ROOTING OF BRACHYBLAST CUTTINGS OF PINES IN KOREA

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ABSTRACT

Rooting of brachyblast cuttings (i.e., cuttings originating from needle fascicles) is a promising technique of vegetative propagation which can be applied to pines. The technique has some advantages in obtaining larger amounts of cutting material from a selected individual and easier rooting than the normal shoot cuttings. The latter advantage is considered to be due to the higher level of growth-promoting substances contained in brachyblast cuttings.

INTRODUCTION

Korea has a long history of cutting techniques as well as layering and grafting (Chung, 1826). It is, however, only since tree improvement work was initiated in 1953 that intensive experiments with cuttings from forest trees have developed. The purpose is clonal multiplication of superior trees.

Hyun and Yim (1956, 1957) investigated the effects of environmental factors upon rooting of cuttings of *Pinus densiflora* Sieb. and Zucc., *Pinus rigida* Mill., *Pinus koraiensis* Sieb. and Zucc., *Pinus strobus* L., *Pinus banksiana* Lamb., *Larix kaempferi* (Lamb.) Sarg., *Abies holophylla* Max., and *Picea abies* (L.) Karst. Yim (1958, 1961, 1962a) continued this work. Physiological studies on adventitious root formation by tree cuttings were also reported (Hong, 1969, 1972; Hyun, 1962, 1967; Hyun and Hong, 1968; Yim, 1962b). The application of the results of those experiments has greatly improved the rooting ability of the tree species listed. Rooting of conifers, however, is generally very difficult to obtain and success is still too low to allow mass production of clones.

One of the most important physiological factors affecting rootability of cuttings is thought to be juvenility associated with the age of the ortet. Hypocotyl cuttings of pines root easily (Hong and Hyun, 1970) even though pines are among the most difficult trees to root. Cuttings from pine trees older than three years, however, have shown a severe decrease in rooting ability (Yim, 1962b). On the other hand, up to 60% of cuttings originating from fascicle shoots of pines (brachyblast cuttings) rooted, even when the cuttings were collected from 9- to 12-year-old trees.

The present paper describes the promising technique of brachyblast cutting in pines, as applied in Korea.

EXPERIMENTAL METHODS

Brachyblast cuttings are prepared as follows: Terminal buds of both main stem and lateral branches of a pine tree are sheared 1 cm below the buds in mid-March (= early spring) in order to stimulate the development of fascicular buds which are latent. The fascicular buds break dormancy and grow actively as the growing season proceeds, developing into long shoots. Until the end of the growing season such long shoots are formed on the debudded tops of branches, resulting in a form of witches' broom. They remain on the tree until used as cutting material in the next spring.

Cuttings are collected in mid-March. They are cut to 4 to 5 cm in length and treated with a quick dip in 1.0% indole-3-butyric acid in talc. Clay balls are attached to the end of cuttings, covering the cut bases. The cuttings are then planted in a washed sand bed in a greenhouse equipped with a misting system which is operated to maintain a relative humidity of about 80%.

Rooting experiments with brachyblast and normal (i.e., originated from normal, not fascicular, shoots) cuttings of *Pinus thunbergiana* (Franco), *P. densiflora,* and *P. rigida* were made at the Institute of Forest Genetics, Suwon, Korea. Two types of cuttings were collected from each individual at the same time, and their rooting ability was compared.

RESULTS

The results presented in Table 1 show that brachyblast cuttings root better than normal cuttings. In some cases the brachyblast cuttings collected from 9- to 12-year-old pines show a rooting ability of 40% to 60%.

TABLE 1—Rooting percentages of brachyblast and normal cuttings from 9- to 12-year-old pines, 5 months after planting the cuttings in the greenhouse. Each replicate of a species comprised 20 cuttings.

Replication	P. densiflora		P. thunbergiana		P. rigida	
	Brachy-blast	Normal	Brachy-blast	Normal	Brachy-blast	Normal
1	40	20	40	5	40	10
2	15	5	40	5	10	5
3	60	20	5	5	15	5
4	40	5	40	20	5	0
mean	38.8*	12.5	35.0*	8.8	17.5	5.0

* Differs significantly from the normal cuttings at the 5% level by t test.

Table 2 shows the comparison of growth substance in the two kinds of cuttings (ratio total growth promoters: total inhibitors, in wheat coleoptile bioassay). The level of root-promoting substances was higher in brachyblast than in normal cuttings.

TABLE 2—Comparison of ratios of growth promoter: growth inhibitor in brachyblast and normal cuttings

	Species		
	P. densiflora	P. thunbergiana	P. rigida
Brachyblast	1.09	0.83	1.33
Normal	0.09	0.34	0.27

Brachyblast cuttings in pines have another advantage in that a larger number of cuttings can be obtained from a selected tree. The technique can be applied to most pines. The number of developed shoots after debudding a twig varies with different species; in general, diploxylon pines develop more shoots than haploxylon pines. In Korea, experiments with modified techniques of brachyblast cutting for vegetative propagation of *P. densiflora, P. thunbergiana, P. rigida* and *P. koraiensis* are in progress.

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