Fruit Tree Leaf Roller on Citrus

experimental field trials conducted in Pomona-Ontario area for control with the newer available insecticides

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Fruit tree leaf roller—*Archips argyrospila* (Walker)—infested between 2,700 and 3,000 acres of oranges in eastern Los Angeles and western San Bernardino counties in the 1950 season.

Lemons in the same area were found to be lightly infested.

Of the orange acreage, 450 acres were considered heavily infested and warranted control measures.

The damage initially consisted of rolling and webbing the shoots of the new spring flush of growth. Later considerable damage was done to the blossoms. Many groves were observed after petal fall where the larvae had destroyed much of the young set fruit.

There were two instances noted where considerable damage was done to mature navels in the field. In another case a high percentage of navels from a moderately infested grove were damaged in the packing house—where the fruit had been stored three days prior to washing and grading.

Recommendations for the control of the larvae by sprays were not available and immediate control measures were desirable.

Commercial applications were started in 12 groves at a time when most of the larvae were half grown. Experimental field trials commenced the same week.

Life Cycle

The fruit tree leaf roller passes the winter in the egg stage. As on deciduous fruit trees there is only one generation a year. The eggs are laid in the late spring and remain unhatched until the following spring.

On citrus in the Ontario-Pomona area, egg mass deposition begins in May with the peak during the month of June. The egg masses may be found almost anywhere on the bark of citrus trees, but are most common on twigs one fourth to 1½ inches in diameter. Observations last year indicated that the first eggs began hatching approximately March 20 and continued through April 15.

Shortly after the buds of the spring flush of growth begin to develop the tiny larvae may be found feeding upon them. They do not appear all at once, but usually hatch over a period of three weeks or more. Approximately 30 days is required for a larva to become fully grown. On April 24 almost all of the larvae were in the second instar or larger. By May 12 over half of them were fully grown.

The larvae very seldom feed on the older leaves. As soon as the new flush of growth becomes mature they abandon them for more tender growth, the blossoms and newly set fruit.

When the larvae are fully grown they become quiescent and transform to the pupal stage within a rolled-up leaf or cluster of leaves or mass of floral parts. Ten to 11 days are spent in the pupal stage. At the end of this period, transformation to the adult or moth takes place.

In the citrus groves observed, the adults were first seen May 11 and fresh egg masses were first found May 15. Therefore, the data indicate that mating and egg deposition take place immediately following transformation to the adult stage. The largest numbers of adults were in the groves around June 15. Few moths were present after July 10 and the last adult was seen July 28 in this area.

Experiments

During the same period that the commercial treatments were being applied, experimental plots were treated using the newer available insecticides. Results obtained in control of typical experimental field trials using DDT, DDD, methoxychlor, parathion, EPN-300, *Ryania*, aldrin and dieldrin applied at various dosages and in different amounts of finished spray per acre with several types

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Results of Typical Experimental Field Trials Using New Insecticides Applied with Various Types of Spray Equipment.

Material	Per cent wettable powder	Pounds per 100 gallons	Pounds actual material per acre	Gallons spray per acre	Spray equipment used	Per cent mortality 2 days	Per cent mortality 7 days
DDT	50	2	10	1000	conventional	76	100
DDD	50	2	10	1000	conventional	29	100
Methoxychlor	50	2	10	1000	conventional	18	100
Parathion	25	½	2½	1000	conventional	86	100
EPN-300[1]	27	½	2½	1000	conventional	18	100
Ryania[2]	100	6	60	1000	conventional	..	70
DDT	50		3	500	boom sprayer	63	99
DDD	50		3	500	boom sprayer	63	100
Methoxychlor	50		4	500	boom sprayer	35	83
Parathion	25		¾	500	boom sprayer	81	100
EPN-300	27		¾	500	boom sprayer	48	100
Ryania	100		30	500	boom sprayer	35	27
DDT	50		3	500	speed sprayer	96	98
DDD	50		3	500	speed sprayer	90	100
Methoxychlor	50		3	500	speed sprayer	76	95
Parathion	25		¾	500	speed sprayer	100	100
EPN-300	27		¾	500	speed sprayer	88	100
Ryania	100		15	500	speed sprayer	28	23
Dieldrin[3]	25		¾	500	speed sprayer	62	100
DDT	50		3	300	spray-duster	91	95
DDD	50		3	300	spray-duster	95	99
Dieldrin	25		¾	300	spray-duster	55	88
Dieldrin	12½%	emulsion	¾	300	spray-duster	62	84
Aldrin[4]	25		1½	300	spray-duster	73	81
Aldrin	25%	emulsion	1½	300	spray-duster	59	79

[1] The active ingredient in EPN-300 insecticide is ethyl *para*-nitrophenylthionobenzenephosphonate.
[2] *Ryania* is a botanical insecticide derived from the stem wood of a South American plant, *Ryania speciosa*.
[3] The active ingredient in dieldrin is 1,2,3,4,10,10-hexachloro-6,7-ephoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-diendomethanonaphthalene.
[4] The active ingredient in aldrin is 1,2,3,4,10,10-hexachloro-1:4,5:8-diendomethano-1,4,4a,5,8,8a-hexahydronaphthalene.

VETERINARY

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The staff of this division is highly trained in certain phases of basic science relating to poultry problems. They aid in the teaching and the application of those phases in courses in medicine and infectious diseases.

It is hoped to develop from the student body and through graduate work more men who will spend their life work with poultry pathology.

Public Health

This field includes meat, milk and food inspection, and the study of diseases transmitted from animals to man.

Research is concentrated on the study of Q fever which has a high incidence among persons associated with animals in areas where outbreaks occur. The cow, the sheep and the goat are known reservoirs of the infection as the causative factor—a Rickettsia—has been found in affected animals. Working in co-operation with the Communicable Disease Center of the United States Public Health Service at Atlanta, Georgia, the division staff members are seeking to determine the temperature of pasteurization necessary to kill the Rickettsia with a proper margin of safety.

School of Veterinary Medicine

The School of Veterinary Medicine is within the Department of Veterinary Science and is one of three schools of veterinary medicine in the 11 western states.

The school at Davis was opened in the fall of 1948 with an entering class of 42 selected students screened from more than 200 applicants. This first class will be graduated in June 1952.

The first University of California School of Veterinary Medicine was organized on the San Francisco campus in 1895. After 18 students were graduated the school was closed in 1900 because of meager enrollment. The next year—in 1901—the College of Agriculture appointed an instructor in veterinary science and bacteriology. From that time until the recent development of the new school, the Division of Veterinary Science has been a research organization in which the teaching of agricultural students and graduate students played a minor role.

Students in the new School of Veterinary Medicine are selected after a minimum of two years of preveterinary work, which may be taken anywhere in institutions giving the required courses.

At the end of the first two years in the school at Davis, successful students are granted the undergraduate degree of Bachelor of Science and then enroll in the Graduate School. After two years of work in the Graduate School graduating students receive the higher degree of Doctor of Veterinary Medicine.

Graduate students may take work in several fields, including comparative pathology and pharmacology for the degree of Master of Science or the degree of Doctor of Philosophy.

In addition, service courses in veterinary science are given to both degree and nondegree agricultural students in the animal science curricula.

The first responsibility of the School of Veterinary Medicine—housed since January 1, 1950, in a specially designed building equipped for 200 students and a teaching staff of 40—is to graduate 50 young men and women each year as qualified veterinarians. A second responsibility—of equal importance—is the continuation of research on animal diseases and their relation to public health. This accumulation of new knowledge reduces animal losses, increases the supply of animal products, and safeguards the enormous finanical investments in the livestock industry.

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ROLLER

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of citrus spraying equipment are presented in the table. Many other trials were applied and observed using higher, the same, or lower dosages in addition to the typical results presented.

A 50% wettable powder of DDT used at the rate of three to 10 pounds of actual material in quantities ranging from 300 to 1000 gallons of finished spray per acre gave from 95% to 100% mortality of the larvae at seven days after treatment. DDT exhibits a high degree of irritation to the larvae causing them to become quickly dislodged from the trees and drop to the ground. The larvae subsequently become moribund and die.

A 50% wettable powder of DDD used at the rate of three to 10 pounds of actual material in quantities ranging from 300 to 1000 gallons of finished spray per acre afforded from 99% to 100% mortality of the larvae at seven days after treatment. DDD shows less irritation to the larvae than does DDT and DDD takes longer than DDT to effect initial mortality.

A 50% wettable powder of methoxychlor used at the rate of three to 10 pounds of actual material in lots of 500 and 1000 gallons finished spray per acre effected from 83% to 100% mortality of the larvae at seven days after treatment. Methoxychlor is somewhat less irritating than DDD and is slower than DDD in effecting initial mortality.

A 25% wettable powder of parathion used at the rate of three-fourth to 2½ pounds of actual material in quantities ranging from 300 to 1000 gallons of finished spray per acre gave from 99% to 100% mortality of the larvae at seven days after treatment. Parathion used at the higher dosages kill the larvae very quickly and few dislodge themselves. At intermediate dosages parathion exhibits a somewhat high degree of irritation, however, at the dosages included in the table this insecticide shows only slight irritation to the larvae.

A 27% wettable powder of EPN-300 used at the rate of three-fourth to 2½ pounds of actual material in quantities ranging from 300 to 1000 gallons of finished spray per acre afforded 100% mortality of the larvae at seven days after treatment. EPN-300 effects a slower initial kill and is less irritating to the larvae than parathion.

The phenomenon of irritation followed by dislodgement varies with each of the above insecticides and also varies at different dosage levels with the same insecticide.

Ryania used at the rate of 15 to 60 pounds of the undiluted material in lots of 500 and 1000 gallons of finished spray per acre gave from 23% to 70% mortality of the larvae at seven days after treatment. *Ryania* exhibits an unusual effect on most of the larvae 12 to 48 hours after treatment in all instances where it was used. This effect consisted of a state of motor inactivity with partial or total insensibility to stimuli. After three days, however, they recovered and few died which were affected in this manner.

A 25% wettable powder and a 12½% emulsion of dieldrin used at the rate of three-fourth pound actual material in lots of 300 and 500 gallons of finished spray per acre afforded 84% to 88% mortality of the larvae at seven days after treatment. Twenty-five per cent wettable powder and a 25% emulsion of aldrin used at the rate of three-fourth to 1½ pounds actual material in 300 gallons of finished spray per acre gave 79% to 81% mortality of the larvae at seven days after treatment. Dieldrin and aldrin did not cause noticeable irritation to the larvae, and there was no apparent differences between the wettable powders and the emulsions.

Cryolite used at the rate of 12 pounds of the undiluted material in 500 gallons finished spray per acre afforded no mortality of the larvae at 14 days after treatment in a commercially sprayed grove.

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The above progress report is based on Research Project No. 1084.