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## **ASEXUAL PROPAGATION OF TROPICAL PLANTS USED IN THE LANDSCAPE**

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You can probably understand why Kauai's nickname of the "Garden Island" is so appropriate, for we have some of the most beautiful gardens in the United States right here. But these gardens did not happen naturally. It took a great deal of planning, preparing, and designing, or in other words, intentional landscaping to create the lush tropical feeling that is so prevalent here.

In most places, creating a garden involves getting plants from a nursery. Somewhere along the line those plants were carefully propagated by someone, and chances are, they made use of such supplies and equipment as rooting hormones, disinfectants, pots and rooting media, special timers, bottom heaters, mist beds, and temperature controlled greenhouses. Then

after the new plants developed, they needed to be transplanted and acclimatized (in perhaps another greenhouse) before they could be put in the landscape. A fair amount of time, labor, and expenses goes into this process.

Here in Hawaii, it is a bit different. And that is what I would like to talk about today — how we can propagate plants as we install or improve on a landscape, and have a very high success rate.

The Hawaiian nursery industry (or commercial plant propagators) began with the backyard growers and involved very little sophisticated technique. They probably took a branch (any size) stuck it right side up in an old can, and left it under a tree until new leaves formed. Then it was given away or traded. Eventually, they graduated to air layering, and even some grafting and budding of special hybrids, but the basic care of the propagating material was the same — stick it under a tree and if for some reason the regular rains stop for a few days, sprinkle it with the hose.

Today, of course, we have many commercial nurseries which deal with propagation on a much larger scale and therefore, have gone to more modern methods. But the backyard growers, especially on Kauai, continue to be quite prevalent and are still achieving a high percentage of rooting with their basic operations.

If we landscapers are careful, and do a bit of extra planning, we can take advantage of these phenomenal growing conditions. We can install unrooted ground covers, shrubs, and even some large trees that will give us somewhat of an instant landscape effect, but in actual fact, they are nothing more than huge cuttings. Of course, one would not put in a complete landscape using only unrooted cuttings, especially on a commercial scale, but in many circumstances, this method can be incorporated into the project and reduce plant and planting costs considerably. Also, I might add that plant availability can be a real problem here on Kauai and the landscaper may not be able to find a plant with roots on it at the time he needs it.

This method of “in-house” propagation works especially well for someone in my position, where we are constantly expanding and improving an already established commercial landscape. We have about thirty acres of intensely planted grounds with a potential of 110 acres. The plants are already acclimatized to our particular conditions, which are somewhat less than ideal. They include very strong winds, heavily laden with salt, that blow almost constantly and a thin layer of soil over almost solid blue rock. Not all plants will tolerate these conditions, but those that do grow amazingly well, and even

here we have had quite a bit of success using propagating material during landscaping.

Starting with a few ground covers, *Rhoeo spathacea* (Syn.: *R. discolor*) cuttings will fill in within a few weeks. Then we can cut them back and propagate the trimmings. *Alternanthera ficoidea* 'Amoena' (Syn.: *A. amoena*) cuttings are placed with several together, giving finally a strong growing clump. This plant can also be divided very easily. *Ruellia makoyana* grows well from runners and fills out within a month, but none look as good right from the start as *Zebrina pendula* 'Discolor' which never even wilt.

*Cordyline terminalis*, or ti cuttings are great for giving instant heights to a landscape. They can also be air-layered if you have the time, in which case the end plant could be five feet tall. The dwarf *Schefflera arboricola* is another one that air layers readily (in less than two weeks roots were showing) and the layers can be hidden from view so as not to detract from the existing landscape. *Hylocereus undatus* is rather slow growing but well worth the wait, especially during the summer and fall, when this night bloomer puts on its floral display. Even some of the small cuttings bloomed just a few months after planting.

Gingers, *Heliconias*, and bananas are quite easy to divide. The foliage of Kahili ginger (*Hedychium gardnerianum*) was quite tall when planted. Banana "keikis," or suckers, make a great gift and are produced in abundance. *Alpinia purpurata*, or red ginger is quite interesting in that it undergoes vegetative apomixis as another means of reproduction. These can be used in the landscape, although the plants are much smaller than division would produce.

Giant spider lilies (*Crinum jagus* (Syn.: *C. giganteum*)) are excellent for an instant landscape effect because of their size and fullness. Divisions four feet tall and six feet cross have been moved successfully with very little yellowing. But the trees are the greatest amazement to me. What do you do when your *Plumeria rubra* gets too big? Just simply cut off branches, any size, and let them dry out in the sun for one to four weeks. Then strip the bark off the lower four inches and plant about eight inches deep in a spot where a new tree is desired.

*Pandanus odoratissimus* is another tree that will tolerate a rootless condition for a long time. One particular tree blew down a few months ago and the roots were severed. Except for a few yellow leaves, the plant gave no outward signs of stress, and has begun to put out new growth.

So there you have just a few examples of how plants can be propagated while planting them directly into a commercial

landscape. For a private residence, where instant fullness is not so important, this technique is even more useful and cost efficient. A very common way of installing a *Hibiscus rosasinensis* hedge is to stick three foot branches into the ground in a criss-cross manner. Then water and wait. With a panax (*Polyscias guilfoylei*) hedge, you can use six-foot cuttings with or without leaves, placed vertically in a row. Some leaves will appear in a week or so.

As with many almost effortless endeavors, sometimes they backfire. In the old days, farmers used thick logs of the Hau tree (*Hibiscus tiliaceus*) as fencing material; not anymore, as the logs sprouted and engulfed a good portion of their land. A few years ago, I planted a vegetable garden and needed some poles for the climbing peas. There were some beautiful panax stakes near by that would be perfect. Being the "knowledgeable horticulturist" that I am, I put the stakes in the ground upside down so they would not grow but leaves still appeared. As the old saying goes, "in Hawaii, when you stick a plant in the ground, be prepared to jump back quickly." This may be a bit of an exaggeration, but as you have seen, we do make cuttings with chain saws!

DON DILLON: Jeanne, do the roots travel from one unit of the foam to the other throughout the strip? If so, does that cause any problem when they are separated?

JEANNIE JONES: In poinsettias there is a tendency for that to happen if the plants are kept on the bench too long. When the individual units are snapped apart the roots gently pull out from the foam because they left an impression as they are going in. So it tends not to cause a problem unless they are very, very over-rooted plants. But that means that they have been held too long.

VOICE: How cost-effective is the system and what percentage take do you get compared to conventional propagation materials?

JEANNIE JONES: Generally, it matches existing systems. At first we thought there might be a greater labor saving because we weren't preparing our own mix, but generally it has been a trade-off. What has occurred is that we have a higher uniformity of rooting and so there may be less than 1% shrink in the propagation. With those particular plants, we had above 90% take on that trial. But instead of having 10% shrink, as some people do in poinsettia propagation, we have been hitting under 1% consistently.

VOICE: We use a similar material in Australia called rock wool. Do you have any experience with this material?

JEANNIE JONES: I have seen the literature on it and I have seen the material. It does seem to be working quite well in Europe both for cuttings and seed germination. We do not have manufacturing capability as yet with any company that I know of in the United States. So it has to be shipped in, which is cost prohibitive. The Oasis material is used with constant liquid feeding. There is no cation exchange capacity in the material, so you must recognize that you have to fertilize the cuttings. As soon as the roots show, the fertilizer must go on.

VOICE: Have you done any work with this material on growing the plants, instead of just rooting them? That is, using it for a longer period of time.

JEANNIE JONES: Initial work is being done right now. Instead of the foam material being in solid form, it is being shredded and put in plastic bags. If you are familiar with the W.R. Grace bagged material, which is out right now, there is a similar sausage bag, called a Grow Bag under testing with this foam material. It is being used in Canada, and I have some trials to be set up in November near Dallas with tomatoes, cucumbers, and such types of plants. So we will begin to get some more information with it. It is light weight, it is easy to use, and workers seem to like setting it up. Production is being matched with existing systems in Canada right now but I don't have any first-hand experiences.

VOICE: That would be just in the shredded form, but what if you made it into the form, say, of a 4-inch pot?

JEANNIE JONES: It seems to be too costly. The individual cube units are about 1½¢ up to 3¾¢, depending upon size. So when you cut that much mass in a straight 6-inch pot, the plant that you are growing in it isn't going to sell for enough money to recoup the cost of the material. You have to get into a high cash crop like vegetables.

HUDSON HARTMANN: Curtis, would it help if you nailed the scions of your grafts into place, using flat-headed wire nails?

CURTIS ALLEY: We don't have to with the tape we use. It holds it very well except along the bottom where it tends to open up. If you put a nail down there it would hold it, but the grafters are under pressure. How many can I do a day? They don't want to take the time to nail the grafts.

MARGARET SCOTT: When you are cutting off the vine for grafting, do you leave one or two of the original shoots?

CURTIS ALLEY: No we don't; in other words, the head of the vine is up where the cordon is, and we go down about 14 inches below the head for grafting. There is nothing above; it is all cut off.

BRUCE BRIGGS: Is there any reason for not cutting off the base and then putting dirt around the base to cover it up completely. Some have done that. Why did you go away from that type of grafting?

CURTIS ALLEY: The question is why don't I go down to the base of the vine and do my grafting down there at ground level? But we have a nice trunk, it might be anywhere from three to eight years old, and with it we can get in with a French plow, or use herbicides, because with the thick bark we will not injure the trunk. If we start at the base and bring up a whole new trunk, we cannot French plow and we cannot use herbicides due to the tender new stem.

HUDSON HARTMANN: Filiberto, where in Italy is the location of the laboratories doing the micropropagation which you mentioned?

FILIBERTO LORETI: They are all in the center of Italy, the Cizana area, the most important areas for peach and apple fruit growing.

VOICE: Do you have any problem with the tissue-cultured plants not growing away well without having a cold period?

F. LORETI: For fruit plants we collect the shoots during the late fall, and put them in cold storage for a certain period. After the cold storage we put them in a growth chamber with high temperatures to promote bud burst and shoot elongation.

VOICE: So they are having a cold period before you use them?

F. LORETI: That's right.

VOICE: For sanitation in tissue culture, why do you not want to have any water go on the top of the plant?

BRUCE BRIGGS: We should wet the plant from the base. When a leaf comes out on a plant with a rain taking dirt out of the air, the dirt seems to get into the body of the plant. For example, if you want to ship some plants to a person who wants to start tissue culture on the plants, you might go out and gather the cuttings for shipping. If the foliage is wet you cut them off, put them in a poly bag and put them in the mail; the percentage of success in getting them started by tissue culture is very, very low. They are dirty. But if you go out on a hot, dry day, pick off those cuttings and put them in a poly bag — but don't close the bag so the cuttings can breathe — ship them so they get there almost wilted and dry, the percentage of success is much, much better.

When you sweat the bag, with all the moisture in there, you immediately start reactions with all the bacteria growing.

VOICE: Bruce, you kept saying sterilization in your discussion; don't you really mean disinfection?

BRUCE BRIGGS: Yes, this is correct, it is actually disinfection.

CURTIS ALLEY: Bruce, have you tried a bacteriacide called Chinosol? It is one of the most widely used bacteriacides in Europe on grape cuttings. It disinfects them and is particularly good in controlling *Botrytis*. The active ingredient is 8-hydroxy quinone.

BRUCE BRIGGS: No, we have not. Has anyone in the room used this in tissue culture? This is the thing we need to do, to get such materials out so we can try them.

VOICE: In rooting *Plumaria* cuttings, does it help to dry them out?

MAUREEN MURPHY: Absolutely necessary. Otherwise they tend to rot in the ground. Also stripping off the bark from the bottom four inches is an old Philippino technique some of my gardeners taught me. In some cases they know best.

RICHARD ZIMMERMAN: This is in regard to citrus grafting. The reason for the micrografting of citrus is because they cannot root shoots in tissue culture. They are interested in obtaining virus-free plants and multiplying them. They were not able to get multiplication or to get them in culture from shoot tips. So they used very small seedlings — cut off the top and do the micrografting on the seedlings. They were able to establish their culture this way. Several references to this are in the *Journal of the American Society for Horticultural Science*, back in the seventies.

KHENG CHEAH NG: I would like to add the reason for micrografting avocado. When they first started to get mature avocado material in culture it would not root. So, in vitro micrografting was done. The shoots were found to be able to root much better than that. They were trying to develop mass propagation methods for avocado clones.

BRUCE BRIGGS: Dr. Loreti, our guest from Italy, do you have anything to add to your paper in the way that you are working on tissue culture in Italy?

FILIBERTO LORETI: May I tell you about micrografting in citrus? We have been doing this for three or four years in Sicily where citrus culture is very important. We do micrografting to use certain rootstocks in order to avoid some diseases. We prefer to micrograft over conventional grafting because it is easy to graft very fast. We cannot grow certain orange or other species on their own roots because of diseases which attack the root system.