

## **6. FLOWERING, FRUIT SET AND FRUIT DROP**

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Large differences in productivity between trees of the same variety in one orchard are well known for Fuerte both in California and Israel, and for Ettinger also in Israel. In California much work has been done on this problem for many years but no real solution has been found. In Israel, too, no solution has been found. Reports are given in other chapters on some of the attempts to find solutions through rootstocks, cultivation techniques, and selection of mother trees. In this section we concentrate on work with flowering, fruit set and fruit drop.

### ***Determination of the critical period***

In 1969, a survey was started on flowering period, fruit set and fruit drop in a number of orchards in the Upper Galilee. It was found that trees known to be non-yielders flowered earlier and heavier than those known as good yielders. At the end of the flowering period the same percentage of set of fruit of 3 mm and larger was found in both groups — but it is not known how much of this set was real and how much was merely apparent set (parthenocarpic). During 1½ months after flowering, most of the young fruitlets dropped from the non-productive trees, which was not the case with the productive trees.

### ***Cross pollination***

In spite of many trials, no fruit set has been obtained from artificial pollinations. This has greatly interfered with our work.

No observations have been carried out on the influence of pollination on the yields of Fuerte trees in the orchards. Observations on the influence of Benik trees as pollinator of Nabal have been made. This combination is supposed to be essential for high yield of Nabal and is common in orchards despite the fact that Benik is commercially unsuitable.

In one orchard in the central district, during a period of seven years (1962/63 to 1968/69), no difference was found between the yields of Nabal trees 6 or 12 meters distant from the nearest Benik tree. After the orchard had been thinned, it was possible to carry out observations for 18 m distance during the last two seasons, and again no difference was found.

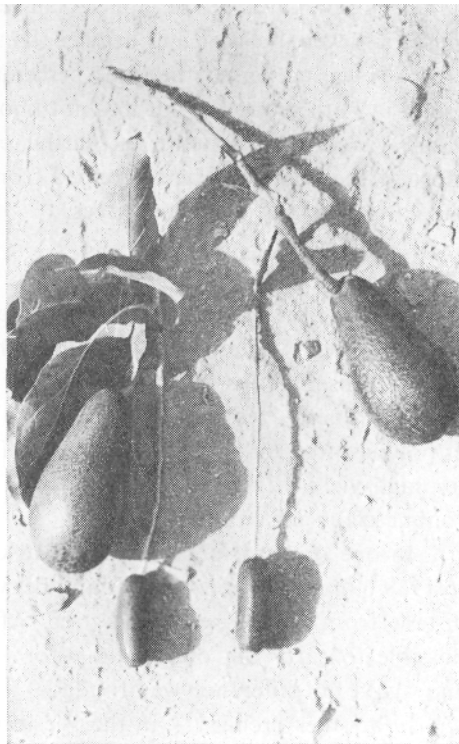
In another orchard — in the Western Galilee — yield estimates were compared during five seasons (1964/65 to 1968/69) for 250 Nabal trees, between 6 and 20 m distant from the nearest Benik tree. Again, no differences in yield were found.

These results cannot prove that pollination with Benik is altogether without benefit for Nabal, but they certainly show that the number of Benik trees in a Nabal orchard can be very much reduced.

### **Seedless fruit (cukes)**

This type of small seedless fruit is well known, but it is not known whether it is truly parthenocarpic (*i.e.*, unfertilized) or whether the young embryo died after fertilization had occurred. During the 1960s, the percentage of such fruits on Fuerte and Ettinger trees rose in many orchards. The weight of cukes of Ettinger is usually not more than 10% of normal fruits, and in Fuerte may reach 25%.

A survey has been carried out in all districts of the country in order to find the factor (or factors) responsible for the production of cukes. Results were so varied that it seems almost impossible to obtain a clear picture of the situation. In nearly every orchard different factors seem responsible: very early flowering, lack of pollinator, faulty irrigation, chlorosis, exceptionally strong trees, one rootstock *versus* another, tree decline, and girdling.



*Plate B.6.1.* Normal fruit developed from late-opening flowers at base of inflorescence.

One common factor which has been found in very many cases is very early flowering. The southeast side of the trees, which generally flowers before the rest, in many cases also bears more cukes. Normal fruit is regularly formed by the flowers at the base of the inflorescence, and these are the last to open (Plate B. 6.1). Girdling brings about both earlier flowering and higher set of cukes.

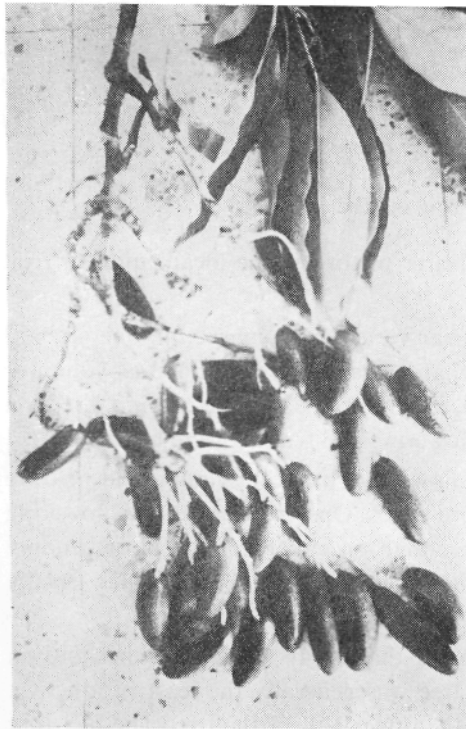
### **Growth substances**

Over the years many trials have been undertaken with growth substances, as sprays on leaves, flowers and young fruits and as injection into trunk or fruit. The aim was to see if a better set of normal fruit, or bigger cukes, could be obtained. Thinning was intended in Hass.

Substances used were: IAA, 2, 4-D, 2, 4, 5-TP, TIBA, NAA, GA, Kinetin, CCC, B-995, Sevin, Ethrel 68-69, Ethrel 68-250, Amidthin, and Fithin.

As spreader were used: Tween-80, Tween-20, DS-4443, Triton-B, Triton-X-100, Agral-90, and Vatsol-ot.

Sprays with 10 ppm 2, 4, 5-TP, on leaves and flowers, produced severe leaf burn and distortions. Sprays with B-995 and GA on flowers resulted in a very high additional set of cukes (Plate B. 6.2). Sprays with 20-50 ppm Amidthin on Hass resulted in fruit thinning. None of the other treatments gave any positive results.



*Plate B.6.2.* Increased set of seedless fruits as a result of gibberellic acid treatment during the flowering period.

### ***Problems of penetration***

The failure of so many growth substances in such a wide range of concentrations to produce any effect, must lead to the question whether these substances actually reached the tissues where they might have done their work; in other words, whether they penetrated at all into the leaves. It has been shown (Chapter B. 1) that avocado leaves have no stomata on their upper surfaces and that avocado trees do not suffer from sprinkler irrigation with saline water because the salt does not penetrate the intact leaf.

Since 1968, a number of substances have been sprayed on the underside of the leaves, but this too has not produced any effect.

This leaves no doubt of the need to start basic research on the structure and chemistry of the cuticle of the avocado leaf in order to clear up the question of penetration into the leaf. This research has not yet been done. Dr. J. T. Martin, of the Long Ashton Horticultural Research Station, kindly agreed to investigate the properties (anatomical and chemical) of leaves of different varieties which we sent to him in different seasons. This has given us much valuable information, but there is no doubt that much work has still to be done.