

Mechanisms of Fenpropathrin-resistance in the Two-spotted Spider Mite, *Tetranychus urticae* (Acari: Tetranychidae)

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Resistance mechanisms in the Two-spotted spider mite, *Tetranychus urticae*, resistance to fenpropathrin were investigated. The resistance ratios of the eggs and adults of R strain were >2,732 and >10,416 to fenpropathrin respectively, compared to S strain. The fenpropathrin-selected strain was cross-resistant to bifenthrin, but showed the negative cross-resistance to bifenazate. Fenpropathrin resistance in *T. urticae* was dramatically decreased to about 11.4-fold when mites were pretreated with cytochrome P450 inhibitor piperonyl butoxide (PBO), but did not show the synergy effect with the carboxylesterase inhibitor triphenyl phosphate (TPP). The esterase activity of *T. urticae* with β -naphthyl acetate as a substrate was higher than α -naphthyl acetate. Enzyme activities of acetylcholinesterase, mitochondrial ATPase, esterase (β -NA hydrolysis) and glutathione S-transferase of R strain showed the difference with S strain as 1.4, 1.7, 1.3, 1.4-fold respectively. However, fenpropathrin resistance of mites showed no consistent relationship with esterase and glutathione S-transferase (DCNB conjugation) in inhibition study. However, the acetylcholinesterase, P450 monooxygenase and mtATPase activity of R strain was more insensitive to fenpropathrin than R strain 1.9, 3.7 and 2.7-fold respectively.