DEVELOPMENT OF BIOLOGICAL CONTROL OF TWOSPOTTED SPIDER MITE, *Tetranychus urticae* KOCH (ACARI: TETRANYCHIDAE) ON GREENHOUSE IMPATIENS, *Impatiens wallerana* Hook.f. cv 'Impulse Orange', USING THE PREDATORY MITE, *Phytoseiulus persimilis* ATHIAS-HENRIOT (ACARI: PHYTOSEIIDAE)

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ABSTRACT

The overall goal of my research was to develop a realistic biological control system for spider mites, *Tetranychus urticae* Koch (Acari: Tetranychidae), on impatiens, *Impatiens wallerana* Hook.f., using the predatory mite *Phytoseiulus persimilis* Athias-Henriot (Acari: Phytoseiidae).

First, I developed a method of estimating the number of spider mites on a plant. Intermediate leaves were chosen as the sampling unit because 60% of the mites were consistently found on the intermediate leaves. Both numerical and binomial sampling methods were developed.

The second objective was to ascertain the most effective release ratio of the predator. Predator:prey release ratios of 1:3, 1:15, and 1:30 were made at low and high initial *T. urticae* densities. Only the release ratio of 1:3 significantly reduced both pest numbers and plant damage within a short time at both pest densities. Damage increased with time required to eliminate spider mites. Regression models suggested that a release ratio of 1:10 or lower would provide a level of control that is consistently acceptable to most growers.

I also investigated the impact of spider mite distribution among plants on the effectiveness of two release strategies of the predatory mite. Before predators were released, spider mites were either evenly distributed among plants or clumped on a few central plants (a “hot spot”). Predators were then released, either evenly over all plants or clumped on the central plants. Predators eliminated spider mites in the clumped (pest)-clumped (predator) treatment first, then in the other predator release treatments. The even prey-clumped predator treatment was the least effective in reducing damage.

For my last objective, I investigated the effects of three different plant ages and two levels of spider mite infestation on spider mite population growth and visible mite damage on impatiens. Leaf damage caused by spider mites was correlated with cumulative mite density and action thresholds were developed. The action threshold is the pest density at which control measures need to be implemented. The level of damage that reduced plant marketability from a ‘premium’ to a ‘discounted’ category was found to be 4-6% leaves showing damage. Older aged plants exhibited greater damage than younger ones. The action threshold was determined to be 2.1, 1.51, and 1.25 cumulative mites /leaf in the three different ages, respectively.