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74. © Slow-release fertilization reduces nitrate leaching in bareroot production of *Pinus strobus* seedlings. Dobrahner, J., Lowery, B., and Iyer, J. G. Soil Science 172(3):242-255. 2007.

SLOW-RELEASE FERTILIZATION REDUCES NITRATE LEACHING IN BAREROOT PRODUCTION OF *PINUS STROBUS* SEEDLINGS

J. Dobrahner, B. Lowery, and J. G. Iyer

Although nitrate (NO_3^-) leaching potential from bareroot tree nurseries is considerable, investigations on the effect of slow-release fertilization on NO_3^- -nitrogen (NO_3^- -N) leachate concentrations is lacking. The effects of slow-release fertilizer (SRF) on NO_3^- -N leachate concentrations, seedling morphology, seedling nutrient content, soil N, and cation leachate concentrations were investigated in bareroot production of *Pinus strobus* (L.) (white pine) seedlings in southwestern Wisconsin. Three fertilizer treatments were used, SRF1 (19-6-12), SRF2 (12-0-42), and a conventional fertilizer (Conv, 15.5-0-0). A total of 180 and 52 kg N ha⁻¹ were applied in the Conv and SRF treatments, respectively. During a 2-year period, soil leachate concentrations were collected weekly (May to December) using porous cup samplers installed at 1 m below the soil surface. Soil samples were collected every 2 weeks and plant tissue at the end of each growing season (late August). There were no treatment differences in seedling morphology (height, diameter, and dry mass) during the first or second growing season. Seedling nutrient concentrations were the same for all treatments at the end of first growing season, but Conv-treated seedlings contained greater N (33 g kg⁻¹ N for Conv compared with 30 g kg⁻¹ for SRF) by the end of the second growing season. Nitrate-N leachate concentrations were greater for the Conv treatment compared with both SRF treatments during the first and second growing seasons. However, treatment did not affect cation leachate concentrations and there was little difference in soil N. Overall, SRF reduced NO_3^- -N leachate concentrations in bareroot nursery tree production without sacrificing seedling quality. (Soil Science 2007;172:242-255)

Key words: Nitrate leaching, slow-release fertilizer, tree seedling growth, nutrient uptake.

CONCERN over nonpoint sources of ground-water contamination has directed much attention and research into reducing ground-water pollution by nitrogen (N)-based fertilizers in agricultural systems (Gehl et al., 2005). In bareroot nurseries, multiple applications of fertilizer N are applied throughout the growing season in an attempt to raise soil N (van den Driessche, 1988). However, soil N is often in excess of plant N uptake, which results in

leaching of nitrate (NO_3^-) from the root zone (Bundy and Malone, 1988; Paramasivam et al., 2001; Weed and Kanwar, 1996). Once leached from the root zone, NO_3^- can enter the ground-water, and in large concentrations, is a public health concern (Goodrich et al., 1991; U.S. Environmental Protection Agency, 2006).

Few researchers have investigated NO_3^- leaching potential from bareroot tree nurseries relative to other agricultural systems where N cycling is well documented (Brye et al., 2001; Lowery et al., 1998; Tyler and Thomas, 1977). Nitrate-N leachate concentrations of 35 mg L⁻¹ and 15 to 20 mg L⁻¹ were measured at 15-cm and 1-m depths, respectively, in an investigation of six bareroot nurseries in the midwestern

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