

3. INARCHING

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By inarching we can change the existing rootstock — which may be too susceptible to some adverse factor — to another, more resistant rootstock. Here in -Israel, a change of rootstock can be helpful in overcoming damage due to salinity and high lime content, since rootstock types differ in their resistance to these two factors. In an existing orchard the only way to change the rootstock is by inarching.

Description of trials

Trials are being carried out on salinity damage or on lime-induced chlorosis. Some trials were started in the early 1960s and have already given results, while others were begun later and the results are so far only tentative. Only the best methods are now being used. Trials are currently going on in 15 orchards with different stock types, mainly West Indian. About 500 trees are included in these trials, which are organized in randomized blocks; the trees were, as far as possible, identical as to condition before inarching. Work with double rootstocks by inarching one into the other in culture solutions in order to follow transportation of chlorine and sodium by radioactive tracers, has been reported already (section B. 1).

Some results of earlier work

Inarching has been found to be an effective method to cure salinity and lime damage in orchards. There have been no technical difficulties in inarching the new stock into the old tree and growth of the secondary stock has mostly been satisfactory, allowing the old rootstock to be cut after a few years (Plate B. 3.1).



Plate B.3.1. Inarch on Nabal tree, 16 months after grafting.

Notes on the condition of the trees — Trees must be inarched before they have declined too much. Otherwise, the take of the secondary stock is frequently unsatisfactory and, even if the take succeeds, growth of the secondary stock is often not strong enough. Age of the tree is also of importance. In nursery trees 100% take is usual, with three-year-old trees about 85% can be obtained, with six-year-old trees only 67%, and in old trees in bad condition — only 35%. In two orchards we found higher take and better

growth of the secondary stock when the inarched tree was Fuerte than when it was

Ettinger.

Notes on the condition of the secondary stock — at time of inarching the stock must be woody. Frequently, but not always, stocks which could not be immediately inarched, suffered from interrupted growth. Good results were obtained by planting sprouting seeds near the trees to be inarched and grafting them after they had grown to the ideal stage.

So far, there are few consistent differences in the results from different types of stock. Good results were obtained from most West Indian types. In one orchard, differences were observed as to variety of inarched tree. With Fuerte seedlings, Hall and Fuchs gave 100% take and Winslowson only 75%; with Ettinger, Fuchs and Winslowson gave 90% take and Hall only 75%. Growth of all the stock types used was satisfactory.

Season of planting and grafting — summer planting and July grafting have been found better than later dates. No difference was found between inarching immediately with planting or a month later. In most cases young stocks were grafted between a month and a year after planting.

Techniques of grafting, covers and supports — No differences were found in take between approach and direct graft. With both, high take can be obtained. Under especially difficult conditions there may be some advantage to approach graft. An additional advantage of this method is the fact that in the case of no-take a second grafting is possible. On the other hand, the direct graft also has its advantages — better contact of the stock with the tree, rapidity and simplicity of procedure, and the possibility to use it on nearly every part of the tree. With the approach graft it is necessary to find on the trunk a sufficiently long, flat and unimpeded piece of bark and this is not always to be found, especially since the root system of the inarched tree does not allow free choice for the planting of the secondary stock.

With young trees (up to three years old) plastic strips can be successfully used as covers for the graft. With older trees this is very difficult and seldom successful. Adhesive paper or cloth covers were found better than tree healing paste, which seemed rather to obstruct the graft union. Nevertheless, some paste is needed to close the gaps between the tree trunk and the covers. For support, the best results were obtained with blunted copper nails. This technique prevents wind and other factors from disturbing the union between the secondary stock and the tree.

Influence of secondary stocks — Experience under saline conditions is rather limited because in the Na'an orchard only relatively few secondary stocks grew sufficiently well and in some other orchards not much influence has been found so far. In some cases, where Winslowson stocks at Na'an grew well, tree decline was halted, new growth started and leaf burn decreased — all this on the side of the inarch as compared to the opposite side, or on inarched trees as compared to controls. Leaves from the inarched side contained more phosphorus and potassium and less chlorine than those from the opposite side of the tree. Positive influences were found in container trials. Leaf burn of Fuerte trees on Mexicola stock was practically cured by well developed Zrifin-67 inarches, while the nearly stationary inarches from another West Indian type brought no relief (Plates B. 3. 2, 3).



Plate B.3.2. Fuerte on Mexicola rootstock with Zrifin-67 (West Indian) inarch, in good condition.

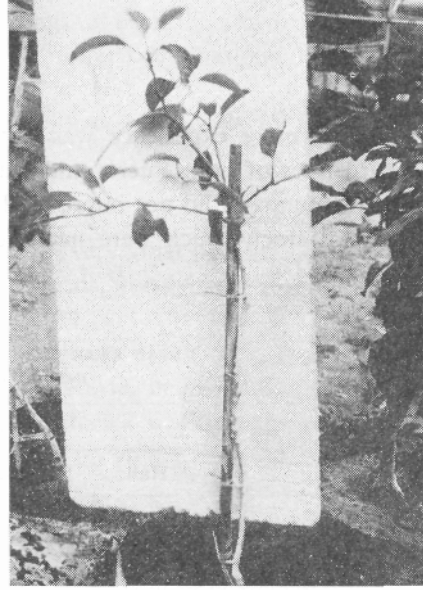


Plate B.3.3. Fuerte on Mexicola rootstock without inarch; most leaves were badly burnt and have dropped.



Plate B.3.4. Fuerte on Nabal rootstock inarched with Hall (West Indian); nearly perfect recovery.

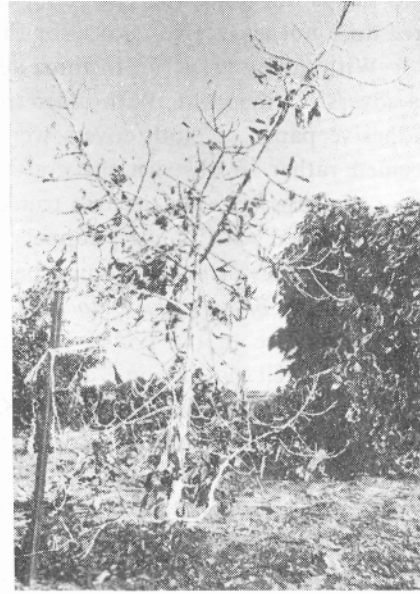


Plate B.3.5. Fuerte on Nabal rootstock without inarch; in very bad condition. In background, tree on West-Indian stock.

Much more experience was obtained under conditions of chlorosis. In one orchard trees of both Fuerte and Nabal were substantially improved by inarching while the controls did not improve (Table B. 3.1). In another orchard, Fuerte trees on Nabal stock which were near death from iron deficiency were cured (Plates B. 3.4, 5).

TABLE B. 3.1
 MEAN RANK OF CHLOROSIS* WITH AND WITHOUT
 INARCHED SECONDARY STOCK

<i>Month</i>	<i>Type of inarch</i>			<i>Mean</i>	
	Hall	B.D. 10/13	Zrifin 99	inarched	control
Dec. 1963	0.5	0.8	0.6	0.6	0.3
Aug. 1964	1.4	1.1	1.3	1.3	1.7
Dec. 1964	1.6	1.6	1.6	1.6	2.0
Sept. 1965	0.3	0.1	0.4	0.3	2.0

* 0 = green, to 3 = very chlorotic. Trees received Sequestrene 138 until the summer of 1963.