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GRAFTING NUT TREES IN A COLD CLIMATE

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Until five years ago, grafted walnut trees could not be bought in New Zealand No nurseryman could offer them, yet in California alone, there are 200,000 acres of grafted walnuts in orchards, and we were told again and again that they were all grafted outside and there was no special trick about achieving good results.

The breakthrough came when we realised that the limiting factor was our low average temperature, thanks to our equitable maritime climate. Walnuts need a temperature of around 80°F for a period of three weeks to make a strong graft union and as you know, we seldom have a spell of weather as hot as this — thank heavens! California has a Mediterranean climate with moderate winters and very hot summers in the interior valleys, as does southern France where walnuts are grafted in the field as a matter of course. However, walnuts have the ability to callus in winter even though dormant and our grafting methods are based on this.

We like to use two-year-old black walnut (*Juglans nigra*) as the rootstock, it will grow a metre a year in the garden, but we need to do work on choosing more suitable rootstocks. *Juglans hindsii* is a possibility, as is the Manregian strain of the common English walnut (*Juglans regia*). The latter is used but little in the States. I have some seedling trees out on the farm, but it will be some years before they start bearing.

We have had many problems getting good scion wood. New Zealand has a large disease-free seedling resource of walnuts and we spent some years tracking down the best trees. They were generally oldish with consequent short annual shoots growth, difficult to graft. Whenever possible, we persuaded the tree's owners to cut a limb to force vigorous new growth for the next year.

We are now at the stage of being able to take good vigorous wood off trees we grafted some years ago, which makes grafting easier if less exciting. This scionwood must be taken when the wood is dormant, but is can be stored for several months in a refrigerator at around 35°F. The ends of the sticks should be waxed to preserve their moisture and they should be wrapped in damp newspaper and then stored in a plastic bag. For safety's sake the damping should be done with a weak solution of fungicide.

I generally start my grafting in late winter (August) but other, more skillful propagators, start anytime after the leaves have fallen off. (Maybe they are just lucky.) I dig out my stock and bring them into the workshop, generally on a Saturday afternoon when the farm work is up-to-date.

If you have good quality scionwood, the type of graft you use doesn't seem to matter. An ordinary whip or tongue graft works well The trouble with walnut scion wood is that it is often very pithy, particularly if the wood is from an old tree. I have generally used the special graft developed at East Malling, England, for pithy wood. It is a double graft, giving a lot of cut surfaces and it fits tightly together even before being bound with budding tape. Personally, I think it is worth the extra time involved.

It is most important to use lots of fungicide. I dip the scion in a fungicide solution and dip the top end of the stock as well. If this is neglected, the grafted trees will soon be covered with mould in the hot box.

Once grafted, the trees are packed into a container of some description. I use old worm drench containers, but anything will do; then the roots are covered with sphagnum moss, sawdust, or pumice. This material is to keep the roots damp and a solution of fungicide is best to use. The correct degree of dampness is when all the water has been squeeze out by hand.

The whole container is then covered with a plastic bag which is tied onto the container. The result is that you get a microclimate which seems to be just right for the graft union.

Then the containers go into the hot box. This can be any shape or size. Its function is to provide a temperature inside itself of around 80°F. I use an enclosed bar heater attached to one end of the box. It should not be on the bottom as this will stimulate the roots into growth. I think it is important to have a small fan operating in the box to even out the temperature everywhere in the box. Without it, you will get quite a range of differing temperatures in various parts of the box. That's all there is to it. Just wait for three weeks and keep your fingers crossed. You should get better than 75% success.

When you take the trees out, they should be kept in a shaded area for at least a week till the leave green up. Leaving them in the sun will kill them. Some of the trees will not break dormancy and these I place out in the garden for a year. The others are potted up and planted in their final position as soon as the danger of late frosts is over. The sooner they are in the field the better.

The hot box method works but so did Stephenson's Rocket, and already we see members of the New Zealand Tree Crops Association improving on the method. Basically they are heeling the grafted trees into sawdust and then running a heating cable on either side of the actual graft, with all that area being well covered with straw for insulation This means that the main part of the tree will not be heated and consequently will not break out of dormancy till the season beckons. By next year we should have this system streamlined.

Grafts of hazel nuts (filberts), (*Corylus avellana*) need a temperature of around 70°F for good callusing and all my remarks about walnuts are relevant. I have grafted them outside but it is not very successful.

Chestnuts (*Castanea sativa*) can be grafted outside more easily than either walnuts or hazels They graft well in the hot box, requiring only a couple of weeks inside I favour tip grafting and have had good success even with wood not much thicker than a match

Tip grafting in the field has worked well. Our local nursery finds that side grafting is vastly better than splice grafting, and I aim to have a go at it.

Budding in the autumn is not successful. One of our members budded a thousand seedlings last season and only got six to take.

New Zealand has, a last, a large scale seedling resource of sweet chestnuts *which is totally disease-free*. In Japan, which imports a large tonnage of the nuts every year, the average life of a chestnut tree is only 15 years because of the disease and insect problems.

We have found some first rate chestnuts, mainly in the North Island; they are now recognised by the Government as an official export crop and we are all set to go.

ACCEPTANCE OF GLASS SUBSTITUTES IN GREENHOUSE CLADDING AND DESIGN

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Here in New Zealand, isolated as we are from the major horticultural areas of the world, new techniques and developments gain acceptance only slowly. New materials for the greenhouse skin are no exception. In recent times, other work (1) has covered the characteristics and operating costs of the alternatives. The aim of this paper is to comment on the current useage of these materials and their applications on the basis of information gleaned from greenhouse builders and growers themselves.

There are certain overlying considerations when choosing a covering and design:

1. The initial outlay.
2. The heat conservation properties of the total structure.
3. Repairs and maintenance, including re-cladding.

To put this another way, the operating costs of the proposed design per unit of area are a major deciding factor. This figure must, however, be balanced against any change in the yield or growth characteristics of the crop in a new environment. The necessity for and the cost of implementing any change in management practice under new conditions must also be considered.

Discussions with greenhouse builders indicate demand in the following areas:

1. Glass in single or multiple span remains popular with the preference being for aluminium construction for low maintenance. The higher cost of aluminium structures as compared with wood means that this is not always feasible. This type of structure appeals to growers of high light-demanding crops, in particular, winter production of vegetables.
2. Non-rigid plastics of the polyvinyl chloride (PVC) and ethyl vinyl acetate (EVA) types pioneered the plastic