

THE ORGANIC WAY- USE OF COMPOST AND MANURE IN SMALL FRUIT PRODUCTION



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Compost

Compost can be an important part of small fruit nutrient management. In addition to adding nutrients to the soil, compost can improve long-term soil health. Composts are best when used in combination with other nutrient management strategies including raw manures, green manures, fertilizers and crop rotations. According to the National Organic Standard, compost can be applied as necessary provided the compost meets carbon to nitrogen (C:N) and temperature requirements and has not been treated with prohibited substances. When using compost it must have a C:N ratio between 25:1 and 40:1. In addition, when using an in-vessel or static aerated pile system for composting the pile must reach a temperature between 131°F and 170°F for a minimum of three days. If using a windrow system for composting, the pile temperature must be maintained between 131°F and 170°F for a minimum of 15 days and turned a minimum of five times during that time. A compost log should be used to document that the composting procedure meets protocol. If the compost used is purchased, it must also have been produced in adherence with these requirements.

The nutrient content in compost varies depending on source materials and composting protocols used; therefore, it is recommended that compost be tested to determine the amount of nutrients it contains (kits are available through local county Extension offices). Finished compost typically has 0.5 to 2.5 percent total nitrogen. Most of the nitrogen is in an organic or slow release form. As a general rule, about 10% of the organic nitrogen in the compost will be available to the plant per year. This percentage is referred to as the availability coefficient. Phosphorus in composts, like nitrogen, is in an organic form that is not immediately available for plant use. As phosphorus is changed to a form useable by plants, some of it binds to soil particles and is again unavailable for plant use. Because of this, compost generally contains very little phosphorus for plant use and phosphorus from alternate sources is typically needed to meet plant requirements. Potassium in composts is in a form that is readily available for plant use, but it is also water-soluble and therefore can leach out of compost piles. Placing a cover over a compost pile can help reduce the amount of potassium lost to leaching. In addition to determining the nutrient content of compost, it can be useful to determine the pH because it can be unsuitably high for small fruit production, particularly for blueberries, which grow optimally in low pH soils.

When using composts, it is best to apply it based on crop needs rather than on a depth basis for long-term soil health. Studies have shown that this is especially the case when growing in high tunnels. The environment within high tunnels excludes factors that assist in the breakdown of compost (for example, rain). Applying compost on a depth basis in high tunnels can increase soil nutrient and soluble salts to well above optimum levels and compromise yields. Compost can be applied based on the amount of nitrogen, phosphorus or potassium the crop needs. Most commonly compost is applied based on the nitrogen requirements of the crop because nitrogen most often is limiting for plant growth.

To calculate how much compost to apply based on the nitrogen needs of a crop, first determine the total amount of nitrogen contained in the compost. Generally this is given in units of pounds per ton or as a percent. If total nitrogen is given as a percent, multiply this number by 20 (2000 lb/ton X 0.01 to change the number from a percent to a proportion) to determine the pounds of nitrogen per ton of compost. Next, determine the availability of the nitrogen in the compost. A general rule is 10% of the organic nitrogen will be made available to the plants in the first year. Finally, determine the amount of nitrogen needed by the crop. Remember to subtract nitrogen added from other sources (e.g., green manures or fertilizers) from the amount of nitrogen needed

by the crop. To calculate the application rate of the compost, multiply the total amount of nitrogen in the compost by the availability coefficient of the nitrogen. Then divide that number by the amount of nitrogen needed by the crop.

For example, a compost has 1.1% total nitrogen on a wet weight basis and analysis has indicated that a June-bearing strawberry planting needs 30 pounds of nitrogen per acre.

Step 1: Convert the 1.1% total nitrogen to units of pounds per ton by multiplying 1.1% by 20. The result is 22 pounds of nitrogen are contained per ton of compost.

Step 2: Determine how much nitrogen will be made available to the plant and multiply it by the amount of total nitrogen in the compost. The result is 2.2 pounds of nitrogen per ton (22 pounds per ton X 10%).

Step 3: Determine how much nitrogen needs to be applied to meet the needs of the crop and divide it by the amount of nitrogen available from the compost. The result is 13.66 tons per acre (30 pounds of nitrogen needed per acre ÷ 2.2 pounds of nitrogen per ton) of compost needs to be applied to supply the plants with 30 pounds of nitrogen per acre.

Timing the application of compost is different than for adding chemical fertilizers because nutrients are generally slowly made available to plants. When applying compost, timing must be adjusted to account for decomposition and the subsequent release of nutrients. For example, June-bearing strawberries have a high nutrient demand in the fall as they produce flower buds for the crop the following season. Compost may need to be applied in the summer so it will have sufficient time to decompose and release nutrients in time to meet plant needs in the fall.

Applying compost at improper times can result in vigorous plant growth late in the season. This delays hardening off of the plants and can lead to winter injury. Additionally, when compost is applied to raspberry plantings, use a fine compost because primocanes have difficulty emerging through large clumps.

Raw Manures

As with composts, raw manures can be used as a part of a nutrient management system. They also are best when used in combination with other nutrient management strategies. However, for reasons outlined below, manures are better suited for use during soil preparation prior to planting small fruit crops rather than after the crop has been planted. Composted manures are a better option for application after the small fruit crop has been planted.

According to the National Organic Standard, raw animal manures can be used anytime when needed on fields planted with crops not intended for human consumption, such as on green manures or cover crops. When raw manures are used on fields that are planted in crops for human consumption with the edible part of the crop not in contact with the soil (e.g., trellised brambles, highbush blueberries, gooseberries, currants), the manure must be soil incorporated a minimum of 90 days before harvest. When raw manures are used on fields that are planted in a crop for human consumption with the edible part of the crop in contact with the soil (e.g., strawberries), the manure must be soil incorporated a minimum of 120 days before harvest. The use of sewage sludge is prohibited in certified organic production. Even non-organic growers should be aware that there are site- and crop-specific restrictions that limit sewage sludge application to cropland, as outlined in state (and possibly local) regulations.

Tables listing the nutrient contents of different manures are available, however nutrient content varies depending on several factors including the feed the source animal was provided, presence of bedding in the manure and manure handling. Also, nutrient availability decreases as the manure ages. Therefore, as with composts, it is recommended that manures be tested for their nutrient content. Manure is typically applied based on the nitrogen needs of the crop. Fact sheets are available through cooperative Extension with detailed calculations for determining application rates for manures (for example, Estimating Manure Application Rates, Penn State Publication CAT UC151).

Nitrogen contained in manures is in the form of ammonia or ammonium, which can be quickly lost, through volatilization, to the atmosphere. To avoid this nitrogen loss, raw manures are soil incorporated. Soil incorporating manures can be a challenge for small fruit crops because the plants are perennial and have shallow root systems that can be damaged during incorporation. Applying manures to the small fruit crop can also damage the plants because of potentially high nitrogen and salt levels in manure. Additionally, manures can be contaminated with human disease causing organisms, which can be transferred to fruit. Manures can also have high weed seed levels, which can complicate production. It has been documented on vegetable crops that as manures decompose they can release compounds which when taken up by plants can lead to vegetables with off-flavors and odors. This may or may not be the case for small fruit crops. However, for these reasons, manures are recommended for use during soil preparation prior to planting small fruit crops rather than after the crop has been planted.

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