Auxins for Hardwood Cuttings

effect of root-promoting hormones in propagating fruit trees by hardwood cuttings studied during past three seasons

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Hardwood cuttings of five species of fruit trees, Marianna 2624 plum, Angers quince, Stockton Morello cherry, Malling-Merton 793 apple, and Mission olive, were used in propagation tests to study the effects of various root-promoting hormones—auxins—applied under several different conditions.

Marianna 2624 plum is a commonly used rootstock for a number of the stone fruit species; the 2624 selection is a seedling of the parent Marianna plum, presumably an open-pollinated cross of *Prunus cerasifera* and *P. munsoniana*. This rootstock is propagated commercially by hardwood cuttings, but in heavy soils considerable difficulty is often experienced in obtaining satisfactory rooting.

Angers quince—*Cydonia oblonga*—has long been used as a dwarfing rootstock for certain of the pear varieties. It is commercially propagated by hardwood cuttings.

Stockton Morello cherry—*Prunus cerasus*—is used to a considerable extent in California as a semidwarfing rootstock for the sweet cherry and is propagated commercially by suckers arising around the base of older trees. It would be desirable to be able to propagate this stock by cuttings. In all the tests conducted with this variety, however, not one hardwood cutting was induced to root. Later studies have shown that it can be easily rooted under mist humidification by softwood cuttings taken from actively growing shoots if treated with indolebutyric acid.

The Malling-Merton 793 apple—*Malus sylvestris*—is a newly developed clonal apple rootstock from England which is usually propagated by some method of layering. Like the Stockton Morello cherry, none of the hardwood cuttings of this stock rooted under any treatment.

The olive—*Olea europaea*—is often propagated by hardwood cuttings but several years are usually required before an adequately rooted nursery tree is obtained.

During the 1952 and 1953 seasons, tests were made of the effectiveness of three root-promoting hormones—indolebutyric acid, naphthaleneacetic acid, and indoleacetic acid—at several concentra-

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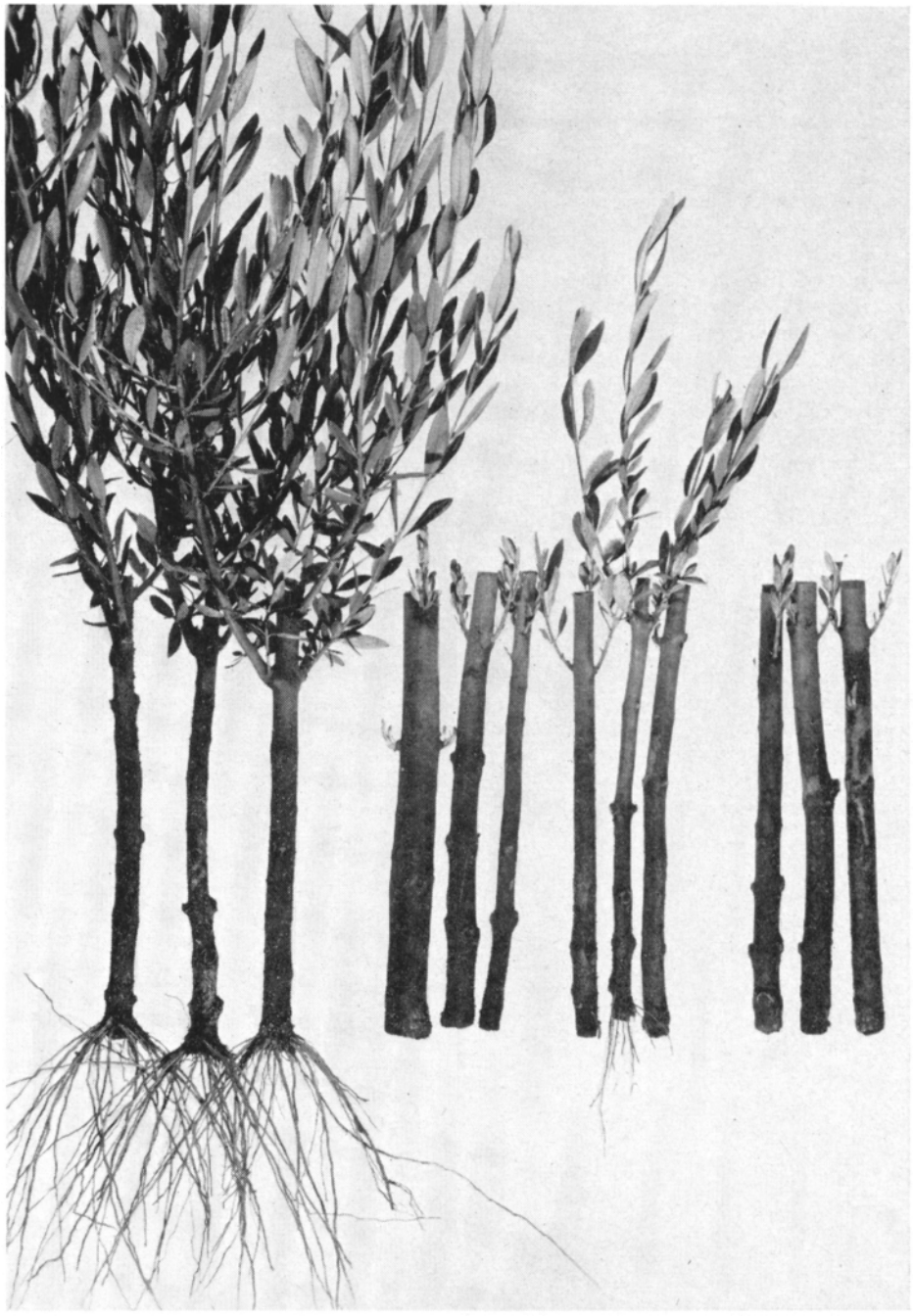

Effect of a root-promoting hormone and a preplanting storage treatment on the rooting and growth of hardwood Mission olive cuttings. *Left to right:* 1, Cuttings treated with indolebutyric acid, 15 ppm., for 24 hours, followed by storage in moist sawdust for 30 days before planting. 2, Same as 1 but without the hormone treatment. 3, Same as 1 but no preplanting storage treatment. 4, No hormone or preplanting storage treatment. Cuttings planted April 2, 1954; dug December 28, 1954.

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tions. With Marianna 2624 plum it was found that soaking the bases of the cuttings in an indolebutyric acid solution at a concentration of 45 ppm—parts per million—for 24 hours was quite effective in stimulating root initiation. In the olive this same material, but at a concentration of 15 ppm, strongly promoted rooting. The quince showed no benefits from hormone applications; it rooted fairly easily with or without such treatments. This is probably because the quince is known to have preformed root initials—incipient roots—present in the stems before the cuttings are made. Since the principal value of hormone treatments is in stimulating the production of root initials in stem tissue, it would not be expected to help in the quince where, at least in some varieties, these root initials are already present.

In the 1952 and 1953 studies, cuttings were also taken at various times during the dormant period and treated with the hormones at different times in relation to the storage and planting dates. Various storage temperatures, both before and after the hormone treatment, were also tried.

Treatment

In general, with the Marianna 2624 plum, the best treatment consisted of obtaining the cutting material at any time during the dormant season and holding it under cold storage at 32F, packed with moist peat moss, until a month before it was to be planted in the nursery row. The cutting wood was then made into cuttings in the usual way, about 8″ long, with the basal cut just below a node. Following this, the cuttings were made into bundles and placed to soak in a 45 ppm solution of indolebutyric acid for 24 hours with the basal 1″ of the cuttings immersed.

Preplanting Storage

After the hormone treatment, the bundles of cuttings were stored in well-ventilated boxes, loosely packed in a mixture of moist wood shavings and peat moss, and held at a temperature of 50F for 30 days, after which they were set in the nursery row.

During the preplanting storage period following the hormone treatment, root initials are presumably formed and are ready to push into active growth shortly after the cuttings are planted. If roots and shoots start developing on the cuttings during the preplanting treatment, the cuttings should either be planted immediately or moved to lower storage temperature, to retard root and shoot development pending the time they can be planted.

The same treatment—as for the Marianna 2624—was effective in rooting the olive, except that the cutting material should not be stored for any length of time at 32F. Much better results were obtained when the cutting material was taken at the time the cuttings were to be treated with the hormone—just before the preplanting 30-day storage period.

In rooting quince cuttings, the preplanting storage period, like the hormone treatment, was not beneficial. The

Effect of auxin (indolebutyric acid), preplanting storage period, and type of cutting on the rooting of leafless hardwood Marianna 2624 plum and Angers quince cuttings. Cutting material gathered December 11, 1953; planted April 2, 1954. Average of 30 cuttings per treatment.

Treatment	Type of Cutting	Cuttings rooted	
		Marianna 2624 plum	Angers quince
		%	%
IBA 45 ppm.; 30 days at 50F before planting	Heel	71	74
	Basal	73	41
	Hyperbasal	45	15
	Subterminal	30	18
	Terminal	33	15
IBA 45 ppm.; no preplanting storage period	Heel	17	89
	Basal	56	73
	Hyperbasal	40	67
	Subterminal	33	26
	Terminal	35	26
Check (no auxin); 30 days at 50F before planting	Heel	3	76
	Basal	0	71
	Hyperbasal	0	48
	Subterminal	0	37
	Terminal	0	28
Check (no auxin); no preplanting storage period	Heel	0	100
	Basal	0	68
	Hyperbasal	0	55
	Subterminal	0	20
	Terminal	0	24

Effect of variety on the rooting of quince hardwood cuttings. Cutting material gathered December 17, 1953, stored at 32F. Made into cuttings March 3, 1954, stored at 50F until April 2, 1954, then planted. No auxin treatment. Average of 30 cuttings per treatment.

Variety	Cuttings rooted			
	Basal	Hyperbasal	Subterminal	Terminal
	%	%	%	%
West Mammoth	83	86	67	30
Rea	72	73	42	15
Angers	71	48	37	28
Burbank	59	52	12	12
Apple	33	37	17	0
Pineapple	23	8	0	0
de Antequera (P.I. No. 33214)	14	0	10	0
de Bourgeat	6	0	0	0

Effect of auxin (indolebutyric acid) and preplanting storage period on the rooting of leafless hardwood Mission olive cuttings. Planted April 2, 1954. Dug December 28, 1954. Average of 30 cuttings per treatment.

Treatment	Rooted	Average no. roots per cutting	Average root length	Average length of new shoots
	%		cms.	cms.
IBA 15 ppm., 30 days at 50F before planting	78	22	11	113
IBA 15 ppm.; no preplanting storage period	16	9	6	29
Check (no auxin); 30 days at 50F before planting	2	5	15	11
Check (no auxin); no preplanting storage period	2	4	8	7

Marianna 2624 plum nursery stock propagated by hardwood cuttings in a heavy soil. *Left:* Before planting, these cuttings were treated with indolebutyric acid at 45 ppm for 24 hours, followed by a 30-day storage period at 50 F. *Right:* Check; no preplanting treatments. Cuttings planted April 2, 1954. Photographed September 1, 1954.