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NOTE / NOTE

Comparison of early height growth between white spruce seedlings and rooted cuttings

J. Beaulieu and M. Bernier-Cardou

Abstract: Early height growth of eastern white spruce (*Picea glauca* (Moench) Voss) rooted cuttings was compared with that of seedlings using annual measurements collected over 5 years in a farm field test replicated on three sites. The experiment included 148 full-sib families obtained from controlled crossings of superior trees selected for a white spruce breeding population in Quebec. Fifteen additional seedlots were used as controls. The average growth rate of seedlings (37.3 cm·year^{-1}) was slightly larger than that of rooted cuttings (36.2 cm·year^{-1}). The yearly growth rate increased over the test period, and it did so at a somewhat higher rate for the seedlings. The relative size of the estimated variance components and the moderate rank correlations of full-sib family height growth features between the two propagule types suggest that tree breeders should favour seedlings over rooted cuttings to rank families for selection purposes, but vegetative propagation would prove useful for bulking up scarce valuable genotypes.

Résumé : La croissance juvénile en hauteur de boutures racinées d'épinette blanche (*Picea glauca* (Moench) Voss) a été comparée à celle de semis à l'aide de mesures annuelles collectées pendant cinq ans dans un essai au champ répété dans trois stations. L'expérience incluait 148 descendances biparentales obtenues par des croisements contrôlés d'arbres supérieurs choisis pour établir une population en sélection d'épinette blanche au Québec. Quinze lots additionnels de graines ont été utilisés comme témoins. Le taux moyen de croissance des semis (37,3 cm·an^{-1}) était légèrement plus élevé que celui des boutures racinées (36,2 cm·an^{-1}). Le taux annuel de croissance a augmenté pendant la période d'essai et il a davantage augmenté chez les semis. La taille relative des composantes estimées de la variance et les corrélations de rang modérées entre les deux types de propagules, quant aux caractéristiques de la croissance en hauteur des descendances biparentales, indiquent que les améliorateurs devraient favoriser les semis plutôt que les boutures racinées pour classer les descendances à des fins de sélection. Par contre, la propagation végétative peut s'avérer utile pour augmenter le matériel dans le cas de génotypes rares qui ont une valeur particulière.

[Traduit par la Rédaction]

Introduction

Tree improvement programs have traditionally relied on seed orchards to produce improved seeds needed for reforestation. More genetic gain might, however, be achieved by bulking up only high-value seeds or by producing planting stock from superior seedlings through vegetative propagation (Isik et al. 2004). This could avoid the disadvantages associated with sexual recombination in seed orchards such as pollen contamination, selfing, and unbalanced matings (Kleinschmidt et al. 1993). Vegetative propagation techniques (rooting cuttings and tissue culture) have been developed and refined over the years for a variety of species, including spruces (Park et al. 1998). Growth and development of plantlets derived from young seedlings are expected to resemble those of the donors (Kleinschmit 1985); however, this assumption may not be consistent across all species (Frampton and Foster 1993). The objectives of the present study were to (*i*) compare the early height growth (1–5 years in the field) of white spruce (*Picea glauca* (Moench) Voss) seedlings with that of rooted cuttings, (*ii*) compare the average height, average growth rate, and average acceleration of height growth of three seedlot types, 14 unimproved control families, a bulk of first-generation improved seedlots (composite), and a group of 148 full-sib families, (*iii*) compare the early height growth of seedlings and rooted cuttings within each of the three seedlot types, and (*iv*) determine whether the ranking of full-sib families based on the height of rooted cuttings at the end of the study is correlated with the corresponding ordering based on seedlings.

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J. Beaulieu[1] **and M. Bernier-Cardou.** Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, 1055 du P.E.P.S., P.O. Box 10380, Stn. Sainte-Foy, Quebec, QC G1V 4C7, Canada.

[1]Corresponding author (e-mail: beaulieu@cfl.forestry.ca).

Materials and methods

Materials

One hundred and forty-eight full-sib families were created using a partial diallel mating scheme designed to produce a

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