STOCK — SCION RELATIONSHIPS*

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General interest among fruit growers in the whole field of stock - scion effects is very high. Cognizant of this interest the Dwarf Fruit Tree Association of America sponsored two group tours of the European fruit growing industry this summer. I had the good fortune to be a member of one of these groups and visited both research institutions and private growers in some of Europes most concentrated fruit areas. A very great deal has already been written about clonal rootstocks and different scion varieties and their relation to one another. I will therefore attempt to limit my comments to some of the stock - scion effects we encountered, that, though certainly not new, are receiving considerable attention at the present time in Europe.

Our group was mainly concerned with apples and consequently most of my observations will be on apples. This is not unfortunate because no other plant has undergone so much intensive study or been developed to such a high degree of refinement in its use of stock - scion combinations. No doubt much of what has been found to be true for apples will also prove true in other woody plants.

Almost throughout western Europe growers are either already using clonal rootstocks for apples or are in the process of changing to them. It seems that all countries have recognized the advantages of these stocks.

My comments here will be brief because interaction effects on tree size, early cropping, yields, etc. will vary from area to area and only experience in the area can provide definite answers. In general three reasons appeared primary in the shift to clonal rootstocks:

(1) The desire for early fruiting in the orchard
(2) The possibility of heavy yields annually, starting only a few years after planting, and
(3) The need for small controlable trees.

A fourth factor must be considered along with these as it is closely related to all three and that is uniformity, without which, of course none of the advantages could be realized. We learned that it was recognition of the lack of uniformity among trees on seedling roots that prompted Wellington and Hatton, the first and second directors of the East Malling Research Station to investigate rootstocks. Their primary concern was to obtain uniform material with which to conduct research on other cultural problems. As you know their work and that of men who followed them at East Malling have made that station the main centre of research and information in this field; research which has provided the foundation on which this revoluntionary development in the fruit industry has been built.

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But this development has brought many problems and accentuated others. Prominent among these and no doubt related to several others is the problem of viruses present in the stock variety, the scion variety, or both. Only a few of the viruses that infect these tree fruits produce obvious symptoms. Many of them are virtually symptomless excepting on a few varieties or certain unrelated indicator plants. For example, Cropley (1) states that many of the rootstock varieties including some of the clones of M II, M III, M IV, M VII, M IX, MM 106, and MM 109 carry the chlorotic leaf spot virus which can be transmitted to an apple chlorotic leaf spot indicator clone R 12740-7A. These rootstocks do not express the symptoms of chlorotic leaf spot. Many of the apple rootstocks and most commercial apple varieties also contain viruses which cause stem pitting in Virginia crab and decline in another indicator called Spy 227. According to Posnette and Cropley (3) he virus "star crack" may render Cox's Orange almost entirely nonproductive yet have virtually no effect on Sunset or Lord Lambourne.

It is known to affect Golden Delicious as well. Rubbery wood virus may seriously affect the vigor of Lord Lambourne and yet have little effect on Sunset or Cox's Orange. If "mosaic" virus and "rubbery wood" are present at the same time the effects on Cox's Orange were severe. The significance of these findings point up the importance not only of the effect that viruses present in the rootstock may have on the scion variety but, conversely, also the effect that viruses in the scion may have on the rootstock. The virus problem, complicated by the many rootstocks each a possible carrier of several and different viruses and many scion varieties also carriers of viruses, is one of great complexity. No doubt many of the conditions that at one time were considered incompatibilities are the result of virus infections. Well known is the fact that many of our apple varieties are entirely infected with the stem-pitting virus. Though symptomless in these varieties it causes stem pitting on Virginia crab and stunting of trees where Virginia crab is used as an interstock.

Mr. A. P. Preston, in charge of rootstock studies at East Malling commented that because of the virus situation much of the work relating to stock and scion will be repeated to determine whether viruses may have been responsible for the results.

In England they have organized a "Mother Tree Scheme" at the East Malling Station to provide the cleanest possible propagation material to nurserymen (2). Most of the apple rootstocks have been virus tested on indicator plants and oniy the cleanest ones are being used. Of these M. VIIa has come into our trade here. These are free of some viruses including mosaic, rubbery wood and chat fruit but most contain chlorotic leaf spot and stem-pitting viruses.

The English are using heat treatment to free tree fruit clones of viruses. Small active plants are exposed to 98° F. for 3 weeks. The small shoot tip is then grafted to a clean seedling

tree and tested for virus. Clean shoots are then propagated for use.

France has also implemented a certification and indexing program to provide reliable propagation materials to nurserymen and growers.

Concerning incompatibilities other then those due to viruses, Dr. Jaques Huet of the Fruits Research Station at Angers, France made an interesting observation. Such incompatibilities are found to be accentuated by warm climatic conditions. For example, peach on Myrobalan plum is very poor in southern France (where peaches are important) but fairly good in the north where it is cooler. In south east England if an interstock such as Brompton is used the tree is quite satisfactory. This is not so in southern France. It seems to me that even these relationships could be virus effects.

Another significant relationship pertains to the juvenility of tree fruit seedlings. Long periods of vegetable growth before flowering plague the fruit breeder. At East Malling this long juvenile period is greatly shortened by grafting wood of the young seedling to an extremely precocious clonal rootstock designated 3431. Young trees planted in 1962 are all fruiting in 1964. If left to grow as seedlings on their own roots many would require 10 to 12 years to fruit. The advantages of this to the breeder are obviously quite remarkable.

In conclusion I will refer briefly to some of the principle rootstocks in use in the countries we visited. In France nearly all new apple plantings are on M IX with a few on M II. Most apples are grown in closely planted hedge rows and trees on M IX were amazingly vigorous. In the famous Po Valley fruit area of Italy most apples are on seedling roots but many new plantings are on M IX. Harvesting the tall trees growing on the rich soils of this valley is beginning to be a problem.

In Holland nearly all new plantings were on M IX or M II; also in hedge rows but pruned to the spindle bush type and not as narrow as the hedges in France. In England M II is most popular. It has better anchorage and less tendency to sucker than M VII. Malling IX is too low in vigor and requires too much coddling. The new M. 26 is very popular and being used a great deal in new plantings. It does not sucker and is intermediate in size between M. IX and VII. It can be propagated economically by hard wood stem cuttings. The English system of culture is mainly of small trees pruned much like a modified leader. They recommend staking while trees are young. Sweden uses mostly their own rootstock, Alnarp II. Though not dwarfing this rootstock produces precocious trees and is easy to control by pruning under Swedish conditions.

The foregoing brief review is sufficient to point up the fact that each country and area has its own peculiar conditions that will dictate the selection of rootstck - scion combinations. Testing carried out in one area can provide leads but cannot provide

reliable answers. Reliable answers can come only after very extensive trials over a fairly long period of time.

LITERATURE CITED

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2. Posnette, A. F. The mother tree scheme. Ann. Rep. of the East Malling Res. Sta for 1961. pp. 125-127. 1962.
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MODERATOR DUGAN: Our final speaker this afternoon is Mr. Robert DeWilde who will talk about production and breeding of lilacs.

PRODUCTION AND BREEDING OF LILACS

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INTRODUCTION

The common lilac *Syringa vulgaris* has been grown in gardens of the world for centuries. The first botanical description was written by a French naturalist in the year 1554. During the seventeenth century, English gardens were enriched with this shrub from seed collected in the lilac's native habitat of Rumania, Bulgaria, and Greece. The lilac was one of the first ornamentals brought to America by the early settlers. The beauty of lilacs has been expressed in poems and songs and is strongly associated with home, family, and memories of spring. There is little doubt that nurserymen can find the production of lilacs and the introduction of superior varieties quite rewarding.

PRODUCTION

Lilacs may be propagated in any of five general methods: seed, cuttings, layers, budding, and grafting. When considering the method of production for lilacs or any plant, the commercial objective is to produce the largest percentage of quality salable plants, true to name, in the shortest period of time. One important prerequisite for quality lilacs is that the salable plants be actively supported by their own root system.

Beginning then with seeds, the varieties of *S. vulgaris* will not reproduce the seed parent true to name since they hybridize rather freely. Only the true species grown in isolation can be relied upon to reproduce the parent plant.

Layering of stock plants can be done in late autumn. The time required to root the layered branch is approximately eighteen months. Two additional years are generally required for development of the severed layer into a saleable plant. The tremendous number of stock plants necessary for even a small com-