

A STUDY OF FACTORS AND PROCESSES THAT MAY BE RESPONSIBLE FOR THE DIFFERENCE IN PRODUCTIVITY OF 'FUERTE' AVOCADO TREES.

Johai Bar-On

Thesis submitted to the Faculty of Agriculture of the Hebrew University of Jerusalem for the degree Master of Science in Agriculture

May 1986, Rehovot

Summary

Introduction. Within any given population of Fuerte trees there is a significant number of trees whose yields are marginal and therefore reduce the average yield of the variety.

In this work we studied a series of processes relating to the fertility of the variety. All observations and experiments were carried out on both productive and non productive trees of the Fuerte variety that were planted in 1969, in a commercial orchard in kibbutz Dafna, Upper Galilee. The selection of trees for the experiment was made on the basis of the average yield of trees for seven years beginning the sixth year after planting. For fertile Fuerte trees the average yield at the beginning of the research was 81 kgs. and for non-fertile trees 19 kgs.

A subsequent experiment was carried out either on whole trees or "twigs" whose lengths were 30 cms.

All procedures were carried out with both productive and non-productive "Fuerte" trees.

Induction of flowering. In order to determine the date of evocation, girdling and defoliation were carried out at various times. We assumed that under these conditions there was no possibility of induction and therefore, the blossoming of these branches would indicate differentiation prior to the above treatment. There were no significant differences between induction in either group of trees.

Fruit bud differentiation. For two seasons, at the onset of autumn, branches were designated, and at two-weekly intervals dormant, terminal buds, were removed for microscopic inspection. There was no difference in the percentage of differentiated buds in either productive or non-productive. As many as 70% of the buds had reached differentiation by mid-August.

Intensity of blooming. Intensity of blooming was evaluated using two methods:

- a). by visual estimation.
- b). by counting the inflorescences on pre designated branches.

It was found that in infertile Fuerte trees blooming began earlier and its intensity was greater. Although the difference was constant it was not significant.

Female and male flower opening. On four, non consecutive days no difference was found in the sequence in either male or female stages between the two groups of trees.

Production of Nectar. We followed the process of nectar production for four days. Measurement began with the opening of the flowers in the morning and ended either at days' end or when nectar was no longer present. Nectar was extracted with a graduated micro-capillary tube. There was no significant difference in the production of nectar between fertile and infertile Fuerte trees.

Sugar concentration in flowers. Flowers were analyzed for their sugar content. Only reduced sugar was present. At the three days of collection, and in every kind of flower, there was no difference in the percentage of reduced sugar content in flowers whose origin was fertile or infertile trees.

Natural pollination. The degree of natural pollination was examined at nine separate times, over two seasons. Flowers were sampled from designated branches and under microscopic inspection the number of pollen grains per stigma was counted. There was found to be no difference between the rate of pollination of flowers in either group of trees. There was, however, a reduction in the degree of natural pollination in avocado orchards when flowering occurred in adjacent citrus groves.

Normality of ovaries. At three separate intervals pistils were collected from flowers at the female stage of development. The collected material were fixed, infiltrated with paraffin, cut with the aid of a microtome and examined under the microscope. No difference was found in the standard of normality of ovaries in flowers whose origins were either fertile or infertile trees.

Evaluation of pollen vitality. The evaluation was carried out by staining the pollen with fluorescent material (F.D.A.). The ensuing microscopic examination of a number of grains which glowed strongly did not indicate any consistent difference between pollen from fertile or infertile trees. There is no doubt, moreover, that this examination can accurately effect the potency of pollen.

Pollen germination and growth pollen tubes. On four separate dates and seven different intervals pistils were collected. The pistils were fixed, made transparent and stained by analin blue. The positions of the pollen tubes were checked under the microscope with the aid of ultra-violet light. There was no consistent or significant difference in the rate of pollen germination or in pollen tube growth, in pistils from either fertile or infertile trees.

Fruit set and fruitlets drop. Detailed observations were carried out after fruit set and fruitlets drop in fertile and infertile Fuerte trees. These observations were carried out in the 1982 and 1983 seasons.

The number of fruitlets was counted on designated branches and those flowers and fruitlets that dropped into pre-placed containers around the trees were collected and counted. There was a greater extent of flowers and fruitlet, abscission, in infertile trees, but this difference was not significant.

There was no consistent or significant difference between the numbers of fruitlets from branches of fertile or infertile trees.

Vegetative growth. Various parameters, were checked regarding vegetative growth of designated branches. Among some of these parameters were found consistent and significant differences. Vegetative growth was more vigorous in infertile trees than that of fertile trees. There is great importance attached to this difference because it was found at the time of fruitset and fruitlets drop, affecting it seems, the varying degree of competition between vegetative growth and fruitlets.