment	Conc. of a. i. (ppm)	Per cent mortality								
		1 day			7 day			14 day		
		24h	48h	72h	24h	48h	72h	24h	48h	72h
Chlorpyriphos (50%) + Cypermethrin (5%) (Nurelle D 505)	344	100a	100a	100a	100a	100a	100a	100a	100a	100a
Betacyfluthrin (12.5g) + Chlorpyriphos (250g) (Bulldock star 262.5EC)	393	100a	100a	100a	100a	100a	100a	100a	100a	100a
Acephate (45%)+ Cypermethrin (5%) (Upacy 50DF)	500	100a	100a	100a	100a	100a	100a	100a	100a	100a
Imidacloprid (50g) + Betacyfluthrin (50g) (Confidar Ultra 100 EC)	30	100a	100a	100a	97.5a	100a	100a	100a	100a	100a
Betacyfluthrin (Bulldock 25 EC)	12.5	100a	100a	100a	100a	100a	100a	100a	100a	100a
Thiacloprid (Calypso 240 SC)	120	100a	100a	100a	80b	100a	100a	95a	100a	100a
Monocrotophos (Nuvacron 36 WSC)	500	100a	100a	100a	32.5c	47.5b	60b	30b	40b	67.5b
Acephate (Starthene 75 WP)	750	95a	100a	100a	27.5c	32.5c	42.5c	15c	32.5b	52.5b
Untreated control		0b	0b	0b	0d	10d	10d	0d	0c	0c

Figures in a column followed by the same letter are not significantly different at P=0.05 according to DMRT.

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Table 2. Toxicity of selected combination products and single compound insecticides to *M. douglasi atrolineata* under greenhouse conditions

Treatment	Conc. of a. i. (ppm)	Per cent mortality						Presistent toxicity		
		21 day			28 day					
		24h	48h	72h	24h	48h	72h	24h	48h	72h
Chlorpyriphos (50%) + Cypermethrin (5%) (Nurelle D 505)	344	100a	100a	100a	100a	100a	100a	2800a	2800a	2800a
Betacyfluthrin (12.5g) + Chlorpyriphos (250g) (Bulldock star 262.5EC)	393	100a	100a	100a	100a	100a	100a	2800a	2800a	2800a
Acephate (45%) + Cypermethrin (5%) (Upacy 50DF)	500	100a	100a	100a	72.5b	85b	100a	2646a	2716a	2758a
Imidacloprid (50g) + Betacyfluthrin (50g) (Confidar Ultra 100 EC)	30	92.5a	92.5b	100a	100a	100a	100a	2744a	2758a	2800a
Betacyfluthrin (Bulldock 25 EC)	12.5	100a	100a	100a	100a	100a	100a	2800a	2800a	2800a
Thiacloprid (Calypso 240 SC)	120	50b	62.5c	77.5b	40c	55c	80b	2044b	2338b	2607a
Monocrotophos (Nuvacron 36 WSC)	500	32.5b	40d	42.5c	30c	37.5d	40c	1260c	1554c	1666b
Acephate (Starthene 75 WP)	750	2.5c	5e	35cd	0d	0e	22.5c	604d	818d	1382c
Untreated control		0c	5e	20d	0d	0e	0d	0e	0e	0d

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