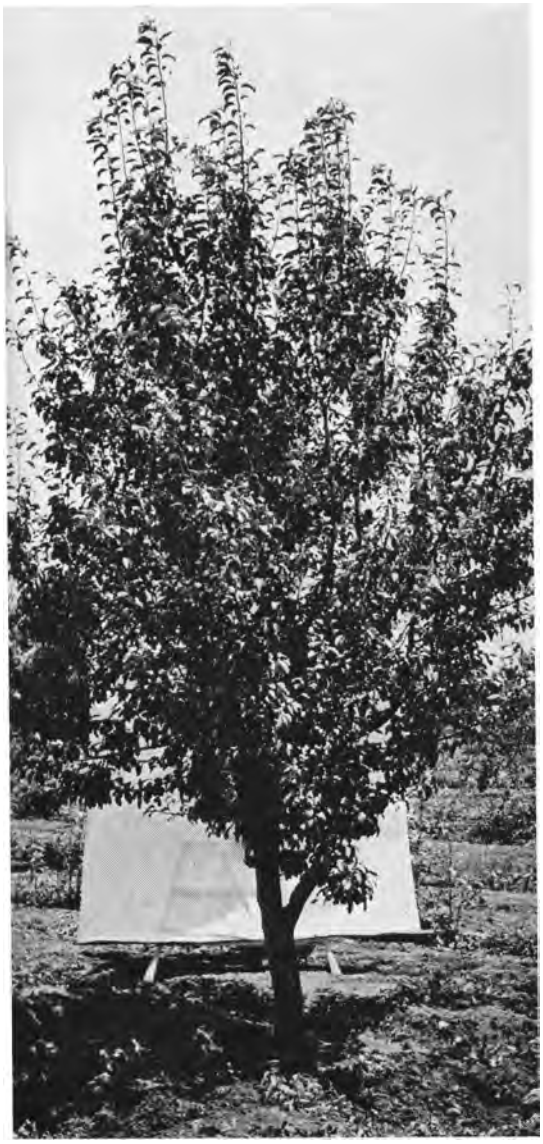
Hudson T. Hartmann, William H. Griggs, and Carl J. Hansen

Old Home pear

Rootstock Propagated

by hardwood cuttings



ght: Vigorous Old Home tree. Both trees orig- ots. Photographed July, 1960.

relatively small Old Home root, but it did have a number of vigorous quince suckers arising from the roots. An examination revealed that none of the trees in the pear variety collection that had vigorous suckers showed decline.

Of the 145 trees top-worked to commercial varieties, only one, No. 8-15, showed symptoms of decline during the spring of 1960. That tree was more severely affected than the Old Home trees which had not been top-worked; it showed collapse on June 20 and by July 19, it was apparently dead. The tree had not developed any Old Home roots. The healthy trees—No. 4-3 and No. 3-6—top-

Concluded on next page

Old Home pear—*Pyrus communis*—rootstock can be propagated readily in commercial quantities by hardwood cuttings taken in the fall, treated with IBA—indolebutyric acid—and held under moist storage at 65°–70°F for about three weeks before planting. To take advantage of the Old Home blight-resistant properties, trees can be planted in place in the orchard and, after the trunk and primary scaffold branches are established, top-budded to Bartlett or other fruiting varieties.

Pear trees known to be directly on Old Home roots have not shown, so far, symptoms of pear decline, which first appeared in British Columbia, Washington and Oregon, then later—March 1959—in California. In many instances, Old Home has been used as a pear rootstock by grafting it on quince as an initial nurse root, then planting the tree deeply so that the permanent root system develops from roots arising from the Old Home stock.

Preliminary studies in 1957 showed that after certain growth regulator applications to hardwood cuttings of Old Home, followed by pre-planting warm storage treatments, rooting could be obtained in commercially useful percentages. Further tests with hardwood cuttings of Old Home and Bartlett pear were conducted during the 1959–60 season. The Bartlett variety was included in the rooting tests because—if the pear decline trouble involves a graft union disorder—Bartlett trees propagated on their own roots might be a means of overcoming the disease.

Hardwood cuttings of Old Home and Bartlett varieties were made from previous season's shoots collected on November 16 and December 15, 1959, and on January 15, 1960. The cuttings were prepared by tying the shoots, mostly ¼″ in diameter, into bundles of about 100 sticks each and sawing them to an 8″ length with a band saw. The smaller terminal growth and larger basal sections were discarded.

At each collection date cuttings of uniform size were separated for three different treatments. Three concentrations of IBA—100, 200, and 300 parts per million—with 75 cuttings per concentration, were used in each treatment.

In Treatment *1*, the basal ½″ of the cuttings was soaked in IBA for 24 hours, then planted immediately in the nursery row. In Treatment *2*, the cuttings were soaked as in Treatment *1*, then placed in orchard lug boxes filled with slightly damp peat moss and held at room temperature—65°F to 70°F—until the first evidence of roots appeared, in about three weeks, and then planted in the nursery row.

In Treatment *3*, the cuttings were treated with IBA as in Treatments *1* and *2*, then placed upright in orchard lug boxes three-fourths filled with damp peat moss. The basal half of the cuttings was inserted into the peat moss while the upper half was exposed to the air. The lug boxes were placed over an electric heating cable system set up in an unheated, out-of-door covered shed with open sides. At the first appearance of

Concluded on next page

Percentage of Old Home Pear Hardwood Cuttings which Produced Vigorous Nursery Trees. Counts Made July 5, 1960

(Each value is based upon 75 cuttings)

Treatment	Collected	Rooted cuttings		
		100*	200*	300*
1				
Treated with IBA and planted at once	Nov. 16, 1959	1.3%	2.6%	2.6%
	Dec. 15, 1959	1.3	0.0	0.0
	Jan. 15, 1960	0.0	0.0	0.0
2				
Treated with IBA, held in warm (65°F) storage approx. 3 weeks, then planted	Nov. 16, 1959	37.3	53.3	42.7
	Dec. 15, 1959	24.3	35.1	24.3
	Jan. 15, 1960	0.0	13.5	8.1
3				
Treated with IBA; held for 3 weeks with base of cuttings over bottom heat but with tops cool, then planted	Nov. 16, 1959	4.0	33.3	22.7
	Dec. 15, 1959	..	...	...
	Jan. 15, 1960	..	...	...

* Base of cuttings soaked in IBA solutions of 100 ppm, 200 ppm, and 300 ppm for 24 hours.

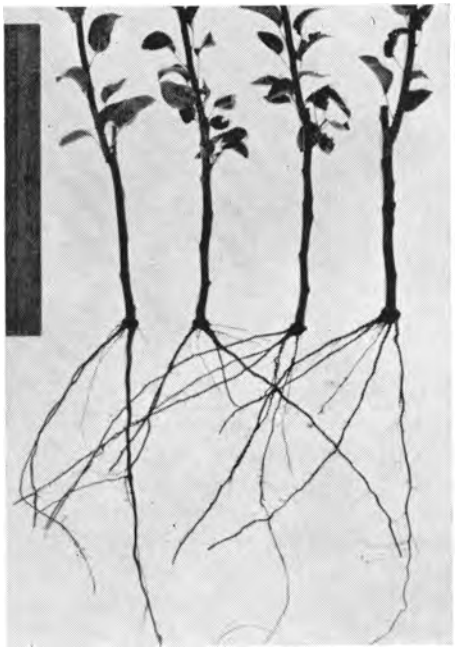
ROOTSTOCKS

Continued from preceding page

roots, the cuttings were removed from the boxes and planted in the nursery row. Treatment *3*, tried only with the cuttings collected November 16, was intended to provide relatively high temperatures—about 70°F—at the base of the cuttings, to stimulate root formation, while holding the buds at the top of the cuttings under the normal winter-chilling conditions.

Before planting, the soil was prepared to a depth of about 10″ with a rototiller. In Treatment *1*, the 8″ cuttings were inserted in the soil by hand, leaving about 1″ of the cutting exposed. In Treatments *2* and *3*, where callus had developed and, in some instances, root protuberances, a trench was dug and the cuttings carefully put in place to the same depth for each treatment.

On July 5, 1960, counts were made of the cuttings which had developed into vigorous nursery trees. Best rooting of Old Home pear cuttings occurred when they were taken in mid-November, treated with IBA at 200 ppm, held in damp peat moss at 65°–70°F for about three weeks, then planted. Cuttings taken December 15 and January 15 also rooted but in lower percentages. A concentration of 200 ppm of IBA consistently gave higher percentages of rooting than either



Root system produced by the Old Home pear nursery trees. July 19, 1960.

100 ppm or 300 ppm. No untreated controls were used in these tests because earlier studies had demonstrated that without the IBA treatment no rooting occurred.

The relatively high pre-planting temperatures in Treatment 2 probably stimulated development of root initials much more rapidly than the lower temperatures occurring in the soil at the time of year the cuttings were made. This undoubtedly accounted for the good results obtained with this treatment.

The 3-week period at 65°F in Treatment *2* did not force the buds into growth because, at the time of year the cuttings were made, the buds would still be in the physiological rest period or they would not have been exposed to enough winter chilling to break the rest influence. The beneficial influence of high temperatures at the base of the cuttings in inducing root formation is also indicated in Treatment *3*, where fairly good rooting occurred.

Hardwood cuttings of Bartlett pear proved to be much more difficult to root than those of Old Home. In only two treatments did rooting of Bartlett occur and these were in low percentages. In cuttings collected November 16, treated with IBA at 300 ppm, and held in warm storage for three weeks before planting, only 3% rooting was obtained. Also, in cuttings collected on the same day, treated with IBA at 200 ppm, and held over bottom heat—Treatment *3*—for three weeks before planting, only 3% rooting occurred.

Hudson T. Hartmann is Professor of Pomology, University of California, Davis.
William H. Griggs is Professor of Pomology, University of California, Davis.
Carl J. Hansen is Professor of Pomology, University of California, Davis.
The above progress report is based on Research Project No. 1450.

RESISTANCE

Continued from preceding page

grafted to Winter Nelis and Hardy varieties, had more Old Home roots than the healthy trees which were not top-grafted. Cutting the Old Home trees back prior to top-grafting may stimulate the trunks to develop roots above the union.

In a demonstration orchard at Davis, a number of Old Home trees propagated on either quince or domestic pear seedling roots are planted each year. Early in June, 1960, five of the trees planted from 1953 through 1956, started showing typical symptoms of pear decline. By July 6, three of the trees had severe symptoms of decline and by July 23 they appeared to be dying. On July 6 and 8 the roots of the five sick trees were exposed by washing the soil away with the high pressure sprayer. The roots of five comparable, but healthy, trees were exposed also. The table on this page shows the amount and development of Old Home roots which had developed above the quince roots and their relation to the health of these trees. All of the trees had several quince roots ranging from ½″ to 1½″ in diameter at their points of origin.

Root Systems of Declining and Healthy Old Home Pear Trees on Quince Roots
Demonstration Orchard, Davis

Tree	Year planted	Tree condition July, 1960	Old Home roots above graft union	
			Number	Diameter at origin
#17–1	1953	Severe decline	0	
17–1	1955	Severe decline	0	
17–6	1955	Decline	1	5/16″
17–7	1955	Severe decline	0	
17–1	1956	Moderate decline	0	
17–8	1953	Vigorous	3	3½″, 4″, 6½″
17–2	1955	Vigorous	3	½″, 1½″, 3″
17–4	1955	Moderately vigorous	1	1¼″
17–8	1955	Moderately vigorous	1	1½″
17–2	1956	Moderately vigorous	1	4″

Four of the five demonstration orchard Old Home trees showing decline had developed no roots above the graft unions. Tree No. 17-6 had developed only one root—the diameter of a pencil—above the union. All healthy trees had developed from one to three Old Home roots above the graft unions. There was an obvious positive correlation between the number and size of the Old Home roots and the size and vigor of the tree.

A few mature Bartlett pear trees, topworked on Old Home framework growing on French seedling roots, which have succumbed to decline in California have been examined and no roots above the graft union were found. This is further evidence that Old Home is resistant to the pear decline only if it has developed vigorous roots above the graft union.

William H. Griggs is Professor of Pomology, University of California, Davis.
Hudson T. Hartmann is Professor of Pomology, University of California, Davis.
The above progress report is based on Research Project No. 1450.