

Rootstocks for Size Control in Apple Trees

Guide H-307

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Modern orchards are being developed with small (dwarf) trees at close spacing. The proper distance for setting the trees varies with the variety selected and the fertility and water-holding capacity of the soil.

A dwarfed tree is produced by grafting or budding a desired variety onto a special type of root system, commonly known as the rootstock, which restricts or dwarfs the growth of the scion variety grafted upon it. Some rootstocks preferred for dwarfing apple varieties were selected at the East Malling Research Station, Kent, England, and are generally termed East Malling (EM). (Often only an “M” is used, and East Malling is usually shortened to Malling.) Other rootstocks resulted from a cooperative breeding program between the John Innis Horticultural Institute, Merton, England, and the Malling Station; they are named Malling Merton (MM).

Four density systems are commonly used—low, 108 trees per acre maximum; medium, 220 trees per acre maximum; high, 600 trees per acre maximum; and ultra-high, more than 600 trees per acre. The producers’ need for knowledge, time, and management skills increases the increase the tree density of their orchards. Also, the more dwarfing rootstock should be grown on the better soils and sites.

Many advantages have been given for close-planted trees. The small size makes them much easier to prune and pick. The use of ladders, at least tall ladders, may be eliminated. Pruning and spraying costs can be lower than those for orchards with fewer trees. Less pruning is needed on close-planted dwarf trees, and they can be pruned from the ground. Less spray material is required, and small spray equipment can be used successfully. Quality of fruit may be better with

the close-planted trees. Annual yields, on a per-acre basis, may be similar after the trees come into full production, because yield is more a function of plant cover than number of plants. Although close—planted orchards cost more to establish, they come into production earlier, so that planting costs are recovered much more rapidly than with traditional plantings. This advantage is maintained throughout the life of the orchard.

Research reports indicate that some of these rootstocks, under certain conditions, are subject to various root rots. Other problems include: nontolerance of various soil types, scion/rootstock incompatibility, poor anchorage from weak root systems, suckering of some rootstocks, and lack of precocity in semivigorous stocks. The MM stocks are said to be resistant to woolly aphids, whereas the EM stocks are not. Since they were selected in a climate far different than ours (less extreme), they should not be expected to perform ideally under our many soil and climate conditions. This is not to say that East Malling stocks are “problem trees” in all areas.

Many of the more important combinations of rootstocks and scion varieties have been evaluated. Winter hardiness and general adaptability have been examined and many of the serious problems have been resolved. No research has been done in New Mexico on the Michigan Clones (MAC). Few growers have planted them in the state. However, some growers have found some incompatibility with MAC rootstock and stark crimson variety (Red Delicious). Even though, installing a trellis system is recommended only for the smallest trees, it has been found that all young apple trees grow better (healthier) when they are staked. Trees are not affected by heavy winds and roots can expand more.

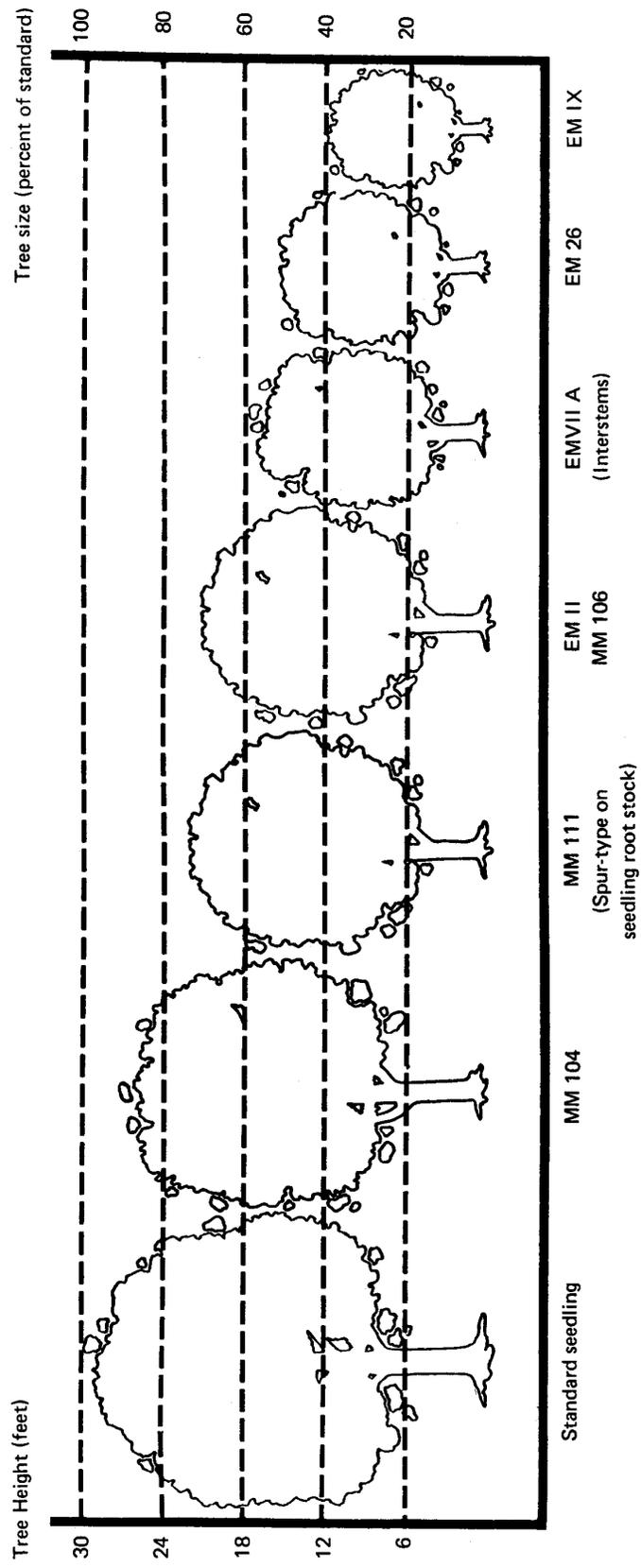


Fig. 1

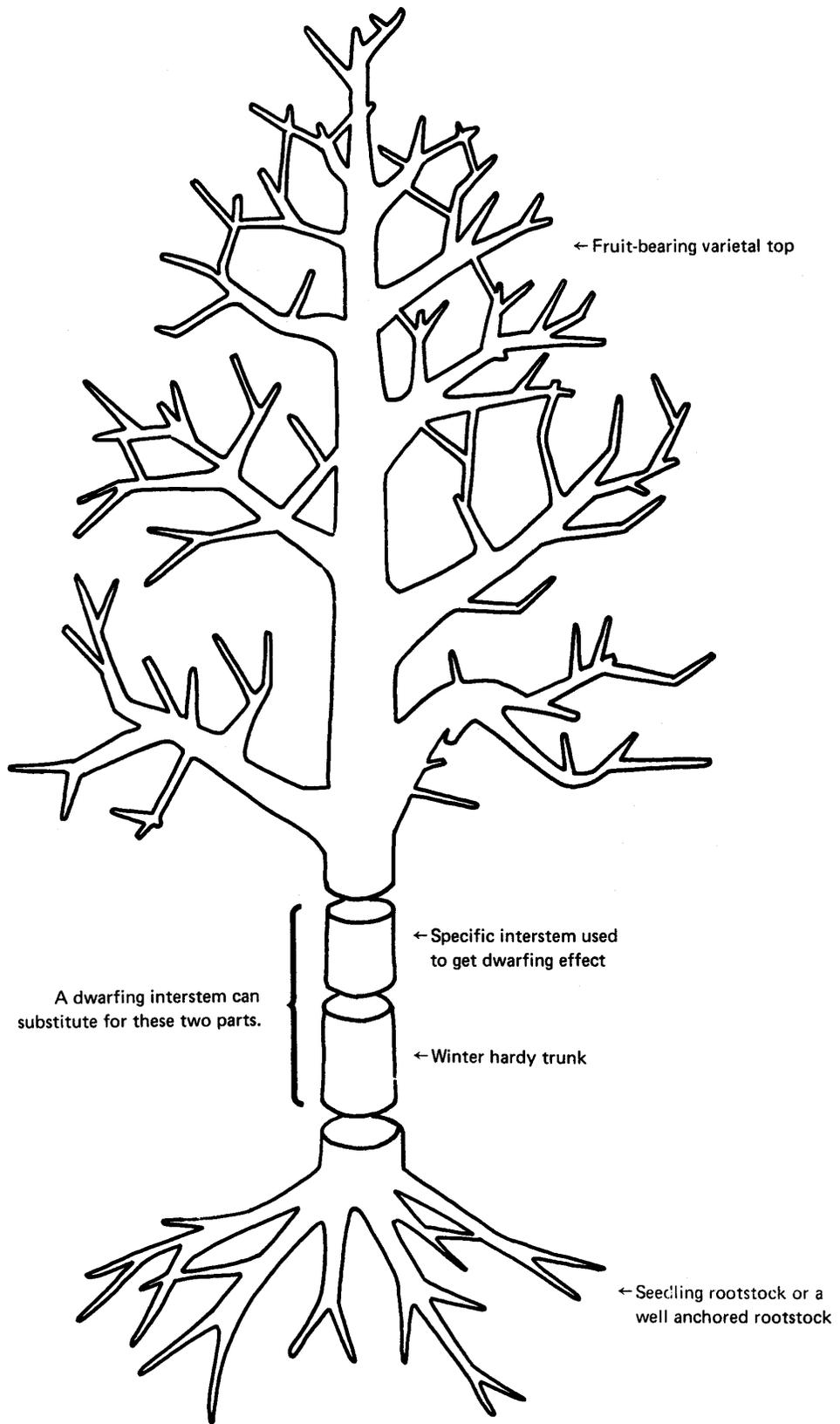


Fig. 2. Interstem dwarf apple tree

The dwarfing effects of the most widely recommended rootstocks are illustrated in (fig.1), and some important characteristics follow.

NOTE: Tree sizes indicated are approximate. Climate and soil environment and cultural practices may alter the size and other characteristics in a given area.

EM IX (40 % of standard size) is the most dwarfing rootstock. The wood is brittle and must be supported by a stake or trellis. It needs deep, well-drained soil. Suckering is reduced by high budding and deep planting. A central leader must be maintained. *EM IX* is very early blooming and slightly hardier than *EM VIIA*.

EM 26 (50% of standard size) should be staked, although it is self-supporting in good soils. It does not do well on slow-draining soils. It is very early and heavy bearing and causes some varieties to mature earlier. It is the most winter hardy, clonal rootstock.

EM VIIA (60% of standard size) is an improved *MVII* rootstock that does well on most soils except heavy clay. It is free-standing, but certain varieties lean. *EM VIIA* is early and heavy-bearing, but not as good as *EM 26*. This rootstock is moderately winter hardy.

MM 106 (70% of standard size) is adapted to lighter soils. Better than *EM VIIA*, it has good anchorage in most soils. It is nonsuckering, early and heavy-bearing and tolerant to high temperatures and drought. However, it is susceptible to collar rot, especially in poorly drained soils, and more susceptible to early winter freeze.

EM II (70 % of standard size) does best in moisture-retaining loam and tends to lean in a heavy clay soil. It has fair resistance to collar rot.

MM 111 (75% of standard size) is drought tolerant, widely adapted to moist soils, well-anchored, classified as medium in bearing age and total yield and moderately winter hardy. Vigorous varieties tend to be upright.

MM 104 (90% of standard size) requires well-drained soil. It has good anchorage and tends to produce a more spreading tree.

MM 106, *MM 111*, *EM II*, and *EM VIIA* are sometimes referred to as semidwarf.

Spur-type trees, interstem grafts and pruning also can be used to control tree size. Spur-type trees usually are 25 percent smaller in height and width and more open than standard trees. A spur-type variety on seedling rootstock makes a tree approximately two-thirds the size of a non-spur variety on seedling rootstock. (Natural differences between varieties also should be taken into account.) Limbs of spur-type trees have more fruiting spurs per foot of bearing wood. Therefore, this wood can be grafted onto dwarfing rootstock or interstem grafts to give still more dwarfing effect.

Interstem apple trees can be 50 to 60 percent of the size of the standard tree. They have seedling rootstock onto which is grafted a compatible scion that will give a winter hardy trunk and have some influence on size control. A dwarfing interstem is grafted above the winter hardy trunk, then the desired variety is grafted on top. In addition to being very winter hardy, interstem trees usually are virus-free. They should be planted in good orchard soil and managed well.

Constructing of an interstem tree may require three grafts incorporating four distinct tree parts (fig. 2). A three-piece interstem also is available-*MM 111* rootstock with an interstem clone, such as *EM IX*.