



Leaf injury caused by the maggots of the carnation leaf miner.

**Carnation growers** in California—constantly combating spider mites, thrips and aphids, and occasional infestations of carnation bud moth or mealybugs—have two new pests to fight.

The carnation bud mite—*Aceria paradianthi* Keifer—was first discovered in California in 1952. A subsequent collection from Maryland constitutes the only other known record of this pest in the western hemisphere. It is probable that the mite was introduced from Europe.

The original infestation was found in Santa Barbara County, and a state-wide survey by the State Department of Agriculture showed the pest to be present also in Los Angeles and Orange counties. During 1956, infested nurseries were found in the San Francisco Bay area, in Alameda, Santa Clara, and San Mateo counties.

# New Carnation Pests

## bud mite and leaf miner found in California may cause serious problems

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Carnation bud mites are exceedingly tiny and they prefer to live within the new shoots, between the bases of the leaves and stem, and under the flower calyxes. Their presence in large numbers is detected by somewhat greasy, distorted, and stunted new growth.

Because of the secretive habits of the bud mite, it has been very difficult to control. Parathion, chlorobenzilate, and Kelthane have given good control of exposed mites, but repeated applications of these chemicals serve only to keep down mite populations.

In recent experimental plots at Redwood City, two new chemicals have shown greater promise for bud mite control. One of these is Diazinon and the other is Phostex, an experimental chemical.

Excellent kill was obtained with wettable powder of Diazinon applied at a rate of three pounds of a 25% material per 100 gallons of water and 25% emulsifiable Phostex used at a rate of one pint per 100 gallons of water. The addition of four ounces of a commercial spreader to the Diazinon spray caused a rather even distribution of the residue over the leaves and possibly enhanced the performance. Phostex, when used as a 25% wettable powder at a rate of three pounds per 100 gallons of water, was inferior to the other chemicals. No plant injury was incurred in these tests.

The other new carnation pest is the carnation leaf miner—*Liriomyza* n. sp.



Distorted terminal shoots injured by the carnation bud mite.

The native home of this pest is not known, but it was first found in several nurseries in San Mateo County in 1956. The maggots of this tiny, black and yellow fly tunnel within the leaves, making serpentine mines. As far as is known, at the present time, only carnations serve as a host.

A 2% parathion dust has given good control of the adult flies as they emerge. Applications are made at 10- to 14-day intervals.

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no beneficial effect and usually a deleterious effect on parasites in addition to rather poor control of miners. Such insecticides include DDT, DDD, methoxychlor, perthane, TEPP, rotenone, and toxaphene. DDT was found to affect the larval parasites, *Solenotus* spp., more than *Halticoptera*, due to differences in the biology of these species. Other materials—parathion, methyl parathion, EPN, aldrin, dieldrin, heptachlor, endrin, isodrin, chlordane, and lead arsenate—may or may not affect parasites, but are more effective in controlling the leaf miner.

More work is needed to determine the best use of insecticides and still preserve natural enemies. The use of seed treat-

ments, systemic materials, baits, and other controls needs investigating. However, mild and warm fall and winter conditions tend to increase numbers of flies on all host plants. Sugar beets, weeds, and lettuce are sources of flies and parasites.

Insecticides should not be applied early in the growth of spinach, so as to allow parasites to get started on the first generation of leaf miners. Where flies are abundant—and insecticides are necessary—parathion applied as a 2% dust at 45 pounds per acre, or the equivalent as a spray, at about the rosette stage, is usually effective when followed by one or two additional applications at 7-10-day intervals, depending upon growth

and possible chemical residue problems. DDT or related materials should not be used. If dieldrin, aldrin, or heptachlor is used early, it should be combined with a phosphate.

The use of more than two or three insecticide applications is not usually economically feasible, and—under high leaf miner population conditions—may not allow the spinach to meet unofficial allowable larval tolerances.

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