PennState Extension

HOME SPENT MUSHROOM SUBSTRATE

Spent Mushroom Substrate

Spent mushroom substrate is the soil-like material remaining after a crop of mushrooms. Spent substrate is high in organic matter making it desirable for use as a soil amendment or soil conditioner.

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Sometimes this material is called spent mushroom compost. This fact sheet briefly explains mushroom growing, so that the reader knows what is in the prepared substrate, and then describes the characteristics and possible uses of the material.

Mushroom Growing

Substrate prepared specifically for growing mushrooms is a blend of natural products. Common ingredients are wheat straw bedding containing horse manure, hay, corn cobs, cottonseed hulls, poultry manure, brewer's grain, cottonseed meal, cocoa bean hulls and gypsum. Growers may add ground soybeans or seed meal supplements later in the production cycle. On top of the substrate, farmers apply a "casing" layer, which is a mixture of peat moss and ground limestone. The casing material provides support for the growing mushrooms.

Spent mushroom substrate still has some nutrients available for the mushroom; however, it is more economical to replace the substrate and start a new crop. Before removing the spent substrate from the mushroom house, the grower "pasteurizes" it with steam to kill any pests or pathogens that may be present in the substrate and casing. This final pasteurization kills weed seeds, insects, and organisms that may cause mushroom diseases. Users may consider spent substrate clean of weed seeds and insects.

Mushroom growers sometimes apply a registered pesticide during the crop cycle. The local garden center sells most of the same pesticides a mushroom farmer uses. Even if pesticides have been applied, they are generally hard to find for two reasons. Organic matter in the substrate effectively binds pesticides. Also, these compounds decompose rapidly at the high temperatures used for pasteurizing the completed crop. It is safe to assume that the pesticide residue on spent substrate is low. Some farms are strictly "organic" and will not use chemical pesticides. These farms can be identified by contacting your Extension office.

Characteristics of Spent Mushroom Substrate

The typical composition of spent mushroom substrate fresh from a mushroom house will vary slightly. Since raw materials and other cultural practices change, each load of fresh spent substrate has a slightly different element and mineral analysis. Therefore the characteristics shown in Table 1 indicate a range of values for each component. Sometimes, fresh substrate is placed in fields for at least one winter season and then marketed as "weathered" mushroom soil. This aged material has slightly different characteristics because the microbial activity in the field will change the composition and texture. The salt content may change during the aging period. If you have any specific questions concerning characteristics of either fresh or aged spent substrate, please contact your local Extension agent.

Appropriate Uses of Spent Substrate

There are many appropriate uses for spent mushroom substrate. Spent mushroom substrate is excellent to spread on top of newly seeded lawns. The material provides cover against birds eating the seeds and will hold the water in the soil while the seeds germinate. Since some plants and garden vegetables are sensitive to high salt content in soils, avoid using fresh spent substrate around those plants. You may use spent substrate weathered for 6 months or longer in all gardens and with most plants. Obtaining spent substrate in the fall and winter, allowing it to weather, will make it ready to use in a garden the following spring. Spring and summer are the best time to use weathered material as a mulch.

As a soil amendment, spent substrate adds organic matter and structure to the soil. Spent substrate primarily improves soil structure and it does provide a few nutrients. Spent substrate is the choice ingredient by those companies making the potting mixtures sold in supermarkets or garden centers. These companies use spent substrate when they need a material to enhance the structure of a soil.

Average Analysis of Spent Mushroom Substrate

Contents	Units	Avg. Fresh	Weathered 16 mos.
Sodium, Na	% Dry Wt.	0.21 - 0.33	0.06
Potassium, K	% Dry Wt.	1.93 - 2.58	0.43
Magnesium, Mg	% Dry Wt.	0.45 - 0.82	0.88
Calcium, Ca	% Dry Wt.	3.63 - 5.15	6.27
Aluminum, Al	% Dry Wt.	0.17 -0.28	0.58
Iron, Fe	% Dry Wt.	0.18 - 0.34	0.58
Phosphorus, P	% Dry Wt.	0.45 - 0.69	0.84
Ammonia-N,NH4	% Dry Wt.	0.06 -0.24	0.00
Organic Nitrogen	% Dry Wt.	1.25 - 2.15	2.72
Total Nitrogen	% Dry Wt.	1.42 - 2.05	2.72
Solids	% Dry Wt.	33.07 - 40.26	53.47
Volatile Solids	% Dry Wt.	52.49 - 72.42	54.24
pH	Standard Units	5.8 - 7.7	7.1
N-P-K ratio	PPM Dry Wt.	1.8 - 0.6 - 2.2	2.7 - 0.8 - 0.47
% x 10,000 = PPM			

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