Valencia Orange Size and 2,4-D

adequate soil moisture important for increasing fruit sizes with 2,4-D sprays applied when fruits are 4–12 weeks old

Louis C. Erickson and Sterling J. Richards

Soil moisture plays an important part in the successful use of 2,4-D for increasing Valencia orange fruit sizes.

An experiment for studying the effect of soil moisture on the response of Valencia oranges to 2,4-D was started in 1952, using 17-year-old Valencia orange trees growing in Ramona sandy loam at Riverside. A test plot of 16 trees sprayed with 2,4-D and a second test plot of 16 nonsprayed trees were maintained within two moisture ranges with the aid of soil moisture tensiometers. The instruments were located to measure soil moisture conditions at the 1′- and 2′-depths near the skirt of the tree and about one foot nearer the line of trees than the nearest furrow on the north side.

Soil of treatments *1* and *2* was irrigated when the average reading of six tensionometers at the 1′-depth reached 300 cm—centimeters—of water, indicating the soil was moist. Soil of treatments *3* and *4* was irrigated when three of the six tensiometers at the 2′-depth exceeded 700 cm of water—moderately dry.

During the warm part of the irrigation season, soil of treatments *1* and *2* was irrigated about every three weeks, while soil of the other treatments required irrigation about every five or six weeks. Water was allowed to flow in the furrows for 24 hours in treatments *1* and *2*, and for 48 hours in treatments *3* and *4*, at each irrigation. Differential irrigation was started in July 1952 and was maintained until the fruits were harvested in August 1954. During the winter months, there were no irrigations because rainfall was adequate to supply the needed soil moisture.

Influence of 2,4-D and Soil Moisture on Fruit Quality of Valencia Oranges
(200 oranges per mean)

Treatments												
	Irrigation to maintain soil moisture				Constituents							
No.	Maximum tension†	Depth of measurement	2,4-D tree spray (ppm)	Fruit wt. gms	Juice %	Rag %	SS* %	Acid %	Ratio, SS/acid	pH**	Number of granulated fruits (out of 25)
1	300	1 Ft.	None	156	60.0	1.6	12.62	0.96	13.15	3.70	8.25
2	300	1	16	172	58.1	1.8	12.63	0.97	13.03	3.69	9.00
3	700	2	None	144	61.4	2.0	12.86	0.97	13.25	3.70	6.38
4	700	2	16	156	60.4	1.7	13.14	0.95	13.85	3.72	4.50
Least significant difference at 5%				7.3	3.65	0.33	0.39	0.042	0.79	0.045	3.35
Least significant difference at 1%				9.9	4.97	0.46	0.53	0.057	1.08	0.075	4.56

* Soluble solids. **Relative acidity compared by statistical treatment of hydrogen ions.
† Cm of water.

Trees of treatments *2* and *4* received a spray containing 16 ppm—parts per million—of the isopropyl ester of 2,4-D on May 29, 1953, completely wetting the trees. At this time, the newly set fruits averaged between ⅜″ and ½″ in diameter.

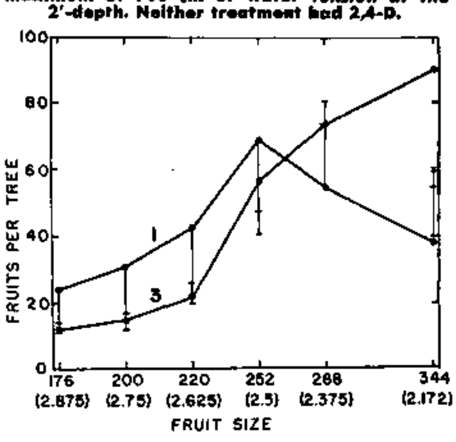
The oranges were harvested and sized on August 30, 1954. Under the moist soil conditions—treatments *1* and *2*—the 2,4-D significantly increased the number of large oranges and reduced the number of small oranges, as shown in the graph in the second column. While the nonsprayed oranges peaked on size 252, the sprayed ones were of nearly equal frequency in sizes 252, 220, 200, and 176.

In the drier soil moisture treatment, the 2, 4-D reduced the number of small oranges but failed to increase the number of large oranges significantly, as shown in the graph in column 3. The nonsprayed oranges peaked on size 344 and smaller, while the sprayed ones peaked on size 252.

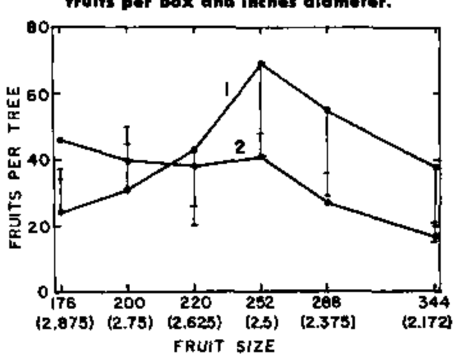
Although an analysis of variance for the total number of oranges per tree failed to reveal any differences between treatments, a paired comparison test of the 16 sprayed and 16 nonsprayed trees

Continued on next page

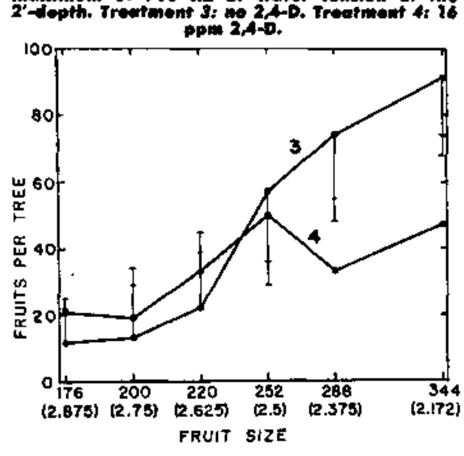
Effects of soil moisture on size of Valencia oranges. Treatment *1*: moist soil—mean maximum of 300 cm of water tension at the 1′-depth. Treatment *3*: moderately dry soil—median maximum of 700 cm of water tension at the 2′-depth. Neither treatment had 2,4-D.



Effects of 2,4-D on sizes of Valencia oranges under moist soil conditions—mean maximum of 300 cm of water tension at the 1′-depth. Treatment *1*: no 2,4-D. Treatment *2*: 16 ppm 2,4-D. Bars on vertical lines indicate differences between treatments required for 5% and 1% levels of significance. Fruit sizes are given in fruits per box and inches diameter.



Effects of 2,4-D on size of Valencia oranges under moderately dry soil conditions—median maximum of 700 cm of water tension at the 2′-depth. Treatment *3*: no 2,4-D. Treatment *4*: 16 ppm 2,4-D.



Argentine Ant Control on Citrus

granular formulations of certain chlorinated hydrocarbons applied to soil surface show promise in preliminary trials

G. E. Carman

Chlorinated hydrocarbon insecticides—dieldrin, heptachlor, chlordane, and aldrin—in granular formulations spread evenly over the ground in citrus orchards, have given as good ant control as comparative spray tests.

The use of certain chlorinated hydrocarbon insecticides, particularly chlordane in sprays or dusts, is a common practice for the control of the Argentine ant—*Iridomyrmex humilis* Mayr—and other ant species on citrus. In most instances, such treatments are on the tree trunk, skirt, and ground litter, but often low-hanging fruit are unavoidably treated with the insecticidal compound which may persist as a surface or penetrated residue—or both—of the marketed fruit. The magnitude of these residues is relatively high at harvest and—because of the presently indicated tolerance levels—might jeopardize the marketability of an entire crop even though only a small proportion of the fruit was actually sprayed or dusted.

Another, but less limiting, disadvantage in treating citrus trees with dusts or sprays is the fact that the insecticide residues on the lower parts of the tree may be toxic or repellent to parasites or predators of economic pests such as mealybug or scale species which are present in the grove.

As a possible means of capitalizing on the unusual effectiveness of the chlorinated hydrocarbon insecticides for ant control, while avoiding the difficulties associated with their use as sprays or dusts, preliminary trials were undertaken with granular formulations of the compounds.

The results of the preliminary field studies have been encouraging, and the use of granules has not involved undesirable post-treatment effects, including the involvement of fruits with insecticide residues. Further evaluation of the granular formulations is necessary because of the limited number of completed trials. However, the greatest liability in their use that can presently be anticipated would result from failure to obtain fully satisfactory ant control.

Granular Types Tested

In the preliminary tests, the insecticides were formulated—2½% and 5% actual toxicant—on granules of bentonites, attapulgus clays, vermiculite, and on screened cut tobacco stems. A 30/60-mesh granule size appears most desirable. With materials such as an attapulgus clay, a 30/40 mesh size might be helpful in minimizing dustiness so as to avoid the deposition of residues on tree surfaces and to limit the exposure of personnel during application, but it would contain considerably fewer granules per pound of material.

Bentonite granules disperse most satisfactorily with traction-activated mechanical equipment because of their greater density. Vermiculite and ground tobacco-stem granules are less suited for use in such equipment.

Cost factors restrict consideration of amounts greatly in excess of 100 pounds per acre, and amounts as minimal as 50 pounds per acre of the most effective materials have generally given unsatisfactory control if less than 2.5 pounds of actual toxicant per acre were used.

Method of Application

The granular formulations can be broadcast by hand or from a crank-type broadcast seeder, but a rapid mechanical means of distribution is probably most practical. Small hand-operated dusters and truck-mounted duster units have been used successfully. The available equipment currently preferred is the revolving disc spreader used for applying commercial fertilizers. Such units are usually traction-activated, and when pulled through the grove at approximately five miles per hour can be adjusted to achieve a reasonably effective distribution pattern of the granules. The momentum of individual granules must be sufficient to penetrate the peripheral shell of the tree and attain a reasonably uniform distribution of granules over the ground under the tree as well as between the trees. Distribution of granules over the area between tree rows does not appear necessary and limits the amount of material broadcast onto the more critical areas under the trees.

Thrown into the tree—in any manner—granules tend to sift groundward. Only rarely have granules been seen to lodge on fruit surfaces and remain there for any length of time. On the other hand, granules have been found over extended periods lodged in cupped leaves, leaf axes, and on surfaces parallel with the ground.

Concluded on page 16

VALENCIA

Continued from preceding page

showed that the 2, 4-D had a real effect in reducing the number of fruits per tree. In the more moist treatments—comparing Nos. *1* and *2*—the reduction of total fruits was 20%, while in the other irrigation treatments—comparing Nos. *3* and *4*—it was 25%.

A median maximum soil moisture tension of 700 cm of water at the 2′-depth was not a severely dry condition, inasmuch as none of the trees showed signs of moisture stress, such as temporary wilting, even in warm weather prior to an irrigation. Nevertheless, this treatment curtailed fruit growth in comparison with the 300 cm mean maximum tension at the 1′-depth. The more moist treatment resulted in more fruit of large sizes and fewer of small sizes, in addition to shifting the peak size from 344 and smaller to size 252, as shown in the graph in the first column on page 9.

A random sample of 50 oranges was taken from each tree, 25 being used for juice determinations and 25 for a count of granulation. The differences in distribution of fruit sizes in the four treatments were also reflected by the significant differences in mean fruit weights of the random samples, as recorded in the accompanying table. The per cent juice, per cent rag—that portion of pulp screened from the juice by the juicer—showed a small but significant increase due to reduced soil moisture. The reduced soil moisture also resulted in an increase in the soluble solids content and ratio of soluble solids to acid where 2,4-D was applied but not in its absence. Where 2,4-D was used, the reduced moisture resulted in less granulation.

Concluded on page 14

RANGE

Continued from preceding page

wild-rye were found in the measured areas. Purple stipa was entirely lacking.

On most ranges where there is a Klamath weed problem, both desirable and undesirable forage plants are present. Where a well-adapted forage grass, such as California oatgrass, is available, grazing use should be aimed toward encouraging this plant.

On most Klamath weed ranges of California, Medusa-head will thrive and provide serious competition to the more desirable forage plants. Range improvements can only be achieved where better annuals and perennials replace the undesirable plants.

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GERANIUM

Continued from page 8

These rooted cuttings may be planted in ground beds or raised beds treated with chloropicrin or methyl bromide, as in the case of the mother-block beds.

Each plant in the increase-block should be identified by the numeral indicating its source mother-block plant.

In the event that virus symptoms appear on any of the plants in the increase-block, all plants of the same origin—including the mother-block plant—should be immediately rogued.

The increase-block should be kept free of insects in the same manner as the mother-block because it is designed to furnish cuttings for use in planting in the field.

When the cuttings in the increase-block are of sufficient size, they may be planted in the field. Field cuttings should never be used for replanting in the mother-block or the increase-block. If the field planting becomes diseased and is plowed up, or if diseased plants are rogued or plants are lost, replanting should be delayed—for at least three months—and then only cuttings from the increase-block should be used.

Cutting knives or clippers used on all cuttings in this system should be soaked in a 1:1000 mercuric chloride solution and wiped dry with a clean paper towl or toilet tissue between use on the plants. Two knives, or clippers, should be available; one set remaining in the disinfectant while the other is in use. Because there is danger of mercury poisoning by absorption through the skin, the operator should wear rubber gloves or use care that the solution does not come in contact with cuts or abrasions in the skin. Skill and careful work are required in the mother-block and in the increase-block, and only an operator with those qualities should work in blocks, performing all operations himself.

Overhead watering must not be used.

All flowers should be removed from the mother-block and the increase-block to reduce Botrytis gray mold.

A number of California growers have set up a procedure for developing disease-free cutting stock and have found a substantial increase in growth of plants and yield of cuttings per plant, as compared to their field-grown material. Also, by using this system, geraniums may be grown intensively on much smaller acreage and yield a much higher return per acre compared with present returns. Perhaps of greater importance is the fact that by selling healthy cuttings, the California producer will capture a much larger share of the market for geraniums in the country.

This system of propagating disease-free cutting stock was set up for geranium production but it may easily be adapted to many other crop plants which are vegetatively propagated.

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The above progress report is based on Research Project No. 1463.

AZALEAS

Continued from page 7

when the plants are taken into the greenhouse for forcing. The first step is to remove from the plants all flowers and buds beginning to show their natural color. Removal and replacement of the surface litter help eliminate the shooting spore stage.

The most important control in the greenhouse is to reduce the humidity. The spores responsible for the secondary spread are extremely susceptible to dryness, and merely lowering the humidity to only 80% or 85% is enough to give a sure control of the disease.

The best control is to prevent the entrance of the fungus into a planting. Because the fungus is found only on the flowers or as resting bodies in the soil, new plants should not be brought in when in flower or if there is any color in the buds. Bringing in only bare-rooted plants will eliminate the soil as a source of the fungus.

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WALNUTS

Continued from page 6

Where the basic lead arsenate treatment is used, it should be applied at four pounds per 100 gallons—by air carrier-type or the conventional high pressure spray rig—at the rate of 800 gallons per acre.

Where DDT is applied by a conventional high pressure spray rig, only 1½ pounds of DDT 50% wettable powder per 100 gallons are necessary when the finished spray is applied at 800 gallons per acre—only one half of the amount of material—listed in the dosage table—is necessary for European red mite and aphid control.

Dosage Table for Combination Codling Moth, European Red Mite, and Walnut Aphid Control. (With DDT applied by air carrier-type equipment only and the finished spray applied at the rate of 400 gallons per acre.)

Codling moth	European red mite	Walnut aphid
DDT 50% wettable powder 3 lbs/100 gals	Systox 21.2% emulsifiable 8–12 oz/100 gals	Not necessary if Systox is used for mite control
	or	
	Ovotran 50% wettable powder 1½–2 lbs/100 gals	Parathion 25% wettable powder 1 to 1½ lbs/100 gals
	or	or
	Aramite 15% wettable powder 3–4 lbs/100 gals	Malathion 25% wettable powder 1 to 1½ lbs/100 gals
		or
		TEPP 20% 8 oz/100 gals
		or
		Nicotine sulphate 40% 8–12 oz/100 gals

WARNING

Parathion, systox and TEPP—like certain other organic phosphate insecticides—are extremely toxic to human beings. Precautionary recommendation on manufacturer's label must be followed without exception or modification.

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VALENCIA

Continued from page 10

The lack of a significant increase in the large-sized oranges in the moderately dry treatment as a result of the 2,4-D spray indicates that soil moisture is an important factor in obtaining consistent results with growth regulator sprays for increasing fruit size. While the results so far are impressive, they represent only one crop and should be considered as a progress report in this investigation.

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