Biology/Phenology

Ecology of western flower thrips in intra- and near-orchard habitats

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Abstract: Apple shoots harbored adult and immature thrips throughout the season until frost. Adult thrips appeared on dandelion flowers before apple flowers developed and first appeared on apple buds at delayed dormant. On the orchard floor, dandelion flowers, as well as other flowers sampled, harbored thrips until frost, sustaining a resident population in the orchard. Thrips fed and reproduced throughout the year in near-orchard habitats by switching hosts that produce new leaves and flowers in different seasons. Some plants, such as arrowleaf balsamroot, *Balsamorhiza sagittata,* bloomed in spring and then were dormant until the next year. Others, such as gray rabbitbrush, *Chrysothamnus nauseosus,* provided growing shoots throughout the spring and summer, and flowers in the fall. The dominant climax woody species of the steppe, big sagebrush, *Artemisia tridentata,* attracted great numbers of thrips when in bloom in the fall. Native grass species attracted some thrips when in flower, but in general samples contained very few thrips. All native grass species sampled were dormant in the summer and fall and could not serve as a continuous food source for immature thrips. The great majority of thrips on apple and other host plants in Washington appeared to be western flower thrips.

Materials and Methods

Four orchards of the cultivar 'Granny Smith' were selected in Vantage, Orondo, Brewster, and Bridgeport, Washington. The Vantage site was under organic management, all the other orchards were under conventional pest management. Beginning in early March after the snow had melted, samples were taken from the apple trees, the orchard ground cover, and 50 m into surrounding uncultivated steppe habitat. As soon as the apple buds started to grow, four samples of buds were taken weekly or biweekly from each site. Starting at half-inch green, flower bud samples and vegetative bud samples were taken separately. Each sample consisted of 25 buds, enough to fit into a 15 x 15 cm bag. Flowers were sampled through complete petal fall.

Two of the most common plant species on the ground were selected for sampling at each site. Four samples that fit into a 15 x 15 cm bag were taken weekly. Plant specimens or vegetative parts with flowers were selected over those without flowers. Actively growing leaf buds were also given preference. Three to four species of plants were selected in the surrounding steppe habitat. The sampling methods were the same as for plants on the orchard ground. Sampling was discontinued when the plant had entered dormancy or, in the case of annuals, had gone to seed and died.

Plant tissue samples were washed with soapy water to dislodge the thrips. Adults and larvae were isolated by pouring the rinse through a series of sieves. Thrips were stored in 70% EtOH until sorted. After the adults and larvae were counted, representative specimens were slide-mounted for identification to species.

Results and Discussion

About two-thirds of the thrips specimens have been counted at the time of writing (December 2002). The following results and discussion are preliminary and may change after all of the specimens have been counted. Almost all of the specimens appear to be western flower thrips; however, identification of reference specimens has not yet been confirmed.

Early in March, when sampling began, apple trees were still fully dormant. When the apple buds reached half-inch green, about the second week in April, adult thrips began to appear in the buds. Thereafter, adult and immature thrips were found in flowers from pink to petal fall. After petal fall, thrips increased in the growing shoots. There was no apparent break between one generation and the next, but the rise in thrips in the samples just after petal fall was apparently due to the flight of the second generation. By June, adult thrips were a little less than 1/shoot in one of the sampled orchards. Both adult and immature thrips were found in shoots until the tips formed dormant buds, about mid-September. As expected, samples of the dormant buds in October yielded no thrips.

Thrips were present on dandelion, *Taraxacum officinale,* and grasses before apple trees broke dormancy. Some dandelion plants had over 10 flowers opened at peak flowering, just before peak flowering of apple. Thrips continued to breed in dandelion during the spring. However, most of the plants went to seed as apple reached full bloom, forcing most of the thrips to find new hosts. Flixweed, *Descurainia sophia*, a yellow winter annual, was common at one site. This plant flowered after apple petal fall. Thrips were found on the flowers until it was mowed in late May. Afterward, thrips were less abundant on flixweed and declined until the plant went to seed and died back, around late June. Following apple petal fall and throughout the summer and fall, thrips were abundant on dandelion flowers. Most dandelions did not produce flowers after the spring, but about 10% produced one flower at a time until frost. Grass species on the orchard floor, such as downy brome, *Bromus tectorum*, Italian ryegrass, *Lolium multiflorum,* and orchardgrass, *Dactylis glomerata,* rarely had any thrips all season. One orchard sampled had a ground cover of orchardgrass with no broadleaf weeds. This orchard apparently benefited from the lack of a preferred thrips host on the ground, because the number of thrips counted in apple flowers in spring tended to be low.

In adjacent land with undisturbed native vegetation, thrips were found in early March on gray rabbitbrush*, Chrysothamnus nauseosus*. As the plant grew new leaves, thrips were found occasionally on the vegetation. In early May, arrowleaf balsamroot, *Balsamorhiza sagittata,* began to bloom, and thrips were abundant in the flowers until they went to seed. Antelope bitterbrush, *Purshia tridentata,* also began to bloom in early May, which attracted some thrips. By July, bitterbrush had begun to grow new shoots, and thrips were found on the succulent growth. Flower heads began to form on big sagebrush, *Artemisia tridentata,* in July and, by September and October, thrips were abundant on the open flowers. Other fall blooming plants

such as rabbitbrush and snow desert buckwheat, *Eriogonum niveum*, attracted thrips to their flowers. Native grasses such as bluebunch wheatgrass, *Agropyron spicatum, s*teppe bluegrass, *Poa secunda,* and needlegrass, *Stipa* spp*.,* had very few thrips. Further, these grasses were dormant after producing seed in early summer. Thus they were not capable of supporting thrips for most of the season.

Both orchard and adjacent native habitats are able to sustain a breeding population of western flower thrips from early spring until fall frost. In the orchard, the primary breeding sites found were in growing apple shoots and dandelion flowers. In adjacent wild areas, because of the diversity of plants and their different growth habits, thrips can find open flowers or growing shoots throughout the year. Orchards that are isolated from uncultivated areas and have few broadleaf plants on the ground may harbor few thrips in the fall generations and few thrips emerging in the spring. Indeed, few thrips were collected from one of the sites which had almost no broadleaf plants in the ground cover.