Ortet and season of collection significantly affect rooting of river birch stem cuttings

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Rooted cuttings can produce genetically homogeneous clones useful for experimental plantations, seed orchards, or afforestation. River birch *(Betula nigra L.) is* of interest as a candidate species for silage cellulose production. This article' investigates variation in rooting of stem cuttings due to season of collection and mother tree (ortet).

White grubs...

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newly planted spruce, deterioration may have serious consequences for many years. The effects of white grub activity may induce, intensify. prolong, or simulate the condition of
"check," notably on soils of low fertility or in years of subnormal rainfall.

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Methods

Cuttings were collected near Douglas. Texas every 4 weeks from February 19. 1972 until January 8, 1973. Forty cuttings, consisting of the terminal 6 to 8 inches of the twig. were taken from each of 10 opengrown ortet trees at every collection period. The 10 trees were limited to an age range of 8 to 10 years to minimize effects of physiological aging (4). Cuttings were collected from the lower one-third of the crown to avoid juvenile-mature differences which exist within the crown (6).

Cuttings were stored in an ice chest for transport to the greenhouse. and immediately prior to placement in the propagating bench each cutting was wounded and treated with a mixture of synthetic auxin and fungicide. Wounding consisted of making two longitudinal cuts, approximately 1 inch long, on opposite sides of the basal end of the cutting. The auxinfungicide mixture was composed of 0.9 percent indole butyric acid (IBA) (1) , 0.8 percent l-phenyl-3-methyl-5-pyrazolone (PPZ) (5), 5.0 percent captan (2). and 94.4 percent talc by weight. If leaves were present, all but three apical leaves were removed. The above combination was selected on the basis of preliminary trials where several alternatives were tested.

Cuttings were then arranged in a randomized complete-block design in intermittent-mist rooting beds with 10 cuttings from each ortet assigned randomly to row plots in each of four blocks. The rooting medium was a mixture of coarse and fine sand and temperature of the medium was maintained at 72°-76° F during cold periods by imbedded heating cables.

After 8 weeks, cuttings were removed and observed for root formation. Analysis of variance was used to evaluate effects of ortet and collection date on rooting, where percentage rooting per plot was converted to arcsin.

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Results

Rooting percentages differed significantly at the 1 percent level of °F with cutting periods, ortets, and cutting period x ortet interaction.

While the rooting percentages of all ortets were erratic, certain of them averaged higher than the mean on most dates (table 1). The average rooting percentage of the four highest rooting ortets during the winterspring season was 52.1 percent as compared with 30.5 percent for the other six ortets tested. This suggests that selection of ortets on the basis of preliminary rooting tests could greatly improve rooting.

Variation due to cutting period is illustrated in figure 1. Among cuttings taken May 30, August 25, and on February 19, less than 13 percent rooted. Among cuttings taken January 8, March 18, and from October 7 to December 12, 30 percent to

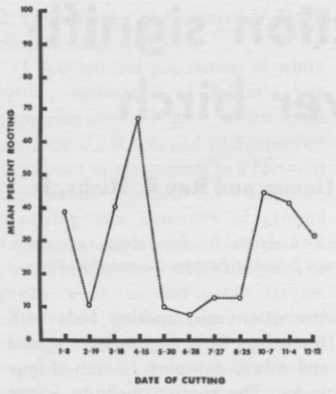

Figure 1.—Variation in rooting response of river birch cuttings by date of collection. Each point is the mean percent rooting of combined totals for 10 ortets.

TABLE 1.—Rooting percentages by ortets and cutting dates

Cutting date	1	2	3	4	5	6	7	8	9	10
					Percent					
1–8	40.0	12.5	70.0	42.5	52.5	55.0	52.5	10.0	20.0	27.5
2–19	7.5	5.0	2.5	0.0	7.5	45.0	30.0	5.0	5.0	2.5
3–18	47.5	0.0	7.5	5.0	45.0	92.5	52.5	20.0	67.5	42.5
4–15	90.0	25.0	45.0	70.0	62.5	77.5	85.0	85.0	67.5	65.0
5–30	12.5	0.0	30.0	10.0	10.0	10.0	7.5	0.0	17.5	0.0
6–28	5.0	5.0	15.0	2.5	10.0	2.5	7.5	10.0	2.5	10.0
7–27	25.0	5.0	22.5	27.5	15.0	17.5	10.0	2.5	7.5	5.0
8–25	27.5	7.5	12.5	20.0	12.5	12.5	10.0	7.5	10.0	15.0
10–7	62.5	20.0	77.5	45.0	50.0	40.0	60.0	30.0	42.5	22.5
11–4	42.5	40.0	75.0	15.0	17.5	45.0	67.5	32.5	30.0	60.0
12–12	37.5	17.5	62.5	45.0	15.0	45.0	45.0	10.0	22.5	20.0
Ortet mean	36.1	12.5	38.2	26.6	27.1	40.2	38.9	19.2	26.6	24.5

45 percent rooted. Sixty-eight percent of the cuttings taken April 15 rooted.

From observations made during each cutting period, it is possible to speculate on the biological and environmental factors responsible for seasonal rooting differences. The low rooting obtained at the February 19 cutting date may be related to bud break that occurred 2 weeks after placement of the cuttings in the mist bed. The nutritional drain on stored carbohydrates by vegetative meristems may have inhibited rooting.

For the October 7 date, leaves were present at the time of cutting, but were soon shed. No leaves were present at the November 4 cutting date and buds remained dormant for the entire 8 weeks. Good rooting occurred for these periods; thus applied exogenous auxin may have replaced the stimulatory effect of buds while higher levels of stored carbohydrates in the tissues at this time of year might supplant the need for leaves in this regard.

Bud break for the December 12 and January 8 cutting dates did not occur until the cuttings had been in the mist bed for 4 weeks. During this time, root primordia would have ample time to develop before bud break depleted stored carbohydrates. For the March 18 date, bud break had occurred 1 week before cuttings were taken and leaves and expanding buds may have promoted rooting by production of photosynthates and native auxins.

The highest combined rooting percentage was observed for the cutting period of April 15. Optimum rooting may have resulted from the combination of greenwood material at the top and hardwood material at the base of the cutting. A supply of stored carbohydrate and rigid conductive tissue was present in the hardwood portion while the expanding meristems at the apex produced additional photosynthates and auxins.

The low rooting percentages for the May, June, July, and August dates may be attributed to several factors. First, only greenwood cuttings were used during this period. This tissue is typically low in stored carbohydrates (3). Energy required for root initiation would depend largely on photosynthates produced by leaves. Certain environmental factors such as greenhouse temperature may have contributed to lower rooting during this period. Daily high temperatures in the greenhouse often exceeded 95^{0}F during the summer months, and these higher temperatures could cause excessive transpiration and respiration of cuttings.

It appears that by selecting ortets and the proper time of year, overall rooting of 65 percent and greater can he expected for river birch cuttings.

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