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Growth of Loblolly Pine and White Pine after Enrichment by Nutrient Loading

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*Low nutrient availability often constrains the growth of young trees following planting to fields or forests. Nutrient loading of young tree seedlings increases their growth in outplanting. Loblolly pine (*Pinus taeda* L.) and white pine (*Pinus strobus* L.) were grown for one year on nutrient-loading regimes that varied from 13 to 410 mg N L⁻¹ in sand culture. Other nutrients varied in proportion to the nitrogen (N) concentrations. Resulting plant growth showed that an array of nutritional regimes from deficient to excessive was applied. The young plants were transplanted into containers of sandy loam and were grown for one year without fertilization. Growth of each species increased with enhanced nutrient loading. The optimum concentration of N for nutrient loading was about 1.5 to 1.8% leaf dry weight for either species. Nutrient loading during nursery culture imparts transplants with nutrient levels that will enable growth for at least a year after outplanting.*

Keywords Exponential nutrient addition, luxury consumption, nitrogen nutrition, outplanting, *Pinus strobus*, *Pinus taeda*

Introduction

Growth of young trees after transplanting of seedlings to fields or forests often is restricted because of low nutrient availability or due to competition from other plants at the sites (Imo and Timmer 1999, 2002; Hawkins, Burgess, and Mitchell 2005). On-site fertilization helps in establishment of trees but sometimes tends to increase the competition from other plants and to limit the accumulation of nutrients by the young, transplanted trees (Imo and Timmer 2001; Jacobs, Salifu, and Seifert 2005). Considerable attention has been directed toward producing transplants that will perform well in competitive environments or in field sites with low soil fertility (Timmer 1997; Imo and Timmer 1999, 2001; Salifu, Jacobs, and Birge 2009). Fertilization of young plants to induce luxury consumption of plant nutrients without marked changes in seedling sizes is called *nutrient loading*. The enrichment of transplants with nutrients leads to improved tree growth and competition after outplanting into field sites. Nutrient loading during nursery culture has improved seedling growth and nutrient accumulation, especially nitrogen (N), and tree performance after outplanting (Malik and Timmer 1996; Imo and Timmer 1999,

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