Mites, Management and Morphology: Tritrophic Interactions in Mite Biological Control Systems

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Phytoseiid mites can be important biological controls of phytophagous pest mites. On perennial crops, successful biological control of pest mites by phytoseiids often depends on the ability of the predaceous mites to persist on the crop independent of densities of the pest mite. It has been observed that plants with abundant leaf trichomes support higher numbers of phytoseiids than plants with few leaf trichomes. Leaf trichomes might therefore influence the success of mite biological control in some crops. We studied the influence of leaf trichomes on the abundance of the phytoseiid *Typhlodromus pyri* on apples and grapes in New York, USA. We hypothesized that *T. pyri* are more abundant on and prefer apple leaves with many trichomes. We also hypothesized that one or more of the following mechanisms are responsible for behavioral preferences for and higher densities of *T. pyri* on apple cultivars with abundant leaf trichomes: escape from predators, increased capture of alternate foods, and mediation of low relative humidity. We found that *T. pyri* were more abundant on apples with many trichomes compared to apple cultivars with few trichomes. Through experiments we demonstrated that these differences could be attributed to increased protection from predators, increased capture of alternative food, and possibly, reduced dispersal loss. We found no evidence to support the hypothesis that differences in predator numbers were due to mediation by leaf trichomes of low humidity conditions. While there are differences among apple cultivars in abundance of *T. pyri* that could be attributed to leaf trichome density, these differences are probably of no importance in commercial apple production because most commercial apple cultivars have abundant leaf trichomes. In grapes, the same patterns of abundance of *T. pyri* relative to leaf trichomes were observed. Furthermore, the abundance of pest European red mite (*Panonychus ulmi*) were partially related to the abundance of *T. pyri*. Thus, in grapes, leaf trichomes likely play an important role in mite biological control.