



mushroom cultivation



what is it?

It's the same as any other kind of cultivation - but mushrooms are not plants, and they're more fiddly to grow. Mushrooms are grown from 'spawn' - mushroom tissue culture that has been produced from spores grown in sterile / laboratory conditions (contamination is a big problem at this stage). Spawn can be obtained from specialist suppliers, then added to a substrate (compost, a log, coffee grounds etc.) to spread their mycelium (thread-like root system) and produce a crop. There are two major stages in mushroom growth. The first is the vegetative stage - the young, developing spawn is encouraged to feed and grow, to get to the second, fruiting stage, when the mushrooms can be harvested.

There are three types of mushrooms that can be cultivated:

- humus-inhabiting - grown in a mix of compost, horse manure, soil and straw; includes the classic button mushroom varieties, as well as others such as blewits or shaggy ink-caps
- wood-inhabiting - grown in logs, like shiitake, maitake (hen of the woods), ear fungus or monkey's head fungus
- mycorrhizal - grown in association with tree roots; truffles, in other words

History

Humus-inhabiting: around 1650, in France, it was noticed that button mushrooms appeared naturally in the autumn after the melon crop. They died as soon as it became too cold though, so they put them in trays and moved them to caves, where the season was extended by protecting them from the cold and the winds that evaporated the moisture from the soil. They were soon growing them year-round in a controlled environment in tunnels. The mushroom industry was born, and other countries followed.



Oyster mushroom tissue culture in a petri dish.



Beech mushrooms (*Hypsizygus tessellatus*) growing on a sawdust block.

Wood-inhabiting: there are written records of shiitake cultivation from around 1000 years ago in China. They obtained spawn as best they could without contamination, and inoculated it into logs of beech and oak that they grew on in the wild.

Mycorrhizal: truffles only grow on the roots of a host tree. It was thought that they could only be collected from the wild, but in 1972 in New Zealand, oak trees were planted with a view to inoculating their roots with truffle spawn. In Europe and North America there is a community of fungi associated with oak roots that will compete with truffles and make cultivation difficult. Oaks are not native to New Zealand, so truffle spawn has no competitors. By 1985, they were able to produce a consistent crop within 7 years - so still difficult but not impossible. They can now be cultivated anywhere, on the roots of oak or hazel - but it takes a lot of land as you have to plant the trees as well. A free-draining loam is required - clay soil isn't good for truffles.

what are the benefits?

It can be a very interesting hobby with delicious results, that could easily become a profitable small business, due to the low cost of inputs and high value of the crop.

The substrate can be a waste product - e.g. humus-inhabiting species can be grown in coffee grounds that coffee shops would usually be more than happy for you to collect for free. Coffee grounds are sterile, and contain the cellulose and lignin that mushrooms need - the perfect substrate.

Mushrooms are healthy and nutritious, and some species have medicinal properties. Reishi bracket fungus has been used to produce medicinal tea for centuries, and now it's used alongside conventional treatments for HIV, to help restore the immune system.



what can I do?

Oyster mushrooms: mix 500g of spawn with 2.5kg of fresh coffee grounds. Keep in bags in a warm, dark place for 2-3 weeks, then make some slits in the sides and mist spray a couple of times per day for 1-2 weeks. Mycelium will spread and produce fruit to harvest in 3-4 days. Then compost the coffee grounds. The cellulose and lignin will be gone, but they'll still break down.

Button mushrooms: source your spawn (you can't do it yourself unless you have a lab) and your substrate. You could get manure from a local farm or stables, but it will need to be sterilised as it will be full of microscopic contaminants. The easiest way to do this is in an industrial pressure cooker. Allow the sterilised manure to cool completely afterwards, otherwise it will kill the spawn. Add chopped (and sterilised) straw to the manure, and mix with the spawn - around 1:10, spawn: substrate. Put the mix into trays around 6" (150mm) deep, but leave the top 1" (25mm) for a casing or topping layer of good quality compost from a garden centre (that will already have been sterilised) that will ensure that spores from the air don't interfere with your mushroom spawn. Keep the trays moist, warm (between 15-28°C) and dark for a few weeks. The fruiting bodies will push their way through the compost topping layer.

Shiitake: spawn is usually supplied on dowels, covered in furry white mycelium. Drill holes and inoculate logs with them. Seal the holes with cheese wax (not beeswax, as bees might arrive to reclaim it!) to stop the spawn drying out or other fungus spores getting in. Don't use softwoods, as

conifers contain natural fungicide; but hardwoods are denser, making it more difficult for mycelium to spread. This means that the vegetative phase can be up to 18 months. Leave the logs outside, under shrubbery so that they're in the shade and protected from frost and winds that can accelerate evaporation. Moisten the logs in dry spells.

Truffles: specialist business with a much longer vegetative stage. A high-value crop that could suit an intrepid smallholder. You could plant maybe an acre of inoculated hazels (which grow much faster than oaks) and if you don't manage to produce truffles, at least you can harvest wood and nuts.

Starting a mushroom-growing business

The more prized / exotic the species, the higher the chance of failure, but the higher the rewards if successful.

There are some useful tricks to increase the chances of success of a mushroom-growing business. Some growers have found that a way to stimulate the fruiting phase is to induce environmental stress. In nature, fungi will exist in the vegetative phase, feeding, for several weeks, but if there is a sudden cold snap, they will fruit. They receive a genetic message that winter has arrived, and this may be the last chance they have to produce spores and pass on their genes. This effect can be recreated artificially. If after a week or so, mycelium is spreading through the substrate, put it in the fridge at 5°C for two days, then bring it out, and you can get fruiting bodies in half the usual time.

resources

- lowimpact.org/mushroom-cultivation for more info, courses, links, products & books, inc:
- Sarah Dalziel-Kirchhevel, *Growing Mushrooms for Beginners*
- Paul Stamets, *Mycelium Running*
- Willoughby Aravelo, *DIY Mushroom Cultivation*
- Jennifer Snyder, *the Shiitake Way*
- fungionline.org.uk – the biology of fungi
- bit.ly/3Cx6oqq – mushroom cultivation booklet
- grocycle.com - grow-your-own mushroom kits
- mushroominfo.com – US Mushroom Council, info on history, growing, nutrition & recipes
- food.com/search/mushroom – over 7000 mushroom recipes
- paulstamets.com - famous mycologist – if you're interested in fungi, you'll love this site



Shiitake mushrooms on a hardwood log.

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