

# Association of $LC_{50}$ and Slope in Probit Model for Fenpyroximate and Pyridaben Resistant *Tetranychus urticae* Populations Collected from Greenhouse and Apple Orchard

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Sixteen populations of *Tetranychus urticae* were collected from various greenhouse crop leaves and eight from apple orchards. Resistance to fenpyroximate and pyridaben of each population was estimated by calculating medial lethal dose ( $LC_{50}$ ), resistance ratio (RR) and slope of probit mortality line. RRs were ranked to four categories determined by Hayashi with low ( $\leq 10$ ), moderate ( $>10$  and  $\leq 40$ ), high ( $> 40$  and  $\leq 160$ ) and extremely high ( $>160$ ). RRs of greenhouse populations were mostly ranked in moderate, but the RRs of apple orchard populations were mostly in low. Man-Whitney's rank sum test revealed that house populations had higher RR than apple orchard populations regardless of treated acaricide. This indicates that greenhouse populations had been stronger selection pressure than apple orchard which is open and thus providing refuge. Four population groups determined by type (greenhouse or apple orchard) and acaricide (fenpyroximate and pyridaben) were tested by polynomial regression between  $LC_{50}$  and slope. The models from four test groups significantly fit for the regression model well ( $P < 0.05$ ), which is representing that resistance to fenpyroximate and pyridaben develops in a predictable way with the slope. Laboratory selected mite strains tested by polynomial regression of time and  $LC_{50}$ , and linear regression of time and slope supported our results that low and high resistance had high slope and intermediate resistance had low slope. Cross resistance of fenpyroximate and pyridaben were significant and the comparison of regression line of  $LC_{50}$  and  $LC_{90}$  for cross resistance indicated that resistance development for fenpyroximate had relatively higher increasing rate than pyridaben.

**Key words:** *Tetranychus urticae*, probit model, slope, median lethal dose, fenpyroximate, pyridaben, greenhouse, apple orchard