COMPOST PRODUCTION IN MUSHROOM FARMING

U.S. mushroom farmers produce more than 869 million pounds of mushrooms annually, contributing $1.3 billion towards the nation's economy (USDA National Agricultural Statistics Service Mushroom Crop Report). Mushroom farms and mushrooms compost wharves operate year-round to provide a safe, abundant and nutritious food product for consumers throughout the United States. Mushroom farms and compost wharves serve as environmental stewards, recycling agricultural byproducts.

Raw Materials/Inputs

Mushrooms are grown on nutrient-rich material called substrate. In creating substrate for mushroom houses, those in the mushroom farm community are also providing a valuable service by recycling byproducts from other agricultural sectors.

One of the main components of mushroom substrate is straw.

Each new crop of compost is comprised of approximately 60 tons of wheat straw by product.

The majority of the wheat straw is trucked from local farmers after they've harvested their wheat crops for the year. Using wheat straw allows mushrooms to be more environmentally friendly as the straw is an agricultural byproduct being recycled.

For the mushroom farms in southeastern Pennsylvania, Maryland and Delaware, the majority of the bedding materials are transported from within a 100 mile radius of mushroom farms. This is due, in large part, to the robust poultry and equine industries in the tri-state area. Grass hay, a renewable resource, is also a common bulk ingredient. Mushroom growers can use hay that is not suitable or has been rejected as feed hay. Grass hay can be grown on land and soils not suitable for other crops.

In addition to the recycling of stable bedding, mushroom substrate may include crushed corncobs, cottonseed hulls, soybean hulls, peanut hulls and cocoa shells, providing a useful solution for byproducts that previously posed waste management challenges for other agricultural operations. Farms are often strategically located near local sources ofthese inputs.

Once the pile is wetted and formed, aerobic fermentation (composting) commences as a result of the growth and reproduction of microorganisms, which occur naturally in the bulk ingredients. Heat, ammonia, and carbon dioxide are released as by-products during this process. The use of forced aeration, where the compost is placed in tunnels and aerated by the forced passage of air via a plenum, nozzles or spigots located in the floor has become nearly universal in the mushroom industry (see following 3 photos below).

In the composting process of making substrate, other products such as brewers grain, seed meals and poultry litter are introduced as nitrogen-producing materials. Once again,the mushroom farm community is extending the value of byproducts and decreasing the direct application of items such as poultry litter on the land, as well as the need to handleor store these items. This is especially important to the Delaware River Watershed and the Chesapeake Bay Watershed.

With the many diverse inputs required to form the growing matter for mushrooms, managing the composting process that produces substrate is extremely important – bothfrom environmental and economic standpoints.

A standard protocol for composting operations is to use leachate from the wharves and growing rooms to add moisture to mushroom substrate as it is being formed.This ensures no nutrients are lost from the facility and decreases the potential for runoff. Wastewater lagoons are lined and aerated to reduce odors.
In addition, management efficiencies on the composting wharves have the added benefitof controlling inputs, including water and other resources used when creating substrate. This, in turn, means less risk to the environment from raw materials at the wharf.

Growing
To begin the process of growing mushrooms, beds must be filled with the compost. During a process known as “spawning,” natural materials such as rye grain, wheat, millet or other small grains are used as the host for mycelium to be introduced intothe substrate-filled beds. Using these grains provides an ecologically sound, all-natural solution to introducing mushroom spawn to the substrate-filled growing beds.

Once the mushroom beds are filled with substrate and inoculated with spawn, a top-dressing called “casing” is applied. Mushrooms are grown indoors on stacked aluminum or wooden trays in production rooms inside larger buildings called mushroom houses. By growing mushrooms indoors,producers are better able to control environmental factors and related energy needs.

Mushroom Production
During the various stages of mushroom production, environmental best management practices are used to ensure inputs and natural resources are used in an appropriate, efficient manner.

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Post-Production
Researchers continue to investigate ways to re-use spent mushroom compost that has been removed from beds after the completion of the mushroom growing and harvest cycle) and the casing material as ingredients in substrate preparation, as well as other uses that are described in the Post-Production section.

On the farm, once the final crop of mushrooms has been harvested, the spent mushroom compost (SMC) is removed from the mushroom growing rooms. Research and market demand demonstrates that this material retains nutrients and fungal suppression qualities that make it an ideal crop production and landscaping component. Many agricultural producers who deliver mushroom substrate ingredients, as described inthe Raw Material/Inputs section, backhaul Mushroom Compost to their farms. The Mushroom Compost is used on crop fields as an organic fertilizer reducing the need for inorganic fertilizers and lime.

Marketed as “Mushroom Compost” after the last harvest of mushrooms, this compost rich in organic matter, has high value for conifer

production, turf grass managers and landscape contractors. Mushroom Compost has been used successfully for runoff mediation and riparian buffer projects, green roofs, artillery fungus suppression, evergreen farms, athletic fields, landfill caps for establishing vegetation, restoration of degraded coal mine lands for wildlife vegetation, myco- remediation and neutralizing acid mine drainage.

Summary

The mushroom farm compost community is proud of its recycling of agricultural byproducts to reducing inputs on the farm and at the packaging and processing facilities, the U.S. mushroom farm community is embracing environmental management and creating a stronger, more sustainable future for its farms and neighbors.