The Nursery Performance of Apomictic Crabapple Seedlings

by

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Recent work by Dr. Karl Sax at the Arnold Arboretum near Boston has shown that some of the Asiatic species of apples are apomictic, that is, they produce seeds without sexual union, and the seedlings will therefore be exactly like their parents. Further work has shown that some of these seedling may be suitable for use as rootstocks; and McIntosh scions worked on several of them produced trees which would be commercially acceptable as dwarfs or trees of less than normal size. A few of the tested species were not satisfactory as rootstocks.

An experiment was begun in 1950 at the Pennsylvania State College to determine on a larger scale the suitability of the more promising apomictic species as rootstocks for commercial apple varieties. The seedlings are being grown and tested in comparison with seedlings of named varieties that are often used as parents of nursery stocks. The species and varieties being used in this study are shown in Table 1.

In this group, *Malus platycarpa* is an American species which develops apomictic seeds. Seedlings of Malling XV were used because they have already been tried in the nursery here and have given good stands of scab-resistant trees. Named varieties worked on them have grown well as nursery trees.

Exactly 400 seeds of each species and variety in the test were counted out and planted in flats in a mixture of two-thirds garden soil and one-third sand; 200 seeds in each flat were spaced one inch apart. The seeds were planted in late November and were placed in cold storage at a temperature of about 30° F., so that the ground became frozen. They were taken out of storage in mid-February and placed in the greenhouse to germinate. It is probable that some seeds had not yet passed out of the rest period, particularly those of *Malus hupehensis* and *Malus platycarpa*. Germination of seeds of these two species was exceptionally slow and irregular. One of the two flats of *Malus platycarpa* contained seeds from a different source than the other, and the seeds in one failed to germinate at all. Some deaths occurred among the seedlings in all flats, principally from the damping-off fungus; the over-all mortality was about 20%.

In late May the young seedlings were transferred from the flats to the nursery. Growth during the first year was slow,

Table 1. Performance of First Year Seedlings of Apomictic Apple Species and Commercial Varieties in the Nursery

Species or variety	No. planted in 1950	No. alive, end of 1951	No. of grafting size, end of 1951
Malus sargenti	191	124	0
Malus sikkimensis	133	110	98
A. A. No. 33,340	92	57	36
Malus toringoides	91	57	32
Malus sieboldi	82	50	37
Malus platycarpa	58	40	30
Malus hupehensis	37	24	23
McIntosh seedlings	235	145	94
Malling XV	153	119	97
Jonathan seedlings	118	88	68
Delicious seedlings	118	76	58

but by the second year the seedlings had become well established and were growing well. At that time it was decided to graft the usable trees the next spring, and counts were made of the number of trees still alive and of the number usable.

Of the apomictic species, *Malus sargenti* produced the most plants, but they were still too small at the end of two years to be grafted. *Malus sikkimensis* came second in number of plants, and first in number ready for grafting. It is the most promising of all the apomictic species tested. The rather striking point about the other apomictic species is that they produced so few seedlings from the number of seeds planted, and that such a small percentage of the seedlings made good trees afterward.

Of the seedlings of commercial varieties, McIntosh produced by far the most trees, but a comparatively small percentage of them survived or made good trees in the nursery. Seedlings of Malling XV came second, followed by Jonathan and Delicious seedlings, which were about equal in performance.

At the beginning of the third growing season most of the usable trees were grafted to one of three named commercial varieties: Stayman C. and O. sport 201, Rome sport 262, and Yorking. It was originally planned to plant groups of fifteen trees of each stock with each scion variety; but some of the stocks produced so few good individuals that, except for *Malus sikkimensis*, only one or two of these three scion varieties were grafted on each stock.

The percentages of successful grafts of each variety on each stock are shown in Table 2.

Most of the graft failures were with the Stayman sport, but we think that the condition of the stocks at the time of grafting may have been responsible.

The growth during the summer of 1952 of the trees on seedlings of commercial varieties has been normal. The trees of all three varieties on *Malus sikkimensis* have grown well, and those of the Stayman sport on *Malus platycarpa* have also grown vigorously. On the other hand, while grafts on *Malus hupehensis* and Arnold Arboretum No. 33,340 were successful, subsequent growth has been poor; the trees are small and spindly, with yellowish leaves; some are practically defoliated. The trees on *Malus toringoides* and *Malus sieboldi* have shown a certain amount of incompatibility, a few trees on each being weak. Some trees on *Malus sieboldi* started well, but now show small leaves and early defoliation.

Table 2. Percentage of Successful Grafts of Sports of Stayman, Rome Beauty, and York Imperial, Worked Upon Seedlings of Apomictic Crabapples and Commercial Apple Varieties

Species or variety of stock	Percentage of successful grafts		
	Stayman sport	Rome sport	York sport
Malus sikkimensis	92	93	94
A. A. No. 33,340	—	100	
Malus toringoides	—	80	—
Malus sieboldi	62	—	—
Malus platycarpa	63	—	—
Malus hupehensis	—	—	100
McIntosh	67	—	90
Malling XV	—		97
Jonathan	—	97	100
Delicious	88	89	—