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Journal of Plant Nutrition
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713597277

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Online publication date: 27 July 2010

To cite this Article Everett, Kim T. , Hawkins, B. J. and Mitchell, A. K.(2010) 'DOUGLAS-FIR SEEDLING RESPONSE TO A RANGE OF AMMONIUM: NITRATE RATIOS IN AEROPONIC CULTURE', Journal of Plant Nutrition, 33: 11, 1638 — 1657
To link to this Article: DOI: 10.1080/01904167.2010.496888
URL: http://dx.doi.org/10.1080/01904167.2010.496888

Journal of Plant Nutrition, 33:1638–1657, 2010

ISSN: 0190-4167 print / 1532-4087 online
DOI: 10.1080/01904167.2010.496888

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DOUGLAS-FIR SEEDLING RESPONSE TO A RANGE OF AMMONIUM: NITRATE RATIOS IN AEROPONIC CULTURE

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□ *The objective of the experiment was to identify the most favorable nitrogen (N) source ratio of ammonium (NH_4^+) and nitrate (NO_3^-) for aeroponically-grown Douglas-fir when pH was maintained at pH 4.0. Seedlings were grown in controlled environments with solutions containing 0:100, 20:80, 40:60, 60:40, 80:20 or 100:0 NH_4^+:NO_3^- ratios. Nutrient additions in the aeroponic culture units were controlled by solution conductivity set points. Seedling growth and nutrient allocation was observed for 45 days. Different NH_4^+:NO_3^- ratios resulted in significant differences in the rate of N addition, growth, morphology, and nutrient allocation. Seedlings grown in solutions containing 60 or 80% NO_3^- were characterized by a combination of high growth and photosynthetic rates, high and stable internal plant N concentrations, and sufficient levels of other essential nutrients. High proportions of NH_4^+ in solution resulted in low rates of N addition, stunted lateral root growth, and may have been toxic.*

Keywords: nitrogen, ammonium:nitrate ratio, *Pseudotsuga menziesii*, conifer seedling nutrition

INTRODUCTION

Nitrogen (N) availability often limits plant growth in natural systems (Forde and Clarkson, 1999) and lack of N constrains the growth of temperate and boreal forest plants more than any other soil nutrient (Vitousek and Howarth, 1991, Millard 1996, DesRochers et al., 2003). Inorganic N is available to plants as ammonium (NH_4^+) and nitrate (NO_3^-), but levels of NH_4^+ and NO_3^- in forest soils vary both temporally and spatially. Most undisturbed, northern coniferous forest soils are acidic with slow rates of organic matter decomposition and nitrification (Lavoie et al., 1992). However, following disturbance, changes in soil temperature, moisture, pH, nutrient availability,

Received 12 November 2008; accepted 9 November 2009.
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