Utilization of municipal composts in organic horticulture: Emerging opportunities and research needs

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Overview

• Organic sector as a market – pros and cons
  – Need the nutrients more than conventional growers
  – Perceptual barriers to use of “off-farm” compost

• What needs to be done to facilitate use
  – Basic requirements for acceptability
  – Demonstrate value to production systems

• AAFC Organic Science Cluster research proposal
Organic soil/nutrient management

- Soil fertility/productivity based on organic matter and soil biology enhancement (=soil health)
- Managed primarily through use of:
  - On-farm composts and animal manures
  - Crop rotation/cover cropping with green manures
Organic nutrient inputs

- Many organic producers of high value horticultural crops also often rely on “high-grade” organic fertilizers for optimal production
  - Fish emulsion
  - Feather meal
  - Pelletized poultry manure
  - Alfalfa meal, soy meal
  - Guano
  - Bone meal
  - Blood meal
  - Kelp meal
5.4 Soil Fertility and Crop Nutrient Management

5.4.5: …the organic matter produced on the enterprise shall be the basis of the nutrient cycling program and **may be supplemented with off-farm organic and non-organic nutrient sources** specified in CAN/CGSB-32.311, *Organic Production Systems – Permitted Substances Lists*. 

 CAN/CGSB-32.310, *Organic Production Systems – General Principles and Management Standards*
Perceived problems with use of off-farm composts

- Fecal bacteria (primarily manure-based composts)
- Heavy metals/trace elements (primarily biosolids or manure-based composts)
- Organic contaminants (primarily biosolids, MSW)
- Antibiotic residues (manure-based composts)
- Herbicide residues (e.g. clopyralid) (primarily yardwaste composts—still a concern)

Underlying concerns – uncertainty and inconsistency

Current perceptions coloured by past inclusion of biosolids in “municipal compost”
Reasons to consider yardwaste and foodwaste (i.e. greenbin) composts for organic horticulture

1. Minimal issues with contamination relative to other “off-farm” composts

2. Rapid growth in availability:
   - Most major municipalities adopting organics diversion programs (~50% of total waste is organic)
   - Metro Vancouver producing ~628,000 tonnes organic waste
   - FVRD producing 65,000 tonnes organic waste per year

3. Forges connections between urban consumers and producers of (organic) fruit and vegetable crops
Use of greenbin compost links local production to the urban consumer.
Do greenbin and yardwaste composts conform to federal organic standards for off-farm composts?

CAN/CGSB-32.311, *Organic Production Systems – Permitted Substances Lists*

- **Prohibited feedstocks:**
  - Biosolids (sewage sludge); leather byproducts; **glossy paper**; waxed cardboard; **paper containing coloured ink**; and animal, animal products and animal by-products that are not guaranteed free of the risk materials specified in *Bone meal.*
Do greenbin and yardwaste composts conform to federal organic standards for off-farm composts?

CAN/CGSB-32.311, Organic Production Systems – Permitted Substances Lists

• **Acceptable feedstocks:**
  • Animal manures conforming to 5.5.1 of CAN/CGSB-32.310, Organic Production Systems – General Principles and Management Standards
  • Animal, animal products and by-products (including fishery)
  • Soils and minerals conforming to this standard
  • Plants and plant by-products (including forestry and source-separated yard debris, such as grass clippings and leaves)
    • *but…”feedstocks that may be contaminated with substances not included in this standard or prohibited by par. 1.4.1 of CAN/CGSB-32.310 shall require documentation to confirm the absence of these substances OR documentation substantiating the common degradation of such contaminants…”*
Do greenbin and yardwaste composts conform to federal organic standards for off-farm composts?

CAN/CGSB-32.311, *Organic Production Systems – Permitted Substances Lists*

“Compost obtained from off-farm sources”

- Shall not exceed the maximum acceptable levels of trace contaminants and foreign matter outlined for unrestricted use (Category A) compost as specified in the CCME publication “Guidelines for Compost Quality”
- Shall not cause a buildup of heavy metals in soil over repeated applications (*implied in CCME criteria for Category A*)
- Shall meet criteria for acceptable levels of human pathogens as specified in the CCME publication “Guidelines for Compost Quality”

*In summary, the standard defers to CCME with respect to compost quality*
Conclusion: Foodwaste and yardwaste composts are generally acceptable for use in organic hort

- Feedstocks compatible with NOS
  - (if document that yardwaste not contaminated with pesticides)
- Requirements for pathogen reduction, minimal trace element concentrations, foreign matter and maturity/stability no more stringent than those required for any other unrestricted use compost for sale in Canada (and BC) (CCME)
- But…local/regional certification bodies can be more stringent than NOS
…but can growers be convinced of the value of compost to their production systems?

Also need to know properties of agronomic relevance:
- pH, C/N, particle size, soluble salts, Na
- Macro & micro elements (total and available)

• Compost Quality Alliance
  - Ensures adequate testing for some properties of agronomic significance
  - Recommended uses broadly defined
## Compost Quality Alliance recommended uses

<table>
<thead>
<tr>
<th>Use</th>
<th>pH</th>
<th>C/N</th>
<th>Moisture</th>
<th>Part. size</th>
<th>EC</th>
<th>%Na</th>
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<tbody>
<tr>
<td>Remediation</td>
<td>5.8-8.5</td>
<td>10-40</td>
<td>NA</td>
<td>&lt;2 inch</td>
<td>&lt;20</td>
<td>&lt;3%</td>
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<tr>
<td>Soil Amendment</td>
<td>5.8-8.5</td>
<td>10-30</td>
<td>NA</td>
<td>&lt;1/2 inch</td>
<td>&lt;6</td>
<td>&lt;2%</td>
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<tr>
<td>Landscaping</td>
<td>5.8-8.5</td>
<td>12-22</td>
<td>&lt;50%</td>
<td>&lt;1/2 inch</td>
<td>&lt;5</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Planting media</td>
<td>5.5-7.8</td>
<td>12-22</td>
<td>&lt;50%</td>
<td>&lt;1/2 inch</td>
<td>&lt;4</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Turf topdress</td>
<td>5.8-7.8</td>
<td>12-22</td>
<td>&lt;50%</td>
<td>&lt;3/8 inch</td>
<td>&lt;3</td>
<td>&lt;1%</td>
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<tr>
<td>Potting soil</td>
<td>5.5-7.2</td>
<td>12-22</td>
<td>&lt;50%</td>
<td>&lt;1/4 inch</td>
<td>&lt;3</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Not enough info to convince commercial growers of value
Conventional growers would want PAN values
...Need to demonstrate impacts on crop health and productivity

- e.g. yields, quality, disease suppression

- In context of specific system constraints on application, e.g.:
  - Surface application vs incorporation
  - Constraints on application rates
  - Interactions with irrigation or weed management

Using municipal composts effectively and economically
Some more notes about strategies for compost use in organic production:

- Potentially Available Nitrogen (PAN) is not critical determinant of application rates
  - Tend to use relatively low, annual application rates to feed the soil slowly
  - Total N inputs approximating N offtake?
  - Annual costs, availability and crop sensitivity (e.g. salts) also often factor into application rates

- Single large applications at time of replanting perennial fruit crops (alternative to fumigation) are also an option
• Proposal to AAFC-Organic Science Cluster
  – Utilization of municipal greenbin composts in organic fruit and veg production

Seed money commitment organized by CCC!
Organic Science Cluster II (OSCIi) – compost utilization project

- Field studies:
  - NS (Derek Lynch and Andy Hammermeister, Dalhousie Univ.):
    - Vegetable rotation, Common Roots Farm
  - ON (John Cline, Guelph Univ.):
    - Surface application to apple orchard
  - MB (Kathy Buckley, AAFC):
    - Vegetable (potato/sweet corn) rotation
  - AB (Frank Larney, AAFC):
    - Potato rotation transitioning to organic
  - BC (Tom Forge, G. Neilsen, D. Neilsen, AAFC):
    - Organic winegrape, apple and cherry
OSCII - Compost project

• Comment re. research approach:

  – “Product development/designer compost” approach: Identify a specific high-value market (e.g. disease suppressive compost for nurseries) and “design” a high-value compost
    • Creates another expensive input for growers
    • Creates high expectations for specific functions

  – Sustainable recycling approach: Utilize locally produced high volume composts as general soil amendments
    • Emphasis on building up soil organic matter and measuring benefits that accrue
    • Do all the small benefits add up to more resilient and profitable production system?
    • Explore municipal-ag cost sharing ideas?
OSCIll - Compost project

• Emphasis on few regionally-relevant high-quality greenbin materials
  – Not screening materials or developing products
  – Comparisons to other soil/nutrient management practices

• Emphasis on strategic/realistic utilization in context of production systems, assessment of:
  – fruit and veg production, quality and safety
  – soil health indicators
  – plant disease incidence and influences on weed growth/management
  – Cost-benefit analyses
Organic apple

- Alternative root zone soil management strategies
  - Annual compost application + tillage
  - Alfalfa hay mulch
  - Bark mulch/5-year compost
  - Plastic mulch/5-year compost

20 Mg/ha; 266 kg total N/ha tree row

Tilled and alfalfa mulch plots

100 Mg/ha; 1330 kg total N/ha tree row
Organic winegrape

- Mission Hill Vineyards
- Variable types of compost
  - Harvest Power
  - GlenGrow
  - Bighorn (beef feedlot + grape marc)
- Modest rates ~10 Mg/ha of vineyard (120 kg N/ha of vineyard)

Side experiment to compare N and C mineralization/conservation under different applic rate scenarios
Greenhouse experiments on wider spectrum of composts (at Summerland):  
- Suppression of apple root disease complex  
- Model system for several common pathogens
Technical review of availability and properties of different categories of municipal composts that are acceptable for use in organic ag (i.e. greenbin composts)
   – Are there general trends?

Well-documented examples of the benefits of using municipal composts in a range of contexts
   – Cost – benefit analyses
   – Inference will be limited to composts of similar quality to those used in the experiments

Technical reviews and papers describing outcomes on individual sites - will target organic and conventional producers
Summary

- Organic sector as a market
  - Need the nutrients more than conventional growers
  - Many other good reasons to make the linkage
  - Barriers to use of “off-farm” compost –
    - partly perception, partly lack of solid data on benefits
- Overcoming barriers to adoption
  - Basic requirements for acceptability –
    - clarification and communication
  - Demonstrate value to production systems
    - well-documented field trials
- The research will benefit both sectors and potentially inform policy
  - Contribute to review of Fertilizer Act?
  - Future opportunities for development of incentives for compost use in local ag? Carbon credits?
Thanks!

CCC – Susan Antler et al.
BC Blueberry Council
Raspberry Industry Development Council
City of Vancouver
BC Investment Ag Foundation
AAFC-GAPS
AAFC-SAGES
BC Tree Fruit Grower’s Assoc.
BC WineGrape Growers Assoc.
Washington Tree Fruit Growers Assoc.
Washington Red Raspberry Commission

AAFC-Organic Science Cluster??

Photo: Brenda Frey