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TWIG GRAFTING OF MACADAMIA

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Most of you have probably eaten the nuts from macadamia trees but I am sure some of you have never seen the trees. In recent years this fruit has created a lot of interest in San Diego County, California, and around the world. Its climatic requirements are similar to avocados and it has been used as a replant for avocado groves which have become unproductive from root rot. It is also being used as a dooryard tree both for the nuts and for its good looks. At present there is a great deal of interest in establishing macadamia production as an agricultural industry in southern California, as has been done in Hawaii and other subtropical and tropical areas.

There are two species of macadamias grown commercially. *Macadamia integrifolia*, the most popular species in Hawaii,

and *M. tetraphylla*, the most widely grown in southern California.

My experience with macadamias dates back to the 1960's when I bought some seed from a tree on a ranch between Los Angeles and Santa Barbara because this tree was supposed to have the most uniform progeny and least likely to have chlorotic seedlings. In spite of this effort on our part, we still had a great deal of variation in our seedlings and quite a number of chlorotic offspring.

Ted Frolich at UCLA provided me with cuttings of 'Stevenson', a *M. tetraphylla* from Australia, and cuttings of 'Dr. Beaumont'. I grew these and then planted them in the field. The Stevenson tree, which is about 20 years old, has almost no chlorosis while the volunteer seedlings growing around it are quite chlorotic.

In the work we have done, it is obvious that macadamia is highly heterozygous and we must assume that if there is the amount of visible variability which we have observed, there must be a great deal of non-visible variability as to reactions to soil, nutrients, temperature, and other environmental factors. A researcher in Hawaii mentioned that they were finding a difference in maturity time of fruit of the same cultivar, growing in the same orchard, which he felt was due to rootstock variability.

In the citrus industry, the citrus nurseryman is very careful to rogue out all gametic seedlings using only nucellar seedlings as rootstock for citrus propagation to insure production of uniform trees.

Gametic seedlings are those developing in the usual manner of pollen being placed on the pistil and the seedling subsequently formed being a new plant bearing variable genetic traits. A nucellar seedling is similar to a bud from the parent tree as it arises in the nucellus of the seed. These seedlings are uniform as they arise from the single female parent.

Macadamias do not produce nucellar seedlings; so, in order to achieve the same uniformity as occurs in citrus, we elected to use selected clones grown from cuttings as our rootstock.

One of the most successful cultivars in our area has been Dr. Beaumont. This is widely planted as a landscape and home orchard tree. It sets fruit at a much younger age than most other cultivars, is tolerant to a wider range of soil conditions than most seedlings, is a handsome tree and grows well from cuttings.

When we became convinced that, for the sake of uniform-

ity in orchard trees, we must use a clonal rootstock, 'Beaumont', having a track record, was the logical choice. It appears to be an *M. integrifolia* × *M. tetraphylla* hybrid, and while it has been found in Hawaii that an overgrowth of the scion occurs when they graft *M. integrifolia* cultivars (which are most widely used there) on *M. tetraphylla* seedlings, we have no reason to believe that when we use a hybrid, such as 'Beaumont' as understock, and a *M. tetraphylla*, such as 'Cate' as a scion that we will have this problem. We first grafted established 'Beaumont' rooted cuttings, which we had grown in gallon cans for 6 to 8 months after rooting. We used a scion about 4 in. long and about 3/16 to ¼ in. caliper. We left the top whorl of leaves on the scion, cutting the leaves in half. We then cut off the understock at about 8 in., retaining leaves below the cut. We next inserted the scion with a cleft graft, tied it in with budding tape, and bagged the scion with a 4×2×8 in. plastic bag without any holes. We placed the grafts in a cool house under benches with very low light. This was done in November and by March we had about 80% take.

Our method of grafting established rooted cuttings in gallon cans was tedious so we looked for a better method of producing trees using a clonal rootstock. Don and Floyd Dillon, with Fred Real, in 1962, wrote a paper (1) describing their work using twig grafts, with an update in 1967 (2). This is a method of grafting cuttings during the rooting process. In our nursery we had used this method in producing citrus cultivars on *Poncirus trifoliata*. We are in the business of supplying 2½ in. pots to nurseries producing primarily for the landscape trade, and we were able to produce a very satisfactory liner using this method. In citrus we also graft very small seedlings in a 2½ in. pot.

In our work with citrus we use a scion about 4 in. long with two leaves which we cut in half. We root the "twig grafts", or heal in the grafts on seedlings, in a closed propagating frame in which we keep the humidity high by frequent mistings. We use this same method of "twig grafting" in our work with macadamias.

In field grafting macadamias, it has been found necessary to girdle the branches to be used as scions prior to cutting the budwood to get a high starch content. Stephenson notes this in the 1983 Yearbook of the California Macadamia Society (3).

We have found girdling is not necessary where we have leaves on our scion to produce starch during the healing in process. We use scions taken near the tips of the branches of the selected budwood tree, trim the leaves, then graft the scion to a cutting from the tree selected as the clonal root-

stock. In approximately 3 months the graft has healed and roots have formed on the rootstock. This then gives us trees which should react in a uniform manner when used in commercial plantings.

I want to compliment Don and Floyd Dillon and Fred Real on their papers covering twig grafting and given to this Society earlier. Anyone interested in this should certainly read their works. They give great descriptions on method, cleanliness, and facilities. Floyd, in his paper, gives full credit to Dr. Halma and Ted Frolich for their generous contribution to those of us who are working in propagation. It was my experience, too, that these two men were always ready to help us when we went to them with questions.

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USE OF MONOCHLORAMINE AS A DISINFECTANT FOR PRUNING SHEARS

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Abstract. Chloramines were investigated for use in disinfection of pruning shears and their efficacy compared with Physan, isopropyl alcohol, propylene glycol, 8-hydroxyquinoline sulfate, and combinations of propylene glycol and terramycin and streptomycin. The objective was to find a suitable replacement for isopropyl alcohol which would have equal or better efficacy, good stability under high contamination, and lower cost Phytotoxicity and corrosiveness of several disinfectants were also investigated.

The best disinfectants were found to be Physan, isopropyl alcohol, and monochloramine Of these, monochloramine was found to be equal in efficacy to the alcohol, least corrosive, least costly, and had excellent stability under high contamination

INTRODUCTION

Monrovia Nursery normally shears the long roots of rooted cuttings to facilitate handling during potting. Since shearing

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