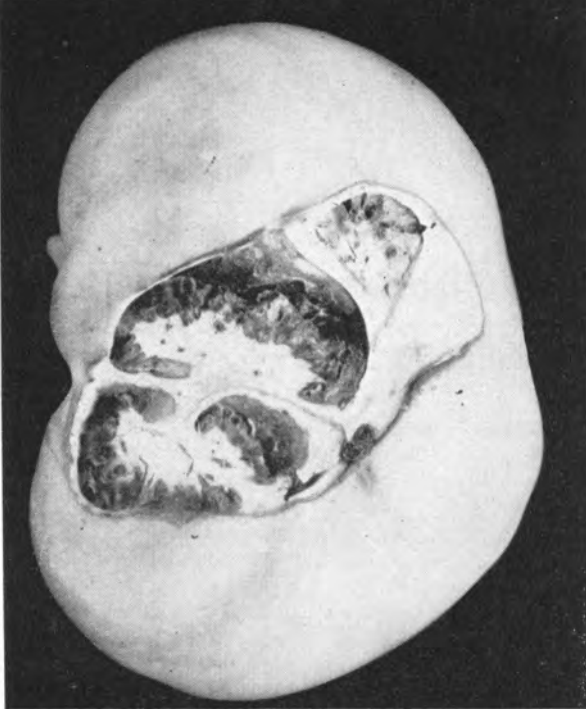


Current Entom

continuous study aims at insects and mites harmful

E. O. Essig



Typical injury to young green tomatoes by the tomato horn worm.



The navel orangeworm has recently become a pest of walnuts in the trees at ripening time and in storage.

The Division of Entomology and Parasitology at Berkeley and Davis aims at controlling the agricultural pests of California, with special emphasis on those of importance to the northern part of the state.

Red spiders and other mites infesting agricultural crops are under constant study by nearly all staff members of the division. New miticides giving much better control than those previously known are being used. Investigations are being carried out on mites infesting tomatoes, cucurbits and other truck and garden crops; on alfalfa, clovers, barley and various field crops; on cotton and potatoes. Mite studies on nuts, fruits and berries are directed particularly against red spiders and blister mites in the coastal and interior valley regions, and the cyclamen mite on strawberries. Mite research on ornamental and on greenhouse plants offers opportunities for first testing new insecticides that might prove noninjurious to humans. Mites are being investigated on stored food products of all kinds, on poultry and on livestock.

Insects as vectors of plant virus diseases are being studied in greenhouse,

laboratory and field investigations. There are over 200 insect-borne plant diseases on record—many of which are exceedingly destructive to agricultural crops, especially to truck and field crops, berries, fruits, vegetables, and ornamentals. The studies involve the discovery of the insect vectors, the manner in which they infect the plants, their distribution, life histories, and the most efficient means of their control.

Fruits and Nuts

Studies are being conducted on all known pests affecting apples and pears, and the research work is being improved constantly through the development of more effective insecticides and spraying and dusting equipment. Among the most important insects involved are: codling moth, leafrollers and a great many other caterpillars—old and new; aphids, leafhoppers, bugs, scale insects, thrips, flat-headed and shot-hole borers, and mites.

Insects infesting stone fruits continue to receive special consideration. Many new species have appeared in past years and others like the oriental peach moth are occasionally appearing. Special projects cover all the common caterpillars like codling moth, bud moth, orange tortrix and other leafrollers, cankerworms, tussock moths and scale insects, aphids, thrips and mites. A number of the new insecticides and miticides show great promise.

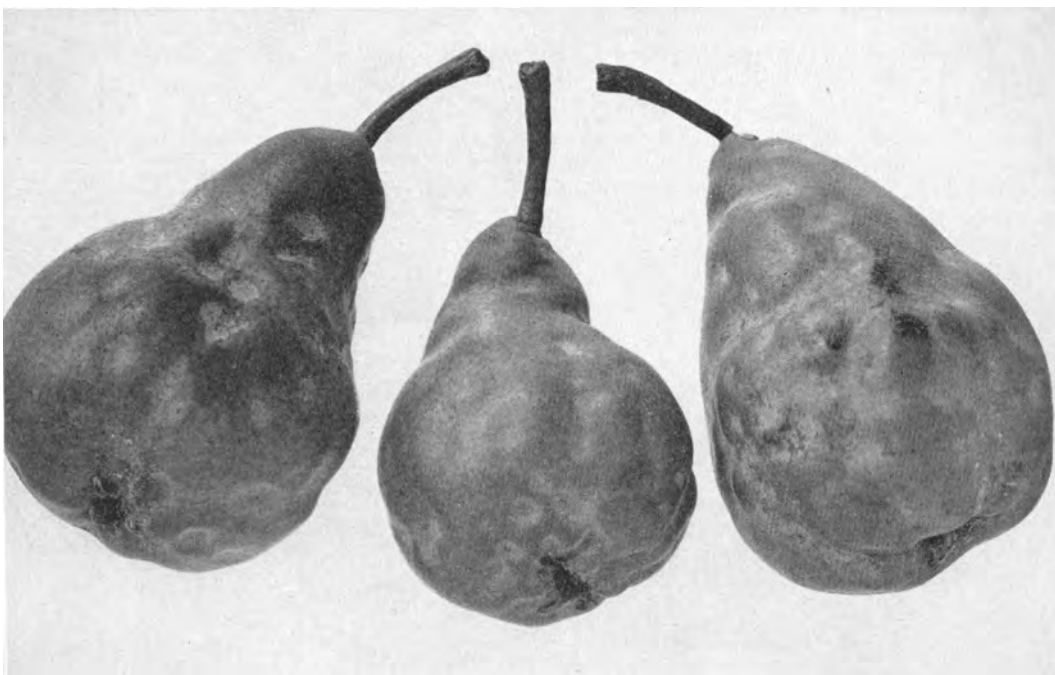
Progress is being made in the control and reduction of the fig and olive scales in the San Joaquin Valley.

Grapes have received a great deal of intensive investigational work in connection with the control of the grape leafhopper, leafhopper-vectors of Pierce's Disease, grape leafroller, red spiders, grape bud and erinose mites, and many other pests.

Nuts including almonds and especially walnuts are receiving much attention because of severe insect and mite damage. On walnuts the developed control programs on codling moth, Catalina cherry moth and others, the walnut aphid and scale insects continues to be very successful. Red spider work is also progressing yearly.

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Deformities of pears caused by lygus bugs and grassbugs when the fruit is small.



ology Research

Discovery and control of all
to agriculture in California

Robert L. Metcalf

The Division of Entomology at Riverside and Los Angeles is responsible for research on the control of insects which are of agricultural importance to more than 4,000,000 acres of cultivated land, and which cause an estimated annual damage of more than \$100,000,000 to southern California farm products.

Additionally, co-operative research studies with the Division of Entomology and Parasitology at Berkeley and Davis directly benefit the agricultural industry of the entire state.

Citrus Pests

Studies of mites attacking citrus resulted in the development of two new acaricides which give excellent control of the citrus red mite and are registered for commercial usage. These are beta-chloroethyl-beta'-(*p*-tertiary-butylphenoxy)-alpha'-methylentylsulfite—Aramite—and *p*-chlorophenyl *p*-chlorobenzene sulfonate—Ovotran. Several other new materials are showing promise under a variety of field conditions and in laboratory studies. Aramite also controls the citrus bud mite.

New materials are being tested for the control of citrus thrips. Aldrin and dieldrin look highly promising but have not yet been licensed for commercial usage because of lack of adequate information regarding possible deleterious residues. Studies of several other compounds indicate potential promise.

Factors which may limit the usefulness of parathion in the commercial control of armored—red, yellow and purple—scales are being studied in field plots of more than 200 acres. Examined are post-treatment effects from commodity contamination by parathion residues present in peel, pulp, juice and by-product oils, changes in fruit quality, possible toxic air contamination by parathion vapors in or near treated groves and interference with the biological control of various economic pests on citrus. A number of new insecticides are under investigation, but none has yet shown promise of attaining commercial usage.

In control studies of unarmored scales of citrus, parathion, at economical dosages, has proved very satisfactory against citricola scale, and has given variable

results against black scale. Applications sometimes produce abnormal population increases of soft brown scale, due to interference with the parasite-predator complex. A new compound, S-(1,2-dicarbethoxyethyl) O,O-dimethyl dithiophosphate, has shown some promise in the control of this soft scale.

Many compounds of suitable boiling points are being tested as possible fumigants for California red scale, yellow scale, black scale and citricola scale, and for mites attacking citrus. To date no promising materials have been discovered.

Two new insecticides, DDD and ethyl *p*-nitrophenyl thionobenzenephosphonate—EPN-300—have shown considerable promise in the control of orangeworms and are being extensively used along with parathion and cryolite in large-scale field tests.

Several new organic phosphate compounds such as a trialkyl thiophosphate—Systox—, dimethyl *p*-nitrophenyl thiophosphate, octamethyl pyrophosphoramide, and S-(1,2-dicarbethoxy-ethyl) O,O-dimethyl dithiophosphate, show

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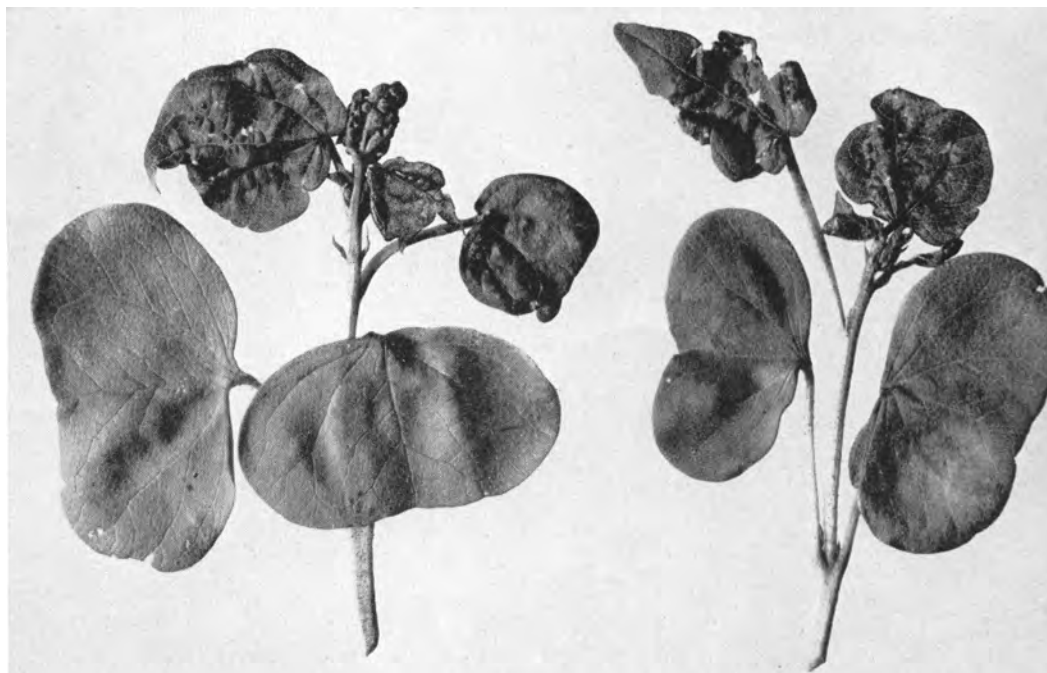


Type of damage to sweet corn done by the corn earworm, a major pest of sweet corn and tomato.



Tent caterpillars appear early in the spring and often defoliate deciduous fruit trees and native trees and shrubs.

Growth retarding injury to young cotton plants caused by thrips.



BERKELEY

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As berries increase in acreage work on berry insects is being extended. Many years of intensive investigations have been devoted to the study of the life history and control of the cyclamen mite of strawberries. These investigations are being pressed with the hope of obtaining greater success with the newer miticides and perhaps also by such other means as resistant varieties and agricultural practices. The root borers, tree crickets, and other insects and mites are also being studied.

Forage Crops

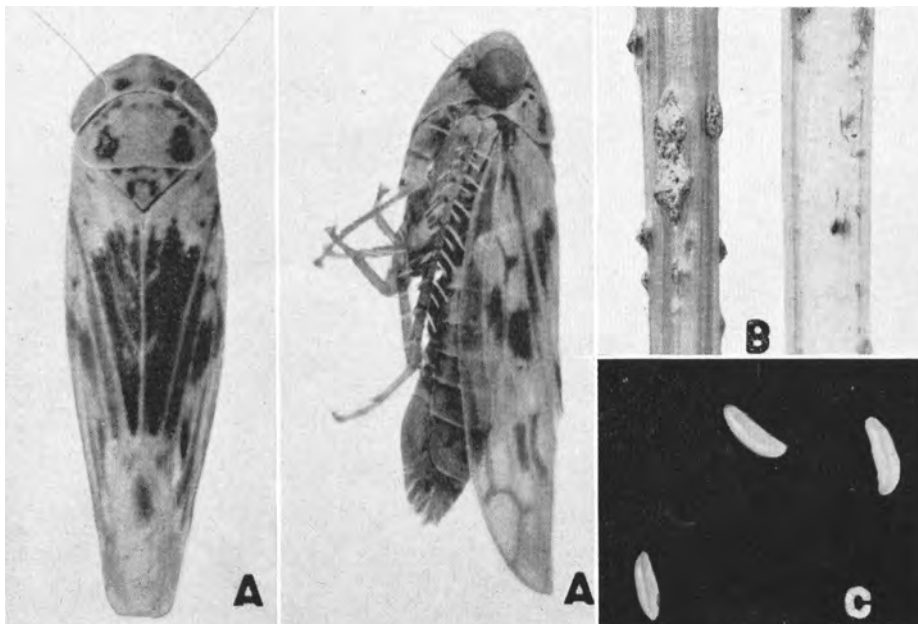
Alfalfa insect pests are being investigated closely, particularly for the control of the alfalfa butterfly, lygus bugs, and other insects. Much has been done to establish a system of supervised insect control which is gradually being taken over by the growers and which has resulted in effective insect control and great savings to alfalfa growers, especially in the San Joaquin Valley.

Continued studies are being made on the work and distribution of the alfalfa weevil. Many other insects of forage crops are also included in these investigations.

Field and Truck Crops

Cotton insects are being studied as new insect and mite problems arise. At the present time effective control appears to have been developed for lygus and plant bugs, aphids, mites and many other pests.

The sugar beet leafhopper—A—eggs—C—and egg punctures—B—in the host plant. The control of this insect is an important problem on the west side of the San Joaquin Valley.



Truck crop insect investigations involve a great many crops and hundreds of different kinds of insect pests such as aphids, thrips, bugs, cutworms, armyworms, wireworms, leafminers, root maggots, stem maggots, and seed maggots, crane flies, garden centipedes, snails and slugs. Tests are being conducted in all parts of northern California and many new discoveries in insect control have been made. The successful treatment of seed to protect it from insect attack in the soil is one of the really great contributions in this field. Very many new insecticides are being tested constantly. This work centers at Davis but nearly every member of the staff is a part of the overall project. Tomatoes, cucurbits, sweet-corn and a number of other crops have special projects.

Bees, Parasites

Apiculture investigations include the building up of breeding stocks of California bees; studies of pollen grains gathered by bees; insecticides in relation to beekeeping; the breeding and genetics of the honeybee including artificial insemination; and the fundamentals of apiculture as related to agriculture in the state.

The control of insects and other parasites of domestic animals is becoming an increasingly important goal of the Division. At the present, active projects deal with studies in poultry parasitology; the seasonal incidence of the parasitic nematode, *Ostertagia circumcincta*, of sheep, the status and control of myiasis-producing flies in California; and control of livestock ectoparasites with hexachlorocyclohexane and similar insecticides.

Other projects in this general field include studies of the biology and control of black gnats, mosquitoes, cattle grubs, and flies affecting man and animals.

Studies in the identification, life histories, distribution and control of plant parasitic nematodes in California are well under way. Great strides are being made in the collection and identification of these ultra-minute agricultural pests and progress in control is being made.

Supplementing the work of the Division has been the establishment of insect collections at Berkeley and Davis with curators in charge. The collections now number more than 1½ million of specimens and many thousands of species.

Miscellaneous Projects

Countless numbers of insects, mites and other pests on the great variety and volume of California ornamentals are being studied. A special project has been set up to cover this field as thoroughly as funds will permit. The testing of new insecticides upon these nonedible plants has been of great assistance to our field investigators who are working on edible crops where residues are involved.

Research of insecticidal residues on food crops—fundamental to the use of chemicals in insect control—aims at a better knowledge of the deposits, toxicity and analyses of toxic residues. Investigations involving taste and smell tests of food products treated with insecticides or growing in treated soils are under way.

Miscellaneous investigations include the following:

- 1, A survey and collection of all the insect species in California and the most important economic species in the Western States;
- 2, studies of all the aphids or plant lice involved in the transmission of plant virus diseases;
- 3, studies in the systematics and bionomics of native bees;
- 4, the life history, bionomics and systematics of the Hemiptera—true bugs;
- 5, morphology, biology and control of coleopterous insects injurious to forests and forest products;
- 6, investigations in insect physiology: respiration and absorption and excretion;
- 7, researches on the taxonomy and biology of North American Siphonaptera—fleas;
- 8, studies of sawflies attacking trees and agricultural crops in California: taxonomy, biology and distribution of the Psyllidae—jumping plant lice;
- 9, the taxonomy, distribution and biology of California leafhoppers;
- 10, the taxonomy, biology, ecology, distribution, and control of California species of thrips;
- 11, systematic and economic studies of the garden centipedes which are injurious to agricultural crops and ornamentals.

E. O. Essig is Professor of Entomology, University of California College of Agriculture, Berkeley.