(298) Composted Algae as an Alternative Substrate for Horticultural Crop Production: Chemical and Physical Properties

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Due to availability, cost, environmental issues, or a combina- tion of these factors, the use of traditional substrate components like peat and pine bark may be limited in the future. For these reasons, research on a range of woody plants and grasses for use in alternative substrates is ongoing in many laboratories across the U.S. The information presented here is an evaluation of the chemical and physical properties of composted algae (CA) as an alternative substrate or substrate component. Algae harvested from an Algal Turf Scrubber (ATS®) in Florida were composted and analyses were conducted on raw, unamended material. Electron microscopy revealed that CA was composed of a combination of filamentous algae and pennate-type diatoms. Organic and inorganic composition of CA as determined by organic matter by loss on ignition was 32% [± 0.8% (n=5)] and 68%, respectively. Carbon and nitrogen (N) of CA determined by dynamic flash-combustion GC was 7.4% (± 0.4%) and 0.8% (± 0.1%) (n=5), respectively. Water extractions using the 1 [CA (50 cm^3)]:2 [solution (100 mL)] method incubated for 1 hour on a shaker (150 rpm) were analyzed by IC and ICP (n=5). Nitrate-N, nitrite-N, and ammonia-N levels in extract solution was 275.7 $mg \cdot L^{-1}$ (± 22.2 $mg \cdot L^{-1}$), 0.8 $mg \cdot L^{-1}$ (± 0.2 $mg \cdot L^{-1}$), and 1.5 $mg \cdot L^{-1}$ (± 0.6 $mg \cdot L^{-1}$), respectively. Potassium and phosphorous (total-P) levels in extract solution was 828 $mg \cdot L^{-1}$ (± 46 $mg \cdot L^{-1}$) and 11 $mg \cdot L^{-1}$ (± 0.2 $mg \cdot L^{-1}$), respectively. Chloride and sodium levels in extract solution was 189 $mg \cdot L^{-1}$ (± 17.7 $mg \cdot L^{-1}$) and 48.6 $mg \cdot L^{-1}$ (± 3.3 $mg \cdot L^{-1}$), respectively. Extract solution pH and EC was 6.90 (± 0.04) and 5.00 $mS \cdot cm^{-1}$ (± 0.29 $mS \cdot cm^{-1}$), respectively. Molybdenum was the only essential plant nutrient not detected in CA in any 1:2 extraction method [water, weak acid (0.01 N HCl), or DTPA (2 mM buffered to pH 5.5)]. The bulk density of CA was 0.89 $g \cdot cm^3$ (± 0.04 $g \cdot cm^3$), and on a volume basis (v/v), CA air space, water holding capacity, and total porosity (n=5) was 4.3% (± 0.9%), 34.8% (± 0.8%), and 39.1% (± 0.4%), respectively. Chemically, CA may have potential as an organic fertilizer or as a substrate or substrate component. CA, however, has physical properties outside of the range of what is considered acceptable for floral and nursery potting substrates/media.
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