

Invisible Injury of Citrus

insecticide tests indicate that oil sprays lower soluble solids in juice and reduce dry matter in leaves

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Certain insecticides may produce invisible—internal—injury to the citrus plant.

Previous tests have shown that petroleum oil sprays caused no visible injury to the fruit, yet they noticeably reduced the soluble solids in navel and Valencia oranges, and increased granulation in Valencias. These effects did not result when HCN—hydrocyanic acid—was used.

Recent studies compared the relative effects of petroleum oils and two of the newer and most promising insecticides, DDT and parathion. Supplementary tests compared the effects of HCN fumigation and oil sprays on grapefruit juice.

Juice Quality Tests

In a comparison of the effects of DDT and oil spray on the quality of orange juice, the differences in some instances were not very great. Still, in 53 of the 54 tests the juice of both navels and Valencias sprayed with DDT contained a higher concentration of soluble solids than those sprayed with oil.

The acids were more variable but 61% of the tests showed a higher percentage of total acids—as citric—in the DDT sprayed fruits than in those treated with oil.

The means for all tests were as follows:

Treatment	Soluble solids per cent	Total acids per cent	Solids, acids, ratio
DDT	12.7	1.15	11.2
Oil	12.0	1.11	11.1

Repeated Applications

A supplementary experiment tested possible effects of repeated DDT applications on the quality of juice in Valencia oranges.

Two plots of 20 trees each were sprayed in the fall with 1¾% medium emulsive oil. During the following year one of the plots was treated eight times with DDT, at intervals of one to two months. The other plot received no further treatment.

Tests were made one month after the last application of DDT. The following group of figures shows that the repeated applications of DDT did not cause a decrease in the concentration of soluble solids in the juice.

Treatment	Soluble solids per cent	Total acids per cent	Solids, acids, ratio
Oil only	12.0	1.20	10.0
Oil plus eight applications of DDT	12.5	1.20	10.4

Another supplementary test was made to determine the relative effects of HCN and oil spray on the quality of grapefruit juice.

Three plots for this experiment were selected in a grapefruit grove in the Coachella Valley.

Plot one was sprayed with oil in December, and again the following January, and fumigated with HCN after each spraying.

Plot two was sprayed with oil once—in December—and fumigated twice at the same times as plot one.

Plot three was fumigated twice, at the same times as plots one and two, but was not sprayed with oil. Light medium oil—2%—and a 24 cubic centimeter dosage of HCN were used in all cases.

The following results show that in grapefruit, as in the orange juice, the oil spray caused a reduction in total soluble solids.

Treatment	Soluble solids per cent	Total acids per cent	Solids, acids, ratio
Oil-sprayed twice; fumigated twice . . .	7.5	1.17	6.4
Oil-sprayed once; fumigated twice . . .	8.0	1.37	5.9
Fumigated twice	9.1	1.36	6.7

In the comparison of parathion and oil spray the differences were not very great. But here, too, the juice of oil-sprayed fruit had a lower concentration of total soluble solids than parathion-treated orange. This was true in 41 of the 43 tests made with navel and Valencia oranges.

Although the averages were not greatly different, in 75% of the tests the parathion-treated fruits had a higher acid content than fruits that were treated with oil sprays.

The means for all tests were as follows:

Treatment	Soluble solids per cent	Total acids per cent	Solids, acids, ratio
Parathion	12.5	1.24	10.4
Oil	11.7	1.17	10.4

Ascorbic Acid

Twenty-seven tests were made to determine the relative effects of different insecticides on the ascorbic acid content of orange juice.

Two of the groves were not treated, two were sprayed with dioctyl phthalate, and the remainder with DDT or petroleum oil.

The average of the ascorbic acid values for the oil-sprayed fruit was 57.3 milligrams—mg—per 100 milliliter—ml—of juice, while the average for the untreated oranges, and the fruit sprayed with dioctyl phthalate and DDT was 63.0 mg—a difference of 5.7 mg per 100 ml of juice. No tests were made with parathion.

Mature navel and Valencia orange leaves were taken from five to 20 trees in each of 10 plots located in five widely separated areas in southern California.

In each instance the leaves from an unsprayed lot were compared with those from another lot in which the trees had been sprayed with 1% to 2% light medium petroleum oil.

In 22 of the 26 tests the navel leaves from the unsprayed trees had a higher dry matter content than those from the oil-sprayed trees. The unsprayed leaves averaged 41.1%, the oil-sprayed leaves 39.6% dry matter.

The unsprayed Valencia leaves had the highest percentage of dry matter in only 13 of the 20 tests. The unsprayed leaves averaged 43.2% of dry matter, the sprayed leaves 42.4%. The average of the differences was 1.6% in the 13 tests where the unsprayed values were highest, but only .5% in the seven tests where the oil-sprayed values were highest.

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