Mist Propagation of *Citrus*®

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Propagation of *Citrus* is most commonly done by budding a desired scion cultivar [orange (*Citrus sinensis*), lemon (*C. limon*), lime (*C. aurantiifolia* and *C. latifolia*), mandarin (*C. reticulata* Mandarin Group), etc.] onto seedlings from desired rootstock taxa. Another method of propagating *Citrus* is twig grafting, which is a vegetative method. This is done by making a cutting of the desired scion cultivar and a cutting of the rootstock and grafting the two together. The propagation material is then placed under mist with bottom heat to generate roots and heal the graft union.

Twig grafting was described by Halma (1931) and is mentioned in *The Citrus Industry*, Volume II, published in 1948. This method of propagation has advantages and disadvantages, like many methods of propagation. Advantages include rapid reproduction of material, as a new plant can be generated in as little as 12 week. Disadvantages include the need for a large budwood supply, as many more buds per tree are used with the twig graft method. Also there is more cost associated with the construction of a propagation house, needed with the twig graft method, which might not be needed with the traditional budding method.

The first step of mist propagation of *Citrus* involves the collection of grafting material. *Citrus* trees put out a spring flush of growth in early spring. This flush should be allowed to harden-off for several months. By the beginning of June the wood is ready to be collected.

It should be mentioned that since there are many diseases of citrus, care must be taken to collect only disease-free budwood. In some *Citrus*-growing states or countries there are regulations concerning the propagation of *Citrus* so always consult the local authorities before propagating *Citrus* in your area. To keep from spreading disease in the mother plant block by mechanical means, always spray clippers with a 10% Clorox solution before moving to a new mother plant.

Using a pair of clippers, make cutting about 6–8 inches long from both the desired scion cultivar and from the desired rootstock. These cutting should be of approximately the same caliper. Once cuttings are collected, they are transferred to the propagation room. Using a sharp knife the top of the rootstock cutting and the bottom of the scion cutting are sliced with a smooth motion to expose the cambium layer in a cut that is at least 1 inch long. The cut starts at least 1 inch from the end of the cutting and dissects the cutting, exposing a flat surface of cambium. The cut would be similar to one making a tongue graft without the tongue portion.

These two cuttings can now be matched up. The cut portion of the scion is matched to the cut portion of the rootstock. Wrapping a budding rubber around the cut surfaces to form the graft union holds the two cuttings together. There is no need for waxing the graft union. The bottom of the rootstock portion is then cut with a vertical cut at a right angle to the stem. Plants are dipped in clean chlorinated water to prepare them for the mist house.

Individual pots can be used for the rooting process. Pots may vary in size; however, a $2 \times 2 \times 4$ inch-high container works satisfactorily. Rooting media may vary as well. A soil mix that has been pasteurized by proper composting or steam treatment is preferred to prevent spread of disease. Pots are placed in flats filled with rooting media and then placed in the mist house.

The mist house consists of heated benches and an overhead high pressure mist system. The rooting medium is best kept at 80–85 ºF. The mist system is set to a controller, which allows it to come on for about 14 sec every 4 min during the warm summer months.

The base of the grafted plant material is dipped into IBA rooting hormone powder at a strength of 0.3% and then stuck into the rooting medium. The base of the cutting will swell and callus will form. From the callus roots will emerge in a week or so and will continue to grow with time. The graft union will heal as the cambium from the scion and rootstock grow together. During summer this process can take 10–12 week.

The mist is turned off the bench for a few days following the proper propagation period and then the plants can be moved out of the propagation house. Success rates can vary depending upon the time of year from 100% success to less than 50%. It is not unusual to achieve 85% to 95% success rates with proper age of cutting material, bench temperatures, mist duration cycles, and following best management practices for cleanliness during all phases of the propagation cycle.

GENERAL SESSION IV: QUESTION AND ANSWER SESSION®

Dave Hannings: Was it necessary to have leaves on both the rootstock and scion to be successful?

Don Dillon: It helps to have foliage on both. In fact, sometimes late in the season some of the trifoliate (*Poncirus trifoliate*) rootstock varieties start to go dormant and percentages will tend to drop off so the leaves help the process.

Luen Miller: Is that *Amsinckia*, the giant-flowered one that you have?

Ginny Hunt: I think it is the giant-flowered one. There is another species called *A. grandiflora*, but this one has fairly large flowers.

Jack Kelly: Are you required to perform germination tests on your seed before you sell it?

Ginny Hunt: We don't routinely perform germination tests and I've not heard of any requirements to do germination tests. The feedback I've gotten from my customers is that the seeds come up very well.

Rich Persoff: Have you done any work with *Salvia funerea* from Death Valley?

Kathy Navarez: No, but if you have some seed I'd be happy to oblige you.

Lane McGlaughlin: Were you using GA_3 to get taller seedlings or to improve germination?

Kathy Navarez: I was trying to improve germination, but I was also trying to see what other factors might be important in the germination of *Salvia* seed.

Lane McGlaughlin: Was the elongation a surprise to you?

Kathy Navarez: No, elongation is very common.

Chris Cotting: What was the percentage of bleach you used and did you dip the whole cutting into the bleach?