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## COMMERCIAL PROPAGATION OF FRUIT TREE ROOTSTOCKS

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This discussion considers the production of fruit tree rootstocks, the techniques that are now commercially in use, the reasons for choosing these techniques of production and applying them to individual subjects based on production costs, suitability for site, and the management of our particular nursery.

### HISTORY

It has only been in the last ten years that our nursery has started to produce rootstocks. Before this we relied upon imports from the Continent, mainly because they had the ability to produce them fairly cheaply with very suitable soil for stoolbeds or layer production.

With the introduction of the EMLA Virus Free scheme from E. Malling and Long Ashton we had a health status that had never been achieved before for any plant. Realizing the value of such a status we decided to go into production ourselves, firstly to supply our own needs, which was achieved about three years ago, and since then to supply our own trade, and very recently prospects of actually exporting which must be the ultimate reward for a very successful research objective.

## PROPAGATION TECHNIQUES

- 1) In vitro micropropagation
- 2) Hardwood cuttings
- 3) Stoolbeds

**In Vitro Micropropagation.** This is the most recent of propagation developments and a very exciting one for our trade as a whole. Although a laboratory technique demanding high capital expenditure input and a great deal of skill, care and attention, this must be the future production technique for all plants. As it develops it will no doubt cater for a wider range of plants.

The most useful application at the moment is the bulking up of new plant cultivars where the unit value is obviously high enough to justify the production cost which is an average of 40p per plant at the moment. The market value of fruit rootstocks is between 18 and 25p depending on the quantity and cultivar. Therefore, commercially for rootstocks anyway this is not the most economical method. Also the plants still have to be weaned off into a compost/loam medium under controlled conditions before being introduced to field conditions, possibly requiring a further year before being lined out for budding.

**Hardwood Cuttings.** Hardwood cuttings have proved very successful with fruit rootstocks but this is only applied to plum rootstocks because they produce few or no roots by the stoolbed or layer method. Apples, although successful by hardwood cuttings, are preferably propagated on the stoolbed, as the production costs are much lower due to mechanization, and there is the advantage that a good proportion of stoolbed rootstocks can be lined out for budding the following spring since they have a more fibrous and hardier root system; hardwood cuttings would need an additional transplanted year to achieve this. There are two hardwood cutting methods open to us for plum rootstock production, depending on the conditions available to the nurseryman.

- 1) *Autumn Insertion.*

Cuttings are taken from hedges, prepared and treated with hormone dip in the recommended way and then inserted into the ground in late October, where they manage to form root initials before the winter sets in. This is obviously the most economical way of growing plums but there are few problems involved with this method.

Firstly, defoliation of the hedge plants has to be achieved artificially as we see little natural defoliation in the West Country before the middle of December and we have had little success with chemicals, leaving us, therefore, to do this tiresome



task by hand. Also, depending on one's soil conditions, this time of year can produce very unsuitable soil for planting; and unless very light sandy soil can be found, conditions can often be against us. Very cold winters with frost lifting the cuttings in the ground and general exposure can also result in losses. It was for these reasons and the rather heavy demand of labour for other operations at this time of year, that we chose the second alternative method.

## 2) *Spring Production Through Heated Bins in Coldstore.*

This system is far more acceptable to a wider range of subjects because we have total control of the environment in which the bins are situated, and also the ability to give different cultivars variable hormone and temperature treatments to achieve the correct amount of rooting. Although 'St. Julien A' plum rootstock is the main subject for this system we very often use the bins for experimenting with other fruit cultivars. The direct cooled coldstore is maintained at 2°C (36°F) throughout the time of rooting.

In the past, spring production of hardwood cuttings with this method without the use of a coldstore produced problems in a warm early spring where the cuttings would start to grow in the bins before rooting was complete, and also the general loss of carbohydrates in a mild environment would cause large losses after planting out. With a coldstore we are, therefore, able to extend the natural dormancy of the cuttings in a very humid atmosphere, lessening the chance of loss of natural food supplies. Invariably one finds that planting conditions are unsuitable and, therefore, the cuttings can remain in coldstore exactly where they are with bottom heat reduced until such time that the soil is in good condition for planting. They can then be planted into the field in warm conditions facilitating immediate growth to lessen the chance of losses through inactivity; 4 to 5 weeks at a bottom temperature of 18°C (64°F) in a 50/50 sand/peat medium is usually adequate for plums. If we have other cuttings which require more or less time, then they are inserted into the bins at different times to coincide at a common planting time for ease of management.

It is important that following planting, irrigation is available and also a sheltered site be chosen, and I would even recommend the use of some sort of temporary shelter belt to be erected if the site is at all marginal. The time between extraction from the bins and planting must be as short as possible to avoid any unnecessary dessication of the cuttings.

**Stoolbed Production.** Stoolbed production is used for a range of apple and pear rootstocks and it is the most economical system for us. We have in the last five years been able to

mechanize all the operations and because the root system having been produced in soil is immediately suitable for lining out for budding, whereas the cultured roots from hardwood cuttings requires an extra year in the field before being lined out.

A fine workable soil is required to allow the efficient use of the special earthing equipment. A first grade rootstock of 8 to 10 mm should be planted for the stool establishment but any larger is liable to die after cutting down to ground level in the first year. Annual applications of well-rotted turkey manure at 20 tons/acre we find does aid rooting and helps to maintain a workable soil structure.

For the first two years the stools are harvested with hand pneumatic secateurs and in the third season we introduce an offset tractor-mounted sawblade, as the stool is strong enough to resist the pressure of this machine. It can harvest 1½ hectares a day which, depending on the rootstock, would be between 60 and 80,000 stocks off a mature stoolbed.

The life expectancy of a stoolbed varies according to the type and is between 12 and 18 years. After this time it produces an ever-reducing quantity and would be uneconomical to keep in production. It is most important to cut as hard as possible into the stoolbed each year, which will maintain its vigor and the grade of rootstock. We generally find, with 'M.M. 106' as an example, that we have a grade-out of 30% each of 5 to 6mm, 7 to 8mm, 9 to 10mm, with 10% spoilage.

Earthing of the stoolbed is mechanical; we have designed our own machinery for this purpose. Herbicides and chemicals for the control of pests and diseases are applied with a tractor-mounted boom sprayer.

Harvesting is generally carried out in December when most leaves have dropped. It is very important to remember that most roots are produced during October and early November so harvesting earlier cannot be recommended.

## **LEYLAND CYPRESS — ROOTING AND EARLY GROWTH OF SELECTED CLONES**

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**Abstract.** Data are presented for rooting, plant growth rates in containers, and field establishment for Leyland cypress trees of 8 different origins.

Cuttings taken in February gave best rooting in all cases and those from lateral branches rooted better than those from shoot tips. Growth rates were