Washington Navel Fruit Drop

effects of 2,4-D on drop of sound and unsound oranges when sprays were applied in the late fall and winter

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Sound Washington Navel orange fruit was the only type in which drop was consistently reduced by a highly significant amount—1% level of probability—in studies in orchards near Pomona and Redlands.

The studies were undertaken to obtain information on the effectiveness of a 2,4-D spray—applied late in the fall or in the winter—for holding sound fruit and various types of unsound fruit on Washington Navel orange trees. Since a large proportion of citrus fruit that drops is not of marketable quality, total fruit-drop counts are not critical measures of the effects of 2,4-D.

Experiments were started in the fall of 1949 in three Washington Navel orange orchards—two near Redlands and one near Pomona. Each plot consisted of a commercial picking unit of four trees in the Redlands orchards, and of six trees in the Pomona orchard, except where missing trees reduced the number. To equalize the size of the plots, the data were reduced to a per-tree basis. There were four replications in the Pomona orchard and five in the others.

Experimental Treatments

Different groups of trees in each of the three orchards were sprayed on each of four occasions at approximately monthly intervals during the fall and winter, as follows:

Redlands orchards	Pomona orchard
November 8	October 30
December 6	December 2
January 19	December 27
February 13	February 2

Treated trees were sprayed to the run-off stage with a 100-gallon conventional sprayer. The spray mixture contained 8 ppm—parts per million—of 2,4-D in the form of a commercial weed-killing product with isopropyl 2,4-dichlorophenoxyacetate as the active ingredient. No 2,4-D had been used previously in these orchards during the growth of the current crop.

Fruit-drop counts were made for all trees in the experiments at the time of each spraying and then periodically until harvest, in late April or May. Each orange on the ground was examined for quality and classified. Field-box production of the experimental trees was determined when the crop was harvested.

Drop from Unsprayed Trees

Fruit drop was in progress when the experiments were started, on October 30 and November 8. Up to that time, the drop was confined to split fruit. Most of this fruit had a secondary infection of Alternaria or some other mold, but splitting was considered as preceding and abetting the fungus. By November 8 approximately 19 split oranges per tree had fallen. The drop of split oranges from nonsprayed—check—trees continued until harvest, although it tended to decrease in rate as the season advanced. For the year of 1949 split fruit was by far the most abundant type to fall.

Next in numbers found on the ground during the season was frozen fruit. It began to drop after the middle of January, even though severe freeze damage occurred as much as a month before. The drop of frozen fruit continued throughout the season and tended to increase in rate up to the time of harvest.

Sound fruit ranked third in average number dropping from nonsprayed trees in the three orchards during the season. The first sound oranges fell early in December; but not more than an average of about five fruits per tree had fallen by April 11. Thereafter, the daily drop from nonsprayed trees averaged nearly one orange per tree. In one of the Redlands orchards the drop of sound fruit remained slight until harvest.

Fourth in quantity dropping from the nonsprayed trees was fruit infected with black rot. These oranges dropped steadily from early in December until harvest. Fruit in other categories was less abundant.

Effect of Sprays

The effect of the 2,4-D sprays on the drop of oranges in the several classifications was variable.

The drop of sound fruit was reduced by a highly significant amount in all three orchards and at all times of spraying. The December and January sprayings resulted in the greatest decreases in sound-fruit drop. Each of these exceeded the decrease resulting from the November application by a highly significant amount. The February application was not significantly less effective than the December and January applications; but it did fall below them in 10 and 11 replications, respectively, out of 14.

The drop of frozen fruit was not consistently reduced by the 2,4-D. In one of the Redlands orchards there were no significant differences. In the Pomona orchard the differences in drop of sprayed and nonsprayed fruit were significant at the 5% level in two out of four treatments. In the second Redlands orchard the fruit drop at all four times of spraying was significantly lower than the checks, and in three of the four treatments exceeded the 1% level of probability. The effect of 2,4-D was about half as great on drop of frozen fruit as on that of sound fruit.

Drop of split fruit was not significantly reduced by the spray except in one instance—the spraying of January 19 in the second Redlands orchard. Since a considerable amount of split fruit dropped prior to the first spraying, the effect of the 2,4-D was obscure. When split fruit dropped only after the first spraying was considered, significant differences were still not obtained in the Pomona and the first Redlands orchards but were extended in the second Redlands orchard.

Drop of black-rot and brown-rot fruit was significantly reduced in only one of the three orchards. As a result of the 2,4-D spray, these culls were held, on the average, less than one fourth as strongly as sound fruit.

Wormy fruit was not found in sufficient numbers in the Redlands orchards to provide suitable data for statistical treatment. A slightly greater amount of wormy fruit was found in the Pomona orchard. Here, the sprayings of December 2 and February 2 resulted in a highly significant reduction in drop of wormy fruit, but the applications of October 30 and December 27 had no effect. Too few wormy fruits were involved to attach much importance to these results.

Fruit falling from the trees by broken stem did not differ significantly in number between treatments. It might be expected that—with a reduction in abscission—more fruits would be broken off by winds. Actually, a few more fruits,

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CAPACITY

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ments. Net inshipments of about 115,000 tons would be required in the projected 1955 situation.

Pastures

About three fifths of all animal unit months—AUM—of grazing in California are on permanent pasture or range land. The other two fifths are on cropland used exclusively for pasture or crop residue feeding. The distribution of all grazing in 1950 and in the projected 1955 attainable situation is estimated in the table on page 2.

Grazing on public lands is a small percentage of the total but it is important to ranchers in certain areas of the State.

Estimates of grazing AUM, as reported in this study are in terms of usage except for open permanent pasture and range in farms where they represent availability. It is assumed that a high percentage of the available irrigated and sudan grass pasture is used. Not all of the available crop residue, and not more than half of the potential grazing on grain land are used.

Grazing Capacity

The estimated total grazing capacity in 1950 was 24.3 million AUM compared with 22.9 million required by the livestock. The margin of capacity over use, as estimated, amounted to about 6%.

The carrying capacity projected for 1955 is 27.1 million AUM compared with the 26.4 million that would be required by the livestock—a surplus of about 2½%.

The 1955 attainable assumes a larger acreage of rotation—irrigated—pasture and higher production per acre. Irrigated pasture was projected at 7,200,000 AUM in 1955, compared with 5,456,000 AUM in 1950. Production per acre was projected at 9.0 AUM compared with 8.0 AUM in 1950. The higher rate per acre results from better production and management practices.

California has about 18.5 million acres of open permanent pasture and range in farms. The State average yield in 1950 was estimated at .55 AUM per acre, and the projected 1955 attainable yield is .60 AUM. This increase is conservative compared to the ultimate potential based on range research. Research has demonstrated that rotation grazing—as an example—could increase production of range forage on grassland by 25% over much of the State.

The full potential in range production would be difficult to attain. Rotation grazing on the range land in farms, for instance, would require an estimated 2,000 miles of additional stock fence; in many cases it would require the development of more stock water facilities; and more ranch labor would be needed. The total increase in production from partial adoption of these practices is projected at about 8% by 1955.

Full utilization of grazing also becomes more difficult to attain as the maximum is approached. Pasturage must be used in place, whereas hay and grain can be brought to the livestock. However, with modern truck transportation, livestock can be moved to where pasturage is available and once a seasonal pattern has been established—geographically—feed and livestock can be co-ordinated more readily.

To be continued

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FRUIT DROP

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but not significantly more, were found under sprayed trees.

Significant differences in total yield were found only in the second Redlands orchard.

Timing of Application

Fruit drop from nonsprayed Washington Navel orange trees in the three experimental orchards averaged about one field box—approximately 150 oranges—per tree for the season from October to late April or May. In such aggregates of dropped fruit, sound oranges ranged from 3.83 to 33.96 per tree, the remainder of the fruits being culls.

In the present experiments the drop of sound fruit was serious near the end of the season—April–May. This would indicate the use of a preharvest spray only to hold the fruit until late in the season. Other data on Washington Navel oranges showed that drop of sound fruit began in December and was serious from the start. When 2,4-D was used as an oil amendment in an August pest control spray very few sound oranges—4.3 per tree—dropped before harvest the following May. A second application of 2,4-D as a water spray during the winter saved additional sound oranges, but these were necessarily few.

Fruit-drop records collected in these experiments show that the four classes of fruit dropping greatest numbers from nonsprayed trees were the following, in decreasing order: split, frozen, sound, and black rot.

The mean reduction in drop of sound fruit for all times of spraying in all three orchards was 70.7%. Drop of frozen fruit was reduced about half as much—35.5%. Drop of fruit infected with fungi, including most split fruit, was reduced about one fourth as much as drop of sound fruit.

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DAIRY

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rated milk spent considerably more than these amounts during the week. In Oakland 46% and in Los Angeles 37% of the families used evaporated milk during the week. The average amount spent by these families was $0.33 in Oakland and $0.38 in Los Angeles.

The actual expense for evaporated milk did not vary greatly with increased food expenditures but the proportion of expense for dairy products tended to decline.

Butter, Ice Cream

The families surveyed spent an average of $0.42 during the week for butter. This amount accounted for 11% of the Oakland families' expenditures for dairy products and 9.6% of that of the Los Angeles families. It amounted to 2.1% of the total food dollar of the Oakland families and 1.9% of the families in Los Angeles.

The amount spent for butter increased from $0.18 spent by those spending $10 or less a week for food to $1.01—Oakland—and $0.77—Los Angeles—by those spending $40 or more for food. But the proportion of butter to total dairy-product expenditure varied comparatively little.

Families in Oakland spent an average of $0.39 and those in Los Angeles spent $0.41 for ice cream, sherbet, and ice milk. These products accounted for approximately 10.1% of the average expense for dairy products in Oakland and 9.4% in Los Angeles.

Only an average of $0.03 in Oakland and $0.04 in Los Angeles was spent for sherbet and ice milk, accounting for only 0.8% and 0.9% respectively of the total expense for dairy products.

The proportion of dairy products expenditures spent for ice cream increased from about 7% in Oakland and 2.3% in Los Angeles for those spending less than $10 a week for food to about 11% for those spending $30 or more a week for food.

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