

2. TRIALS WITH ROOTSTOCKS AND SOURCES OF BUDWOOD

A. Ben-Ya'acov and Ch. Oppenheimer

a. Rootstock Trial at Kubeiba (see section A. 3)

In this trial four varieties were grown on five rootstocks. The orchard is planted on medium-light soil of low lime content, conditions which do not generally lead to the development of chlorosis even on susceptible rootstocks. Under these conditions Guatemalan types, and especially Nabal seedlings, were superior to Mexican seedlings as rootstocks. The mean yield per tree for the first eight harvests was: 32 kg on Duke, 34 kg on Northrop, 37 kg on Fuerte, 40 kg on Benik, and 46 kg on Nabal. Trees on Mexican stocks showed more tip burn than those on Guatemalan stocks.

b. Work with Rootstocks and Sources of Budwood

The plant material used in orchards in Israel comes today from about 400 mother trees each for seeds and budwood. It is obviously impossible to carry out trials of this magnitude in orchards of a research institute, and we have therefore decided to build up a scheme for investigation in commercial orchards. This will also enable us to study stocks and scions under different conditions of microclimate and soil.

Plans for new orchards

The work is planned on a large scale and will be carried out through the supply of marked material (seeds and budwood) to the nurseries, arrangement for preparing groups of plants from different and marked combinations of stock and scion in the nurseries, and preparation of orchard plans for the growers. This will allow conclusions to be drawn without interfering with the commercial aspects of the groves.

Normally, randomized blocks are used, but certain variations on the block pattern have been made here. In most cases we have also included guard rows, so that the orchard can in the future be used for trials with other cultural techniques, such as on fertilizers or irrigation. The plan takes into account future tree thinning so that it would be possible to eliminate some stock-scion combinations entirely, if it should prove desirable.

Between spring 1968 and spring 1969, 30 orchards were used for this project, with more than 10,000 trees, which include 69 rootstock types and about 100 sources of budwood. The project will be increased considerably in 1969/70.

Work in existing orchards

At the same time we are trying to obtain as much information as possible from existing

orchards wherever records of stocks and sources of budwood are available. In most existing orchards there are either no records at all, or very scanty ones; in such orchards not very much can be done. In a few orchards records have been kept, but nowhere in these orchards are stocks or sources of budwood arranged in an experimental pattern, and no comparable combinations exist. In most cases different stocks were used for different varieties or at least sources of budwood, according to the nurseries' methods before they entered in on our scheme.

Experimental plots

In four experimental plots, totaling 200 dunams (20 hectares), Mexican and West Indian stocks are planted alternately. In three of the plots, yield records for the first three harvests showed no consistent differences. Certain trees — some on one and some on the other stock — gave higher than average yields. However, the health of trees differ — generally trees on West Indian stock have shown less tip burn, but seem to have suffered more after a very wet winter than those on Mexican stock. Ettinger trees seem to grow slower and Fuerte trees quicker on West Indian than on Mexican stocks.

In eight other plots different Mexican types — or Mexican with Guatemalan or Mexican/Guatemalan hybrids — can be compared as stocks. In one of these plots we could prove that the specific combination of the type of stock with one type of scion is decisive, and not the stock-type or scion-type by itself. The Guatemalan stocks were less suited to soil of high lime content or to other marginal soils but somewhat more resistant to medium concentrations of salt.

In 1963-1965, five rootstock trial plots were planted under saline conditions. In one of these, planted in 1965, eight stocks were budded with Fuerte under normal trial conditions. Analyses of water and soil, measurements of tree development, ranking of salinity damage, and leaf analyses have been carried out. Clear differences are seen between trees on different stocks, in growth increments and leaf composition.

Influence of rootstock on tree nutrition

In six of the orchards mentioned above, a survey is being carried out on the influence of rootstock types (and as far as possible also source of budwood) on the composition of leaves, in the light of tree condition and yields. Some of the differences — especially between the different races as rootstocks — seem to be highly consistent.

Sources of budwood for Fuerte

In this variety, the most important but also the most unreliable in its yields, performance seems to depend much on the individual mother tree from which budwood was taken (source of budwood). In both California and Israel large differences in yield between Fuerte trees in the same orchard are well known, and some trees never yield at all. We have devoted much time to tracing the linear descent of Fuerte trees of differing productivity to known sources of budwood. In this context, we are trying to elucidate the history of the variety in Israel, the different introductions and their distribution, and thus to trace the most important sources of budwood now in use in the nurseries. In the new orchards we shall be able to compare these different lines with greater exactitude.

c. Vegetatively Propagated Rootstocks

One can never obtain uniform rootstock material from seeds. Through vegetative propagation genetically uniform rootstocks may be produced, but it is clear that genetic uniformity does not, by itself, guarantee uniformity of the trees grafted on these vegetative stocks.

Uniform rootstocks would be of importance not only for the grower, but would also make it easier to draw more accurate conclusions from every kind of research in the orchard. Only vegetative rootstocks allow the propagation of selected types resistant to salinity and lime, or of types influencing health and productivity of the tree (if such stocks can be found). Vegetatively propagated stocks have been grown here for experimental purposes for many years (see sections B. 1 and B. 4), but only recently are orchards on such rootstocks being planted or planned.

Stocks from selection at Na'an (see section B. 1) — Four trial plots have been planted with Vegetatively propagated stocks grown from these selections, and are being compared with seedling stocks. Some of them are irrigated with water of high salt content and some with low. Exact copies of the original trees, *i.e.*, Vegetatively propagated stocks from their stocks budded with budwood from the same trees, have also been prepared.

Trials of seedlings vs. vegetative stocks (in cooperation with E. Lahav): The plan is to lay out eight trial plots in different districts of the country, four with Mexican stocks and non-saline water, and four with West Indian stocks and saline water. In each plot, seedlings will be compared to vegetative stocks from the same trees. Plants are now being prepared in the nursery. These plots should give us more information about the degree of variability of trees on these two types of stock.

B. 2. Summary: The work on this relatively new concept is still in the very early stages. It is intended to use 50-70 commercial orchards on about 1000 du. Past experience has led us to the belief that it will be possible to establish important differences between stock and scion types and thus to improve yields in the orchards through selection of the best combinations.

At the present stage of knowledge, Mexican type stocks are still preferable for most conditions where soil and water are of good quality. Nabal can be used as stock on light soils, where there is no danger of chlorosis, and with water of slightly higher salinity than would be good for Mexicans. On soils of high lime content and with saline irrigation water, only West Indians should be used, until the time when newer selections prove themselves. After the winter of 1968/69 some doubt about West Indian stocks arose because they seemed to have suffered more from water lodging than did the Mexicans.