THE BROAD MITE, POLYPHAGOTARSONEMUS LATUS, AS A POTENTIAL PREY FOR PHYTOSEIID MITES IN CALIFORNIA

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In laboratory studies, individuals of Euseius stipulatus Athias-Henriot, Typhlodromus rickeri Chant, T. porresi McMurtry and T. annectens DeLeon offered broad mite, Polypagotarsonemus latus (Banks), as prey had developmental and ovipositional rates comparable to those offered a known favorable food (tetranychid mites or pollen). Euseius hibisci (Chant) had a longer developmental period and a markedly lower oviposition rate on P. latus than on the control food. Immature survival and ovipositional rates of Euseius concordis Chant, Typhlodromus occidentalis Nesbitt, Amblyseius limonicus Garman and McGregor and Iphiseius degenerans (Berlese) were very low on P. latus compared to control foods.

The broad mite, Polypagotarsonemus latus (Banks), infests many crops in the field in tropical areas of the world and in greenhouses in other regions (Jeppson et al., 1975). For many years infestations of this mite have been observed in California on citrus and avocado seedlings in greenhouses and nurseries (Ebeling, 1959). Recently, however, the broad mite has become a pest on lemons in the field in coastal areas of Southern California (Brown, 1980; Brown & Jones, 1983).

Few studies have been conducted to investigate the suitability of tarsonemid mites as prey for phytoseiids. The only extensive work is that of Huffaker & Kennett (1953, 1956) which demonstrated that Amblyseius cucumeris (Ouds.) and A. aurescens Athias-Henriot could control populations of Steneotarsonemus pallidus (Bank) on strawberry. Moutia (1958) reported that Euseius ovalis (Evans) "effectively checked" populations of broad mite on Chili pepper in Mauritius. As an initial step in investigating the potential of biological control of broad mite in California, various species of native and introduced Phytoseiidae were tested to determine their ability to develop and reproduce on P. latus.

MATERIALS AND METHODS

The suitability of the broad mite as a food source was tested for 9 species of Phytoseiidae: (1) Euseius stipulatus (Athias-Henriot), an introduced species established on citrus in some areas of Southern California (McMurtry, 1977); (2) E. hibisci (Chant), the common native phytoseiid on citrus and avocado in California; (3) E. concordis (Chant), introduced from Brazil in 1982; (4) Amblyseius limonicus (Garman & McGregor), a native species found on citrus and avocado in Southern California only near the coast; (5) Typhlodromus occidentalis Nesbitt,
a native species associated especially with *Tetranychus* species on various crops; (6) *T. rickeri*, introduced from India in 1961; (7) *T. annectens* DeLeon, cultured from individuals imported from Mexico in 1982 (it also has been collected from avocado in California); (8) *T. porresi* McMurtry, also imported from Mexico in 1982; and (9) *Iphiseius degenerans* (Berlese), introduced from Italy in 1971 (McMurtry, 1977). All test mites were obtained from insectary cultures maintained on units similar to those described by McMurtry & Scriven, 1975.

Broad mites were reared in the laboratory on small green lemon fruit (3-5 cm long) in 1 l pastic cartons at a temperature of 27 °C and RH of 70%. Experimental arenas for confining broad mite and phytoseiid mites consisted of young lemon leaves (ca. 5 cm long), still with a purplish color, bordered with Cellucotton® barriers on foam plastic pads in 20 x 20 cm stainless steel pans filled with distilled water. All stages of broad mite were transferred by brushing them from fruits to the leaf arenas. After 4-5 days, when an abundance of eggs and larvae was present, phytoseiid mites were placed on the leaves.

To determine if the phytoseiids could develop on broad mite, 5 predator eggs (less than 24 hrs from oviposition) were placed in each of 10 leaf arenas in tests with *E. stipulatus* and *E. hibisci*, and 8 eggs in each of 8 arenas for the other species. The number of phytoseiid mites were counted daily and, insofar as possible, the stage of development was recorded. Maturity was confirmed when mating was observed. To determine rate of oviposition, adult females from the development tests were maintained on the same arenas for 6-7 days of oviposition, except for *E. stipulatus* and *E. hibisci*, which were retained for only 3 days of oviposition because of a shortage of broad mite. Separate oviposition tests subsequently were conducted for these 2 species; 10 females taken at random from the stock cultures, were placed singly on leaf arenas, and their oviposition recorded daily for 7 days. Because of effects of previous food, the first 2 days’ oviposition was not included in the calculations of oviposition rates. Additional mites of each species, provided with food known to be favorable for development and oviposition, served as controls. The control food was pollen of *Malephora crocea* on small lemon leaves for the 3 *Euseius* species, *A. limonicus* and *I. degenerans*. The Pacific spider mite, *Tetranychus pacificus* McGregor on bean leaf arenas, was the control food for the 3 *Typhlodromus* species (pollen is not a favorable food for these species).

RESULTS AND DISCUSSION

All 9 species of *Phytoseiidae* fed and developed to maturity on the broad mite as prey. In all species, a lower percentage reached maturity on this food compared to the control foods of pollen or Pacific spider mite (table 1). *E. stipulatus* had the highest percentage of individuals reaching maturity on broad mite, but developmental time apparently was about 1 day longer than on pollen. This species also had the highest rate of oviposition on broad mite, although the rate was significantly lower than on pollen in both oviposition tests. The lower oviposition rate of *E. stipulatus* on both foods in the separate test for oviposition probably can be attributed to the fact that test females taken at random from the culture included some older, less productive individuals, whereas the females in the other test were all newly matured.

*T. rickeri*, *T. annectens* and *T. porresi* all had comparable developmental periods on broad mite and Pacific spider mite, but fewer individuals completed development on the broad mite (table 1). *T. porresi* had a significantly higher oviposition rate on broad mite than on *T. pacificus*. Other studies (unpublished) indicated that other tetranychids are more favorable prey than *T. pacificus*. *T. rickeri* and *T. annectens* had comparable ovipositional rates on broad mite and *T. pacificus*. *T. annectens* was found on avocado trees in Chiapas, Mexico in relatively high numbers (several mites/leaf). One of the potential prey species present was another tarsenemid,