

## Effects of seedbed density on one-year-old *Fraxinus angustifolia* seedling characteristics and outplanting performance

Emrah Cicek • Nurten Cicek • Nebi Bilir

Received: 14 December 2004/Accepted: 1 June 2006/Published online: 26 October 2006  
© Springer Science+Business Media B.V. 2006

**Abstract** To assess the effects of seedling spacing on one-year-old seedling morphology in the nursery, seeds of three provenances of *Fraxinus angustifolia* were sown at five different seedling spacings within rows of two different spacings in the seedbed. Subsequent growth performance of one-year-old seedlings was assessed by planting in the forest. Within row spacings were: 4.3, 5.0, 6.3, 8.3, and 12.5 cm, and there were five rows at 20 cm apart, or three rows at 33 cm apart across the 1.2 m wide seedbeds. Both spacings within and between rows significantly affected shoot height, root collar diameter, root dry weight and shoot dry weight, but not root/shoot ratio. Wider spacings produced larger seedlings, but only the wider spacing within rows significantly increased fine and coarse root mass. Provenances showed significant differences in diameter, root/shoot ratio, and fine and coarse roots, and they also showed interactions with row spacings in height and diameter measurements. One year after outplanting, diameter growth was significantly related to provenance, and diameter growth was 88% greater for trees from 33 cm nursery row spacing than those from 20 cm nursery row spacing.

**Keywords** Nursery • Spacing • Morphology • Provenance

### Introduction

The ash species *Fraxinus angustifolia* (Vahl.) is one of the most important hardwood species in Turkey, and it has been grown in Turkey for 40 years. In Turkey, almost all ash forest areas are covered by *F. angustifolia* (about 12,000 ha) as

---

E. Cicek    N. Cicek  
Faculty of Forestry, Abant Izzet Baysal University, Duzce 81620, Turkey  
[e-mail: emrahcicek@hotmail.com](mailto:emrahcicek@hotmail.com)

N. Bilir  
Faculty of Forestry, Suleyman Demirel University, Isparta 32260, Turkey

Springer

We are unable to supply this entire article because the publisher requires payment of a copyright fee. You may be able to obtain a copy from your local library, or from various commercial document delivery services.