PROPAGATION OF CHERRY ROOTSTOCKS

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Recent studies at Oregon State University show that rootstocks for cherries can be materially improved and refinements in tree adaptation gained by selecting superior genotypes of *Pruns avium, P. mahaleb,* or their hybrids, for propagating as seed lines or clones (1, 2). This approach to standardization of the nursery tree and further improvement in orchard tree performance is supported by research results (3, 4, 5), showing that differences in tree size and vigor, fruit production and soil adaptability can be achieved by such selection.

Seedlings of Mazzard and Mahaleb are still the principal rootstocks used for sweet and sour cherry varieties, respectively. Since both species require cross-pollination for production of fertile seed, their seedling progeny are quite heterogeneous. The extent of this variability is dependent on the genetic make-up of the two parents and the degree of isolation provided the seed orchard. Led by plant pathologists seeking virus-free rootstock materials, nurserymen have made great strides the past ten years establishing seed orchards for the production of virus-free, uniform seed lines. This seed is far superior to the old mixtures of pre-World War II days. Wholesale seedling producers in the Pacific Northwest are using such seed lines of Mazzard and Mahaleb almost exclusively.

If some of the specifically desired rootstock effects (tree size control, tree structure, early fruit bearing, soil adaptation, winter hardiness, and disease resistance) imparted by specific seedling selections are to be perpetuated without change and the nursery tree thus standardized, we must resort to clonal propagation. The propagation of clonal rootstocks of apple and plum trees has become well-established in recent years. Pear and walnut trees are also being extensively propagated in some areas on vegetatively-propagated rootstock materials. The use of named, clonal rootstocks is almost universal in England and Europe for not only fruit tree nursery stock but for many ornamentals. It is small wonder, therefore, that there is a growing interest in using named understocks for cherries and in methods for vegetatively propagating them. The use of root suckers of Stockton Morello cherry as a semi-dwarfing stocks for cherries on certain heavy, wet soils in California was probably the first instance of vegetative propagation of a cherry rootstock in this country.

There are various means to clonally propagate cherry rootstocks, some being more successful than others, depending on the species and variety in question. Layerage (mound, continuous and air), cuttage (root, hardwood or softwood stem), and nurseroot grafting of rootstock materials has been previously described (6). Systematic research and the experience of nurserymen have set forth the most successful techniques for propagating the clones deemed to have desirable characteristics.

Mahaleb Clones and *Hybrids*—(P.I. 163091, 193701, 194098 and certain Mazzard x Mahaleb hybrids now under test)

These Mahaleb clones have proved superior for Montmorency sour cherry in our tests at Oregon State University (2), and are worthy of trial. Tables 1 and 2 show the effects of these various stocks on tree size and early fruit production. California workers are interested in select Mahalebs for high-working to sweet cherry.

Propagation of Mahaleb by layerage or by hardwood cuttings has been almost a complete failure. The use of root cuttings has only limited possibilities. Research (7, 8, 9, 10) shows that softwood cuttings provide the most economically feasible means of increasing Mahaleb cherry and its hybrids on a large scale. Rooting such cuttings under mist is no longer difficult, but handling large numbers of such cuttings and achieving high transplant survival is a problem that must be solved before this procedure can be considered economically practical for nurserymen.

Table 1 Tree size and yield of Montmorency sour cherry on selected clones of *P mahaleb* rootstock and a clone of *P avium* or Mazzard cherry Lewis-Brown Horticultural Farm, Corvallis, Oregon, 1958-62

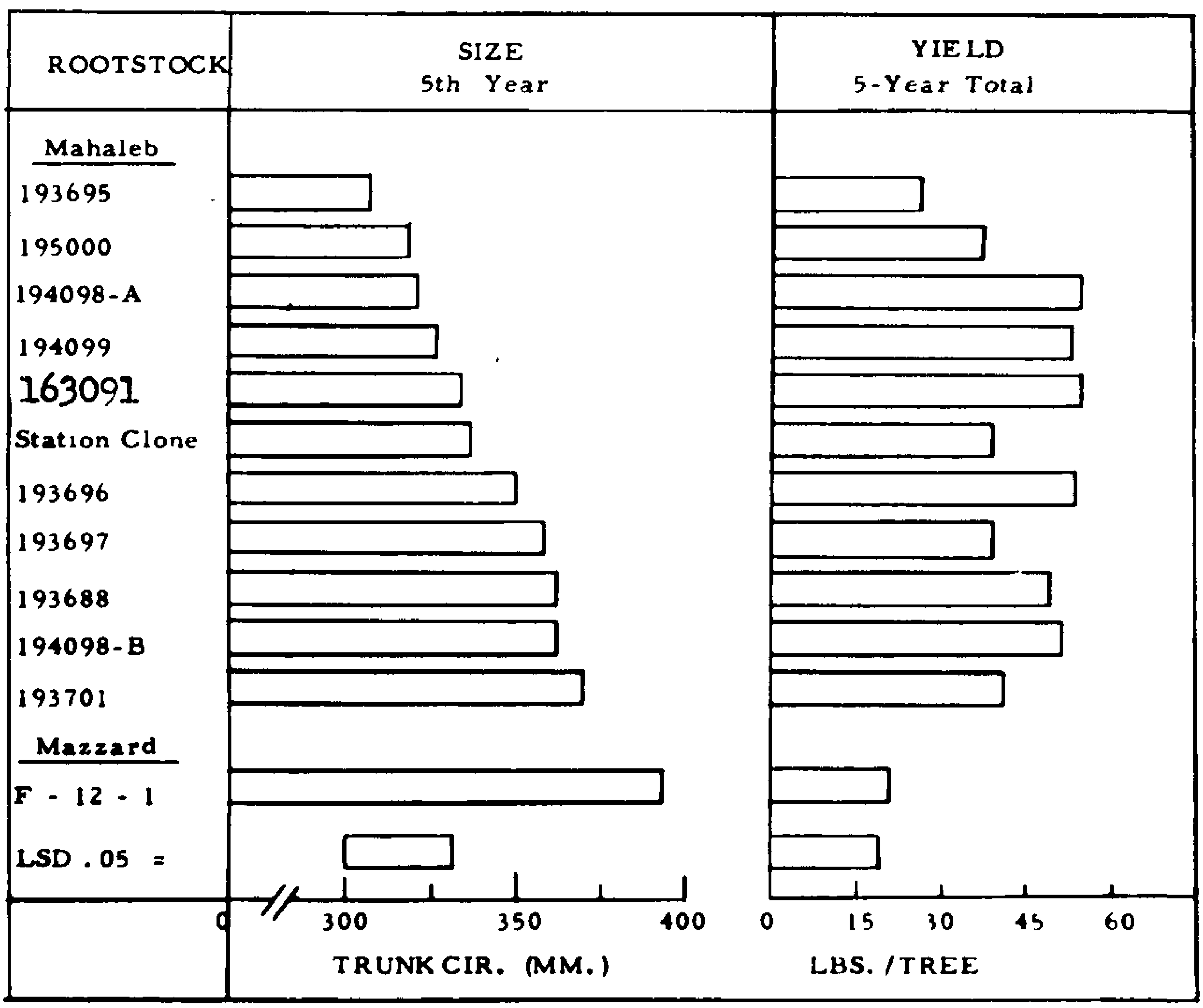
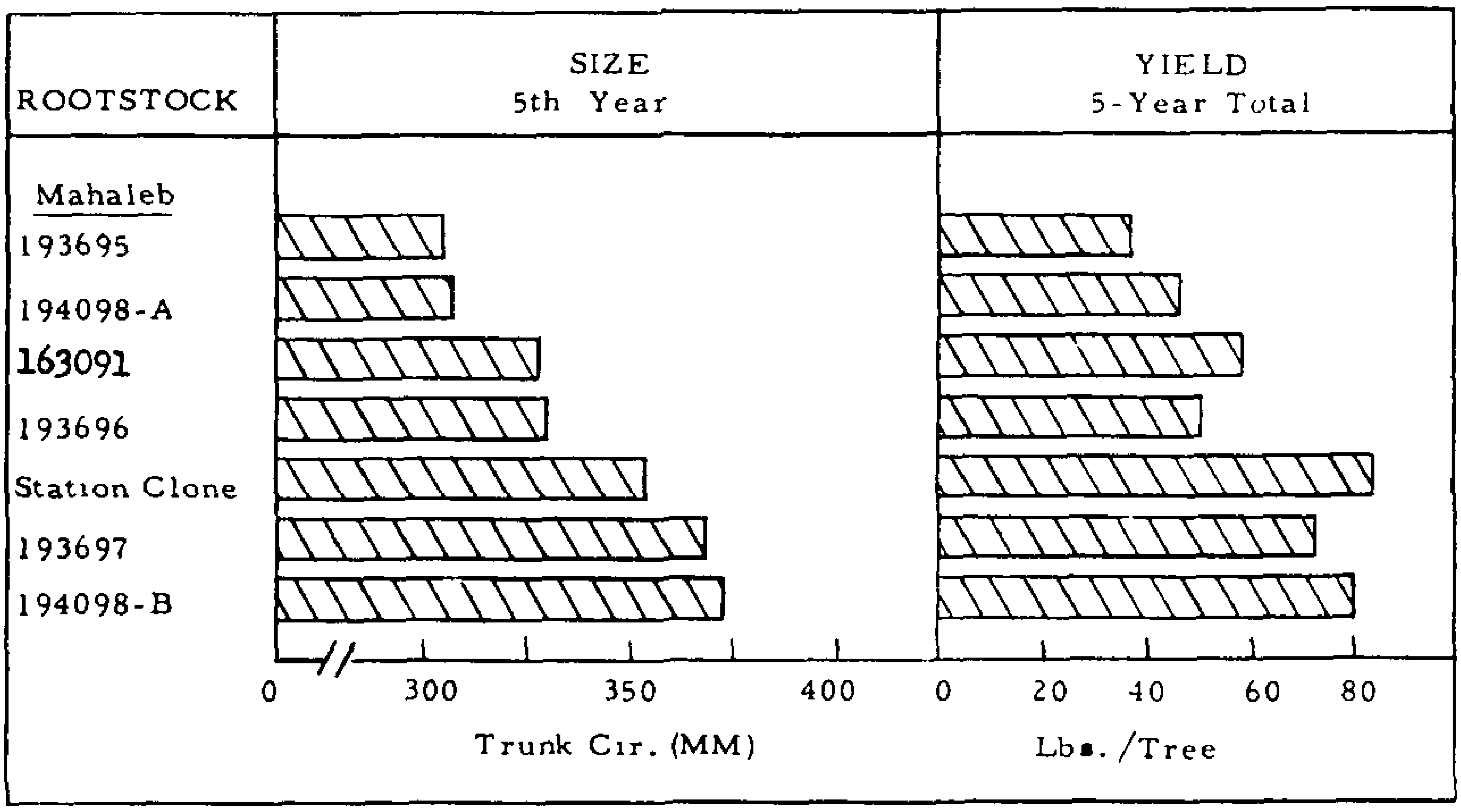


Table 2 Tree size and yield of Montmorency sour cherry on selected clones of *P mahaleb* rootstock Page Walton Orchard, Junction City, Oregon, 1958-62.



Sweet (7) rooted certain clones of Mahaleb in 15 days, 98 per cent rooting within 25 days. Graham (8), who has made the most exhaustive study of rooting Mahaleb, showed that terminal cuttings of current season's growth were most apt to root. He found 70 per cent of such cuttings rooted if they had an apical bud and were treated with Hormodin No. 2 powder. Cuttings without an apical bud did not root when treated with Hormodin No. 2 powder alone. However, 80 per cent of such cuttings rooted when treated with indolebutyric acid and adenine, with more and longer roots than those having an apical bud. Adenine, plus Hormodin No. 2 powder, was significantly better for succulent cuttings than was Hormodin No. 2 powder alone. As the tissue of cutting became more woody, the growth regulator alone increased rooting until no difference was apparent between cuttings treated with the growth regulator and cuttings treated with the growth regulator plus adenine. Hartmann (9) rooted leafy softwood cuttings of Mahaleb under mist in relatively high percentages (70-100) when terminal cuttings were taken in late spring and early summer from shoots in active growth and treated with indolebutyric acid (2000 ppm, concentrated-solution-dip treatment).

Mazzard Clones — (British F-12-1, German Huttnerschen and others under test)

British (11) and German (5) workers have selected several superior Mazzard types for rootstock purposes. Such uniform material is particularly desirable when top-working sweet cherry to gain gummosis-resistant trunks. Seedling variability is most pronounced when trunk and scaffolds, as well as the root, are seedling tissue in the "built-up" tree.

Mazzard clones have been propagated most readily by continuous layering. The vigorous Mazzard selection, F-12-1, from the East Malling Research Station in England is being propagated commercially by Oregon nurserymen using layers, and to a lesser extent, root cuttings. The superior vigor of this stock over that of common Mazzard seedlings is illustrated in Table 3. Cherry layering beds must be carefully tended. New shoots arising from the stools must be kept mounded as they elongate to sufficiently etiolate their bases for satisfactory rooting. The underground portion of the layering bed should be renewed frequently by laying down new shoots that have been left at time of harvesting the rooted layers.

Hardwood cuttings of Mazzard cherry are very difficult to root, and softwood cuttings are only slightly better. Hartmann (9) in comparing the rooting of Mazzard with that of Stockton Morello and Mahaleb found that cuttings of sweet cherry rooted with much more difficulty. However, Graham (8) found that *Prunus avium* (Mazzard) could be induced to root satisfactorily (70 per cent) if retreated with Hormodin No. 2 powder three weeks after initial treatment with the same material. All unrooted cuttings again retreated after the fifth week rooted by the end of the eighth week.

It appears that with proper management both Mazzard and Mahaleb can be successfully rooted from softwood cuttings and on a commercial scale. At the present time this cannot be said of hardwood cuttings.

Table 3 Comparison of tree size of sweet cherries* growing on common seedlings and a selected clone of Mazzard, Page Walton Orchard, Junction City (trunk circumference)

BLOCK	F-12-1 MAZZARD (MM)	MAZZARD SEEDLING (MM)
A	364	422
B	472	376
C	466	372
D	447	390
E	441	376
F	494	463
G	413	376
H	449	436
I	373	356
J	436	397
K	381	307
L	388	338
M	363	270
Average	422	275
Total Number Trees	40	39

* Composite of data for both Royal Ann and Black Republican trees

Morello Clones — (Principally Stockton Morello for dwarfing)

Now that virus-free sources of Stockton Morello cherry are available, there is considerable interest in propagating these as semi-dwarfing rootstocks for sweet cherry varieties in certain districts. The practice of taking root suckers from existing orchards is no longer considered advisable in light of the virus complication. California workers have demonstrated the feasibility of propagating this stock on a large scale from softwood cuttings. Hartmann and Brooks (9) rooted leafy softwood cuttings of Stockton Morello cherry in relatively high percentages (77-85) under mist sprays when terminal cuttings were taken in late spring and early summer from shoots in active growth and treated with indolebutyric acid (2000 ppm, concentrated-solution-dip treatment). Greenhouse mist beds gave satisfactory results early in the season (May), but out-of-door beds gave better rooting later in the season (June).

The specific benefits to be derived from vegetatively propagating certain select rootstocks of cherry justify the development of commercial procedures. Research has shown how they can be rooted in quantity. Both research and industry must solve the problem of large scale handling of such materials to assure greater survival of the rooted cuttings than has here-to-fore been demonstrated.

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