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Reduction of Pre-Harvest Drop of Washington Navel Oranges by 2,4-D Sprays

By N. J. HALSE, B.Sc. Agric., Research Officer

THE uses of various synthetic "plant hormones" in agriculture are many—one of the most generally known of these uses being their action in reducing pre-harvest drop of fruit. Naphthalene acetic acid, commonly known as N.A.A. is widely used for this purpose with apples, but 2,4-Dichlorophenoxyacetic acid, commonly known as 2,4-D, is much more effective with citrus fruit.

Following a successful demonstration of the effect of 2,4-D spray in reducing mature fruit drop of Navel oranges under local conditions, it was decided that a further investigation was warranted to see whether such a spray could be combined with a routine citrus spraying. As the cost of the 2,4-D used is negligible the cost of application is the main consideration. If a special operation can be avoided by incorporating the hormone in a routine spray, such as white oil or Bordeaux mixture, the cost is so low that application of the hormone is economic for even a small reduction in fruit drop. This is particularly important as fruit drop is variable and annual use of the hormone is needed in case of a year of severe pre-harvest drop.

SUMMARY OF PREVIOUS INVESTIGATIONS

Jones (1) in an experiment carried out locally showed that July spraying with the hormone reduced fruit drop from 25% to less than 10%. In this case the rather high concentration of 20 p.p.m. was used. In recent American work Stewart (2) has successfully used low concentrations (4 parts per million)

with a late summer oil spray. Winter spraying at 8 parts per million showed little additional benefit.

PRESENT INVESTIGATIONS

In the investigation carried out on 2,4-D in combination with routine sprays, five treatments were applied; their details are given below:—

- (a) Control—no spray.
- (b) Sprayed with 4 p.p.m. 2,4-D (free acid equivalent) on March 14 in a white oil spray.
- (c) Sprayed with 4 p.p.m. 2,4-D on April 19 in dispersible copper fungicidal spray.
- (d) Sprayed with 8 p.p.m. 2,4-D on April 19, in dispersible copper fungicidal spray.
- (e) Sprayed with 8 p.p.m. 2,4-D on June 18, in water.

The source of 2,4-D for the experiment was a commercial preparation containing the ethyl ester at a concentration of 9.6% free acid equivalent. Considerable care is necessary in making up the solutions. The concentration of 8 p.p.m. is equivalent to 1½ oz. of the commercial preparation per 100 gallons of water.

EXPERIMENTAL PROCEDURE

The experiment was carried out on the property of Mr. J. E. Anderson, Upper Swan. Thirty Washington Navel orange trees bearing a reasonable crop were selected. The layout consisted of six blocks of five trees each block containing the five treatments.

The treatments were applied with a knapsack spray to avoid spreading the material on adjacent trees. The rate of application was approximately three gallons of the spray solution per tree.

On 21st May the fallen fruit was counted and removed from beneath the trees and these counts were repeated at intervals until harvest. A division into sound and unsound fruit was made. It was assumed that this division would separate fruit which fell due to fungal infection from fruit which fell due to a

weak abscission layer. It is the latter type of fall which is reduced by the hormone spray.

During the latter part of the trial the incidence of "water soak" was very high and the number of unsound oranges increased rapidly. Due to this fact the oranges were picked and counted on 7th August, somewhat earlier than originally anticipated. As the fruit was picked a count was kept of the number of buttons which separated from the oranges.

Information which was obtained concerning the total number of fruit on each tree, the fruit size and the detailed numbers of fallen fruit sound and unsound, was not considered to be relevant to the conclusions and has not been included in the results.

GRAPH OF PROGRESSIVE DROP OF SOUND FRUIT.

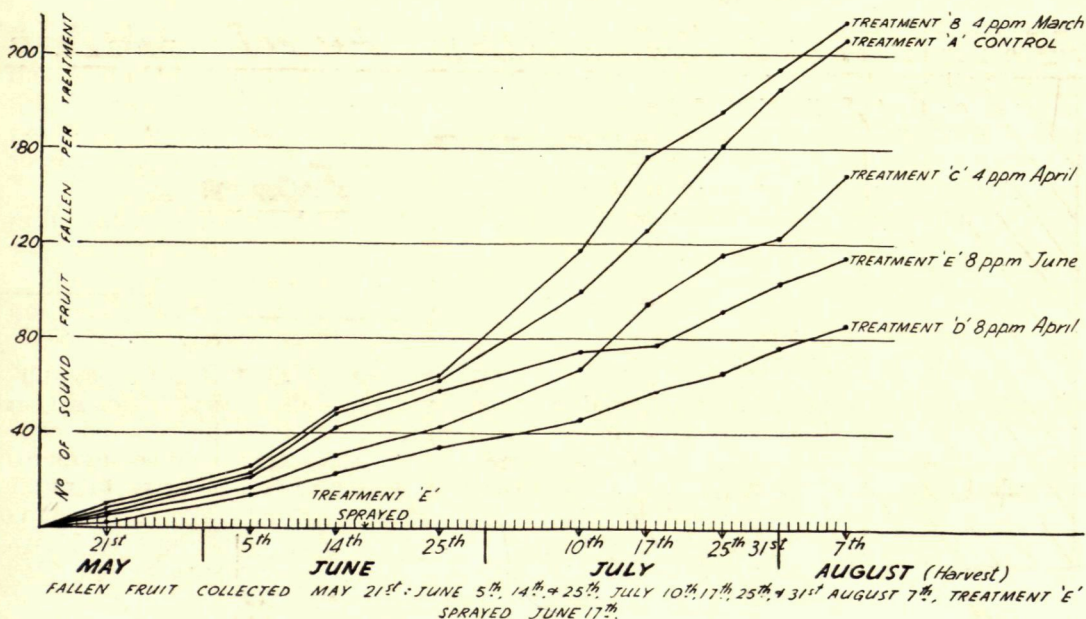
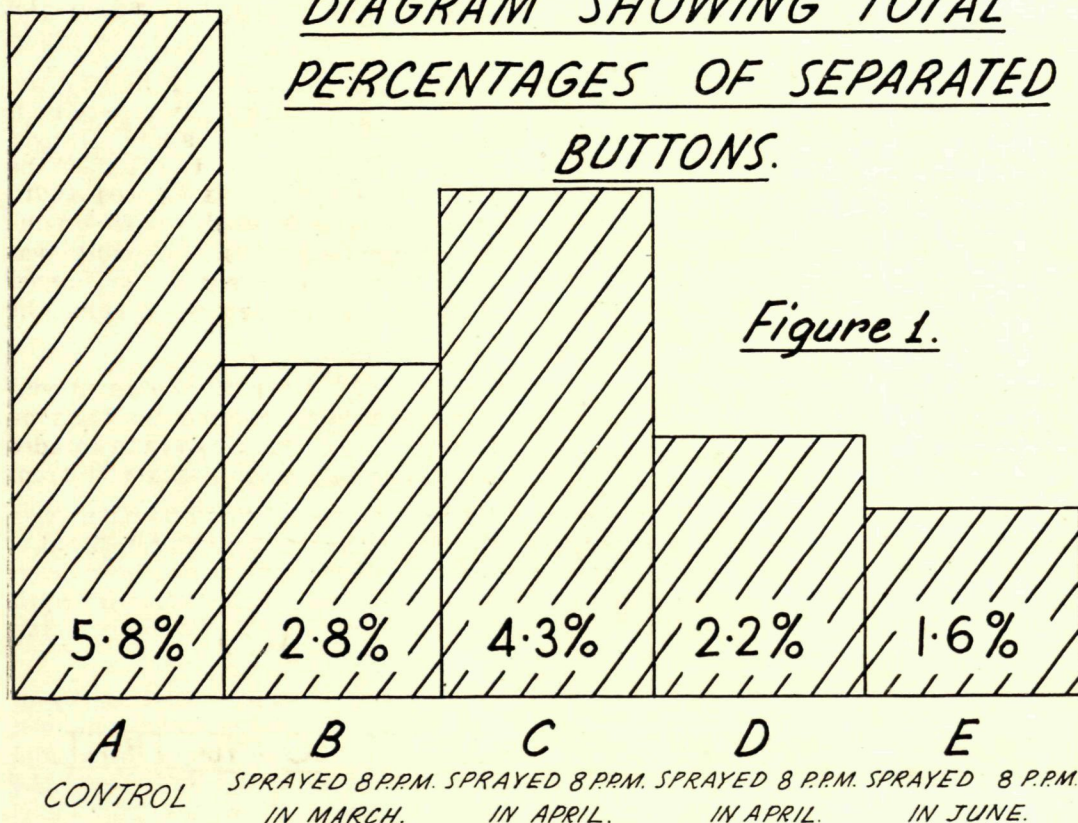
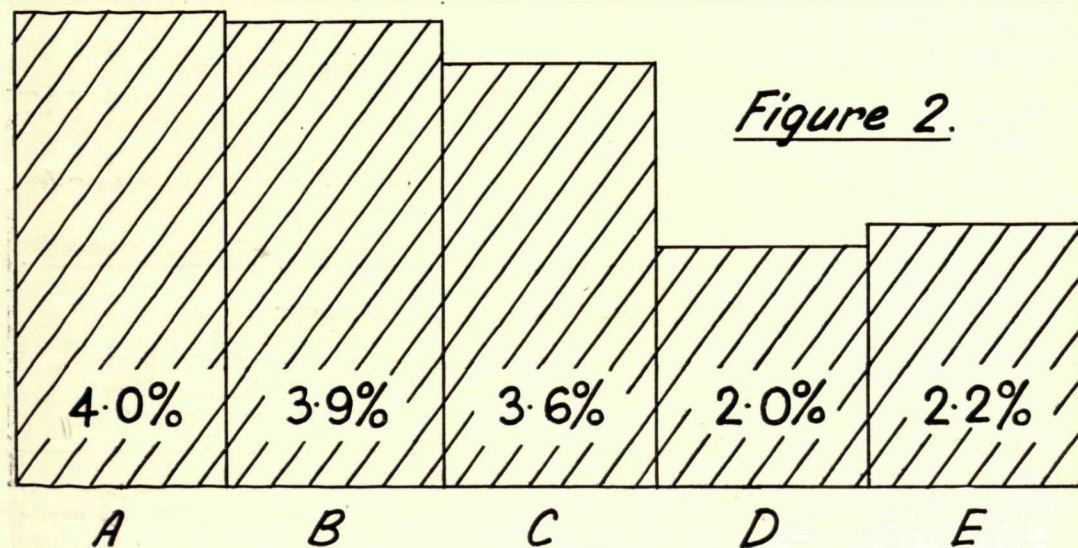


DIAGRAM SHOWING TOTAL
PERCENTAGES OF SEPARATED
BUTTONS.



PERCENTAGES OF SOUND FRUIT FALLEN.



DISCUSSION OF RESULTS

The striking feature in the experimental results was the very light fall of sound fruit. In a previous investigation on this property by Jones (1) the untreated trees had dropped 25% of their total crop and most of the fall was sound fruit; but in this experiment the maximum fall was 4% of sound fruit from the control trees. The difference may be due to the improved nutrient status of the trees or to a seasonal effect.

The fall of unsound fruit was not influenced by treatment—it was of the same magnitude as the fall of sound fruit.

An investigation of separated buttons showed a considerable amount of variation within treatments (see Fig. 1). Statistical analysis indicated, however, that the treatments were significant; this means the differences were due to treatments rather than to chance variation between trees. A summary of the results shows that the two treatments sprayed with 8 p.p.m. had less than half the percentage of separated buttons of the control treatment.

A study of the effects of the treatments on the fall of sound fruit shows that—

Treatment B—4 p.p.m. 2,4-D applied in March in routine white oil spray had no effect in reducing the number of fallen fruit.

Treatment C—4 p.p.m. 2,4-D applied in April with copper fungicidal spray; the reduction in the number of fallen fruit was not significant.

Treatment D—8 p.p.m. 2,4-D in April with copper fungicidal spray; the reduction in the number of fallen fruit was statistically significant. Therefore the treatment definitely was reducing the fall of fruit—the reduction was not due to chance.

Treatment E—8 p.p.m. 2,4-D in June; the reduction in the number of fallen fruit was statistically significant, again indicating a definite effect of treatment.

CONCLUSIONS

The experiment showed that a concentration of 4 p.p.m. was inferior to 8 p.p.m. in reducing the preharvest drop.

The March application of 4 p.p.m. was not effective in reducing the fall but a higher concentration might have been successful. The applications in April and June were both effective in reducing the number of fallen fruit.

It was shown that a 2,4-D spray of 8-10 p.p.m. can be successfully combined with an early winter copper fungicidal spray. This 2,4-D spray reduces the pre-harvest drop of Washington Navel oranges. Another likely benefit of the spray would be the reduced number of oranges with separated buttons.

REFERENCES

- (1) Jones, L. T., *Journal of Agric.*, W.A., 28, 1 (1951).
- (2) Stewart, W. S., *California Citro-graph*, 36, 2.

CHART FOR PACKING APPLES

A chart giving details of the correct method of packing apples is now available at the Department of Agriculture, Perth, or from District Officers. This chart embraces packs for apples of various shapes, such as round, flat, long and medium long types with brief explanatory remarks.

It is printed in two forms; a wall-type chart for packing shed use and a small pocket-size folder.