Tree Fruit Cuttings Propagated

vegetative propagation of softwood cuttings of certain tree fruit rootstocks achieved by chemical and mist treatments

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Tree fruits are usually propagated by budding or grafting on seedling rootstocks but such seedlings tend to show more or less variability in many characteristics, including resistance to nematodes and diseases.

Sometimes individual seedlings or clones are found that are free from or have marked resistance to such pests. Certain seedlings or clones used as rootstocks may impart either a dwarfing effect or cause increased growth and tree size. To retain valuable characteristics of rootstocks it is necessary—in most cases—to propagate them vegetatively rather than by seed.

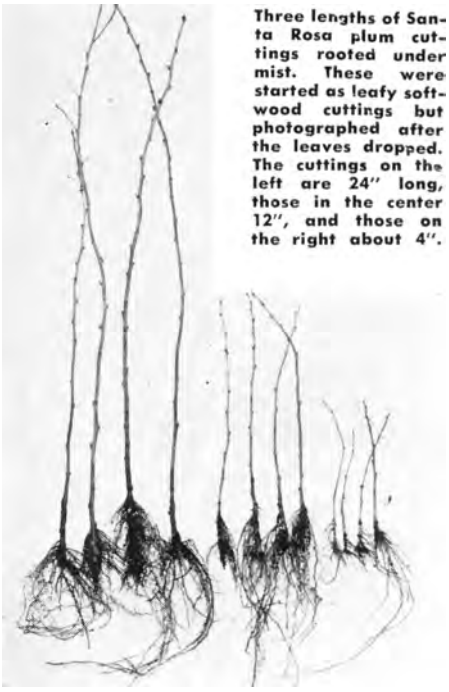
Some vegetative propagation methods —layering, suckers, or division—permit small scale reproduction but are often not suitable for the commercial nurseryman who requires plant production in quantities of thousands or hundreds of thousands.

Although propagation by cuttings is the vegetative method most generally used—for large scale production of nursery plants on their own roots—cuttings of most tree fruit species are so difficult to root that the method is little used for such plants.

The advent of mist propagation makes it possible to root cuttings of a number of the difficult-to-root tree fruit species.

With the mist propagation method, leafy, softwood cuttings taken from young shoots in the spring are rooted under mist sprays, applied intermittently in such a manner as to keep the leaves of the cuttings continually wet.

In addition to the mist sprays, the cuttings are treated with root-inducing hormone chemicals. Trials with various growth-regulators—singly and in combinations—have failed to show any to be superior to indolebutyric acid. Commercial preparations with the active ingredient dispersed in talc are available but —sometimes—better results are obtained by the so-called concentrated-solution-dip method. Just before the cuttings are inserted in the rooting medium their baasl ends are dipped for about five seconds in an approximate 4,000 ppm—parts per million—solution of indolebutyric acid made by dissolving a level one-fourth teaspoon of the pure crystals in three and one-third fluid ounces of 50% alcohol. Isopropyl alcohol can be used satisfactorily. The solution should be kept tightly sealed and stored in the dark.



Three lengths of Santa Rosa plum cuttings rooted under mist. These were started as leafy softwood cuttings but photographed after the leaves dropped. The cuttings on the left are 24" long, those in the center 12", and those on the right about 4".

A rooting medium of equal parts fine vermiculite and Sponge Rok has given good results and was used in most of the tests in this series.

Santa Rosa plum and Peach Rootstock No. 7—a stock now under test for nematode resistance—were used in rooting tests in 1954. At that time, continuous day and night mist was used but later trials have shown that intermittent mist is better. In that and other experiments the superiority of the five-second dipping treatment in indolebutyric acid at 4,000 ppm over the control was so clearly indicated that the treatment was routinely used in subsequent work.

In the 1955 tests the Santa Rosa plum and Peach Rootstock No. 7 were again used, as well as Fay Elberta peach and Brompton plum.

In addition to the usual length cutting—about 4"—longer—12"—cuttings were tried and, for the Santa Rosa plum, the cuttings were 2' long. The longer cuttings did not root in higher percentages than the shorter ones but did develop heavier root systems and produced initially larger nursery plants. It would be practically impossible to keep such long cuttings with their large leaf area alive

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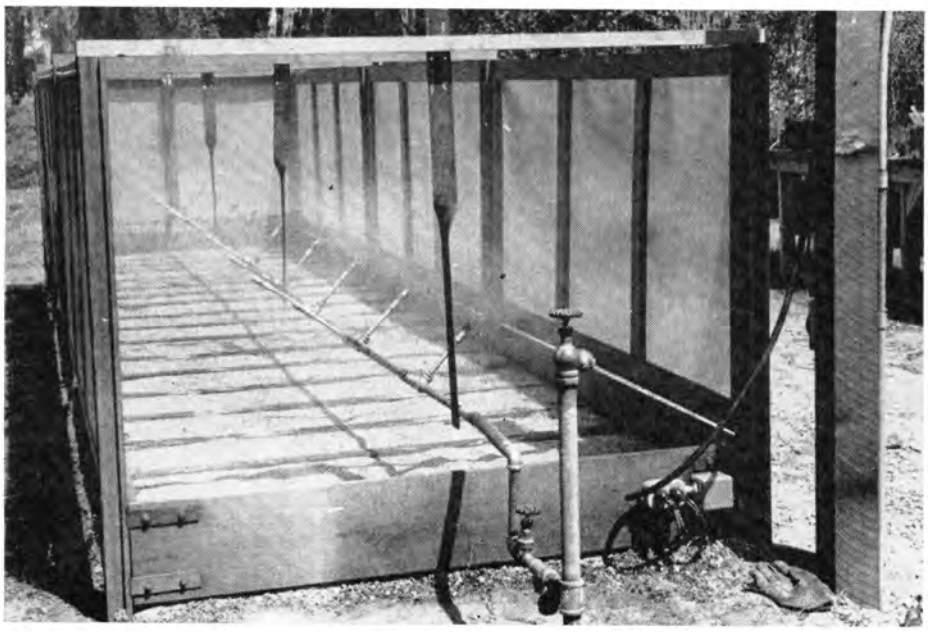
An out-of-door mist propagating bed equipped with electric soil cables for bottom heat. This is set up to supply continuous mist. An intermittent mist bed would have a solenoid valve, operated by a time clock, in the water supply line.



CUTTINGS

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in the usual propagating beds, but under mist no difficulty was encountered in preventing wilting.

Wounding the base of cuttings by stripping off leaves, cutting out slices of bark or making slits in the bark with a knife point will markedly stimulate adventitious root production in some plants. Wounding by knife slits was tried on the cuttings in the 1955 tests but no particular benefit seemed to appear.

After the cuttings were rooted the flats were moved to hardening-off beds where the amount of mist applied was gradually lessened until the plants would survive without it. The cuttings were left in the flats—but watered about every three weeks with a nutrient solution—until they were dug preparatory to planting out in the nursery row. This system was not entirely satisfactory because many of the rooted cuttings were dead by the time they were dug.

Tests in 1956

The 1956 tests included various fruit-tree rootstocks—listed in the table at the foot of this page—in which there is interest in vegetative propagation. The Old Home, Old Home 50, and P-87 pear varieties are noted for their resistance to fire blight and for their habit of producing desirable body or intermediate stocks for topworking commercial pear varieties. Rooted cuttings of these would furnish blight-resistant roots and, at the same time, body stocks for the blight-susceptible commercial varieties. Fairly good rooting percentages with adequate quantities of roots were obtained with all the species except *Pyrus calleryana*.

Indolebutyric acid at three different concentrations was applied by the concentrated-solution-dip method. The cuttings were started in early June and dug in mid-September. Rooting was generally completed after six weeks and the remainder of the time the cuttings were in the hardening-off bed, where the mist was gradually reduced until eliminated. In almost every case there were cuttings which had rooted but subsequently died before digging. It seems important to discontinue the mist as soon as possible after rooting.

While many fruit species apparently can be propagated by leafy softwood cuttings under mist—particularly if treated with a root-promoting hormone —not all species respond to this tech-

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Root Production by Softwood Cuttings Under Intermittent Mist in Full Sun. Started June 13, 1955. Removed from Flats January 30, 1956. Average of 45 Cuttings per Treatment.

Variety and species	Treatment ppm	Rooted %		Aver. No. roots per rooted cutting	Average root length
		Total	Alive		
SANTA ROSA PLUM (*Prunus salicina*)	IBA 4000 (wounded)	71	29	12	2.8 cm.
4" cuttings	IBA 4000 (not wounded)	91	60	15	4.4
12" cuttings	IBA 4000 (wounded)	88	56	15	4.6
	IBA 4000 (not wounded)	93	69	20	5.5
24" cuttings	IBA 4000 (not wounded)	82	60	25	8.5
PEACH ROOTSTOCK No. 7 (*Prunus persica*)	IBA 4000 (wounded)	100	64	11	8.1
4" cuttings	IBA 4000 (not wounded)	85	58	6	10.7
12" cuttings	IBA 4000 (wounded)	73	31	15	6.4
	IBA 4000 (not wounded)	89	64	12	8.9
FAY ELBERTA PEACH (*Prunus persica*)	IBA 4000 (wounded)	91	26	10	7.0
4" cuttings	IBA 4000 (not wounded)	58	9	4	5.9
12" cuttings	IBA 4000 (wounded)	51	11	15	7.2
	IBA 4000 (not wounded)	64	9	8	7.2
BROMPTON PLUM (*Prunus domestica*)	IBA 4000 (wounded)	36	6	6	3.9
4" cuttings	IBA 4000 (not wounded)	24	4	4	2.2
12" cuttings	IBA 4000 (wounded)	60	16	9	5.8
	IBA 4000 (not wounded)	40	16	8	5.9

Propagation of Peach Rootstock No. 7 and Santa Rosa Plum Softwood Cuttings Under Continuous Mist in Full Sun. Started June 8, 1954. Dug July 22, 1954. Average of 144 Cuttings Per Treatment.

Treatment	Per cent rooted	Aver. number of roots per rooted cutting	Aver. root length
Peach Rootstock No. 7. (*Prunus persica*)			
Indolebutyric acid, 4,000 ppm	68	4	4.8 cm.
IBA in talc, 3,000 ppm	29	3	3.4
Control	15	1	2.7
Santa Rosa Plum (*Prunus salicina*)			
Indolebutyric acid, 4,000 ppm	94	17	1.9
IBA in talc, 3,000 ppm	65	4	1.9
Control	56	3	1.3

Root Production by Softwood Cuttings Under Intermittent Mist in Full Sun. Started June 6, 1956. Dug September 17, 1956. Average of 60 Cuttings per Treatment.

Variety and species	Indolebutyric acid treatment (5 seconds)	Per cent rooted		Average number roots per rooted cutting	Average root length	Per cent of cuttings with secondary roots		
		Total	Alive			Light	Medium	Heavy
OLD HOME PEAR (*Pyrus communis*)	2000 ppm	90	88	7	10.3 cm.	72	26	2
	4000	95	93	9	11.0	82	16	2
	6000	98	97	13	10.3	91	9	0
OLD HOME 50 PEAR (*Pyrus communis*)	2000	50	38	5	7.1	88	8	4
	4000	38	37	6	10.3	84	16	0
	6000	78	52	11	7.6	91	9	0
P-87 PEAR (*Pyrus communis*)	2000	20	18	1	10.6	65	26	9
	4000	43	43	3	8.2	83	17	0
	6000	50	50	2	11.7	74	16	10
VARIOLOSA PEAR (*Pyrus pashia* X *P. communis*)	2000	40	37	2	12.1	34	53	13
	4000	70	68	6	15.1	84	15	1
	6000	87	87	10	9.4	87	12	1
(*Pyrus calleryana*)	2000	2	2	3	8.0	0	100	0
	4000	5	5	2	18.0	0	75	25
	6000	5	5	3	13.0	0	50	50
BROMPTON PLUM (*Prunus domestica*)	2000	63	45	5	11.1	42	31	27
	4000	77	42	9	10.3	55	25	20
	6000	75	52	11	9.8	40	52	8
HAVENS 2B PLUM (*Prunus insititia*)	2000	30	10	4	6.7	50	50	0
	4000	68	23	6	9.4	60	35	5
	6000	78	33	14	6.4	42	48	10
VIRGINIA CRAB APPLE (*Malus sylvestris*)	2000	75	47	6	6.0	70	25	5
	4000	78	60	10	6.2	77	23	0
	6000	88	45	14	6.5	90	10	0

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nique. Varieties which have been tested but rooted either not at all or in very low percentages include Golden Delicious, Northern Spy, East Malling IX and East Malling XVI apple, Texas almond, peach-almond hybrid, and Farmingdale pear.

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California Agriculture, May, 1956, page 7, published a description of mist equipment.

DONATIONS FOR AGRICULTURAL RESEARCH

Gifts to the University of California for research by the Division of Agricultural Sciences accepted in May, 1957

BERKELEY

California Spray Chemical Corporation $10,000.00
For research on phosphate fertilizers with California soils

Nopco Chemical Co. ..... 2 lbs. vitamin-mineral feed supplement
For research on influence of diet during growth period on a skeletal abnormality in poultry

Pennsylvania Salt Manufacturing Company of Washington ..... 17 gals. Penco Sytan
For walnut insect investigations

Stauffer Chemical Co. $700.00
For research on control of mites and insects affecting deciduous fruit crops

DAVIS

American Cyanamid Company
Farm and Home Division ..... "Gemco" Blender seed treater
For treating seed with insecticide, fungicide, etc., for experimental field work

Charles Bach Company $200.00
For barley research

Beet Sugar Development Foundation $4,000.00
For research on nematode-plant relationships on sugar beets

California Committee on the Relationship of Electricity to Agriculture $5,400.00
For research on the use of electricity in agriculture

California Seed Association Research Committee .... 250 lbs. onion seed
For research on seed storage in sealed containers (Erroneously reported in April as received from Northrup-King & Company)

Chemical Process Company .... 2 folders on Duolite ion exchange resins
For research in food technology

The Cryovac Company $2,500.00
For studies on microbiology of prestuffed poultry

The Dow Chemical Company $200.00
For experimental aircraft spraying of brush

Herman Frasch Foundation $2,500.00
For research on the effect of environment on the chemical constitution of plants in relation to disease and pest resistance (1st of five annual payments) (The above was acknowledged in April, 1957 but the full grant is for $10,000 annually on a 5-year basis, subject to review and approval of progress each year.)

National Can Corporation
Cans and ends not to exceed value of $1,000.00
For experimental use in the pilot food processing plant

R. O. Robinson, Jr. ..... 2-#80 Rainbird sprinklers
1-#80 Special Rainbird sprinkler
For water application studies

Saratoga Horticultural Foundation
10 specimen plants in 1-gal. containers
For studies in landscape management

Stecher-Traung Lithograph Corporation
1 bundle (2,000) stock #1141 utility labels
For studies in food technology

Sugar Research Foundation, Inc.
For study on effects of sweetness on the consumers acceptance of apricots, pears and peaches $2,000.00
For project to determine consumer acceptance and preferance for sucrose sweetened wines ..... $ 750.00
For study of the role of sweetener in food preservation $1,125.00

Syntex Animal Products $1,500.00
For study of progesterone and other progestational hormones in heifers and cows of the beef cattle breeds

Zonolite Company $750.00
For research work on control of insects through the use of solid carriers of toxicants applied to either soil or sand

LOS ANGELES

Eli Lilly and Company $5,500.00
For research on gibberellic acid

Naugatuck Chemical $1,150.00
For research on factors affecting the abscission process in relation to defoliation in cotton

U. S. Golf Association Green Section $500.00
For research on cool season and warm season grass combination studies

RIVERSIDE

American Potash Institute $1,500.00
For soil and fertilizer research on vegetable crops in southern California

Chemagro Corporation $3,000.00
For research on insecticidal effectiveness, residual behavior and mechanisms of action of Syston, Guthion, Dylox, Di-Syston and Bayer 21/199 and perhaps certain derivatives of these materials (1st payment of total of $6,000.00)

Shell Chemical Corporation $3,000.00
For research on residues of pesticidal chemicals

Thompson Chemicals Corp. ..... 1 gal. Fruit Fix Super CONC 800
For experimental fruit quality work on oranges