

SELECTION OF AVOCADO ROOTSTOCK SUITABLE FOR USE WITH SALINE IRRIGATION WATER

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The avocado tree is highly sensitive to saline irrigation water. Even water of relatively low salt content, which is generally considered satisfactory for irrigation of most cultivated plants, may be too saline for avocado trees on the common rootstocks.

Since the sources of irrigation water with very low salt content are limited, it was deemed necessary to find rootstocks with higher tolerance to saline irrigation water than that of the common sensitive root-stocks.

Observations and experiments with avocado trees in the United States (2,3,4,5,6) and Israel (11) have shown that there is a great difference in the behavior of avocado trees from different horticultural races which are grown under the same saline conditions. Furthermore, it has also been shown that great variability exists between seedlings which have been grown from seeds collected from the same tree (7,8).

All avocado varieties are highly heterozygous, both egg cells and pollen grains are of unknown genetic constitution, and practically every seedling is different from all others. This makes it possible to select types which can withstand irrigation water with relatively high levels of salinity.

Two outdoor experiments with avocado seedling trees were carried out from 1958 to 1961 by the Division of Subtropical Horticulture at the Volcani Institute of Agricultural Research, Israel. Several root-stocks were selected with higher tolerance towards saline irrigation water than that of the common rootstocks. In addition, various aspects of the uptake and distribution of chlorine and sodium within the plants have been studied in these experiments (7,8), and in a series of glasshouse experiments (10).

During the years 1958-61, a large-scale experiment was carried out to select avocado seedlings tolerant to saline irrigation water. A total of 576 seedlings were tested from eight varieties which represent the Mexican and Guatemalan races, a hybrid between these two, and a hybrid between the Guatemalan and West Indian races. The experiment was carried out under natural climatic conditions, in large and deep containers buried in the soil. The plants were irrigated with water containing 830 ppm

sodium chloride except during the winter seasons, when plants received only rain water. Periodic measurements of growth increments and grading of plants according to damage were carried out. Leaf samples were taken every two months to study variations in their chemical composition. Soil samples were analyzed to determine changes within the soil during the experiment.

As a result of the saline treatments, all plants showed various degrees of leaf scorch two months after the beginning of the experiment. Simultaneously, a great increase in chloride concentration was found in the leaves. The percentage of sodium in the leaves was low, and in most cases did not increase during the experimental period. Only in seedlings of the Mexican variety Northrop, did a high increase of sodium occur in the leaves after one year. This increase became more pronounced towards the end of the experiment.

Parallel to the high sodium concentration, symptoms of damage due to sodium excess appeared on the leaves as necrotic spots between the veins. In the roots of all plants a high level of sodium was found.

An examination was carried out to check the reliability of the criteria for growth increment as a measurement of plant resistance to saline conditions, and it was found that this method of testing is reliable (7).

A simple way was found to compare the reaction of different seedling populations and seedlings within each population, according to growth increase and the stage of damage by a method of ranking (1).

Before the termination of the experiment, nine plants were marked as outstanding in their resistance to saline water: five Guatemalans, two from a cross with a West Indian type, and two from a Mexican type.

In another experiment, seedlings of five different varieties of either West Indian, or hybrids between W.I. and Guatemalan races, were tested. In this experiment, the irrigation water contained 1330 ppm of NaCl and by the end of the experimental period most of the plants had either died or had suffered great damage of leaf scorch and declined. Four plants (two of a West Indian type and two of Guatemalan x W.I. hybrids) had survived, however, and although somewhat damaged, they have completely recovered after being transplanted and irrigated with water of better quality.

After the termination of these two experiments, cuttings were taken from the 13 outstanding selected seedlings and introduced into rooting beds under mist-spray to be rooted as clonal rootstocks so as to ensure uniform progeny of the original plants (9).

Various percentages of rooted cuttings have been obtained from most of the selected seedlings, and only in the case of two West Indian seedlings was there no rooting at all.

Some of the rooted cuttings from each selected seedling have been grafted with the varieties Fuerte and Hass. These plants are now ready to be tested as grafted trees under saline conditions. The tests will last several years before the results will show whether they can be recommended to growers as rootstocks to be used under saline irrigation water.

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