GRAFTING AND CUTTING PROPAGATION OF PECANS

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Pecan orchards are often established by planting either grafted or seedling trees. Orchard establishment using grafted trees may reduce the time required for fruit production, and no grafting knowledge is necessary. However, grafted trees are more expensive, and cold damage to grafted trees may cause loss of the scion with resprouting from the rootstock. Scion death requires regrafting, which would then delay production. Seedling trees are inexpensive compared to grafted trees; but because additional labor and expertise are necessary for grafting, growers usually prefer to purchase grafted trees. However, a major problem with grafted pecan trees is lack of cold hardiness.

Cold Damage. Cold damage to young pecan trees most often occurs on the trunk near the soil line in the fall. Moderately damaged trees develop vertical splits in the bark, with loss of phloem and cambium in the damaged area. Severely damaged trees may be completely girdled, resulting in the loss of the top and resprouting from the roots. Normally, this type of cold damage does not occur after the trees are 4 to 6 years old.

Pecan rootstocks are produced from open-pollinated seed and, therefore, are very diverse in cold damage susceptibility, tree vigor, and other characteristics. However, seed from certain open-pollinated female parents have shown greater cold hardiness than other selections. Hinrichs (1) reported that 1-year-old trees of 'Stuart' grafted to either 'Giles', 'Indiana', or 'Major' seedling rootstocks were not damaged when exposed to low temperatures in the fall (Table 1). Damage to 'Stuart' trees on other rootstocks ranged from 33 to 83% of the trees damaged. Cold injury on many of these trees was severe enough to kill the tops, with the rootstock resprouting. Trees grafted on 'Giles' seedling rootstock were larger after 5 years than trees on 'Indiana' or 'Major' seedling rootstocks. The largest trees were those on 'Mahan' seedling rootstocks, but 33% of the trees were damaged by fall freezes.

Madden (2) has also reported that the rootstock affects the cold hardiness of pecan trees. He evaluated 'Wichita' and 'Choctaw' trees grafted on 'Apache' or 'Riverside' seedling rootstock. Both cultivars were more cold-hardy on the 'Apache' seedling rootstock than 'Riverside' seedling rootstock (Table 2).

The graft height on the rootstock also has a significant influence on the cold hardiness of the tree. Most fall cold injury to young trees occurs at or near the soil line. By grafting the scion

Table 1. Effect of rootstock on cold damage and growth of 'Stuart' pecan trees in 1960.[1]

Source of seedling rootstocks	Trees damaged Fall, 1961 (%)	Tree height Jan., 1965 (ft.)
'Giles'	0	10.1
'Indiana'	0	9.5
'Major'	0	9.2
'Success'	33	9.6
'Patrick'	33	8.2
'Mahan'	33	12.8
'Green River'	33	8.0
'Stuart'	50	10.4
'Burkett'	50	10.1
'Western'	67	9.2
'Dodd'	67	11.8
'Niblack'	67	9.8
'Love'	67	10.9
'Dooley'	83	7.6

[1]Hinrichs, H. A. 1965. *Proc. Northern Nut Growers' Assoc.* 56:44–51.

Table 2. Effect of rootstock on cold damage of 4-year-old grafted 'Choctaw' and 'Wichita'[1] pecan trees.

Scion cultivar	Source of seedling rootstock	No. trees observed	Trees damaged Fall, 1976 (%)
'Wichita'	'Apache'	83	12.1
'Wichita'	'Riverside'	81	37.0
'Choctaw'	'Apache'	60	8.3
'Choctaw'	'Riverside'	100	39.0

[1]Madden, G. 1978. *Pecan Quarterly.* 12:17.

Table 3. Effect of trunk type on cold damage of 1-year-old 'Gloria Grande' and 'Sumner' pecan trees.[1]

Trunk type[2]	Scion cultivar	No. trees examined	Trees damaged (%)
Juvenile	'Gloria Grande'	125	0.8
Adult	'Gloria Grande'	106	47.2
Juvenile	'Sumner'	700	0.4
Adult	'Sumner'	211	80.6

[1]Sparks, D. and J. A. Payne. 1977. *HortScience.* 12:497–498.

[2]Trees with juvenile trunks grafted into root 12 to 18 in. above soil line. Adult trunk grafted 3 to 4 inches below soil line.

higher on the rootstock, the hardy juvenile rootstock is in the area most frequently damaged. Sparks and Payne (4) reduced cold injury by over 45% by grafting the scion 12 to 18 in. above the soil line (Table 3). Pecan producers that have had frequent cold damage on nursery grafted trees (those grafted at the soil line), are establishing seedling trees in their orchard, then grafting them 2 to 3 ft above the soil line to avoid cold damage.

Scionwood. Healthy scion wood is essential to successful propagation of pecans. Whip-or-tongue, 4-flap, and inlay bark grafts require scionwood that is collected while dormant. Scionwood is usually collected in February, then stored moist at 34°F in polyethylene bags. One problem frequently encountered is damage to trees from exposure to midwinter cold before the scions are collected. This damage may not affect tree growth or production, but graft survival can be reduced. Therefore, we evaluated scions from several collection dates to determine if scions could be collected before cold damage occurred. This would require scions to be stored up to 3 months longer.

Scionwood was collected from 'Mount' and 'Squirrel' cultivars monthly from November 15, 1983, through March 15, 1984, and stored in polyethylene bags with a moist paper towel at 34°F until evaluated. Scion viability was evaluated by grafting 15 trees of each cultivar using the 4-flap graft, then recording scion survival.

Scion survival of 'Squirrel' was not significantly different among the December through March collection dates (Figure 1). No 'Squirrel' grafts survived when scions were collected in November. Fewer grafts of 'Mount' lived when collected in November than February, but there were no significant differences among the other collection dates.

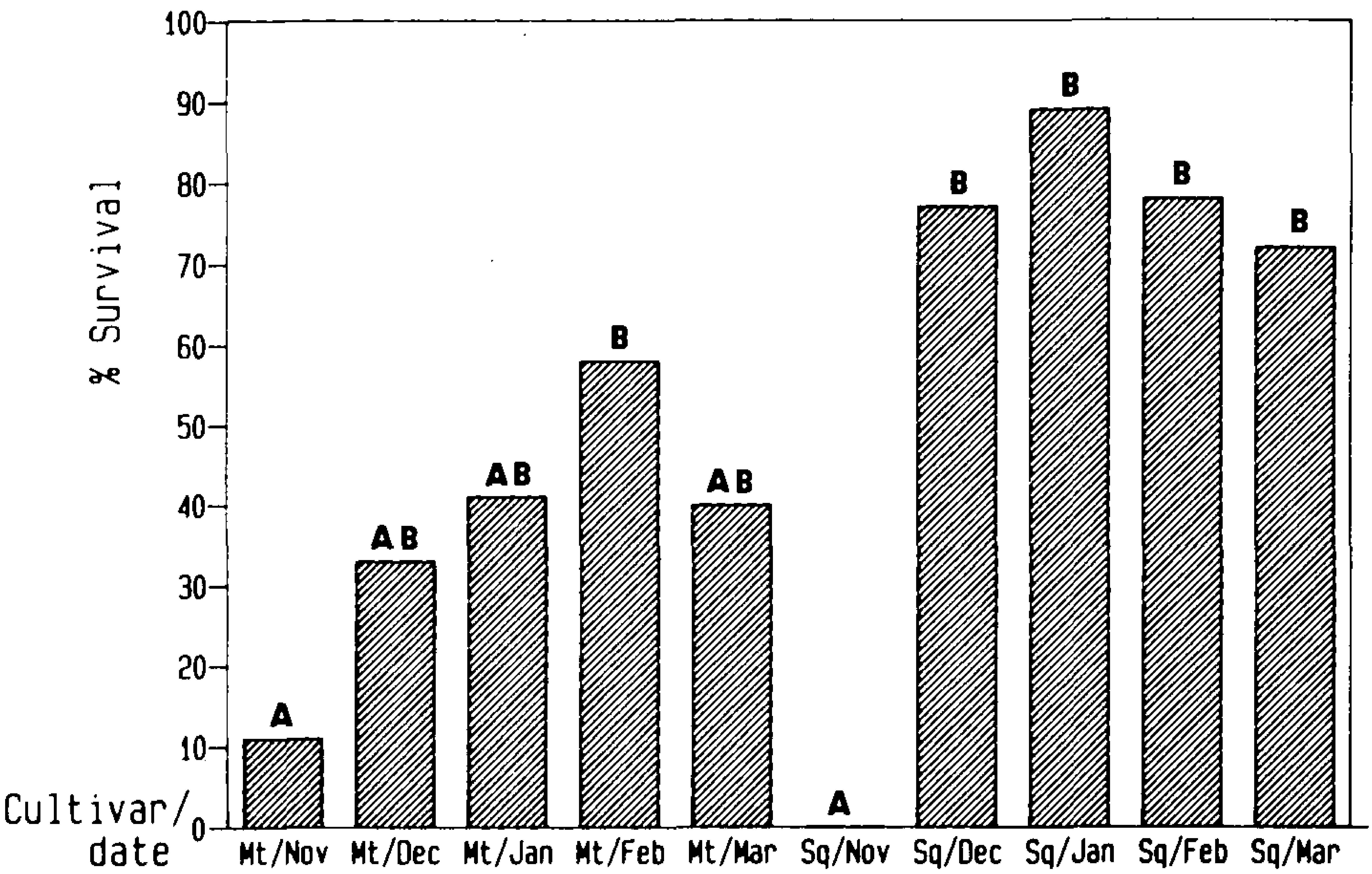

Figure 1. The influence of scion collection date on scion survival when grafted using the 4-flap graft. Mean separation within cultivars using Duncan's multiple range test, 5% level.

The 1983–84 winter was mild, and no scionwood had cold damage from any collection date. However, these results suggest that scion collection in mid-December may be possible to avoid cold damage. Defoliation from frost had occurred November 12 and wood was collected November 15. November scion collection was not successful, indicating that the trees were not sufficiently dormant to allow long term wood storage.

Pecan Rooting. Performance of pecan trees could be improved by selecting rootstocks with desirable traits. However, the inability to propagate pecans asexually prevents the production of uniform rootstocks with desirable characteristics. Therefore, a study was conducted to evaluate the effects of collection date, indole-3-butyric acid (IBA) concentration, and wood type on rooting of pecan cuttings (3).

Juvenile cuttings, from sprouts of 20-year-old seedling trees cut 2 in. above the soil line, as well as adult cuttings taken from vegetative growth in the upper portion of 15-year-old 'Western' trees, were used in factorial combination with four concentrations of IBA. Cuttings were taken on the 15th of February, April, June, August, October, and December to evaluate seasonal changes in rootability. Cuttings 8 inches long were taken from lateral shoots of 1-year-old wood in February and April and from current season's growth in June, August, October, and December. The basal ends of the cuttings were dipped for 3 minutes in IBA solutions of 0, 0.5%, 1%, or 2% and placed under intermittent mist at 78°F. The propagation medium was equal parts of sphagnum peat moss and perlite in 950 ml containers. Cuttings were evaluated for rooting after 90 days. A randomized complete block design with seven replications and three subsamples was used.

Juvenile cuttings rooted better than adult cuttings at most IBA concentrations when cuttings were taken during February, June, or August (Table 4). The rooting percentage of juvenile cuttings was highest during February. Rooting percentage of juvenile and adult cuttings was greatest using 0.5% or 1% IBA.

Lack of rooting during April, October, and December was associated with the absence of foliage on the cutting. Cuttings made during February were dormant, but buds began growth within 2 weeks when placed in the greenhouse. April cuttings had young shoots, but the shoots rapidly abscised. June and August cuttings retained a portion of their foliage, possibly because they were more mature. Senescence had begun in October, and cuttings defoliated soon after being placed under mist. December cuttings did not initiate new growth. Thus, cuttings from February, June and August had foliage, and these were the only treatments in which significant rooting occurred.

Results indicate that both juvenile and adult pecan cuttings can be rooted during certain times of the year. However, the rooting percentages may not be commercially acceptable. Furthermore, cuttings were difficult to establish, once rooted.

Table 4. The interaction of cutting source and IBA concentration on rooting of pecan cuttings.

Cutting date	IBA concn.	Rooting Cutting source Juvenile	Adult
February 15	0 %	38%	0%
	0.5	71	5
	1.0	52	5
	2.0	29	0
April 15	0	0	0
	0.5	5	0
	1.0	0	0
	2.0	0	10
August 15	0	0	0
	0.5	10	33
	1.0	29	19
	2.0	10	10
October 15	0	0	0
	0.5	0	0
	1.0	0	0
	2.0	0	0
December 15	0	0	0
	0.5	0	0
	1.0	0	0
	2.0	5	0

LITERATURE CITED

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4. Sparks, D. and J. A. Payne. 1977. Freeze injury susceptibility of non-juvenile trunks in pecan. *HortScience.* 12:497–498.