



By Dr Ian Hall



Pink oyster mushroom

Growing mushrooms

Part three: compost and wood-waste



Wood ear mushroom growing on sawdust in plastic bags

ABOUT 95 per cent of all mushrooms consumed in the world belong to the saprobic group and are cultivated on various dead plant and animal remains. The shiitake mushroom was the first to be cultivated in the 10th century in China but now around 50 species are cultivated from the exotic to the distinctly illegal. Most are available either fresh or dried in New Zealand although sometimes you may have to search hard to find them. Asian grocery stores are an excellent source of the dried mushrooms and once rehydrated, are competitively priced. (See table below).

The methods used to cultivate these mushrooms are fundamentally

quite simple. You first learn what the mushroom needs to grow on (the substrate), you locate a reliable source of a culture of the mushroom, and then you put the two together with the right temperature and moisture. Of course it is not quite as simple as that and, as I explained last month, the production of the button mushrooms is now the domain of the big boys. This is partly because of the disgusting aromas generated during composting of the animal and plant remains these mushroom grow on and the relatively new requirement that these smells are not inflicted on the neighbourhood.

The other edible saprobic mushrooms are less obnoxious and generally are cultivated on sawdust,

Some edible mushrooms that can be grown on compost, straw or wood waste and their production in China

Some common names	Botanical name	Chinese production in 2003 (x 1000 tonnes) *	Percent of total Chinese production
Button mushroom, champignon de Paris, crimini, Portobello, Swiss brown, etc.	Agaricus bisporus	1330	12.8%
Grey oyster mushroom	Pleurotus ostreatus		
Phoenix mushroom, Indian oyster mushroom	Pleurotus pulmonarius		
Abalone mushroom	Pleurotus cystidiosus		
Pink oyster mushroom	Pleurotus djamor	2488	24.0%
Golden oyster mushroom	Pleurotus citrinopileatus		
King oyster mushroom	Pleurotus eryngii		
Shiitake, dong gu, hua gu, Enokitake	Lentinula edodes Flammulina velutipes	2228	21.4%
Straw mushroom	Volvariella volvacea		
Black poplar mushroom, tea tree mushroom, pioppino	Agrocybe aegerita		
Monkey head mushroom	Hericium erinaceous		
Brazilian mushroom	Agaricus blazei		
Nameko	Pholiota nameko	4341	42.0%
Wood ear mushrooms	Auricularia		
Hen of the woods	Grifola frondosa		
White jelly fungus	Tremella fuciformis		
Buna shimeji	Hypsizygus tessellatus		

(* from Shu-Ting Chang www.unapcaem.org/publication/TM-Mushroom.pdf)



Shitake on a log.



Woodear mushroom growing on a rotting stump.



Sawdust logs inoculated with the grey oyster mushroom, China



Golden oyster mushroom.

newsprint, and other waste cellulose-containing materials where the side-effects of cultivation are generally tolerable. A variety of methods are used, many of which are anything but complex and are likely to be more attractive to the lifestyler looking for a paying hobby rather than a multimillion dollar investment.

The traditional method for cultivating shiitake is on oak logs about 1m long and 8cm to 15cm diameter. These are cut and collected in Spring just before bud break. The logs are then dried a little and a network of shallow holes drilled into the surface. A culture of the shiitake fungus is then pushed into each hole and the surface sealed over. The logs are then propped up under a forest canopy where the temperature is about 20 deg C and the moisture level in the logs maintained at about 35 per cent.

Over the following six to 12 months the fungus grows out into the

wood from each of the small holes and eventually completely colonises the logs. At this point the logs are soaked in cold water and this triggers the shiitake to fruit. The logs are then rested for about three months, during which time the fungus gathers nutrients for another fruiting which is again triggered by the cold water treatment. In this way four lots of fruiting bodies can be harvested over a year.

More modern techniques for cultivating shiitake dispense with the logs and instead the fungus is grown in heat-resistant plastic bags filled with sawdust and supplements or simply on blocks of a compressed sawdust-supplement mixture. To avoid problems from bacteria, fungi, nematodes, viruses, etc. the substrate is heat treated.

Size, thickness of the cap, taste, texture, moisture content, and the pattern on the cap all contribute

to the perceived quality of shiitake fruiting bodies. The highest grade hua gu (Chinese) or donko (Japanese) has a pattern of cracks that resembles a flower on the surface of the cap and can command much higher prices than the lower grade dong gu (Chinese) or koshin (Japanese). Some growers of shiitake on sawdust based media will scar the surface of the fruiting bodies when they are at the small button stage. When these grow to maturity they have the cracked appearance of hua gu although the texture of the caps usually belies their origin.

The techniques I saw in Zhang Jia Jie, Hunan, are typical of those which can now be seen throughout China. The substrate was made from 1000kg of cotton husks mixed with a suspension of two per cent calcium hydroxide, two per cent calcium sulphate and two to five per cent ground rock phosphate in water. The mixture was then covered with clear



Plastic bags filled with shiitake mushrooms.



Shiitake growing on sawdust blocks.


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polythene and left in the sun until it reached pasteurisation temperature – about five days. Two and a half kg of the pasteurised materials were

then placed in polypropylene bags cut from a roll of tubing. The ends of the tubing were passed through 50mm rings, the bag folded backwards over the outside of the ring and the open neck covered with newspaper. Three small cuts were then made along the length of each bag, a culture of the fungus pushed into each and the cuts sealed with sticky tape.

The bags were then stacked four or five high in rooms and incubated at approximately 22 to 27 deg C for 3-4 weeks. The bags were then removed and the colonised substrate buried horizontally in a field, leaving only the upper 3 to 5cm exposed. Fruiting occurred after two weeks and there were a total of five flushes separated by intervals of two weeks.



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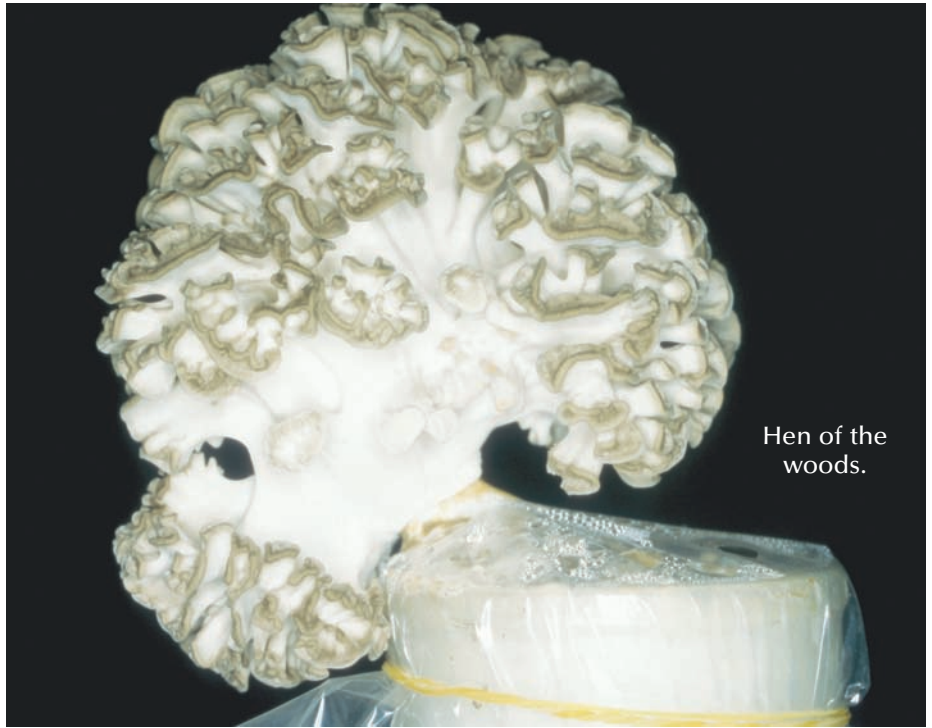


King oyster mushroom

Alternatively, the bags were incubated in rudimentary shelters where, despite a complete lack of hygiene, yields were remarkably high, typically in the order of 1kg of fresh mushrooms from each kg of fresh substrate. Once the last flush of mushrooms had been picked, the grower was left with the spent remains, which were used as a garden mulch.

Because of the prices saprobic mushrooms can command and the demands made by a discerning market, many growers now grow their mushrooms in wide-necked polycarbonate bottles containing about 1kg of substrate. The tops of these bottles can be seen in the photos illustrating the king oyster and hen of the woods mushrooms.

If you would like to try growing small quantities of saprobic



Hen of the woods.

mushrooms, kits are available from a range of suppliers including Mushroom Gourmet in Northland (www.mushroomgourmet.co.nz).

Some further reading

Button mushroom basics http://en.wikipedia.org/wiki/Agaricus_bisporus
Getting started www.mykoweb.com/articles/cultivation.html

Training manual on mushroom cultivation by Shu-Ting Chang www.unapcaem.org/publication/TM-Mushroom.pdf published 2008

Edible and poisonous mushrooms of the world by Ian Hall and colleagues, published 2003, available from Ian Hall, truffle1@ihug.co.nz

Growing gourmet and medicinal mushrooms by Paul Stamets, published 2000, available from Amazon.



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