ROW CROP PRODUCTION

Compost Research & Education Foundation

USING COMPOST

Description:

This application consists of applying compost to agricultural land to improve soil quality and provide crop nutrition. There are a variety of row crops; including cereals (barley, wheat, oats), canola, corn, soybeans, cotton, etc., that may benefit from compost use.

Key Benefits/Return on Investment:

- Nutrient savings – up to 50-100% savings on specific starter fertilizer nutrients (depending on crop requirements*),
- Can replace organic matter volumes generated through cover cropping,
- May reduce or eliminate lime/gypsum application and,
- Research and field practical experience illustrates that the ongoing usage of compost
  - Improves water holding capacity, reducing irrigation requirements,
  - Increases cation exchange capacity, improving soil's ability to retain nutrients,
  - Reduces soil compaction and bulk density, providing fuel savings during tillage, and
  - Enhances microbial processes, nutrient cycling to plants.

Application Procedures:

- Complete a soil test before applying compost, fertilizer, or other amendments in order to determine the requirements of the soil as they relate to the specific crops being grown and products.
  - The addition of compost will typically reduce the addition of fertilizer, lime, and gypsum.
- Where appropriate, cultivate soil to condition it for planting using disc or similar implement.
- Uniformly apply compost throughout the field using a traditional manure spreader (flail/rear discharge or side discharge) or other specialized equipment.
  - Lower rates (4-8 ton/acre) of compost are typically used in multiple (successive) year applications as a nutrient supplement, organic matter source, and to improve water holding capacity.
  - Higher application rates (10-20 tons/acre) are used to modify soil structure and other properties in a short-term.
- Existing soil conditions, compost characteristics and the nutrient requirements of the crop will influence appropriate compost application rates. Most often, compost rates are calculated based on the nitrogen or phosphorus requirements of the crop, with supplemental nitrogen or phosphorus applied to balance the ratio of nutrients that the crop needs.
- Thoroughly incorporate the compost to a depth of 8 to 10 inches using a disc or mole board plow, or other tillage equipment.
- Plant crop seeds, then irrigate based on plant needs, soil moisture, and climatic conditions.

Compost may also be applied over crop land managed using a no-till management style. In these cases, apply the compost over the crop stubble before drill seeding, and water it in when possible. For forage crops which may be harvested (cut) several times during a growing season, apply compost when the crop foliage is dry, so the compost can easily filter to the soil surface, and water it in when possible.

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ROW CROP PRODUCTION Using Compost

Compost Parameters:

Parameters[1,5]	Reported as (units of measure)	General Range
pH[2]	pH units	6.0 - 8.5
Soluble Salt Concentration[2] (electrical conductivity)	dS/m (mmhos/cm)	Maximum 20
Moisture Content	%, wet weight basis	30 – 60%
Organic Matter Content	%, dry weight basis	30 – 65%
Particle Size	% passing a selected mesh size, dry weight basis	95% pass through 3/8" screen or smaller
Stability[3] Carbon Dioxide Evolution Rate	mg CO2-C per g OM per day	< 4
Physical Contaminants (man-made inerts)	%, dry weight basis	< 0.5% (0.25% film plastic)
Chemical Contaminants[4]	mg/kg (ppm)	Meet or exceed US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels
Biological Contaminants[5] Indicator Organisms Fecal Coliform Bacteria, and/or Salmonella	MPN per gram dry weight MPN per 4 grams dry weight	Meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) levels

General:

Compost Analysis: All compost products have different characteristics. Before selecting a compost product, a compost analysis should be completed by a reputable laboratory* to determine the characteristics of the material, so that the right material can be used for the appropriate purpose. Once determined, the soil should be appropriately amended to a range suitable for the plant species to be established and results desired.

Soil Analysis: Before any soil preparation procedures ensue, a soil analysis should be completed by a reputable laboratory to determine any nutritional requirements, pH and organic matter adjustments necessary.

Compost application rates depend upon soil conditions and quality, product cost, and manufacturer's recommendations. The use of stable, nutrient rich compost will reduce initial fertilizer requirements by the amount of available nutrients in the compost. To gain the greatest nitrogen benefit, used compost possessing a C:N ratio of 15 or below.

*Note: certain nutrients contained in compost may release more slowly than a specific crop requires. Estimating compost nutrient release rate can be more difficult than with chemical/inorganic sources and is affected by regional climatic conditions.

References:

Baroldi, L., Personal Conversations. 4/18/2016.

Butler, T., Muir, J. and McFarland, M., Using Compost for Forage Production. Texas Water Resources Institute, 2004.

Sabey, B.R., Effect of MetroGro Application Rates on the Germination and Emergence and Growth of Corn, Wheat and Bluegrass. Colorado State Ubniversity, March 23, 1984.

Smiciklas, K.D., Walker, P.M., and Keller, T.R., Evaluation of Compost for Use as a Soil Amendment in Corn and Soybean Production. Illinois State University, Department of Agriculture. Compost Science & Utilization, Summer 2008.

***The Seal of Testing Assurance (STA) Certified Compost Program provides a comprehensive history of compost analysis results from proficiency-tested laboratories, list of ingredients, and suggested directions for using that unique product. www.compostingcouncil.org/participants**

[1] Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost (TMECC, The Compost Research & Education Foundation).

[2] It should be noted that the pH and soluble salt content of the final amended soil is more relevant to the establishment and growth of a particular plant, than is the pH or soluble salt content of the specific compost used to amend the soil. The pH and soluble salt content of the compost is diluted when mixed with the native soil, so testing for these parameters in the amended soil is suggested. Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum tolerable quantities are known. Most ornamental plants and turf species can tolerate a soil/media soluble salt level of 2.5 dS/m and 4 dS/m, respectively. Seeds, young seedlings and salt sensitive species often prefer soluble salt levels at half the afore mentioned levels. When specifying the establishment of any plant or turf species, it is important to understand their pH and soluble salt requirements, and how they relate to existing soil conditions.

[3] US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels = Arsenic 41ppm, Cadmium 39ppm, Copper 1,500ppm, Lead 300ppm, Mercury 17ppm, Molybdenum 75ppm, Nickel 420ppm, Selenium 100ppm, Zinc 2,800ppm.

[4] US EPA Class A standard, 40 CFR § 503.32(a) levels = Salmonella <3 MPN/4grams of total solids or Fecal Coliform <1000 MPN/gram of total solids.

[5] Landscape architects and project (field) engineers may modify the allowable compost specification ranges based on specific field conditions and plant requirements.

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