

number of insecticide treatments applied. Regime 1 showed a significantly higher number of predators than the other three treatment regimes, which did not differ significantly.

Mean numbers of beneficial predators per week (fig. 1) in regimes 2, 3, and 4 were about equal from July 9 to July 30 and then rapidly declined. The number of predators in regime 1 remained high throughout the season, with the high point occurring on August 25. The reduction in number of predators between July 23 and July 30 is attributed to insecticide applications between the two sampling dates. In individual fields, beneficial predators declined dramatically after application of an insecticide. Predator populations resurged rapidly, if there was not a second application within one week. When the number of insecticide applications was increased, predators were largely eliminated.

The mean number of bollworm-budworm eggs was significantly lower in treatment regime 1, compared with the other regimes, while mean number of larvae was significantly higher in regime 3, compared with the other treatment regimes. Since the mean number of bollworm-budworm eggs and larvae increased progressively from regime 1 to regime 3 and then decreased in regime 4, while the mean number of beneficial predators decreased with increased numbers of insecticide treatments, it appears that bollworm-budworm was suppressed by the combined action of both predators and insecticide treatments, with the predators having the greatest effect.

The mean number of bollworm-budworm eggs per week (fig. 2) shows a generation peak about August 11 in all treatment regimes and the apparent beginning of a second generation on the last sampling date. All four treatment regimes were approximately equal from July 9 to July 30. After this date the bollworm-budworm eggs in treatment regimes 2, 3, and 4 increased rapidly while in regime 1 they remained low throughout the season.

Robert A. Van Steenwyk is Assistant Research Entomologist, Nick C. Toscano is Extension Entomologist, Gregory R. Ballmer is Staff Research Associate, Ken Kido is Staff Research Associate, and Harold T Reynolds is Professor of Entomology, Department of Entomology, University of California, Riverside.



Carrot foliage with powdery mildew (left), as compared with healthy foliage (right). Note white spots of fungal growth on diseased leaves.

Powdery mildew on carrots—a new disease

Demetrios G. Kontaxis

Powdery mildew has been reported for the first time on carrots grown in the Imperial Valley.

California's third largest carrot-producing county is Imperial County, with more than 6,000 acres of carrots. Fields are planted to carrots during September to November and harvested from December to June. More than 90 percent of the acreage is planted to the Emperor 57 cultivar.

In April, Pest Control Advisor Ralph Pedley of Stoker Company showed the author a carrot disorder in one field. Field and laboratory examination revealed that the disorder was powdery mildew.

Symptoms

The leaves of many plants were covered with small white-grayish spots on both sides and on their petioles. In advanced infections, the whole foliage was covered with fungal growth (see photo). Such plants looked as if they had been dusted with a white powder. Shaded leaves showed a higher incidence and a more severe infection than did leaves well exposed to the sun. Older, infected leaves

turned brown and died.

The disease was widespread in the field with several local spots of higher incidence.

Causal agent

Laboratory examination indicated that the causal agent was a fungus, the hyphal and spore structure of which resembled that of powdery mildew commonly found on local sugar beets. C. E. Yarwood, Professor of Plant Pathology, U.C., Berkeley, identified the pathogen as *Erysiphe polygoni* DC.

This is the first recorded incidence of powdery mildew on carrots in the Imperial Valley. Furthermore, it is the second recorded incidence of the disease on carrots in the United States (in 1975 the same disease was observed in Santa Maria, California—C. E. Yarwood, personal communication).

Demetrios G. Kontaxis is Farm Advisor (Plant Pathology), Imperial County.