Building Better Potting Mix Blends with Biosolids and Carbon-Rich Residuals

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Objective:

Determine suitability of composts and blends made with biosolids and urban organic carbon sources as high value potting mixes.

Introduction:

Market value of potting media in the Northwest (including BC) was recently estimated at $130 million. The main ingredients are non-renewable resources including sphagnum peat, perlite, and/or vermiculite.

Previous research at WSU Puyallup has shown that a blend of Tagro mix and bark is equal to or superior than standard peat-based potting mixes for growing chrysanthemums and bedding plants. Tagro mix is a garden amendment made from Class A Tacoma wastewater biosolids. The City of Tacoma now produces a Tagro-based potting mix, and sells it locally as the most profitable product of their biosolids stream. The City produced 2000 yards of potting mix in 2008, utilizing 25% of their biosolids stream.

King County currently uses about 10% of their biosolids stream to produce a biosolids:sawdust compost, but compost production is threatened by a decreasing supply of suitable sawdust. Locally available C-rich materials to compost with biosolids include construction debris, land-clearing debris, and horse manure.

Methods:

Compost production

Composts were produced in aerobic reactors providing similar conditions to full scale static aerobic piles. Composts were made from King County biosolids (1 part by volume) blended with construction debris, land clearing debris, or horse manure (3 parts by volume). All composts met PFRP pathogen reduction requirements and were 8 months old at the time they were prepared as potting mixes.

Potting mixes

The composts produced above were screened (7/16 in.) and blended 1:1 (v:v) with aged Douglas-fir bark to produce potting mixes. The bark was used based on benefits observed in previous research at WSU. They were compared with standard King County biosolids compost (Groco), the commercial Tagro potting mix, fiber from a mixed anaerobic digester (dairy manure and food waste), and an industry standard peat-perlite mix. The Groco and digester fiber were also blended with aged Douglas-fir bark.

Greenhouse experiment

- Marigold and sweet pepper seedlings transplanted into 4-inch pots filled with potting mixes
- 8 replicate plants/treatment
- All treatments received supplemental P, K and micronutrients
- Two nitrogen levels compared
- Drip irrigated and grown under standard greenhouse conditions
- Measured shoot growth index, visual quality, shoot dry mass, and flower and bud number

Treatment Key

PP	Commercial peat-perlite potting mix
CDB	Construction debris-biosolids compost + bark
DDB	Anaerobic digester fiber (dairy manure and food waste) + bark
GroB	Groco biosolids compost (King County)+ bark
HWB	Horse manure-biosolids compost + bark
LDB	Land clearing debris-biosolids compost + bark
Tag	Commercial Tagro potting mix (biosolids based)

Fig. 1. Freshly mixed biosolids and construction debris feedstocks

Fig. 2. 2.5-yard aerobic reactor showing aeration pipes and pump connector

Fig. 3. Potting marigold plugs

Fig. 4. Applying N fertilizer to peppers

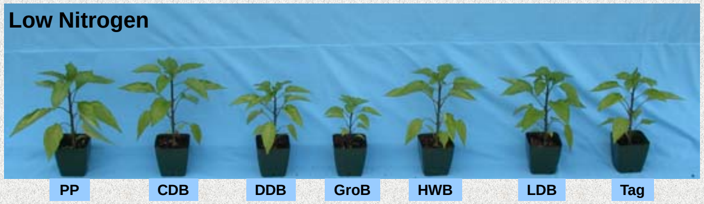

Fig. 5. Visual comparison of typical pepper plants grown in each potting mix under low nitrogen fertilization.

Fig. 6. Visual comparison of marigolds grown in alternative biosolids potting mixes compared with peat-perlite mix and Tagro potting mix under high (left) and low (right) N fertilization.

Results:

- Experimental biosolids composts with horse manure, construction debris, and land clearing debris performed equal to or better than peat-perlite and equal to Tagro for growing marigold.
- Experimental composts performed equal to peat-perlite and Tagro for growing sweet pepper.
- Traditional Groco compost did not perform as well as the other treatments.
- Anaerobically digested dairy fiber was intermediate between Groco and other treatments in overall performance.
- Higher nitrogen rates improved plant growth and quality across all potting mixes in pepper (a plant with higher N demand), but had fewer significant effects for marigold (a plant with lower N demand).

Relevance to Beyond Waste Goals:

Mass of Materials (statewide and King County as example)

Material	Statewide (dry tons)	King County (dry tons)
Biosolids	95,000	30,000
Land clearing debris	419,000	70,000
Wood residue	834,000*	170,000
Horse manure	407,000	27,000
Douglas fir bark	265,000**	

*Construction debris is a subset of wood residue
** Derived from Washington DNR data

Opportunities and feasibility

- •Adequate supplies of alternative C-rich materials to make compost with existing biosolids supply. King County currently uses about 10% of its biosolids production for compost (none to potting mix), and Tacoma uses 25% of its biosolids in potting mix.
- •Replaces potting mixes made from non-renewable materials.
- •Technology to make compost is well established and technology to make potting mixes from biosolids composts or blends is easily adopted.
- •Unmet demand in home and commercial markets for potting mixes from local, renewable resources.

Barriers and challenges

- •Product must have consistent high quality to be acceptable as a potting medium
- •Collection of carbon materials from decentralized sources
- •Potential saturation of demand forcing products to lower value markets

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