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Managing irrigation to reduce nutrient leaching in containerized white spruce seedling production

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Abstract Increasing irrigation efficiency and reducing groundwater contamination from agricultural and nursery runoff are important components in environmentally compatible plant production practices. The objectives of this study were to quantify mineral leaching from containerized (2+0) white spruce seedlings grown under three different irrigation regimes (30, 40 and 55% V/V) and to determine the effect of irrigation regime on growth, nutritional status, and gas exchange. To negate the effect of environmental variables, a completely randomized block experiment was installed in a normal production run of air-slit containerized white spruce seedlings grown under an unheated polyethylene tunnel. Whereas substrate water content was monitored daily, biweekly measurements of tissue and substrate fertility and seedling morphophysiological variables were made over the course of the growing season. Leaching of mineral nutrients was continuously monitored throughout the experimental period. Reducing volumetric substrate water content from 55 to 30% did not have a significant effect on seedling growth, carbon allocation, tissue nitrogen content, or end-of-season morphology. This irrigation strategy also resulted in a 20% reduction in water usage and, more importantly, reduced the total leachate volume by 65% and the quantity of N leached by 52%. Maintaining rhizosphere water content of (2+0) white spruce seedlings at 40% V/V compromises neither plant growth nor physiological processes. This strategy limits leaching of water and mineral nutrients, and

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