

this group were negligible. With the Montmorency, mazzard stocks from sources in Virginia, Maryland, California, and from abroad all produced satisfactory trees. Mahaleb stocks from two foreign sources produced very poor trees, while the stocks from the seeds of the tree in Maryland and from one of the foreign sources produced trees equal to those on the mazzard stocks with which they were compared. With Saint Medard, the two mahaleb stocks used made better trees than the mazzards with which they were compared. One foreign source of mahalebs produced poor trees when worked to Montmorency, but good trees when worked to Saint Medard.

Conclusions

The results of the orchard trial would lead to the conclusion that the sources of cherry stocks are very important in the performance of the trees grown upon them. With sour cherries good sources of mahaleb seed may produce better trees than some of the mazzard stocks. The variety of the cherry must also be considered. A stock doing well with one variety of cherry does not necessarily do well with all other varieties. With sweet cherries the weight of evidence is still in favor of mazzard stocks as compared to mahaleb, but it is possible that better strains of mahaleb may some day give us satisfactory stocks for this species also.



The Behavior of Several Apple Varieties on Malling Rootstocks

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A fruit tree is made up of two parts, namely the desired variety forming the trunk and branches, and the rootstock supplying the root system. As a rule in the past apple seedlings raised from seeds of commercial varieties have been widely used as rootstocks for orchard trees. Trees grown on these seedling rootstocks will reach large size and may not come into bearing as early as de-

sired. Such trees may also present problems in pruning, spraying and harvesting. With the trend to greater mechanization of all orchard operations, trees of smaller size than those on seedling rootstocks may be more desirable.

To meet this need, especially that of size control and earlier bearing, rootstocks for apples have been selected that offer promise. Most prominent among such size-controlling rootstocks

are the "Malling", or M rootstocks, so named because they have been selected and standardized at the East Malling Research Station in England. They are propagated, not from seed, but by such vegetative means as layering, hardwood cuttings and root cuttings. In these vegetatively-propagated rootstocks each individual plant of a given type is identical to each other plant of that type. They are designated by a number, for example M. I or M. II. The numeral "I" has no reference whatever to performance or desirability, but merely indicates that this was the first type of rootstock described. This accepted system of numbering has the advantage and orchardists throughout the world. of meaning the same to nurserymen

Size Differences

Of the existing 17 Malling rootstocks, numbered by Roman numerals I to

XVII, 12 are under test at the New York Experiment Station at Geneva, and 8 have been selected as the best available to provide a range from a very dwarf to a very vigorous or large tree. The performance of given varieties, as McIntosh, Cortland, Red Delicious and Golden Delicious differs widely on each of the numbered rootstocks, but 4 distinct size groups can be recognized.

Dwarfing Stocks

Malling IX is the only recommended rootstock for apples which always produce very small quickly-bearing trees. Trees on IX need a good soil. Furthermore, the root system of IX is very brittle and it requires a good support. For such reasons trees on IX are adapted for garden planting rather than commercial orchards.



Fifteen-year-old Baldwin tree on Malling IX rootstock.
Branches are bending under a heavy crop.

The rootstocks VII, V and IV have restricted the growth of the scion variety to a lesser degree than IX, producing trees of intermediate size. These "semi-dwarfing" stocks, with the exception of IV, are sufficiently well anchored to be suitable for commercial orchard planting. Malling VII appears to be an excellent rootstock for both the orchardist and the home gardener, because it makes a medium to small-sized tree which rapidly attains its size and then bears heavily.

Semi-standard Stocks

The third size group which might be called "semi-standard" includes the stocks II, I and XIII. Growth restriction of the scion variety on all three is less than either on IV or V and the trees, depending on the soil condition where grown, may be only slightly smaller than such trees growing on seedling rootstocks. The chief merit of II and I is the early and heavy bearing induced by these rootstocks. Malling XIII on the other hand, does not induce early bearing but shows great tolerance to soils which over a period in early spring may be very wet. Under such conditions, XIII has proven to be a good rootstock for varieties which are early and heavy bearers such as Cortland, Golden Delicious and Rome. On the other hand, XIII has failed in soils which are extremely dry over a greater part of the growing season. It might also be pointed out here that in contrast to the peculiar adaptation of XIII to wet soils, Malling I is very sensitive to moisture levels and will do best in well-drained, not so dry soils.

Standard or Vigorous Stocks

Malling XVI and XII are rootstocks which induce considerable vigor. The growth any given variety will make on either rootstock will depend again on the soil. In good soils, trees on XVI will be the larger ones. However, when grown in lighter soils, trees on XVI, may be considerably smaller but never as small as on I, II and XIII. Fruiting of trees on XII is delayed, but there are indications that this rootstock is adapted to extremely dry soils; under such conditions bearing may be somewhat earlier.

It is of importance that trees on Malling rootstocks are given sufficient spacing. Minimum distances of trees on stocks of the semi-dwarf group should not be less than 20 feet between trees in the tree row. Trees on either I, II or XIII should have not less than 25 feet between trees in the row. Spacing between different tree rows will depend on spray machinery used and cultural practices.

Yield Differences

Total yield, of course, will depend on the bearing surface of each tree. Taking the typical dwarf tree on IX as the example, maximum yields of from 80 to 100 pounds per tree are reached about 8 years from date of planting. Yields have fluctuated little after this except with varieties which are typical biennial bearers. The total average yield per McIntosh tree, as shown in the accompanying table has been greatest on rootstocks I and IV. In each case, trees on these rootstocks of the same age and

TABLE 1—Average Total Yield Per Tree of McIntosh on Malling Rootstocks, 1939-48. (Yield in pounds).

Year Planted	I	IV	V	VII	XII	XIII	XVI
		1551		1144	1137	1083	1231
						603	

*Trees mulched with hay mulch since planting.

grown under the same cultural practices have borne an average of 1551 and 1475 pounds per tree, respectively. Total yield of 12-year old McIntosh trees on stocks I, VII, XII, XIII and XVI have been surprisingly uniform, each stock yielded an average total of over 1000 pounds, but it must be remembered that trees on XII have a larger bearing surface and require more space than trees on VII and V.

Cultural practices have influenced yields. Thus trees planted in sod and grown without mulch have produced less per tree than trees mulched with hay mulch since planting.

Yield differences have varied with varieties and there is an indication that certain variety rootstock combinations are outstanding, such as Cortland and Delicious on II and VII. High yielding stocks for the variety McIntosh are IV, I, II, VII and XVI; whereas, for Cortland XIII may be added to the list. Malling II and VII may be given preference for Red Delicious, whereas Golden Delicious is doing well on II, I, VII and XII. Although IV has given a very good yield record, it is doubtful if this rootstock should be recommended since the root system is brittle and trees in wind-exposed locations, if not supported, are easily blown over.



BREEDING STRAWBERRIES FOR VITAMIN C

By G. M. Darrow, et al, 1947
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There is a wide variation in the Vitamin C content of strawberries. New varieties resulting from a breeding program will likewise show considerable variation and the fruit may contain higher or lower amounts than either

parent. However, there is a tendency for the offspring to contain a high vitamin C content if the parent varieties were high in this substance.

The authors conclude that it is feasible to breed for high ascorbic acid (vitamin C) content of strawberries, and by breeding, to increase greatly the already high value in this fruit.

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