TECHNIQUES FOR ROOTING ASPEN ROOT SPROUTS

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The Aspen Genetics and Tree Improvement program of the Institute of Paper Chemistry (IPC) has had the problem of vegetatively propagating selected and improved individuals of various *Populus* species and hybrids for a number of years. With a growing interest in these materials, a number of others have the same problem. As these materials come into use, perpetuating the individual becomes more important silviculturally because it allows a known clone or, preferably, clones to be established as a stand with highly predictable results. Cottonwood-type materials root readily from dormant cuttings, but aspens root poorly if at all from dormant cuttings. An exception is P. *alba* and its hybrids, which generally root with reasonable ease.

This paper is a summary of the experience obtained and minor studies performed on rooting aspen sprouts at the IPC since 1956. The procedures described have been used for large-scale production of selected clones. The procedure is one originally described by C. Muhle Larsen (3). His technique utilized sections of roots kept in sphagnum to force adventitious buds to break. The resulting shoot was cut from the root and treated as a succulent cutting. The succulent shoots root quite readily for most of the aspens. Succulent tips from growing aspen have also been rooted with some success using this technique.

Treatment of Roots

The control of pathogens is important in the success of this method. Therefore working with clean tools and sterile sprouting medium is desirable.

Younger roots under 1 inch in diameter generally produce more shoots than old or larger roots. The roots are brought into the greenhouse, scrubbed clean, cut into lengths 6 inches or less, dipped in a standard captan solution,[2] the cut and wounded parts coated with a microcrystalline wax, and the sections put into a sterilized 1: 1 volume mixture of sand and vermiculite that just covers the roots. The sprouting media are kept as dry as possible without desiccating the roots. Keeping the media dry, using the captan dip, and waxing the root wounds prevents pathogens from attacking the roots and sprouts. When the sprouts are 1 to 2 inches long with two developing leaves, they should be severed from the root and handled as a succulent cutting (fig. 1). Sprouts can be removed from the roots from the second to sixth week after starting. Conditions may prolong this period. Generally, one sprout per inch of root can be expected. Three sprouts per inch of root have been produced on occasion.

Early work at the Institute showed fall to be the ideal time to collect roots for sprout production. But root collections made at any time during the year resulted in reasonable sprouting.

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2 1½ tablespoons of Captan 50W per gallon of water.

Figure 1.—Aspen root sprouts ready to be severed from root section.

Rooting Root Sprouts

The best method of rooting the succulent root sprouts depends on the control of pathogens. This too is accomplished by using clean tools, sterilizing the rooting media, and controlling the media moisture. Here also a 1 :1 sand-vermiculite mixture is the media used, the sprouts being sprayed with a captan solution or dipped in a 4-percent thiram talc to control pathogens. Hormones can also be used. One of the simplest means of controlling moisture is to seal the rooting container in a polyethylene bag (fig. 2) and check it one to three times a week. The use of saucers, as shown, rather than larger flats allows better control of pathogens. This procedure generally speeds rooting of the sprouts, which are ready to transplant in 2-3 weeks (fig. 3). Sprouts transplanted into nursery beds can reach plantable size in one season (fig. 4). With reasonable care in applying the described technique, a 70-90-percent rooting success for most of the aspens can be expected. An exception is *Populus grandidentata,* the most difficult of the aspens to root from root sprouts. This species appears to be slower to root and more susceptible to pathogenic problems than the others.

Hormones

Limited work has been done using hormones to promote rooting of aspen cuttings. Farmer (2) describes work using indolebutyric acid (IBA) at 20, 50, and 100 p.p.m. He increased rooting percent as the IBA levels increased. He also mentions critical problems with "fungal infections and subsequent mor

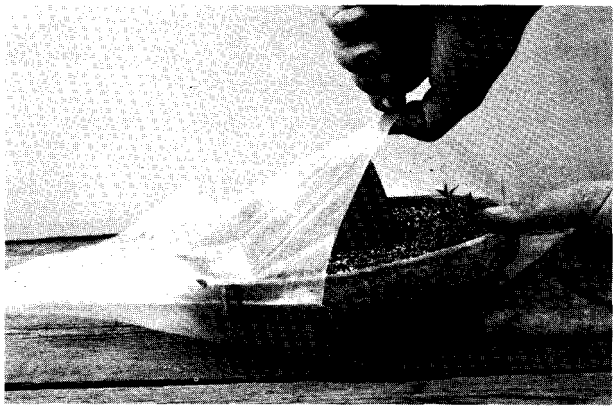

Figure 2.—Root sprouts being sealed in polyethylene bag. Bag maintains a favorable environment for root development.

Figure 3.—Rooted sprout after 2 weeks in bag.

tality." Barry *et al.* (1) in their work used IBA quick dips starting at 1,000 p.p.m. and found their lowest level (1,000 p.p.m.) had the most vigorous root systems. They also found "the effects of IBA concentration vary from time of year and maturation of wood." Soaks and talc preparations of indolebutyric acid (IBA) at 300 p.p.m., naphthalene acidic acid (NAA) at 500 p.p.m., and citric acid (CA) at 5-percent have been tried at the IPC with improved rooting percentages evident in singular tests. While better root systems generally developed with hormone treat-

Figure 4.—Rooted root sprouts transplanted to nursery beds in June and pictured near end of first growing season.

ments, the percentage of shoots rooting was not always increased. The use of fungicides on the sprouts and rooting media probably has a greater influence than hormones toward the percentage of stem rooting.

Storage of Roots and Sprouts

Since ground condition is unpredictable in spring, and since spring is also a very busy time for the nurseryman, a study was conducted to determine whether propagation by rooting root sprouts could be done during the winter. Propagation programs initiated in late November or early December in a greenhouse produced rooted sprouts quite readily but necessitated their being kept in the greenhouse in pots, thus a space problem developed. This was not satisfactory for the production of large numbers of trees.

The possibility of storing roots for a later start was investigated. Roots collected in November, packed in sand in a polyethylene package, and kept in either an unheated building or an area refrigerated between 30-40° F. could be successfully started any time from November through March. Storage in a deep freeze killed the roots.

Roots processed in February or March result in a large number of large plants, which must be kept indoors until frost danger is past. The possibility was explored of holding rooted sprouts in their rooting saucers and delaying the transplanting to growing positions. By limiting water and fertilizer, the sprouts could be kept alive at a small size for up to 2 months in the sand-vermiculite mixture without adverse effects.

Conclusions

The above techniques for producing aspen rooted sprouts give a fairly complete but flexible system for vegetatively propagating large numbers of aspen individuals. Roots can be collected in the fall, started in late February or March, and the resulting sprouts held as small rooted sprouts until they can be transplanted to nursery beds when the danger of frost is past. Large numbers of selected clonal planting stock can be produced in 1 year in this manner. When the trees are lifted and heeled-in in the fall, surplus roots can be collected, stored, and then used to repeat the cycle.

Literature Cited

1. Barry, W. J., and Sach, R. N.
   1968. Vegetative propagation of quaking aspen. Calif. Agriculture 22 (1): 14.
2. Farmer, R. E., Jr.
   1963. Vegetative propagation of aspen by greenwood cuttings. J. Forest. 61 (5): 385.
3. Muhle, Larsen, C.
   1943. Stiklinger of urteagtige skud paa r¢dder of baevreasp og graapopple. Dansk Skovforen Tidsskr. 28: 96-113.