



Spirotetramat toxicity to immatures and sublethal effects on fecundity of female adults of *Tetranychus urticae* Koch*

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Abstract

Acute toxicity of spirotetramat to immatures and its sublethal effects on adult females of two-spotted spider mite, *Tetranychus urticae* Koch, were investigated in laboratory bioassays, at $27 \pm 2^\circ\text{C}$, 50–80% RH and 16/8 L/D photoperiod. Acute toxicity was tested by successive treatments of eggs, larvae, protonymphs and deutonymphs on bean leaf discs, and mortality was evaluated based on the number of mites reaching the adult stage. Concentration-mortality data were subjected to probit analysis and the following LC_{50} data were computed: 0.10 mg/l (larvae), 0.17 mg/L (protonymphs) and 0.15 mg/L (deutonymphs). The acaricidal effect after the treatment of eggs was not the result of spirotetramat toxicity to this developmental stage, but rather of its residual activity on hatched larvae ($\text{LC}_{50}=0.62$ mg/L). Sublethal effects were evaluated after the treatment of pre-ovipositing adult females on leaf discs using the concentrations of 2 mg/L, 20 mg/L and 200 mg/L. After 18–20 hours of exposure on treated discs, females showing no visible symptoms of poisoning were transferred to untreated leaf discs and re-transferred to new discs at 48 h intervals over ten days. Based on the number of eggs laid and survival rate of females, gross fecundity and net fecundity were calculated. At the end of the tenth day, the survival rate was 0.72 in untreated and 0.40, 0.27 and 0.05 in females treated at the concentrations mentioned above. Compared with the control mites, gross fecundity was reduced by 9% (2 mg/L), 29% (20 mg/L) and 93% (200 mg/L), while net fecundity decreased by 40% (2 mg/L), 67% (20 mg/L) and 98% (200 mg/L). The results indicate that spirotetramat exerts similar effects on spider mites as do the acaricides spiropdiclofen and spiromesifen.

Key words: Spirotetramat, *Tetranychus urticae*, toxicity, sublethal effects.

Introduction

Spirotetramat, a tetramic acid derivative, has been recently introduced as a new product intended for controlling whiteflies, aphids and other sucking insect pests of agricultural crops. The insecticide has high acute toxicity to immature insects and significantly reduces the fecundity and fertility of adult females (Bretschneider *et al.*, 2007; Cantoni *et al.*, 2008; Brück *et al.*, 2009). Even though some suppressive side effects of spirotetramat have also been detected on spider mite populations in field trials targeted against insects (Brück *et al.*, 2009), there are still no adequate studies on possible acaricidal properties of this compound.

Similarly to spiropdiclofen and spiromesifen, derivatives of tetronic acid, spirotetramat inhibits lipid biosynthesis. Spiropdiclofen and spiromesifen are highly toxic to eggs and other immature stages of spider mites, while their activity against adult females is through reduction of fecundity and fertility (Wachendorff *et al.*, 2002; Nauen *et al.*, 2005; Marcic, 2007; van Pottelberge *et al.*, 2009; Marcic *et al.*, 2010). The objective of this paper is to provide an evaluation of spirotetramat toxicity against immature stages of the two-spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae), as well as its sublethal effects on fecundity.