

A spectacular flight of asparagus aphids in the Imperial Valley in October 1986 was so dense that it resembled a snowstorm. Below: winged and wingless forms of the aphid feeding on asparagus ferns.



Asparagus aphid is spreading fast

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California asparagus producers are facing potentially serious problems from the widespread establishment of the asparagus aphid, first discovered in the state in October 1984. During the fall of 1986, many growers in the Imperial and Coachella valleys were forced to apply repeated aerial insecticide treatments to their fields when asparagus aphid populations increased to enormous densities. Similar outbreaks are likely to occur in other asparagus-growing regions of the state, and growers and pest control advisors need to watch their fields for early signs of infestation.

Damage

Asparagus is a perennial crop that is allowed to grow lush vegetative ferns throughout the summer. In the fall, after the ferns have withered, they are mowed and either incorporated into the soil or cleared. In areas with cold winters, the crowns remain dormant until early spring, when new spears emerge from the ground. In the warm climate of the Imperial Valley, regrowth begins two to three weeks after mowing. Asparagus spears are harvested for up to 60 days before growth is allowed to proceed unchecked once again. Healthy fern growth is essential for replenishing the crown food reserves that are depleted during harvest.

Damage from feeding by the asparagus aphid, *Brachycorynella asparagi* (Mordvilko), is a complex, poorly understood process. Pronounced changes in growth of the asparagus plant occur when

the number of feeding aphids reaches a certain critical density. One theory is that the feeding aphid injects a compound into the plant that produces harmful effects. Symptoms of aphid attack include a shortening of the internodes between the whorls of cladophylls, or needles, which produces a characteristic tufted appearance marked by a blue-gray-green color. Premature release of buds from the crown during the fern stage of growth also has been reported. This can result in plant death if all viable buds are exhausted at the time of fern cutting in the fall.

One of the more serious consequences of moderate to heavy aphid infestations in the summer and fall is a delayed effect, which becomes apparent at the time of spear production in the spring. A bunching of spears occurs as they break through the soil surface; the number and size of marketable spears available for harvest is reduced significantly.

Substantial economic losses have been reported from regions where moderate to heavy infestations have occurred. For example, an estimated \$12 million loss in the 1980 asparagus crop in Washington resulted from asparagus aphid infestation. Losses in California already have been reported from the Coachella Valley, where 1985 infestations of asparagus led to reduced yields and poor fern growth in 1986. With nearly 38,000 acres of asparagus valued at \$75.5 million grown in California during 1986 and the wide distribution of asparagus aphid that has occurred during the past three years, it is apparent that this may become a serious problem.

The asparagus aphid

The asparagus aphid, *B. asparagi*, is distinct in appearance from the green peach aphid, *Myzus persicae* (Schultz) and *Aphis* spp., which also occasionally colonize asparagus. The gray-green aspara-

gus aphid is small, about 1.5 mm in length, with short antennae. Both winged and wingless forms can be found in most colonies on asparagus. The asparagus aphid feeds on the stems of asparagus plants, often obscured from view at the base of the needles. Because the aphids grow in colonies, distribution on asparagus plants is frequently in clumps; the greatest numbers of aphids inhabit the lower portions of the plant.

In temperate climates, asparagus aphid eggs overwinter in the soil and on the previous year's dead ferns. Wingless females emerge from the eggs in the spring and reproduce asexually on young asparagus plants. Production of both winged and wingless forms continues throughout the growing season until autumn, when males and females appear. After mating, the females lay the overwintering eggs.

We suspect that this life cycle, which is reported from more temperate areas, will vary in the warmer regions of California. In the lower desert of southern California, where schedules for fern cutting and sub-

dino, San Joaquin, Santa Barbara, Solano, Tulare, and Yolo.

Potential problems in California

A case in California that indicates the severity of the asparagus aphid problem occurred in the Imperial Valley, where some 4,000 acres of asparagus valued at \$6 million were grown in 1985. Asparagus aphid infestations first were reported in this valley in October 1985. No severe problems were encountered throughout 1985 or during the spring harvest of 1986. During the summer of 1986, however, just nine months after the aphid was first sighted, growers had to apply insecticides specifically to control asparagus aphids. We were interested in evaluating the potential for population increase and the rapid spread of this aphid throughout the valley.

Beginning on June 19, 1986, we placed aphid traps (yellow sticky cards) in five locations in the Imperial Valley. The traps did not register any asparagus aphids until July 17. At this time one trap about $\frac{3}{4}$ mile from the nearest asparagus

to 52,000 were trapped throughout the day. Large clusters of aphids collected on the ground and in numerous locations close to buildings or large trees. The aggregations formed in just a few minutes and remained as the aphids slowly expired. Subsequent trappings from October 31 to the present have revealed no asparagus aphids.

In conjunction with these trapping studies, we surveyed all asparagus fields in the Imperial Valley for the presence of asparagus aphids. We located the fields with the aid of the Imperial Valley Agricultural Commissioner's Office. At four corners of each field, we dislodged aphids from the asparagus ferns by beating the plants five times over a counting sheet. While other studies have shown that beating aphids from the ferns yields variable results, we felt that this technique would be adequate for a general rating of the infestations. After the aphids were dislodged, the number of aphids in five 0.80-square-inch areas on the sheet were counted. These numbers were averaged for a corner location count, and the four locations were averaged for the number of aphids per field. We also obtained records of spray applications as an indication of aphid pressure before the survey.

In this study, we detected asparagus aphids in all 59 asparagus fields in the valley and, of these, 69 percent either had heavy aphid densities or had recently been treated. In the relatively short time since its introduction into the valley, the asparagus aphid has become well established throughout.

Conclusions

These studies, which were limited in time and location, do not provide specific information on the biology of the asparagus aphid in California. They are intended to show that, at least in the warmer regions of the state, large population increases and dispersal of this pest can occur rapidly. In both trapping studies, aphid densities ranged from virtually none to very high numbers in a matter of weeks, and the aphids have spread throughout the valley in less than a year.

This work suggests that, if the occurrence and distribution experienced in the Imperial Valley takes place statewide, the asparagus aphid most likely will become a primary pest problem in asparagus production throughout California.

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The asparagus aphid has been shown to reproduce and disperse rapidly in the warmer regions of the state. It could become a serious pest.

sequent spear harvesting are staggered and asparagus plants regrow immediately, plant material is continuously available to the aphid. This situation and the mild winter temperatures might diminish the asparagus aphid's tendency to overwinter in the egg stage. Asparagus aphid problems in the early spring therefore are likely to be more severe than those encountered in the northern latitudes.

The asparagus aphid is native to Europe and first was found in North America in New York and New Jersey in 1969. It became established over the next few years throughout much of the eastern seaboard before it was reported in Illinois in 1977. The next new record came in 1979 from the state of Washington, and by 1981 it had been found in Oregon and Idaho.

As anticipated, the aphid eventually arrived in California; it was discovered in October 1984 on asparagus in a southern California home garden in Hemet, Riverside County. Within a month of the initial sighting, additional collections of the aphid were made from commercial asparagus fields in the Coachella Valley, locations in Kern County, and fields in Fresno County, indicating that the aphid probably was established in California for some time before its discovery. To date, the asparagus aphid has been reported from 15 California counties: Fresno, Imperial, Kern, Kings, Madera, Merced, Orange, Riverside, Sacramento, San Bernar-

field registered 6 winged asparagus aphids. The following week, an average of 95 winged asparagus aphids were trapped, a large increase in migrating winged forms. Insecticide applications in the area of the traps reduced the number of winged aphids trapped to 0. This condition remained for eight weeks until the fourth week of September, when aphid numbers once again increased, from 0 to 72 per trap. Aphid densities peaked on October 9 with 95 aphids per trap, declining to 0 on November 7, after fields again were treated. No asparagus aphids were trapped until March 1987, when a few winged forms were caught.

In a second monitoring study, we used a rotating net trap to aerially sample aphids throughout the daylight hours. Sampling twice a week began on October 8, 1986, and is continuing at present. The rotating trap, which consisted of two conical nets 15 inches in diameter positioned on opposite ends of an 11-foot-long horizontal shaft, was operated for 15-minute periods at hourly intervals throughout the daylight hours. For comparative purposes, the total sampling time for each date was the same.

In this study, only a few winged aphids were trapped on October 8. The count increased steadily up to October 24, culminating in a spectacular flight of dispersing aphids. On that date, one 15-minute sampling caught 28,000 aphids, and close