SportsTurf MANAGERS ASSOCIATION

Experts on the Field, Partners in the Game.

www.stma.org

SAFE
The Foundation for Safer Athletic Fields

Compost Applications to Sports Fields

Compost is a product resulting from controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth. It is organic material that can improve chemical, physical and biological characteristics of soils. Composting offers resource efficiency and a useful product from organic waste.

Benefits of Compost

Compost is an organic matter resource that can improve physical, chemical, and biological characteristics of soils or growing media.

Turf area before compost application. Picture courtesy of Kevin Mercer

Turf area following compost application. Picture courtesy of Kevin Mercer

Physical Benefits

- Improves soil structure, soil porosity and density to help make a better root environment.
  - o Fine textured soil
    - Reduces bulk density
    - Improves soil structure
    - Improves porosity
    - Increases infiltration and permeability to reduce erosion and runoff
    - Resists compaction and surface crusting
    - Promotes drainage
  - o Coarse textured soil
    - Caution must be taken when applying compost to sand-based fields. Organic matter content should not exceed 3 %. If organic matter does exceed 3%, water infiltration and percolation may become restricted.
    - On fields with less than 3% organic matter, compost additions can increase water holding capacity to reduce water loss and leaching. It can also improve soil aggregation due to humus content. Humus is a result of a high degree of organic matter decomposition. It is a stable residue that holds soil particles together to help resist erosion and improve moisture holding capacity.
- Improves soil water holding capacity which can lead to more efficient water utilization through reduced irrigation frequency and/or intensity.
- Moderates soil temperature so it is cooler in the summer and warmer in the winter.

Compost Applications to Sports Fields

Chemical Benefits

- Supplies nitrogen in a slow release form. Also contains phosphorus, potassium and other macronutrients and micronutrients.
- Although it may not replace current fertilization programs, compost provides nutrition and makes current fertilizer programs more effective.
- Improves the cation exchange capacity (CEC) by improving the soil's ability to hold nutrients for plant use.
- Depending on the pH of the compost and native soil, a compost addition may raise or lower the pH of the blend if added in appropriate quantities.
- Compost can act as a buffer or stabilize the soil making it resistant to pH changes
- Can bind and degrade pollutants such as heavy metals, pesticides and toxic organic compounds so they do not leach.

Biological Benefits

- May control or suppress some soil borne plant pathogens.
- Supplies beneficial microorganisms that promote root activity by assisting in the extraction of nutrients from the soil.

There are commercial products available that supply the same benefits of compost to the soil. STMA encourages you to talk with other STMA members and vendors to see if this is a better option.

Compost Characteristics and Testing

Before choosing compost, you should be aware of your current soil conditions by taking soil tests every 1-3 years. This will provide a synopsis of the nutrients already present in the soil so you can choose the most beneficial compost for your situation.

Compost quality is dependent on raw materials (feedstock) and how it is produced. Certain composts may be detrimental to the environment depending on the feedstock. Always obtain a sample before applying compost to sports fields, or make sure the product has been field tested by a university or used successfully by other turf managers. Use the following table as a guideline to target ranges when choosing certified compost products.

	Target Ranges
Chemical Characteristics	
pH	6.0-8.0
Soluble Salts	As topdressing: less than 6 mmhos/cm or dS/m As soil amendment: less than 20 mmhos/cm or dS/m *Dependent on turf species, type of salt, concentration and application. Always irrigate after application to assist in leaching salts.
Nitrogen	0.5-3.0% (dry weight basis)
Phosphorus	0.2-0.9%
Potassium	0.2-0.5%
Micronutrients	Make sure micronutrient levels are not excessive as this could be toxic to plants
C:N Ratio	Below or equal to 30:1
Metals	Check state and federal regulations

Compost Applications to Sports Fields

	Target Ranges
Physical Characteristics	
Appearance	Resembles dark topsoil with light, crumbly structure
Odor	Earthy aroma.
Moisture Content	30-50%
Solid Content	50-60%
Organic Matter and Ash Content (Organic matter is an estimate of the sample material that combusts at high temperatures during a lab test. The material that does not combust is ash content. These values are subtracted from 100 to reach a percentage of ash content and organic matter in the compost.)	Organic Matter: • Greater than 30% of solid content • 50-60% of solid content is ideal (dry weight basis) Ash Content: • Less than 70%
Particle Size	Passes 3/8 inch screen; larger particle sizes can be used if it is being tilled into the soil prior to seeding or sodding
Bulk Density	900-1000 pounds per cubic yard
Foreign Materials (glass, metal, plastics)	Should not be more than 1-5% by dry weight

	Target Ranges
Contaminants	
Weed Seeds	Proper composting and storage destroys viable seeds due to high temperatures. Occasionally weed seeds can survive.
Herbicide Residues	Most are degraded sufficiently during composting and rarely detected, although there is evidence that some herbicide residues have been found in composts in amounts that can be harmful to plants. To prevent problems from residual herbicides, do not add treated plant waste to the compost.
Pathogens	Fecal Coliform: <1000 MPN/gram total solids Salmonella: <3 MPN/4 grams of total solids There are no limits on pathogen content for specific compost applications, however these identify the EPA established limits on pathogen content applied to compost use in general.

Compost Applications to Sports Fields

	Target Ranges
Additional Tests	
Bioassay (maturity of the compost)	
Emergence %	Very mature: >90 Mature: 80-90 Immature: <80
Seedling vigor %	Very mature: >95 Mature: 85-95 Immature: <85
Stability (respirometry)	Very stable: <2 Stable: 2-8 Moderately unstable, raw compost: 8-15 Raw compost or raw organic products: 15-40 Raw feedstocks, unstable material: >40

Types of Composting

There are many different methods of composting. These methods can range from small scale (for homeowners), to large scale (community composting programs). Composting methods most commonly used at athletic facilities include passive composting, backyard or onsite aerated composting, in-vessel composting, and vermicomposting. There are also facilities exploring the benefits of compost tea. In all composting programs, the most efficient decomposition takes place when microbial activity is optimized. Nutrients, particle sizes, moisture content, oxygen flow, and temperature must all be regulated for an efficient and successful process.

Passive Composting

Passive composting involves placing organic material in a pile to decompose on its own with no maintenance. Without aeration, anaerobic degradation occurs. This is characterized by low temperatures, lack of oxygen, slow decomposition, and undesirable odors. For active composting, microbial activity needs to be encouraged for rapid degradation. Passive composting can take 2-3 years to turn into a usable material.

Backyard or Onsite Aerated Composting

Small scale composters such as home owners and small businesses can implement a composting program to reduce waste and disposal costs. Yard trimmings, such as leaves and grass, can be combined with food scraps in a compost pile. For rapid degradation, the pile must be actively turned to provide aeration for microbial activity. Improper management of food scraps can be odorous and attract animals. This method requires very little time and equipment. Conversion of organic material with active turning can take three months to over one year depending on the turning frequency.

Compost pile before decomposition. Picture courtesy of Kevin Mercer

Compost pile after decomposition. Picture courtesy of Kevin Mercer

Compost Applications to Sports Fields

In-Vessel Composting

In-vessel composting can process large amounts of waste, can be any size and can accommodate almost any type of organic waste. Raw materials are fed into a drum, silo, or concrete lined trench. These vessels are closely monitored to keep consistent temperatures, moisture, and aeration. There is usually a mechanism to turn the material for optimum aeration. In-vessel composting can be expensive and may require technical assistance to operate properly. However, this method produces minimal odor and minimal leachate. Conversion is quick and usually takes about 2.5 months.

In-vessel composting. Picture courtesy of Kevin Mercer

Vermicomposting

Vermicomposting is the incorporation of red worms into bins of organic matter to break material down into high value compost called castings. The optimum temperature for worm activity is between 55-77 degrees Fahrenheit. Worms typically eat anything, including food scraps, paper, or plants. One pound of mature worms (800-1000) can eat up to a half pound of organic matter per day. It takes about 3-4 months to produce harvestable castings.

Compost Tea

Compost tea is made by soaking or steeping finished compost in water. The resulting liquid material is then used for either a foliar or soil application. There are few controlled, replicable scientific studies that exist to support claims of the tea's effectiveness. However, there are claims that the tea acts as a biological control against foliar diseases.

Using Compost in Turf

Compost is used for two different applications in turf: incorporated into the soil prior to establishment or as topdressing.

Prior to establishment

Apply 1-2 inches of compost and incorporate it into the top 4-6 inches of soil. To avoid a layer forming, be sure to till the compost in as deeply as possible. Depending on the composition of the compost, additional fertilizer may need to be added, or it may need to be irrigated to leach salts. Always have the compost tested to determine its composition and what supplements need to be added. Incorporating compost provides many benefits to the soil, however, it will not cure soil physical problems.

Established turf

When topdressing with compost, the most effective application is following core cultivation. Apply ¼-1/2 inches of compost and work it into the site so it is evenly distributed. Spring and fall are the best times to topdress with compost. Avoid excessive applications as this could result in the buildup of a surface organic layer. While topdressing with compost provides many benefits, the degree of physical benefits to the soil when tilling compost into the top 4-6 inches are much greater.

Topdressing with compost. Picture courtesy of Kevin Mercer

Compost Applications to Sports Fields

Successful Compost Use at Sports Facilities

Sports facilities around the country are implementing their own composting programs. It's easy to get started. Consult schools, campuses, or your own facility to obtain raw materials for composting. Common raw materials used include:

- Coffee grounds
- Animal manure – poultry, horse, cattle
- Leaves
- Grass clippings and yard waste (Try to avoid using plant waste treated with herbicides, as this could be problematic in finished compost. Always read the pesticide label to see if clippings from treated turf can be used for compost.)
- Wood chips and sawdust
- Clean paper, cardboard, and shredded newspaper
- Food waste from dining facilities excluding dairy products, fats, grease, lard or oils, meat or fish bones and scraps

Benefits of compost applications at St. Mary's College of Maryland. Picture courtesy of Kevin Mercer

These materials can be combined into piles, rows or vessels at appropriate proportions to reach a 30:1 (or less) carbon to nitrogen ratio. Organic materials that contain nitrogen include grass clippings, food waste, coffee grounds and manure. Organic materials that contain carbon include dry leaves and woody materials. The pile should be kept out of direct sunlight and moisture content should be carefully monitored so the pile does not become too wet or dry.

To reach a finished product, mature compost requires proper aeration, consistent particle size, sufficient moisture, and high temperatures. The time frame for proper decomposition varies depending on if all of these factors are met and also the method used (piles versus in-vessel). Some sports fields will have multiple piles in various stages of decomposition so compost is available when needed.

Finished compost can be used on newly seeded beds, annual flower beds, vegetable gardens, as topdressing for athletic fields and turf areas, or tilled into the soil for added nutritional benefits.