mushrooms in drylands

by Tammy Davis

keystone species and soil-building

In our desert environment, water is a critical issue in the creation of an island oasis full of diversity and life. There are many techniques used in permaculture to trap and store moisture to enhance plant growth (e.g. swales, heavy mulching, rainwater catchment). Implanted mycelium can be another important tool in retaining moisture and creating healthy soil in our challenging environment. In the creation of a compatible biome within a desert environment, fungi can be used as a keystone species for the development of microcosm habitats which will support a succession of plant species. A keystone species is one that, once established, makes the situation favorable for many other new species that couldn't exist under previous conditions due to lack of nutrients or moisture in the soil. Fungi can perform this role and create healthier soil by forming a moisture-retaining layer in the soil and converting bound-up nutrients into a usable form for plants.

beneficial relationships with plants

Mushroom mycelium is probably the most critical element in a healthy ecosystem. All plants are dependent on the decaying process of mycelium and other micro-organisms for nutrients. Since saprophytic mushrooms (those which feed on dead or dying matter) are non-competitive to neighboring plants, they pose no danger to them. In fact, plants near a mushroom bed often thrive as the result of increased moisture retention and the release of nutrients into the root zone. Many are benefiting from direct associations of mycelium with their roots. These are called mycorhizzal associations and benefit both plants and fungi as they exchange nutrients.

permaculture and nutrient recycling

Paul Stamets, in his excellent resource book, *Growing Gourmet and Medicinal Mushrooms* , says "When gourmet and medicinal mushrooms are involved as key organisms in the recycling of nutrients, the biodynamics of permaculture soar to extraordinary levels of productivity. Not only are mushrooms a protein-rich source of food for humans, but the by-products of mushroom cultivation unlock nutrients for other members of the ecological community. " The rapid return of nutrients back into the ecosystem, especially here in the desert where this process is much slower, enhances the life cycles and growth of plants, animals, insects, and soil micro flora.

Mycelium is present in all healthy soils, even if one rarely sees a fruiting mushroom body. It is often visible as a white thread-like web just under the surface of the soil. You may notice mycelium between the bark and wood of dead trees and wrapped around fallen twigs and branches as it works to break the wood down into soil. Every pile of debris, whether it is tree trimmings, wood chips, straw or even coffee grounds, will support mushrooms. Unless selectively inoculated, debris piles become habitats of miscellaneous "weed" mushrooms. Indeed, mycelium is already present in the straw mulch of the swales of many permaculture sites in New Mexico. Why not make the edible species dominant so as to increase the yield of your landscape as well as the productivity of your soil? This is the premise of **mycological landscaping.** After having experienced the taste of your first harvest of freshly grilled mushrooms, you will come to appreciate the beauty and excitement of a newly erupting flush of mushrooms in your garden!

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pest control

As we increase the health of our soils we are creating a moist climate favorable for fungi in the garden area. If we establish a beneficial, non-parasitic, edible species into a growing area it will actually prevent other harmful parasitic fungi from entering and establishing themselves. It has also been shown that waste straw from oyster mushroom cultivation, if turned into garden soils can reduce the populations of nematodes, which are costly to gardeners and farmers.

mushroom compost

The mycelium grown in culture has a much higher success rate if it is acclimated to local conditions in stages. This is why I grow the mycelium out into boxes of wood chips and sawdust indoors over the winter before introducing it into the garden. However, if this is to be done on-site, there is a wonderful way to design a staging process that includes and benefits your composting system, garden, and swales.

Straw bale compost bins with layers of straw, leaves, sawdust and wood chips inoculated with mycelium will break down into rich soil much more quickly. This is good for the garden, land quality and yield as well as providing a mycelium-inoculated substrate to add to garden beds for producing mushroom fruitings.

It is possible to host 4 or 5 different species in separate compost bins to be installed into different areas on site such as swales, shady patches, buried logs, the vegetable garden and at the base of north-facing walls.

Once the mycelium is established, the innoculated wood chip material can be removed from the compost bin and put into the ground with fresh wood chips in order to create a mushroom patch in the areas selected. The mycelium left in the compost pile would simply accelerate the composting process.

experiment!

Since this is literally ground-breaking work for replenishing the soils here in New Mexico, it would be beneficial to stage a comparison of plants grown near mycelium beds and plants grown in other locations in order to illustrate any difference in growth and moisture retention. I believe we will see an improvement in the growth, health and vigor of plants grown in association with mushroom beds. If we attempt to mimic this connection observed in nature our permaculture sites will certainly benefit from the addition of this very important component.

references

Stamets, Paul 1993. *Growing Gourmet and Medicinal Mushrooms.* Ten Speed Press, Berkeley, CA. p. 42.

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