Control of Orangeworms

cryolite, DDD, parathion found most effective against four main species of orangeworms in southern California

E. Laurence Atkins, Jr.

Orangeworm is the term used for the larvae or caterpillars of several species of small moths damaging citrus in certain areas of southern California.

The four orangeworms most commonly encountered are: orange tortrix, *Argyrotaenia citrana* (Fern.); pyroderces, *Pyroderces rileyi* (Walsm.); holcocera, *Holcocera iceryaeella* (Riley); and platynota, *Platynota stultana* Walsm.

The principal injury caused by orangeworms is essentially the same; the larvae feed on the peel and partially into the pulp of the fruit. Fruits in a cluster are generally more subject to attack than single fruits. While most affected fruits drop off the tree, those fruits that do not drop constitute a packing house problem. Additional expense is entailed for sorting to avoid packing damaged fruits. A small number of fruits with pinhole injuries are inadvertently packed and decay may occur in transit. This type of injury is especially serious with lemons.

Damage

Larvae of the orange tortrix feed almost exclusively on fresh material and injured fruits drop relatively soon after attack.

The principal damage from orange tortrix on navels occurs mostly during the late fall and winter months and on Valencias during the late spring and summer.

The orange tortrix commonly attacks lemons in most of the coastal areas. For the last three years important injury to lemons has occurred in scattered groves in Ventura County and treatment is becoming a common necessity in that area.

The second species of orangeworms, the pink scavenger worm—pyroderces—occurs in the counties of Los Angeles, Orange, Riverside, and San Diego.

Pyroderces feeds on the orange fruits but the principal sources of food for the larvae are composed of the dead floral parts of orange blossoms which have been partially decomposed by molds and the honeydew exuded by scale, mealybug and aphid infestations which have become infested with sooty mold fungus. These materials are webbed together on the surface of fruits and leaves.

When feeding on the fruit, the larva generally makes one or more small, shallow holes in the orange peel which are difficult to detect in the packing house, and may not be as effectively graded out as orange tortrix damaged fruits.

Most pyroderces larvae pass the winter and spring months in mummied oranges hanging on the tree and lying on the ground under the tree. Some larvae, especially during milder winters, are found under the buttons of young fruits. The population generally begins to appear in numbers on the trees during late June and July, and causes its greatest damage to ripe Valencia oranges during August, September and October.

The larvae of the black scavenger worm—holcocera—causes injury resembling that caused by pyroderces but the holes in the peel of the fruit are larger, due to the larger size of the larvae. Holcocera thrive best as a scavenger on dirty trees such as result from heavy infestations of mealybug and black scale. This species is usually of minor importance.

Platynota is the least common of the four species of orangeworms and it is doubtful that it is responsible for extensive economic damage on citrus.

Control

Cryolite, DDD, and parathion are the three most effective materials of the many tested for the control of the various orangeworms. Choice of material depends upon the particular orangeworm present.

Cryolite does not kill rapidly and is ineffective against pyroderces. DDD controls all four species mentioned, and may be substituted for cryolite in most instances.

Parathion quickly kills all species but is limited in its use, primarily because of its application hazards. Fruit should not be picked for 30 days after a parathion application. Parathion reaches the peak of its effectiveness within two days and its residual action lasts for about 30 days; the initial high kill often extends its protection to 90 days after application. The effects of adverse weather and the amount of new growth occurring during the first 30 days after treatment are important considerations.

Cryolite does not result in maximum control until about 30 days after application, but residue remains effective for three to six months.

DDD achieves maximum control in about seven days and its residue remains effective for three to six months.

A treatment for the control of orange tortrix on navels applied during the period from May through August usually is satisfactory. Treatment should be made before mid-June to prevent fruit scarring by the larvae. Orange tortrix infestation on navels often does not become evident before November or December, when the larvae are usually large and difficult to kill with cryolite. Under these conditions either DDD or parathion are desirable.

For the control of orange tortrix larvae on navels during May and June with sprays applied with a conventional spray rig—without use of tower spray gun—as a thorough outside coverage the following formulae are recommended: *1*, cryolite, three pounds in 100 gallons of water; *2*, DDD 50% wettable powder, one pound in 100 gallons of water; or *3*, parathion, 25% wettable powder, one-half pound in 100 gallons of water. For application with a speed sprayer, spray-duster, or boom sprayer and in 300 to 500 gallons of water per acre, one of these formulae can be used: *1*, cryolite, 30 to 60 pounds per acre; *2*, DDD, 50% wettable powder, nine to 12 pounds per acre; or *3*, parathion, 25% wettable powder, six to nine pounds per acre.

When a dust application is desirable one of the following dosages can be used: *1*, cryolite, straight at 75 pounds per acre; or *2*, cryolite, 50%, at 90 pounds per acre; or *3*, DDD, 5%, also at 90 pounds per acre. While a dust treatment is generally satisfactory, experimental evidence shows that a higher degree of control can be obtained by one of the spray applications.

Control of orange tortrix on Valencias is more complicated than on navels. Maximum insurance against damage on Valencia oranges requires a treatment in the fall to protect against injury and drop during the winter season. Another treatment during May or June is necessary to protect against damage during the summer season. For spring applications any one of the spray or dust formulae suggested for navels can be used.

When treatment during the fall is desirable, it should be applied as a spray either by incorporating the insecticide

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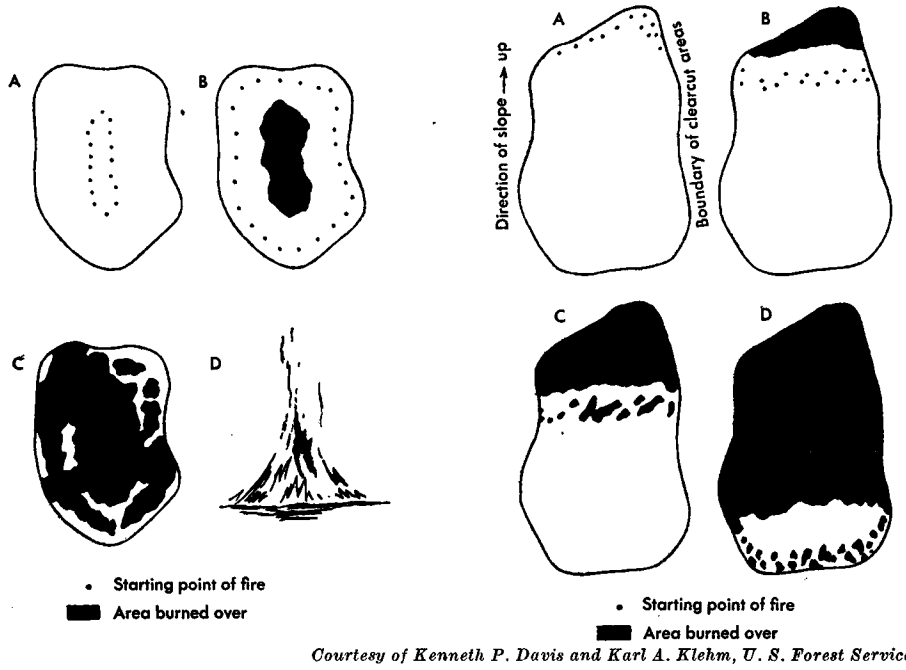

Courtesy of Kenneth P. Davis and Karl A. Klehm, U. S. Forest Service

***Left.* Diagramatic illustration of center firing method of burning. A.—First fires started in center of area. B.—Fires in center united; second series of fires started near edge. C.—Inner and outer fire beginning to merge; fire spreading out to edge of area. D.—Cross-sectional view of C showing smoke and flame drawn toward center. *Right.* Diagrammatic illustration of strip firing on slopes. A.—First fires started along extreme upper edge. B.—As soon as upper edge is well burned out, second strip of fires started 50 to 100 feet down the slope. C.—Third strip of fires started. D.—Final strip of fires started along lower edge.**

be sent into dense brush to start fires. Two or three should always work together under such conditions. In center or strip firing a tractor or bulldozer should be walked along lines where firing is to be done to provide easy means of access and escape.

Any one of the four firing techniques—flame throwers, spraying, smashing, or V-ignition—can be used to start fire according to the plan prepared. Whenever there is doubt as to whether fire can be started at a given time or place, some special firing technique should be employed. Even then fuel and weather conditions can make successful firing impossible.

Time of Ignition

The question of when to burn must be answered at the site of the proposed burn after a careful study of the fuel structure, topography, type of control lines, manpower and equipment available, present and anticipated weather conditions, and size of the burn. The co-ordination of the effects of all these factors must come from past experience and from rule-of-thumb guides.

Under severe conditions of wind, temperature, and humidity, it may be impossible to control any fire which is started. Conversely with little or no wind, low temperature, and high humidity, ignition may be impossible.

The fire-boss who selects the best combination of firing plans for the conditions under which he must burn, and who uses appropriate fuel manipulation or ignition techniques increases the probability of obtaining an effective burn while decreasing the probability of escape.

(To be continued)

The fifth and last section will be published in July.

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with the regular oil spray for scale insects and mites, or by making a subsequent spray treatment after the oil spray has been applied. When incorporated in the oil spray, cryolite, one pound, or DDD, 50% wettable powder, one pound per 100 gallons of oil spray are satisfactory.

Under no circumstances should cryolite or DDD be added to the regular oil spray except under the approval of the manufacturer of the oil being used.

For water sprays in the fall any one of the spray formulae suggested for spring treatment of navels and Valencias may be used.

Usually the only time that pyroderces on Valencias need control treatment is during the fall when the fruit is mature and still on the trees. For application with a conventional spray rig, less tower, as a thorough outside coverage one of the following formulae should be used: *1,* DDD, 50% wettable powder, two pounds in 100 gallons of water; or *2,* parathion, 25% wettable powder, three fourths to one pound in 100 gallons of water. For application with a speed sprayer, sprayduster, or boom sprayer and in 300 to 500 gallons of water per acre, either DDD, 50% wettable powder, 12 pounds per acre; or parathion, 25% wettable powder, nine pounds per acre is satisfactory.

If it is desirable to add materials to the regular oil spray application for scale and mite control DDD, 50% wettable powder, at the rate of 1½ pounds per 100 gallons of oil spray is recommended.

Where mixed populations of various orangeworms occur in sufficient numbers to make control desirable, the formulae suggested for the control of pyroderces should be used.

Applications against orange tortrix on lemons should be made when the populations of orange tortrix occur in sufficient numbers to make control desirable. For sprays, one pound of cryolite should be added per 100 gallons of the regular oil spray formulation for scale and mite control, with a conventional spray rig. Water sprays may be used as suggested for orange tortrix on navel and Valencia oranges. Dusts of straight cryolite at 75 pounds, cryolite, 50% at 90 pounds, or DDD, 5% at 90 pounds per acre, may also be used to control orange tortrix on lemons.

Ability to judge whether or not a treatment for control of orange tortrix and pyroderces is warranted at a time when maximum results would be obtained is very difficult. No entirely satisfactory criterion is currently known. Therefore, except in groves that have a history of annual losses from orangeworms or where infestations are heavy enough to be evident at the time, treatment must necessarily become one of insurance and should be so considered.

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