Ants and Citrus Pests

ant infestation of tree by restricting biological control causes leaf and crop reduction, and smaller fruit sizes

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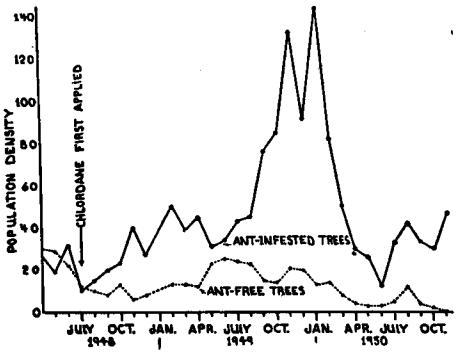
Citrus pests can not be checked satisfactorily by biological control if honeydew-seeking ants are abundant in the grove.

Studies in untreated citrus groves showed that ant infestation may cause serious increase in populations of California red scale, citrus red mite, citrus aphids, citrus mealybug, soft (brown) scale, black scale, and yellow scale. The adverse effects are most serious in groves where effective natural enemies of the pests are present but which are untreated for extended periods.

The experiments were made in groves which had received no insecticidal treatments for four to 24 years.

Ants were excluded constantly from one tree in an orange grove at Escondido since October 1948, but had access to an adjacent tree. The grove had not been treated with insecticides for 10 years, and effective natural enemies of the citrus pests were present. Pest population and tree conditions were very similar at the beginning of the test.

The ant-free tree is now exceptionally clean and very vigorous. The ant-infested tree, although never exceedingly heavily infested by any given pest at any one time, has suffered cumulative damage from higher populations of citrus mealybug, red scale, soft (brown) scale, black scale, citrus red mite and aphids. It has less than 25% as much foliage as the ant-free tree, 70% as much fruit, and the fruit size was reduced to an average of 344 oranges per box, as compared to 200 oranges per box from the ant-free tree. The California red scale and the citrus mealybug were responsible for most of the damage.



Population trends of the California red scale on ant-infested and ant-free lemon trees.

Noticeable differences between the infestations on these two trees did not occur for nearly nine months after the ants were eliminated in 1948. In 1950 the relative pest population density was: one California red scale per sample on the ant-free tree, 24 scales on the ant-infested tree. For the citrus mealybug the ratio was zero to 59 colonies per sample in favor of the ant-free tree; for soft (brown) scale zero to 13 colonies; for black scale two to 53 individuals; for aphids zero to five colonies, all in favor of the ant-free tree.

Similar results were obtained from experimental comparison of this type made in groves near Vista, Irvine, Santa Paula, and Santa Barbara.

Detailed studies were made in two Santa Barbara lemon groves concerning both the pest and natural enemy populations. The heavier populations of the California red scale on ant-infested trees resulted only indirectly from the presence of the ants. The red scale does not produce honeydew or other material which is desirable to the Argentine ant. The ants are attracted to the honeydew secreting mealybugs, soft scales or aphids but they

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***Left:* Orange tree from which ants were eliminated for two and one half years, is clean and vigorous. *Right:* Adjacent tree heavily infested with ants during the same period shows reduced leaves and crop, smaller fruit sizes.**

NORTH

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field selection of resistant plants, is now available.

No wilt-resistant California Common plants have been found; but by crossing, the wilt resistance of the Turkestan variety, and the resistance to leaf spot and downy mildew obtained by selection in California Common, have been incorporated into a new variety, Caliverde.

Large numbers of Caliverde plants are exposed in the greenhouse to high populations of the sharpshooter leafhoppers carrying the dwarf virus, to discover dwarf-resistant plants. This work should yield a variety of alfalfa resistant to all four diseases.

Ornamentals

Among the diseases of ornamentals which have been investigated are powdery mildew, downy mildew, Verticillium wilt and virus diseases of rose; root rot and Fusarium wilt of carnations; powdery mildew of heather; stem rot of peperomia; Verticillium wilt of chrysanthemum; Septoria leaf spot of Esther Read daisy; powdery mildew of snapdragon; root rot of poinsettia; rhizome rot and spotted wilt of calla; flower blight of camellia; and bacterial and virus diseases of orchids.

Botrytis infection has been studied on Bouvardia, Stephanotis, cyclamen and tuberous begonia and other bulbs; virus diseases on primula, annual stock, sweet pea, and freesia and other bulbs.

Basic Research

Experiments using radioactive sulphur as a tracer, explain how sulphur kills the rust or powdery mildew fungus without injuring the leaf tissue.

Other tests show that sulphur vapor is more effective as a fungicide at higher temperatures.

To safeguard the high reputation of California seeds and to aid growers, pure culture procedures have been developed to detect plant pathogenes on seeds. This makes it possible to analyze any seed lot for its disease-freedom or disease-potential, and inform seedsmen or growers if they need to take precautions against any particular fungus.

Chemical activities and responses of plant pathogenic bacteria are under study.

Some strains of the potato scab organism, *Streptomyces scabies*, were found to produce an antibiotic that is active against Verticillium and Fusarium wilt fungi.

The antibiotics, penicillin, streptomycin, bacitricin, aureomycin, and circulin killed pathogenic bacteria on tomato seed, so that healthy seedlings were produced while 30% of the seedlings from untreated seed were infected.

Sodium salt of o-hydroxydiphenyl—natriphene—at dilutions of 1:2000 has been found effective as a plant dip against a bacterial disease of orchids.

When cultures of two species of pathogenic bacteria, those causing tomato canker and walnut blight, were treated with certain chemicals of the naphthalene group or with certain uranium salts, mutations were induced which resulted in strains with greatly reduced virulence.

The size and shape of plant virus particles are being studied by means of the electron microscope. Methods of extracting virus from diseased tissues have been improved and two spectrophotometric methods for measuring virus concentration in plant tissues developed.

Many compounds are applied to living infected tissue to determine their effect on virus multiplication. This is done with entire plants, detached leaves, and tissue cultures. Any compound that will inhibit virus multiplication may find important applications in medicine as well as agriculture.

SOUTH

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Experiments on date fruit spoliage reveal that wet weather, microorganisms, insects, and mites are responsible, and that commercial control can be effected by covering the fruit bunches with strong paper bags, inserting wire rings in the bunch to separate the fruit strands, and dusting the fruit with various fungicides and insecticides.

The role of the fungus *Trichoderma lignorum* in the control of Armillaria mellea, a fungus causing root rot of various trees, is being studied.

Ninety-six of the most promising and important peach varieties have been tested for tolerance to the peach mosaic virus. Most of the clingstone varieties fall in the tolerant or little damaged class, and most of the freestone are in the severely damaged class.

Work on diseases of commercial floricultural seed, nursery, bulb, and ornamental crops aims at obtaining disease-free seed or planting stock, and at methods for keeping them healthy. Some of the studies attempt to control established diseases of a wide variety of commercially important ornamentals of California.

ANTS

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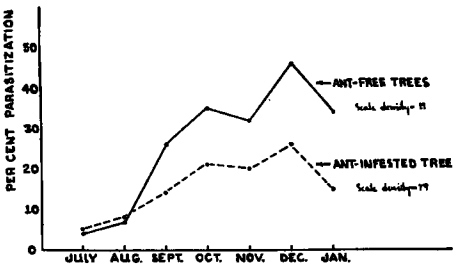
do not distinguish between the natural enemies of these and other pests. The ants seem to be particularly effective in capturing or disturbing the principal red scale parasite, the golden chalcid. Thus the red scale increases in ant-infested groves where this parasite is prevalent.

The citrus red mite, too, increased sharply on ant-infested trees. The ants show no particular interest in the mites but attack their natural enemies. In a lemon grove at Montecito there was an average of 1,437 citrus red mites on 1,000 leaves taken from ant-infested trees, while the same number of leaves from ant-free trees averaged only 66 mites.

It is evident from this experiment that in an untreated grove having efficient citrus red mite predators present, the effectiveness of the predators may be nullified by the adverse activities of ants to such an extent that mite populations may increase 20-fold.

Data from the Montecito tests show that on ant-infested trees 63% of the leaves suffered medium to very heavy feeding damage. On ant-free trees only 32% of the leaves suffered medium to heavy feeding damage, and none suffered very heavy feeding damage.



Per cent parasitization of California red scale by *Aphytis* during a period of heavy ant infestation on ant-infested and ant-free lemon trees.

The gray field ant or crazy ant, individual for individual, is much more destructive of natural enemies of citrus pests than the Argentine ant. But the Argentine ant is most generally distributed and occurs in larger colonies, so its over-all effect is greater.

Pest populations increase during and shortly after the season of greatest ant activity. Their relative increase, with respect to ants, is greatest in years of ant abundance.

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