Grapefruit effects of 2,4-D sprays on preharvest drop, yield and quality

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From the time of spraying—June 3—until harvest—August 26—a period of 12 weeks, the fruit drop from the non-sprayed trees amounted to 15.6% of the crop. In comparison, trees sprayed with 5 p.p.m. or 25 p.p.m. 2,4-D dropped 7.3% and 5.5%, respectively. This was a reduction of 53% in fruit drop of trees sprayed with 5 p.p.m. 2,4-D, and of 65% in that of trees sprayed with 25 p.p.m. 2,4-D.

Excessive Concentrations

Still greater reductions were obtained with sprays containing 75 and 225 p.p.m. 2,4-D, but certain undesirable effects of these high concentrations appeared to render them impractical for commercial use.

Besides causing abnormal sizes of fruit, the 225 parts per million spray induced some fruits to become cylindrical in shape; other fruits developed navels and grew thick, coarse rinds having excessively large oil glands, while still other fruits developed dry, hard juice vesicles.

Laboratory tests were made on the juice of samples of fruit picked at intervals of two weeks during the period from June 17 to August 12, 1946.

No reduction in total soluble solids and no increase in total acidity were observed as a result of treatment with 2,4-D. The ratio was not reduced. There was also no significant change in pH of the juice. These data do not indicate any undesirable effects of the five and 25 p.p.m. sprays on fruit quality.

In the one block that was not harvested in August, fruit-drop counts were continued at intervals of about two weeks until January 6, 1947. This was 19 weeks after the period of commercial harvest and 31 weeks after the date of treatment.

Because of lack of replication of treatments, the observations made subsequent to August 26 are more variable than those made earlier. They indicate, however, that the 2,4-D sprays were effective in reducing fruit drop for a total period of at least 26 weeks, and that during this time the effects were positively correlated with the concentrations of the spray.

Soon thereafter the effects of the more dilute concentrations of 2,4-D—five and 25 p.p.m.—appeared to wear off, and the trees treated with these sprays dropped their fruit rapidly during the next few weeks. The rate of fruit drop from trees sprayed with 75 and 225 p.p.m. 2,4-D was only slightly accelerated in the final period.

Deformed Leaves

The sprays containing 2,4-D concentrations of 25 p.p.m. or more caused a curling and buckling of young, expanding leaves. The degree of deformation was in proportion to the concentration of 2,4-D. Deformations caused by 75 and 225 p.p.m. 2,4-D tended to persist as the leaves grew; those caused by 25 p.p.m. 2,4-D frequently were temporary.

Mature leaves showed different responses to excessive concentrations of 2,4-D. Those sprayed with 225 p.p.m. 2,4-D developed irregular chlorotic areas which persisted for several months and then gradually disappeared.

Fruit Sizes

Average fruit size, as indicated by the number of fruits per field box, was not significantly changed as a result of the treatments. Actually, however, some fruits from trees sprayed with 225 p.p.m. 2,4-D were greatly increased in size; others were very small. This effect was less apparent in fruit from trees sprayed with 75 p.p.m. 2,4-D and was not evident in that from the five and 25 p.p.m. treatments.

Fruit Quality

At the time the trees in this experiment were sprayed—June 3, 1946—a second crop of fruit had set but the June drop had not been completed.

Observations made on the quality of this fruit—harvested July 9, 1947—indicate effects of 2,4-D on the second crop to be very similar to those on the first crop.

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somewhat, and frequently there is a slight
undergrowth of the sweet or rough lemon
stock. Generally, this undergrowth is not
as pronounced as with sour orange stock.

Sweet orange trees budded upon mandarin
stocks also are characterized by
fairly smooth unions. However, the mandarin
trunk is usually distinguished by
vertical ridges or fluting. The mandarin
bark itself is smooth and somewhat slate-
colored. These two characters readily dis-

tinguish it from sweet orange or rough
lemon stock.

The Sampson tangelo, while not
commonly used as a rootstock for oranges,
results in a union which is similar to that
resulting when sweet orange is used and
it cannot be distinguished from one by
visual inspection.

Sweet orange on sour orange stock is
usually characterized by an undergrowth
of the sour orange stock. Although the
undergrowth is frequently very distinct,
the union may occasionally be fairly
smooth. This variation possibly may be
associated with different strains of sour
orange. There are no visible distinguish-
ing features of the bark.

There is an overgrowth of the stock
associated with trees budded on trifoliate
orange, hybrids of the trifoliate orange,
grapefruit or shaddock.

The shaddock is not widely used as a
stock and the reactions of trees budded
on shaddock and grapefruit are similar.
They will be considered here as the grape-
fruit type.

Trifoliate orange stock generally shows

more overgrowth than any other stock.

The overgrowth is so extensive it forms
a shoulder or shelf several inches wider
than the scion. The outer margins of the
shoulder may occasionally be higher than
the inner margin adjoining the scion.

The bark of the stock is not smooth
but is roughened and presents a webbed
appearance. This aids in distinguishing
it from the grapefruit type which has
smooth bark.

The chief difference between stocks of
grapefruit and trifoliate orange is that
the trunk of trifoliate orange is markedly
ridged or fluted. The grapefruit stock is
smooth and round.

Grapefruit stock is characterized by
two types of unions. One of these displays
the wide bench overgrowth similar to
trifoliate orange. The bark is smooth and
the stock is not ridged or fluted.

The second grapefruit stock type varies
in that the overgrowth of the stock is not
as conspicuous.

Both types are characterized by a flar-
ing or bulging near the soil line which
gives an enlarged bole effect. This en-
larged base serves to differentiate this
type from sweet orange or rough lemon
stock.

Frequently the grapefruit bark is
lighter than the orange scion.

The grower cannot be too cautious in
his efforts to ascertain the stock or stocks
on which his orchard is planted.

Occasionally only an examination of
the bud unions may be needed to provide
identification. The character of the fo-
lage on root suckers may also be indica-
tive in some cases.

Frequent information on the nature of
the bud unions and of the stock suck-
ers may be correlated to provide more
positive information.

In many cases it will be necessary to
carry out the chemical tests and to sup-
plement them with such observations as
have been made in the orchard.

There will be instances when all the
facts available are insufficient for positive
identification.

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A composite sampling consisting of
eight fruits of uniform size was taken
from each of the six trees per treatment
for measurement of fruit quality.

These differences were noted in the
fruits with increase in concentration of
2,4-D in the spray treatment: an increase
in the ratio of length to width, an increase
in the number of rudimentary seeds, a
decrease in the number of normal-
appearing seeds, a decrease in rind thick-
ess, an increase in soluble solids and
pH of the juice, an increase in percent-
age of rag—tissue not passing through the
vibrating screen of an electric juice ex-
tractor—and an increase in the specific
gravity of the whole fruit.

Samples of abnormally large fruits and
of cylindrically shaped fruits from the
trees sprayed with 225 p.p.m. 2,4-D also
were examined for fruit quality. These
fruits generally showed even more ex-
treme effects of high concentrations of
2,4-D in the spray than the normal size
fruit.

Additional Experiments

A total of 32 field plots containing 61
comparisons of fruit drop from 2,4-D
sprayed and nonsprayed trees were estab-
lished in 1947 in the counties of Orange,
Riverside, San Bernardino, Los Angeles,
Ventura and Tulare. Spray applications
were made between February 17 and
August 7.

The average decrease in drop was 30
fruit per tree or a decrease of 44% of
the drop occurring on nonsprayed trees.

The 2,4-D applications were effective
in reducing fruit drop in all of the wide
range of localities tested.

The 1947 experiments were in agree-
ment with those of 1946 in indicating
that in water sprays about eight p.p.m. of
2,4-D is the most desirable concentration
to use in the usual spraying rig.

The data indicate that 2,4-D may be
applied in conjunction with other spray
chemicals.

Sprays containing 2,4-D did not seem
to impair the keeping quality of grape-
fruit and may actually increase storage-
ability by reducing the percentage of
black buttons on the fruit.

Conclusion

Applications in 1946 and 1947 of water
sprays containing eight p.p.m. of 2,4-D
effectively reduced the preharvest drop of
mature grapefruit when applied at dates
ranging from April 15 to just prior to
harvest.

Additionally, the 1946 experiments in-
dicated that sprays which were applied
before the June drop was completed in-
creased production by apparently reduc-
ing the drop of mature fruit which occurs
at that time. It is not definitely known
whether such a reduction of June drop
will be generally beneficial or harmful.

Possible cumulative effects of 2,4-D ap-
llications which may be made at any
season have not yet been established. A
longer period of testing is necessary to
determine these effects.

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