

THE MUSHROOM GROWERS' NEWSLETTER

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WELCOME

Welcome to The Mushroom Growers' Newsletter. This newsletter is intended for people who are interested in cultivating mushrooms in the Northern California and Southern Oregon areas. Its focus will be on issues related to cultivating, processing and marketing mushrooms. In general the idea is to help you make money in the mushroom business.

This will be the only free issue. If you want to continue getting this newsletter please send \$35.00 for 12 issues to:

The Mushroom Growers' Newsletter

P.O. Box 5065

Klamath Falls, OR 97601

I'll do my best to get the newsletter out on a monthly schedule, but, even if I don't, you are guaranteed to get 12 issues for your \$35.

WHO??

So who, or what, is The Mushroom Company? The Mushroom Company is Jerry Haugen, your editor and Trish Haugen, my able partner. We will be publishing and distributing information related to mushrooms.

My primary interest is supporting the establishment and growth of the mushroom industry in this area. It seems to me that keeping folks up-to-date and supplying information is a way that I can serve that purpose. I feed the family with my job as Operations Research Analyst with the U.S. Forest Service in Klamath Falls. As part of that job, I work with people who are concerned about maintaining the quality of life in this area in the face of major changes that are facing the timber and agriculture industries.

Trish and I are both interested in growing mushrooms ourselves and Trish has a building that we are currently converting for mushroom growing. She has managed a health food store, has a strong background in horticulture and is a great cook! She is also attending Oregon Institute of Technology, working toward degrees in Physical Therapy and Nutrition.

HELP WANTED

I need your help. First of all, when you send in your hard-earned \$35.00 please include a note discussing what you would like to see in this newsletter. Second, send me any information you might like to share or questions you may have. Third, if you have special expertise in some area, please let me know so that I have someone to turn to when I get stumped with a question (that's likely to be more often than not!).

Hopefully with this approach, I can keep track of people with various types of expertise. I will be happy to refer you to someone who might be able to help with your particular problem. You are welcome to give me a call evenings (between 5:00 PM and 10:00 PM) or weekends for this type of help. Also, please feel free to call if you have anything that you would like to see in this newsletter. My number is 541-883-3719 and I have an answering machine in case I'm not around. (which is fairly common).

If you have an article, an advertisement or something else you would like to see published in this newsletter, send it in.

THE U.S. SPECIALTY MUSHROOM INDUSTRY

Note that in the following discussion the prices mentioned are based upon the point of first sale. Growers who package and sell their crop directly at the retail level get higher prices than those who sell them in bulk to brokers or repackers. The "price at first sale" is a weighted average of all these methods of sale.

From Mushrooms by the National Agricultural Statistics Service, U.S. Department of Agriculture, August 20, 1991:

"Volume of sales for commercially grown specialty mushrooms (Shiitake, Oyster, and all other specialties) in 1990-91 totaled 6.07 million pounds, 2 percent above the 1989-90 volume. Virtually all specialty mushrooms are sold fresh. The value of the 1990-91 specialty mushroom crop amounted to \$22.4 million, virtually unchanged from the previous season.

"Shiitake sales totaled 3.90 million pounds, 4 percent

above last season. This production grew on 315,000 natural wood outdoor logs, 229,000 natural wood undercover, and indoor logs, and 1.14 million square feet of indoor growing area. The value of sales was \$16.3 million or \$4.17 per pound.

"Oyster mushroom sales totaled 1.49 million pounds, down 6 percent from last season. This production was grown on 261,000 square feet of indoor area. The sale of this crop reached a value of \$3.98 million or \$2.67 per pound.

"All other specialty sales totaled 674,000 pounds, 15 percent higher than the previous season. Production was achieved on 95,000 square feet of indoor growing area. The value of sales totaled \$2.12 million or \$3.14 per pound.

"If grower's 1991-92 intentions are carried out, the number of Shiitake natural wood outdoor logs in production will decrease 12 percent, the number of natural wood undercover and indoor logs will drop 2 percent, and the square feet of other production area will increase 6 percent. Oyster producing area is expected to decrease 1 percent. All other specialty intentions are up 4 percent. A specialty mushroom grower is defined as one having at least 200 natural wood logs in production or commercial indoor growing area."

More information from this NASS report will be used in subsequent issues. You can obtain a complete copy (14 pages) of the NASS report on mushrooms from NASS for \$6.00. Or send \$5.00 to The Mushroom Company and we will fix you up with a copy. The next version of this report will be issued in August.

MT. SHASTA MYCOLOGICAL SOCIETY

Mycology, the study of fungi, is what the Mt. Shasta Mycological Society is all about. The group meets the last Thursday of every month. Dues are \$12.00 per year and includes their monthly newsletter, The Funguide. The Funguide describes the group's activities and news of interest to collectors of wild mushrooms. The editor is Kim Donahue, 623 Pony Trail, Mt. Shasta, Ca. 96067. Contact Kim for more information.

FOR THE BEGINNER

This article is for those of you who have heard about mushroom cultivation and think you might like to give it a try. If you don't know anything about the subject, read on. This month, we discuss what a mushroom really is and the general concepts associated with

growing them.

Mushrooms are those little umbrella shaped guys that grow out in the forest, right? Well, yes and no. What you normally see growing out in the forest is, in fact, the fruit of the mushroom. The major part of the fungi is hidden beneath the forest floor. That part is collectively called the mycelium (or mycelia, in the plural). The mycelium looks like a fuzzy mold to the naked eye. With a microscope, or better than average eyes, you can see that it is in fact an intricate network of microscopic filaments called hyphae. It would take more than a thousand hyphae in a bundle to approximate the thickness of a human hair! It takes miles of hyphae to sustain a single mushroom fruit. The mycelium converts rotting wood and other materials into sugars which sustain the life of the fungi.

Mushrooms can be generally categorized into three groups. The **parasites** attack living trees. The **saprophytic** fungi are nature's decayers. They help create rich soil out of dead plant and animal materials. The **mycorrhizae** work in harmony with tree roots. They improve the tree's ability to collect and distribute needed water and minerals. The mycorrhizae benefit by accessing sugars created by photosynthesis within the tree's leaves. All of the principal cultivated mushrooms are of the saprophytic type.

It has been recently found that, even though the commonly cultivated oyster mushroom is saprophytic, it has its carnivorous side. The mushroom has been found to produce cells which bear tiny droplets of a substance that is toxic to nematodes (a tiny worm). If one of these hapless worms gets splashed with this poison, it becomes paralyzed. The mushroom hyphae have been seen to home in on the worms and eat them alive! This doesn't have a whole lot to do with the process of cultivating mushrooms, but it does point out the fact that we are constantly learning new things about how mushrooms live.

We do know that mushrooms don't fruit randomly. Certain conditions must be present. Recreating these conditions is the heart of mushroom cultivation. You must start with a good strain of mycelia and get it to grow in something. Oyster mushrooms, for example, are typically grown in straw. Shiitake mushrooms prefer oak logs. The substance in which the mycelia grows is called the substrate. While the amount of fresh air and carbon dioxide available affects growth, the key conditions to getting the mycelia to grow and then fruit are temperature,

humidity and light. Different species require different values and cycles of these factors at different points in their life. Let's use oyster mushrooms as an example.

While the hyphae are spreading throughout the substrate, a temperature around 80°F is preferred. They also like 90 to 100% humidity and total darkness. To get the mycelia to bear fruit requires cooler temperatures (55-60°F), about the same humidity and natural sunlight twelve hours a day. Slightly warmer temperatures (60-64°F) and lower humidity (around 90%) seem to help most while the mushrooms grow and are picked.

Obviously reproducing these conditions for continuous harvests throughout the year requires an indoor area with heat, cooling, humidification, ventilation and suitable artificial light. In subsequent issues we will get into the details of building such a facility.

For more information, you might like to check out the following sources at your local library or bookstore:

- All That the Rain Promises and More..., by David Arora. A very humorous look at mushrooms with a focus on how to identify them and how to eat them. A handbook that costs \$15.95.
- The Mushroom Cultivator, by Paul Stamets and J.S. Chilton. All the details from spore to commercial production including detailed descriptions of the environmental conditions needed by many mushrooms. 415 pages \$29.95.
- Jekyll-Hyde Mushrooms, an article by George Barron in the March 1992 edition of Natural History Magazine. Highlights the carnivorous tendencies of certain mushrooms.

SHIITAKE CULTIVATION

Different species of mushrooms are cultivated very differently. Each month we will highlight a particular species and discuss the general procedures which apply. Thus, as you get into mushroom farming, you will be better able to decide which species you would like to cultivate.

Shiitake can be cultivated either on logs or sterilized wood chip substrate. Preferred substrates are oak, chinkapin, alder and hornbeam (on the east coast). Other less suitable substrates are aspen, poplar and willow. The easiest and lowest technology approach uses whole green logs as the substrate. Diameters of the logs are typically 2 to 12 inches and lengths are usually 3 to 4 feet. The general idea is to have a

large enough diameter to feed the mushrooms for several months while keeping the logs of a manageable size because they need to be moved around from time to time as we will see.

Logs should be cut when the tree is dormant (i.e. in the winter). If the buds break open before the tree is cut, you will have a much harder time getting the mushrooms to grow. The bark should be left on and the logs seasoned for about a month. At this point, the mushroom mycelia can be introduced to the log in a process called inoculation. Unless you are into the very painstaking process of culturing your own mushrooms, you will probably purchase spawn (live mycelia) from one of the companies that provides this material. The only supplier in the Northern California/Southern Oregon area is The Mt. Shasta Mushroom Company, 623 Pony Trail, Mt Shasta, CA 96067 (916-926-4774).

There are several ways to inoculate a log. One way is to drill a series of three-quarter inch holes about one inch deep around the logs, fill the holes with spawn growing on a sawdust substrate and seal the holes with wax. Another technique involves drilling 3/8 inch holes around the log (every 4 to 6 inches around the circumference and every 8 to 12 inches along the log). Hammer a 3/8 inch piece of mycelia-permeated doweling into each hole and call it good.

The inoculated logs can be stacked outdoors for 6 to 9 months to allow the mycelia to spread through them. It's best to keep the moisture content of the logs at around 55 to 65%. One way to check this is to cut a 1 inch slice off of one of the logs with your chainsaw and weigh it (let's say it weights 0.4 pounds). Dry it slowly at low temperature in your oven and weigh the dry slice (let's say it weights 0.2 pounds). The difference between the wet and dry weight is the water content. The percentage of water in the wet log is the water content divided by the wet weight of the log (in our example that would be 0.2 pounds divided by 0.4 pounds or .50 = 50%). To have 60% water content we want 1.5 times as much water as dry wood in our log. Given our 0.2 pounds of dry wood we want to add 0.3 pounds of water (0.2 X 1.5 = 0.3). That gives us 0.3 pounds of water and 0.5 pounds of total weight (0.3 divided by 0.5 comes out to 60%). If we determine that we want our logs to weight 0.5 pounds per inch, a 48 inch long log would weigh 24 pounds. Now it's just a matter of weighing our log periodically to see if it weights 24 pounds or so. Periodic sprinkling is the easiest way to keep you logs wet.

Check the cut ends of your logs from time to time. After 6 to 9 months you should be able to see the mycelia (a moldy looking substance) grown all the way through the log. Your mushrooms are now ready to fruit and under natural outdoor conditions they probably will. For more reliable results you'll want to induce fruiting. This is done by almost saturating the logs with water. That's a matter of soaking them in water at 70° F for about 24 hours (or until just before they stop throwing off bubbles). Next, bring the logs into your grow room and control the air temperature between 60 and 65° F with humidity around 95%. For best results you might try cycling the humidity from 50 to 90% 3 or 4 times per day. You'll want natural light, 12 hours on and 12 hours off. After 7 days of this, the mushrooms will begin to appear and you can lower the humidity a little (to 85-90%).

Let the mushrooms grow until the edge of the cap is only slightly curved under then pick with a twist and a pull. When you've finished picking the logs should be moved back outdoors to rest for 40 days to six months at which time you can soak the logs again and bring them back indoors to fruit. You can get around 8 flushes out of a log.

How about the economics of all this? In Mt Shasta, oak is selling for around \$150 a cord (a cord is a volume measuring 4 by 4 by 8 feet or 128 cubic feet). In Happy Camp I hear it's going for about \$50 per cord. Let's assume you pay \$150 per cord for the wood, \$35 for the spawn and are able to sell the mushrooms wholesale at \$5.00 per pound (currently prices are around \$6.50 a pound). The logs can be induced to produce mushrooms for a year or so and can pro-

duce 9 to 60% of their green weight in mushrooms. Oak weighs around 2,200 pounds per cord and at a fairly typical yield of 25% will produce 550 pounds of shiitake over a year. 550 pounds at \$5.00 per pound provides a return of \$2700 per cord with out of pocket expenses of less than \$200. Obviously your grow room will cost some money and your time has some value so figure these in and see if shiitake growing is for you.

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CLASSIFIED ADS

INFORMATION. Now available from The Mushroom Company: Mushrooms released August 20, 1991 by the Agricultural Statistics Board, National Agricultural Statistics Service, United States Department of Agriculture. National and state level statistics on the mushroom industry in the United States. Covers agaricus and specialty mushrooms (shiitake, oyster and other). 14 pages. Send \$4.00 (includes postage and handling) along with your name and address to The Mushroom Company, P.O. Box 5065, Klamath Falls, OR 97601.

WANTED: Can you reproduce full color illustrations (photographs) on card stock for less than \$1.00 per 8x10 page? If so call Jerry at 541-883-3719.

NEXT MONTH: Mushroom Co-op, Oysters, grow rooms and more...

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