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BIORESOURCE TECHNOLOGY

Using mushroom farm and anaerobic digestion wastewaters as supplemental fertilizer sources for growing container nursery stock in a closed system

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Abstract

Wastewaters from farm and composting operations are often rich in select nutrients that potentially can be reutilized in crop production. Liners of silverleaf dogwood (*Cornus alba* L. 'Argenteo-marginata'), common ninebark [*Physocarpus opulifolius* (L.) Maxim.], and Anthony Waterer spirea (*Spiraea* × *bumalda* Burvénich 'Anthony Waterer') were grown in 6 L containers filled with a bark-based commercial mix. Plants were fertigated daily via a computer-controlled multi-fertilizer injector with three recirculated fertilizer treatments: (1) a stock (control) solution with complete macro- and micro-nutrients, electrical conductivity (EC) 2.2 dS m^{-1}; (2) wastewater from a mushroom farm; and (3) process wastewater from anaerobic digestion of municipal solid waste. The wastewaters used in both treatments 2 and 3 were diluted with tap water, and the computer was programmed to amend, dispense and recirculate nutrients based on the same target EC as in treatment 1. For comparison, there was a traditional controlled-release fertilizer treatment [Nutryon 17-5-12 (17N–2P–10K) plus micro-nutrients topdressed at a rate of 39 g/plant, nutrients not recirculated]. All three species responded similarly to the three recirculated fertilizer treatments. Growth with the recirculated treatments was similar and significantly higher than that obtained with controlled-release fertilizer. Throughout the study, the EC measured in wastewater-derived nutrient solutions, and also in the container substrate, were similar or close to those of the control treatment, although there were small to large differences among individual major nutrients. There was no sign of nutrient deficiency or toxicity symptoms to the plants. Small to moderate excesses in concentrations of SO_4, Na, and/or Cl were physiologically tolerable to the species.

Keywords: Nutrient recirculation; Wastewater recycling; Fertigation; Container culture; Ornamentals; Woody species

1. Introduction

Wastewaters are often rich in nutrients and have been used for irrigation and as supplemental fertilizer sources in a wide variety of agricultural and horticultural production systems (Gori et al., 2000; Hussain and Al-Saati, 1999 Moore, 1994; Pescod, 1992). Sources of wastewater include municipalities (Allhands et al., 1995; Beltrao et al., 1999; Bouwer et al., 1998; Revel et al., 1999; Sumner, 2000), biosolids and sewage treatment plants (Epstein, 2003), anaerobic digestors (Little and Grant, 2002; Riggle, 1996; Wu and Liu, 1998), composting farms (Jarecki, 2000; Jarecki et al., 2005), and compost leachates and teas (Chong et al., 2005; Gils et al., 2005; Grobe, 2003; Scheuerell, 2003).

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