



The re-use of Spent Mushroom Substrate

Goal 12 Ensure sustainable consumption and production patterns

SDGs program

21-05-2018

ID



BORN IN 1973
PLACED IN RUTIGLIANO (ITALY)
DIMENSION > 7 ha
CORE BUSINESS > mushroom
production (different species of
pleurotus and agaricus)
TOTAL REVENUES > 2,5 mil
TARGET > GDO and DO

ROLE OF SUSTAINABILITY



Fungo Puglia pays attention to sustainability through all its supply chain. It is spending all the efforts on sustainable practices, included the environmet in which is sited in, the social performances of its workers and the economic outcomes oriented to an intelligent use of its resources.

The facility is sourrounded by trees and gardens in order to make workers more productive and relaxed. The idrocooling system for mushroom production permits a water re-use. The raw materials do not present pesticides inside. A solar panel system provides 80% of clean energy used by the firm.

MUSHROOM CULTIVATION



The most important step in having a good quality product is the selection of raw materials. The production of the compost (a mixture of natural products, including horse-bedded straw, hay, poultry manure, ground corncobs, cottonseed hulls, gypsum, and other substances) requires a deep selection of primary goods from reliable suppliers.

Raw materials are produced in a natural way without pesticides and avoiding the depletion of natural resources.

MUSHROOM CULTIVATION



MUSHROOM CULTIVATION INVOLVES SEVERAL OPERATIONS

steps in mushroom production

- ✓ Selection of mushroom spores or strains
- ✓ Maintenance of mycelial cultures
- ✓ Development of spawn/inoculum
- ✓ Choosing a growing medium
- ✓ Pasteurizing or sterilizing the medium
- ✓ Seeding the beds with spawn (material from mature mushrooms grown on sterile media)

SPENT MUSHROOM SUBSTRATE



Spent mushroom substrate (SMS) is the soil-like material remaining after a crop of mushrooms has been harvested.

It is high in organic matter, making it desirable for use as a soil amendment or soil conditioner.

Sometimes this material is called spent mushroom compost (SMC).

Considering the potential property of this substrate, Fungo Puglia has started an intensive collaboration with local scientific partners in order to carry on trials and enhance sustainable results.



DIPARTIMENTO DI SCIENZE DEL SUOLO, DELLA PIANTA E DEGLI ALIMENTI

SPENT MUSHROOM SUBSTRATE

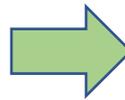
Mushrooms are grown in a mixture of natural products, including horse-bedded straw, hay, poultry manure, ground corncobs, cottonseed hulls, gypsum, and other sub-stances.



This mixture is composted in piles or ricks, creating a dark brown, fibrous, and pliable organic growing media



When the composting process is complete, the media is brought into mushroom houses where it is placed into beds or trays and used as a substrate for growing mushrooms.



After the mushrooms are harvested, the "spent" substrate is removed from the houses and pasteurized with steam to kill insects, pathogens and mushroom remnants (figure 1)



Figure 1. SMS

SPENT MUSHROOM SUBSTRATE



Spent mushroom substrate has many appropriate uses

The spent mushroom is rich source of nutrients, which make it well suited for supporting plant growth and make nutrient rich compost with other organic wastes.

Spent mushroom manure is used for many fertilizing purposes.

- Spent compost is regarded as an attractive material for **improving soil texture.**

It contains much organic matter, few heavy metals, and no weed seeds or pathogens which are harmful to agriculture or horticulture.

- SMS is excellent to spread on top of newly seeded lawns because it will provide cover against birds eating the seeds and will hold water in the soil while the seeds germinate

SPENT MUSHROOM SUBSTRATE



Characteristic of Mushroom waste:

- High Organic matter content
- High moisture content
- Moderate plant nutrient content
- Relatively low bulk density
- Unbalance distribution of major plant nutrients

Chemical analysis of mushroom waste:

Substrate	pH	EC (dS/m)	N (mg-L ⁻¹)	P (mg-L ⁻¹)	K (mg-L ⁻¹)	Ca (mg-L ⁻¹)	Mg (mg-L ⁻¹)
Mushroom waste	8.33	25.6	23.6	28.0	7430	1108	376

SPENT MUSHROOM SUBSTRATE



Why Use SMS?

The most valuable aspect of SMS is its high organic matter. This allows soil to retain moisture in dry weather and shed it during wet weather. By creating air spaces, SMS acts as a sponge in gravel or sandy soils and permits clay soils to drain. SMS will not leach from the ground. Nutrients remain in the soil and, unlike inorganic fertilizers, do not contribute to groundwater pollution if applied correctly.

There are many advantages of SMS over other composts produced from food and garden wastes including:

✓ A consistent, formulated & homogeneous product

The SMS production cycle occurs all year round with consistent materials and compost products.

✓ High water & nutrient holding capacity

SMS includes sphagnum peat and an organic matter formulation resulting in moisture and nutrient retention.

SPENT MUSHROOM SUBSTRATE



Why Use SMS?

- ✓ Weed free nature

Extensive composting and indoor pasteurization ensures that weed seeds cannot enter the product.

- ✓ No nitrogen draw-down problems

Unlike wood and paper wastes frequently found in other products, SMS has been supplemented with nitrogen.

- ✓ Absence of heavy metals

Reduces consumer concerns SMS supports plant growth and is a good soil amendment for farming, turf management and home gardening.

SPENT MUSHROOM SUBSTRATE



DOUBLE RECYCLING...

Producing nutritious food at a profit, while using materials that would otherwise be considered “waste,” constitutes a valuable service in the self-sustaining community we might envision for the future.

SPENT MUSHROOM SUBSTRATE



DOUBLE RECYCLING...

Using mushroom substrate on your garden recycles a product which would otherwise be disposed of as waste. As the substrate itself is recycled by-product from primary industry, you're **DOUBLE RECYCLING!!**

Use mushroom substrate as a:

- Mulch
- Soil conditioner
- Potting mix additive

It is great for:

- Most flowering plants
- Trees and shrubs
- Vegetable gardens & herbs
- Establishing lawns

SPENT MUSHROOM SUBSTRATE



DOUBLE RECYCLING...

You can save water with mushroom substrate because it:

- Stores up to 70 percent of its own weight in water
- Improves transmission of water through the soil
- Keeps the soil cooler in warmer weather, warmer in cooler weather and increases soil resistance to both wind and water erosion

How to use mushroom substrate in a new garden bed:

- Spread mushroom substrate on the soil surface
- Incorporate the substrate into the top 10 to 30 cm of the soil
- Allow about 1 week for substrate to settle and blend with the soil
- Sow the seeds or transplant the plants
- Water well initially

SPENT MUSHROOM SUBSTRATE



Future...

Abundant availability of organic wastes pose problem of disposal.

Bio-conversion of these renewable wastes would solve pollution problems and also the organic wastes become available for soil enrichment.

Bio-degradation of various agro and agro-industrial wastes could be accomplished through several micro organisms to degrade lignocelluloses complex.

Biological pretreatment of lignocelluloses wastes with mushroom fungi might become economically and environmentally attractive.

Spent mushroom substrate is likely to be an excellent physical and nutritional source for composting along with other raw materials.

SPENT MUSHROOM SUBSTRATE



...Future

The **production of biogas** from spent compost is very low and provides little prospect of economic use in the present circumstances.

Per kg of dry matter 2.7 or (according to another experiment) 44 litres of methane can be produced.

Only 10% of the dry matter can be converted to methane.

Another disadvantage is that for biogas production very large quantities of water would have to be added to the spent compost, which would make it difficult to dispose of the residue.

SPENT MUSHROOM SUBSTRATE



...Future

Some consideration has been given to burning spent compost to obtain **energy from it**.

The potential heat production is estimated at 1,500 kJ/kg.

However, spent mushroom compost contains 60% water, and half the dry matter is ash, so the material first has to be dried before it can be burned properly.

A considerable quantity of ash is then left in any case, and arrangements have to be made for its disposal.

Besides, burning is harmful to the environment, so expensive measures have to be taken to combat air pollution. Obtaining energy from spent compost by incineration therefore has little future



Thank you for your attention!!