Impact of Composted Dairy Manure on pH Management and Physical Properties of Soilless Substrate

Dairy manure compost has contributed to sustainable agricultural production through recycling of animal waste and improving chemical and physical properties of soil. DMC and similar composted materials have been shown to serve as a substitute for peat moss in some crops, but little information is available on the effects of compost on pH stabilization and physical properties in container root substrates. The objectives of this study were to (1) quantify the impact of DMC on substrate pH establishment and stabilization throughout crop time and (2) to test the effect of DMC on physical properties of substrate.

Rooted cuttings of pot chrysanthemum 'Kory' (*Dendranthema* x *grandiflora* (Ramat.) Kitam) were grown in substrates composed of 25% perlite and 75% sphagnum peat moss amended with 5, 10, 15, 20, 25, or 30% DMC by volume. Control treatments contained 25% perlite and 75% sphagnum peat moss formulated with or without agricultural dolomitic limestone. All treatment substrates included a wetting agent and anhydrous calcium sulfate. Root substrate pH and electrical conductivity (EC) was measured via the pour-through method, while other physical properties (dry bulk density (D_b, g cm^{-3}), total porosity (TP, % substrate volume), container capacity (CC, % substrate volume), and air space at CC (AS, % substrate volume) were measured in a 7.6 cm tall column.

Initial substrate pH increased quadratically with increasing DMC amendment. Substrate pH levels decreased over time in all treatments except the un-limed 0, 5, and 10% DMC treatments, indicating the pH buffering capacity of DMC was of a similar magnitude to agricultural limestone (Figure 1). EC levels for all treatments were within acceptable limits for seedlings and bedding plants. D_b increased as DMC increased from 0 to 30% (Figure 2A). TP and CC both decreased as DMC increased from 0 to 30% (Figure 2B-C). Little effect was seen on AS (Figure 2D).

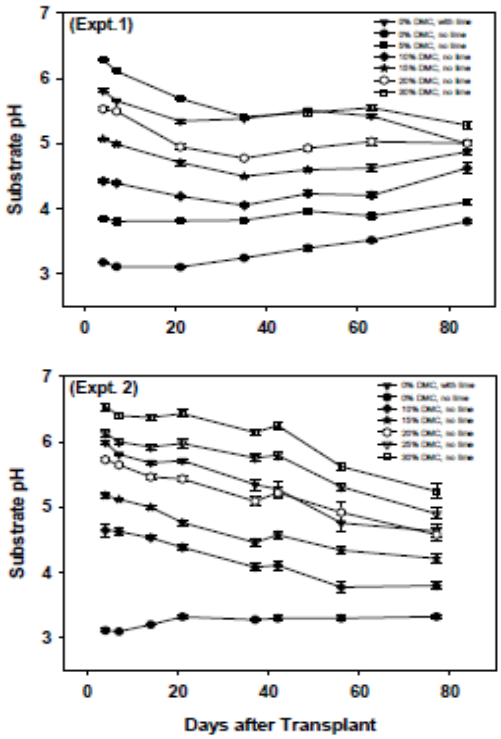

Figure 1. Substrate pH levels over time in treatments with and without limestone or dairy manure compost (DMC).

This study demonstrated that DMC can be used in place of limestone to set initial substrate target pH and buffer it as well as limestone over 77 days of production. DMC increased bulk density and decreased CC, but did not significantly affect shrinkage, EC, or AS.

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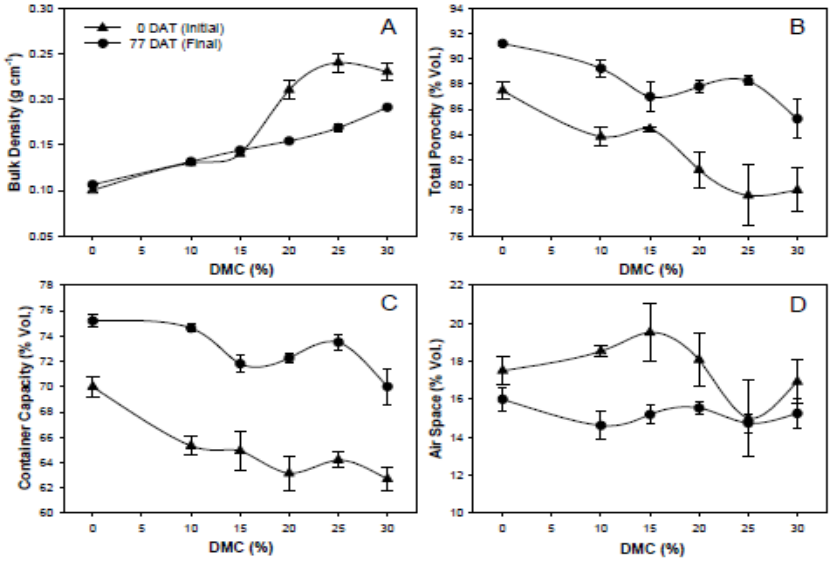

Figure 2. Average substrate properties in a 7.6 cm tall column at the beginning and end of Experiment 2, including A) dry bulk density (D_b), B) total porosity (TP), C) container capacity (CC), and D) air space (AS).

Jeong, K.Y., P.V. Nelson, J. Frantz, and W. Brinton. 2011. Impact of composted dairy manure on pH management and physical properties of soilless substrate. Acta Hort. 891:173-180.