

Short communication

Toxicity of insecticides to *Coccinella repanda* Thunberg and *Harmonia octomaculata* (Fabricius) (Coleoptera: Coccinellidae)

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Summary

Laboratory tests of the contact toxicity of eight insecticides to *Coccinella repanda* adults and six insecticides to *Harmonia octomaculata* adults were conducted at Toowoomba, Qld. Insecticides in ascending order of toxicity to *C. repanda* were endosulfan, chlorpyrifos, profenofos, methidathion, methomyl, monocrotophos, cypermethrin and deltamethrin; and similarly for *H. octomaculata* were permethrin, sulprofos, methidathion, chlorpyrifos, cypermethrin and deltamethrin. *H. octomaculata* was less susceptible to methidathion, cypermethrin and deltamethrin than *C. repanda*. Results are discussed in relation to choice of insecticides for control of Queensland sunflower pests.

INTRODUCTION

The transverse ladybird (*Coccinella repanda* Thunberg) and the maculate ladybird (*Harmonia octomaculata* Fabricius) are prevalent in south Queensland cropping systems (Bishop and Blood 1978, Turner and Franzmann 1979). In sunflower crops on the Darling Downs (roughly differentiated by latitudes 27° and 28°S and longitudes 151° and 152°E), I have observed up to sixty *C. repanda* adults on individual plants. As *C. repanda* and *H. octomaculata* are known to feed on *Heliothis* spp. eggs and larvae (Room 1979), their conservation through judicious use of pesticides which are of low toxicity to coccinellids, is desirable. Kay (1979) examined the toxicity of nine insecticides to *C. repanda* adults and larvae, as an aid to developing a pest management programme for lucerne aphids, *Therioaphis trifolii* (Monell) f. *maculata* and *Acyrtosiphon kondoi* Shinji, and found that endosulfan and pirimicarb were the least toxic of the chemicals tested. However, in sunflower insect management systems, different chemicals from those used in lucerne are registered or likely to be registered for the control of pests such as *Heliothis* spp. and *Nysius* spp. This study reports on the topical toxicity of eight insecticides to *C. repanda* adults and six insecticides to *H. octomaculata* adults.

DISCUSSION

Adults of both species were hand collected from sunflower crops, near Toowoomba, Queensland, and insecticides tests conducted between December 1981 and April 1982. During and after testing, adults were held at 26± 1°C in groups of ten in glass petri dishes, each of which contained a 2 cm² moistened sponge and clean filter paper. Dosing occurred within 24 hours of collection, and no food was supplied. A topical application method similar to that used by Kay (1979) was employed. A 0.25µL drop of acetone solution containing technical grade insecticide was applied to the dorsal thorax of each insect, using an Arnold Hand Microapplicator. Ten insects were treated at each of five doses, together with an untreated (acetone only) control, and three or more replicates were used. Mortality was recorded after 24 and 48 hours. Adults capable of co-ordinated movement after vigorous prodding were classed as live. Results for insecticides tested, other than endosulfan, were analysed by the probit method. They are given in Tables 1 and 2 for *C. repanda* and *H. octomaculata* respectively. It was not possible to obtain precise LD₅₀ values for endosulfan because of difficulty in obtaining a sufficiently high concentration in the 0.25µL acetone drops. Twenty-four hour values are included to provide data on

knockdown effects. Chemicals in ascending order of toxicity of *C. repanda* after 48 hours were: endosulfan, chlorpyrifos, profenofos, methidathion, methomyl, monocrotophos, cypermethrin and deltamethrin. The 48 hour LD₅₀ values of chlorpyrifos and monocrotophos to *C. repanda* were close to values recorded by Kay (1979). The remaining chemicals were not tested by him, so no comparisons can be made. The synthetic pyrethroids, cypermethrin and deltamethrin, were highly toxic to *C. repanda* and so they should be used as infrequently as possible in sunflowers, in order to preserve *C. repanda* populations.

Table 1. LD₅₀, Fiducial limits, and slope value of probit line for *C. repanda* adults

Insecticide	24 Hours				48 Hours			
	LD ₅₀ µg a.i./ insect	95% Fiducial limits		Slope value	LD ₅₀ µg a.i./ insect	95% Fiducial limits		Slope value
		lower	upper			lower	upper	
chlorpyrifos	0.306	0.199	0.471	1.7	0.312	0.180	0.497	2.2
profenofos	0.231	0.138	0.401	1.1	0.205	0.122	0.352	1.2
methidathion	0.228	0.133	0.398	1.4	0.120	0.064	0.231	1.0
methomyl	0.040	0.026	0.061	1.7	0.032	0.011	0.093	1.3
monocrotophos	0.018	0.012	0.027	1.9	0.014	0.009	0.021	2.0
cypermethrin	0.0016	0.001	0.0024	1.8	0.002	0.001	0.004	1.4
deltamethrin	0.0017	0.0009	0.0030	1.1	0.001	0.0006	0.0014	2.0

Footnote: Endosulfan was also tested, and found to have an LD₅₀ value of >20 µg a.i./adult. Precise values could not be obtained because of difficulties in dissolving large amounts of endosulfan in 0.25µL drops.

Table 2. LD₅₀, Fiducial limits, and slope value of probit line for *H. octomaculata* adults

Insecticide	24 Hours				48 Hours			
	LD ₅₀ µg a.i./ insect	95% Fiducial limits		Slope value	LD ₅₀ µg a.i./ insect	95% Fiducial limits		Slope value
		lower	upper			lower	upper	
permethrin	1.184	1.006	1.347	3.4	2.005	1.795	2.312	3.9
sulprofos	1.645	1.464	1.863	3.5	1.084	0.966	1.199	4.5
methidathion	0.584	0.456	0.708	2.5	0.744	0.610	0.872	3.1
chlorpyrifos	0.483	0.420	0.603	3.5	0.361	0.321	0.415	3.5
cypermethrin	0.335	0.261	0.409	2.7	0.276	0.128	0.394	3.2
deltamethrin	0.018	0.016	0.023	2.9	0.016	0.014	0.017	4.7

Insecticides in ascending order of toxicity to *H. octomaculata* after 48 hours were permethrin, sulprofos, methidathion, chlorpyrifos, cypermethrin and deltamethrin. Permethrin was much less toxic than the other two synthetic pyrethroids, cypermethrin and deltamethrin. Of interest is the fact that methidathion, cypermethrin and deltamethrin had higher 48 hour LD₅₀ values for *H. octomaculata* than for *C. repanda*, indicating interspecific differences in susceptibility to pesticides. The reason for this is unclear, but may be related to the fact that *H. octomaculata* is a larger coccinellid.

The LD₅₀ value for endosulfan against *C. repanda* adults could not be determined precisely but was in excess of 20µg a.i./adult. A major difficulty in determining precise LD₅₀ values was that endosulfan would not dissolve in acetone solution to form the higher concentrations required in 0.25µL drops. Kay (1979), using 1.0µL drops, obtained a 48 hour LD₅₀ value of 34µg/adult *C. repanda* for endosulfan. Endosulfan, therefore, must be considered a highly suitable candidate for inclusion in sunflower pest management systems because its LD₅₀ values indicate that it is considerably less toxic to coccinellids than all other chemicals tested.

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