

KIWI PROPAGATION

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The kiwi or Chinese gooseberry, *Actinidia chinensis* (Planch) may be propagated by various means (1). Budding or grafting desired cultivars on seedling rootstocks is the most usual practice. Owing to rootstock variability and the longer time required to obtain planting stocks, several propagators desire to grow kiwis from stem cuttings. As with most trees and vines, seedling variation makes necessary vegetative propagation using selected scion cultivars. Suitable ones are available for topworking or for cuttings.

Seed extraction. Soft, mature fruits yield large numbers of viable seed. The simplest way to handle seed fruit is to store it soft ripe at about 4.0°C until the seed is to be planted. The fruit is then peeled and the pulp liquified in an electric food blender. This pulp may be evenly spread on the planting medium without further treatment or the seed sieved, dried and returned to storage in a plastic bag.

Seed germination. Seed planted directly after extraction germinates readily. Stored seed becomes dormant and thus fails to germinate satisfactorily. To break dormancy either of two methods may be used. (1) Subject seeds to temperatures alternating between 10°C by night and 21°C by day for 2 to 3 weeks (before or after sowing), or (2) store moist seed 3 weeks continuously at 4°C. Germination takes 2-3 weeks after planting at 20°C.

Raising seedlings. Seed sown in January under hothouse conditions produce seedlings that may be pricked out and planted in flats or small peat pots later to be moved into containers or in the nursery row about 46 cm between plants and 76 cm between rows. As with most seedlings, kiwis are subject to "damping off" fungi and should be planted in a suitable medium, adequately watered and fertilized. Transplanting in outdoor nursery rows must be delayed until all danger of frost is past.

Budding seedlings. With favorable growing conditions, stocks should be large enough (ca. 6 mm in diameter) for budding in September or early October. Matured shoots of the current season's growth makes suitable budwood. For convenience in handl-

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ing, a short stub of the petiole is left when the leaves are cut from the budstick. Utilizing the shield (T) bud, the stocks are budded about 10 cm above ground level.

After the buds have "taken" the stock is cut back about 2.5 cm. above the bud union. (If the stock is cut in the spring to "force" the bud, the vines "bleed" copiously and may result in bud loss.) Bud ties are removed during or soon after cutting back the stocks.

Grafting seedlings. Grafting wood is cut during the dormant period and held in damp sphagnum or sawdust in a cool, shaded area until it is used. Scionwood, like budwood, may also be stored under refrigeration at 4.0°C in sealed polyethylene bags.

Grafting is best done in late winter. If grafted when spring growth starts, excessive bleeding may cause a poor "take". Two or three good buds per scion, about the same thickness of the stock, is suitable for whip and tongue or cleft grafting. As with budding, the stocks are grafted about 10 cm above the ground level and firmly tied. All cut surfaces require a suitable sealer to prevent drying. To avoid constriction of growth, the binding material is cut with a sharp knife as soon as the graft union has healed.

Care of topworked seedlings. Bud and graft shoots require staking and tying to produce suitable straight trunks. Stakes should "face" the bud, preferably on the windward side. All rootstock suckers must be rubbed off and undesirable lateral scion shoots "pinched" in order to maximize growth of the young vine main stem.

Stem cuttings. To hasten establishment of suitable planting stock and to eliminate rootstock variability, softwood cutting propagation appeals to both nurserymen and growers. Only lately have California kiwi propagators seriously considered utilizing this type of reproduction.

Limited experience indicates that softwood cuttings can be taken from new growth throughout the growing season until about September. Each cutting should have one fully expanded leaf (cut in half, if necessary, to conserve space in the rooting bed). The basal cut should be just below the node and treated with indolebutyric acid (IBA). (Most satisfactory concentration of IBA appears to be about 8000 ppm.) The cutting is then placed in a well drained propagating medium with intermittent mist and bottom heat.

Under favorable conditions roots appear in 3 or 4 weeks. After root initiation sufficient to sustain the transplant, the cuttings are potted in a well-drained, fertile loamy soil mixture and held under humid, shady conditions until it is safe to move them into well-illuminated hothouse or lathhouse. If they are to be lined out in

the nursery row, it should be done after danger of frost is past in the spring and after the rooted cutting is sufficiently hardened.

LITERATURE CITED

1. Fletcher, W.A. 1973. Growing Chinese Gooseberries, Bull. No. 349, New Zeal. Minis. Agric. Fish.

MODERATOR DON DILLON: Now, we are ready for questions for our second panel of speakers.

VOICE: On kiwi's; how long does it take from a cutting until they fruit?

KARL OPITZ: Well, they will be in production in a couple of years. Fruit is borne on current season's shoots from wood that matured the year previously. It depends on how much vegetative growth they make. They come into production rather rapidly but will not be in full production for about 6 to 7 years. This could be maintained for a long time, since the kiwi is a long life plant — if you don't rot it off by excessive "good" care.

LARRY CARVILLE: A few years back I wrote to a friend and he sent me some plants of kiwi which he was growing. Are kiwis bisexual or unisexual? He sent me a male and a female plant and I have been rooting them and growing them along.

KARL OPITZ: There needs to be a male plant to about 7 females. They are dioecious. That is about the correct ratio. So when you are planting them out you must know what the sex is of each plant.

VOICE: Are there selected clones of kiwi?

KARL OPITZ: Yes, the 'Hayward' is the best clone grown in New Zealand. There are several other clones that they use — 'Bruno' and several others. We have a 'Chico' selection that was made at the USDA Plant Introduction Station at Chico, California. As far as we know, it is identical with 'Hayward'. There are some other cultivars but it looks like the 'Hayward' (or 'Chico') is the one to grow. They do very well under the right condition.

VOICE: Are there selected understocks that seem to be best with the kiwi? In other words, are there rootstock advantages in terms of increased production?

KARL OPITZ: We know that if you grow the selected clones on their own root they do well and are uniform. There may be rootstocks more resistant to diseases, which may influence productivity, and which make them more resistant to late spring frosts and early fall frosts, but that is a wide open thing. We don't know anything about rootstocks for kiwi.

VOICE: How about hardwood cuttings for propagating kiwi?

KARL OPITZ: They will root from hardwood cuttings. Some of the more knowledgeable nurserymen root both hardwood and

softwood cuttings in the same area at the same time. The softwood cuttings start growth much more rapidly but hardwood cuttings will root.

BARRIE COATE: I have two questions — one for Mr. Opitz and one for Mr. Hall. First, do you find that there is a relationship between the female cultivar and a male cultivar for best possible pollination?

KARL OPITZ: Several male cultivars exist but 'California' male (from Chico) blooms at the same time as 'Hayward'.

BARRIE COATE: A question for Mr. Hall. About the use of the tape in budding: It seems a silly question, perhaps, but do you wrap the green plastic tape starting from the top or from the bottom?

JOEL HALL: On the walnuts, start wrapping from the bottom and work to the top, they make a tie at the top.

BARRIE COATE: What type of tie? Do you actually make a knot?

JOEL HALL: No, we use the same type of tie that we use with budding rubbers. We slip it through a slip-knot type tie.

HUDSON HARTMANN: In California we have a problem with walnuts called "black line." This is related to the rootstock, where there is a degeneration of the tissues at the graft union. I am wondering what Joel recommends as the best rootstock to overcome this "black-line" problem?

JOEL HALL: To avoid "black-line" we are working with seeds of some cultivars of *Juglan regia*, particularly Eureka and Serr, but we do have one problem as far as nursery production goes. Such seedlings are very slow growers. We find that for propagation, use of *J. regia* seedlings slows the program. We have a farm advisor who is working with the University of California on this problem. Walnut black-line in Contra Costa County, California, has just about destroyed the walnut production there. It seems to be a problem in compatibility. We don't know really what it is. Some growers plant a *J. hindsii* seedling, then bud different limbs with budwood from several different trees. I have seen orchards where this has worked — where one of the limbs would get black line and they would cut it off. The other limbs did not have the problem.

CURTIS ALLEY: Joel, in the last two years we have been planting California green with grapevines; growers have also been fumigating the soils, especially old vineyard soils. They have been getting into trouble with tie-up of phosphates when they fumigate. Have you had experience with this in your fumigation?

JOEL HALL: Yes, we have; in fact, this is why we only use 200 pounds of methyl bromide per acre. This is the minimum requirement. We go with 200 pounds of methyl bromide and then

get a root sample for our inspection program. But methyl bromide, of course, does tie up, particularly, the metallic elements — iron, manganese, phosphorus, zinc, etc. Particularly zinc and phosphorus. We have to use massive amounts of phosphorus and zinc — more than we would otherwise — particularly after using methyl bromide fumigation. So it is very important to follow methyl bromide fumigation with a good program of phosphorus and zinc fertilization.

RALPH SHUGERT: Hudson, about 6 years ago in Oregon we met some growers who were working on Mahaleb × Mazzard crosses hoping to come up with some new cherry rootstocks. I wonder what has happened in the last 6 to 8 years in that regard?

HUDSON HARTMANN: Dr. Al Roberts of the Oregon State University at Corvallis has been interested in the cherry rootstock situation and has a collection of *Prunus mahaleb* from all over the world. I really don't know much more about it than that. Maybe some of the people here from Corvallis could fill us in on the status of the Oregon cherry rootstock studies.

CURTIS ALLEY: Hudson, in our vineyards every year we spend a lot of money suckering the vines. You said to use NAA to stop suckering of cherry rootstocks. What concentration is used?

HUDSON HARTMANN: I think about 500 ppm. This hasn't been in nursery work, though; it has been on older trees. This work has been done by Jim LaRue, Steve Sibbett and others in the Extension Service at the University of California. They tried it on olives, crepe myrtle, and various things like that. But as far as I know, they haven't tried it in nurseries or on more tender material. They published an article in *California Agriculture* not too long ago about their work, but I don't believe that they have experimented with nursery material or grape vines.

JOLLY BATCHELLER: In rootstocks for dwarf peaches, why aren't they using seedlings of the dwarf flowering peach? What is the problem there? I have such trees about 10 feet tall grafted 8 or 9 years ago.

HUDSON HARTMANN: These are genetic dwarf flowering trees and could be grafted on a vigorous rootstock. Seedlings propagated from seeds taken from the dwarf clonal tops may or may not be of a dwarfing type. However, cuttings taken from these dwarfed clones could be rooted and tried as a clonal rootstock.

RICHARD NELSON: Dr. Alley or Joel Hall. Have you used mycorrhizal fungi to overcome phosphorus and zinc deficiency at all? In grapes or in the tree fruits?

CURTIS ALLEY: In grapes it is just being tried this year. The results should come out in a year or two.

JOEL HALL: No, we haven't used mycorrhizal fungi in our nursery for this purpose.