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COLD-HARDINESS OF YOUNG AVOCADO TREES ON MEXICAN AND GUATEMALAN ROOTSTOCKS

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SUMMARY

Although avocado varieties of the Mexican race used as rootstock are inherently more cold-hardy than varieties of the Guatemalan race, observations made in two young rootstock trial plots indicate that this difference does not manifest itself when the trees are in a succulent condition at the time of a freeze.

A desirable characteristic of avocado varieties of the Mexican race as rootstocks is the greater inherent cold resistance than that of varieties of the Guatemalan race. However, the physiological condition of the budling at the time of a freeze is an important factor in cold hardiness.

Information to this effect has been obtained in two experimental plots established for the purpose of testing the relative merits of Mexican and Guatemalan varieties as rootstocks. As a result of low temperatures the trees, which were then in a succulent condition, suffered severe damage and, as will be shown presently, the greater inherent cold-hardiness of the Mexican stock did not manifest itself.

One of the plots referred to was planted in the spring of 1948 in Santa Barbara County. It consisted of 137 MacArthur trees on 9 Guatemalan and 5 Mexican rootstock varieties. Eighty-seven of them were standard budded trees and 50 were "tip grafts." The trees were not protected against low temperature. As previously reported, (*Halma, F. F., and F. A. White. Grafting cold-injured avocados. Calif. Avocado Society Yearbook 1949:83-86*.) the January, 1949 freeze killed every tree to the ground. Eight percent of the budlings and 51 percent of the tip grafts had their roots killed. The greater mortality of the tip grafts was undoubtedly due to their much smaller size, although some of them that survived were only 20 feet from budlings that were completely killed.

Pertinent to this discussion is the fact that half of the budlings that were completely killed were on Mexican and half on Guatemalan rootstocks. Most of the trees which survived were successfully grafted below ground shortly after the freeze, and the rest were allowed to produce root sprouts for later top-working. Unfortunately, the hope of obtaining information concerning possible influences of Mexican and Guatemalan rootstocks on growth during the second year was not realized due to another and more severe freeze in January, 1950, which killed practically every tree, in the plot.

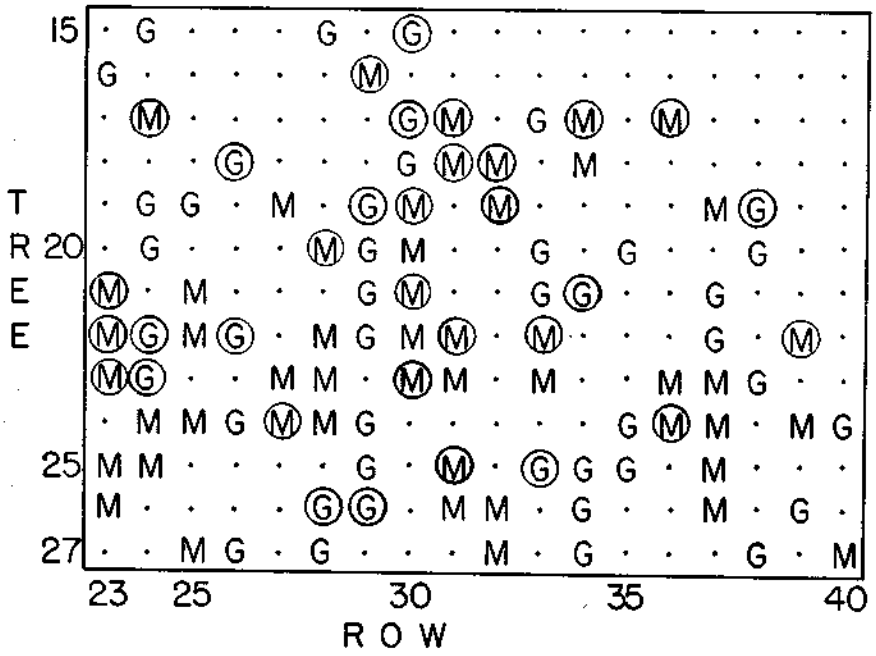

Fig. 1. *Distribution of killed and partly frost-damaged Fuerte trees.*
M—indicates trees on Mexican stock.
G—indicates trees on Guatemalan stock.
Dead trees are circled, balance recovered either by means of root-stock sprouts or scion.
Orange trees are represented by dots.

More extensive information was obtained in the other plot. It was planted in Los Angeles County in July, 1949, in an old orange orchard on level land with light soil and clean tillage. The avocados were planted in place of orange trees that had been removed. The plot consisted of 113 Fuerte budlings, 51 on six Guatemalan and 62 on 6 Mexican rootstock varieties.

The trees made excellent growth and they were in succulent condition when the sudden freeze of December 10, 1949 occurred. It caused severe injury despite the fact that the trunks were wrapped with several thicknesses of newspaper. The degree of injury varied. In some cases both scion and stock were killed, while in others only the scion. A few showed little more than leaf and twig killing above the paper wraps on the trunk. Incidentally, some 30 trees planted in November, a month before the freeze, were hardly affected, probably because they were in a dormant condition.

Although the mortality in the July planting appeared to be low at first, it increased steadily during the 1950 season. In many cases where the Fuerte scion was killed, the rootstock portion which seemed to be sound failed to produce sprouts or the growth produced was weak and eventually died. This continued increase in mortality delayed the appraisal of the damage until the spring of 1951. Fortunately the plot suffered no further setback during this period.

The observations are summarized in the following table. They are in line with the limited information obtained in the MacArthur plot in that they indicate no relationship between survival and rootstock variety. In other words, in these young, actively growing trees the

greater inherent cold-hardiness of the Mexican rootstock did not manifest itself. Actually the loss of the trees on Mexican stock happened to be greater than those on Guatemalan stock, but the number of trees involved is too small to stress this point.

The trees on the various stocks were well distributed, as seen in figure 1, which shows a representative section of the plot. The unmarked spaces are occupied by orange trees. For the sake of clarity the trees are divided into two groups: those that died and those that recovered, either by means of rootstock sprouts or by scion regeneration. The lack of a pattern together with the fact that in several instances dead and recovered trees on the same rootstock variety were only about 22 feet apart suggests the difference in tree condition rather than difference in temperature was the determining factor.

Table I
Cold-hardiness of Fuerte on Mexican and Guatemalan rootstocks

Number of trees on	Rootstock variety	Percent scion and stock killed	Percent scion killed, stock survived	Percent scion recovered
Guatemalan				
11	Anaheim	27	46	27
5	Challenge	40	20	40
10	Dickinson	40	20	40
9	Itzamna	33	22	44
9	Nabal	11	33	55
7	Taft	29	0	71
Total 51				
Mexican				
9	Blake	55	22	22
11	Duke	55	9	36
13	Ganter	46	8	46
10	Northrop	20	20	60
8	Mexicola	12	38	50
11	Topa Topa	45	9	45
Total 62				
All Guatemalan		29	26	45
All Mexican		40	16	44

These observations indicate the importance of frost protection of young trees, whether Mexican or Guatemalan stock. They further emphasize that nothing should be done to stimulate them into late fall growth. In the case of the trees mentioned above, a frost following continued warm weather and the absence of cold nights to force them into a more or less dormant condition were undoubtedly the causes for the severe damage received. It is doubtful if these growers could have done anything to force their trees into dormancy without a period of cool weather.