SUPPLEMENTING PLANT NUTRITION

Compost
Research & Education Foundation

USING COMPOST

Description:

This application consists of spreading a uniform layer of compost over a planting area to act as a supplemental nutrient source, which provides additional agronomic benefits.

Key Benefits:

- Supplies primary, secondary and micronutrients, primarily in slowly releasing form,
  - Typically releasing nitrogen over 3 to 4 years, phosphate 3 to 5 years, and the majority of potassium during the year of application.

Over Time

- Improves water holding capacity, reducing irrigation requirements,
- Increases cation exchange capacity, improving soil's ability to retain nutrients,
- Reduces soil compaction,
- Enhances microbial processes, nutrient cycling to plants, and
- May provide soil-borne disease suppression, reducing pesticide applications.

Application Instructions:

Agriculture

- 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. Seed and water.
- 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, then water 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.

Immediate tillage and/or 'watering in' will help to conserve ammoniacal nitrogen found in the compost, helping it attach to soil particles.

Compost has been used in select applications (e.g., home gardens, organic farmers) as a primary crop nutrient source. This type of system requires larger amounts of compost, which are applied in consecutive years. Caution must be taken with this system, as it can cause soil nutrient imbalances over time.

Turf Top Dressing

- Prepare area by mowing grass to preferred height. When possible, core-aerate the area to be treated with compost.
- Uniformly apply compost, then back drag the area treated with a weighted chain link fence, rake, or specialized implement, and water. Apply compost when the turf foliage is dry, so the compost can easily filter to the soil surface, and water it in when possible.

Additional Information:

- The use of stable compost possessing a C:N ratio of 15:1 will allow more of the compost-based nitrogen to be used by the crop. Compost possessing higher levels of ammonia and nitrate nitrogen will more quickly provide nitrogen to the crop.
- Understand that nutrients are cycled out of compost over time, and that supplemental nutrient addition is typically required in order to grow high-quality crops or obtain acceptable yields.

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

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.

Compost Research & Education Foundation

SUPPLEMENTING PLANT NUTRITION 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 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[3]	mg/kg (ppm)	Meet or exceed US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3 levels
Biological Contaminants[4] 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:

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. Once determined, the soil should be appropriately amended to a range suitable for the crop species to be established. Compost application rates depend upon soil conditions and quality, plant tolerances, and manufacturer's recommendations.

NUTRIENT VALUE OF COMPOST
Valuing the nutrients found in compost is a moving target, as commercial nutrient values change on a monthly basis. Further, compost customers often value the specific nutrient that they require (e.g., nitrogen or sulfur) and not the full suite of nutrients in the product (especially secondary and micronutrients).

Example calculation: Yard Trimmings Compost with a nutrient content of 0.67-0.25-0.33 (on a wet wt. basis) yields
Nitrogen – 13.4 lbs/t x $0.65/lb. N value = $8.71/t
Phosphorus (P2O5) – 5 lbs/t x $0.70/lb. P value = $3.50/t
Potassium (K2O) – 6.6 lbs/t x $0.75/lb. K value = $4.95/t
Total N-P-K value per ton of compost = $17.16

References:

Agricultural Prices, National Agricultural Statistics Service, USDA. October 2012.

Economics of Using Composted Dairy Manure, Texas Water Resources Institute, 2004.

Alexander, R., Strategies for Increasing the Value of Biosolids Compost, Water Environment Federation Conference 2006.

Maynard, A., Using Yard Trimmings Compost as Fertilizer on Vegetable Crops. BioCycle, May 2004.

***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.

Developed for the CREF by R. Alexander Associates, Inc.