

MUSHROOM CULTIVATOR'S TIPS - Edited by Bill Russell
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Here is a collection of tips, hints, and growing suggestions that were collected over the years from fellow amateur mushroom growers and experimenters. They demonstrate the ingenuity and resourcefulness that is typical of mushroom growers.

AGAR MEDIA TIPS

I make my agar in 6 oz artichoke jars. Each jar will fill 4 to 6, 100 mm petri dishes. They are made of heavy glass and I do not have trouble with them boiling over in the pressure cooker. Rick Gibson, New Freeport PA.

Edible agar from Chinese markets works as well for most uses as the much more expensive commercial lab grade. Bill Russell, State College PA.

Cultures which have been stored under mineral oil for a long time (over a year) often revive better by transferring to liquid media rather than solid media. Use standard formulations for Potato Dextrose agar or Malt Yeast Peptone agar BUT omit the agar. Dispense in test tubes and sterilize at the usual time and temperature. Eric Garrett, Columbus OH.

If you are using only two agar media, use a rabbit food pellet or an aquarium charcoal pellet thrown into your plate or slant to visually differentiate one type from another. K. McDonald, Louisville KY.

Oatmeal V-8 Agar: Cook 50 g Quaker oats in one liter water for 10 min. Add 50 ml unsalted V-8. While boiling hot, pour in blender jar and blend thoroughly. Add 20 to 30 g agar while blending and continue blending 2 to 3 minutes. This agar recipe does not contaminate easily, but it does not germinate mushroom spores easily, either. Rick Gibson, New Freeport PA.

Aureomycin (Chlorotetracycline HCL), the cheap antibiotic that you can purchase in feed stores cannot withstand the high temperature of autoclaves. It can, however, withstand pasteurization temperatures, and it is sterile as purchased. So it can be added to your agar mix after the agar cools, and just before pouring into your plates. Here's to bacteria-free cultures! Joe Kish, Canby OR.

When cloning mushrooms you almost have to use gentamycin sulfate in your agar (approx. 100 mg/l) to avoid bacterial contamination. Rick Gibson, New Freeport PA.

Hay infusion agar is good for some wood-loving fungi. Mix 50 g decomposing hay to one liter tap water, sterilize for 30 minutes at 15psi. Filter through cheesecloth, add 2g K₂HPO₄, 10g glucose, 15g agar, and add enough water to bring total volume back up to 1L. Sterilize and dispense as usual. Eric Garrett, Columbus OH.

Dr Barrie Overton suggests making spore prints on aluminum foil. Not only is the color easier to see on foil than on paper, the spores are easier to transfer onto agar media. Bill Russell, State College PA.

Rabbit food pellets can be used in place of dog food for your dog food agar. K. McDonald, Louisville KY.

Add a pinch of wheat flour and sugar to a pint of malt agar for simple but effective growing medium. Add the proper amount of water and mix well in a blender. Use wheat germ in a pinch. Charles Stuart, West Chester OH.

Make PDY (potato-dextrose-yeast agar) with 10 g dextrose rather than the normally recommended 20 g and it will contaminate less readily. Rick Gibson, New Freeport PA.

To suppress bacterial growth when making tissue cultures from wild specimens, a combination of two antibiotics is far superior to just one. Here are two suggested combinations:

1. Gentamycin 50 mg/l + Chloramphenicol 16 mg/l.
2. Gentamycin 10 mg/l + Penicillin 50 mg/l.

Eric Garrett, Columbus OH.

Another way to help suppress bacteria in media is by adding the proper combination of inorganic salts. Make the following two stock solutions:

1. NaH₂PO₄ 25 g
Na₂HPO₄ 25 g
H₂O 250 ml

2. MgSO₄
10 g FeSO₄
0.5 g NaCl
0.5 g MnSO₄
2 g H₂O
250 ml

Add 10 ml of sol'n #1 and 20 ml of sol'n #2 per liter of medium. Eric Garrett, Columbus OH.

If a culture has become contaminated with mold, you can sometimes recover it by transferring to the following medium:

1 gm Potassium phosphate KH₂PO₄
0.2 gm Magnesium sulfate MgSO₄
0.1 gm Calcium sulfate CaSO₄
0.01 gm Ferrous sulfate Fe₂(SO₄)₃
10 Gm glucose
20 gm agar
1 L water

The mushroom mycelium will often outgrow the mold mycelium. Bill Russell, State College PA.

Vitamin B-1, also known as Thiamine, is an excellent media additive for encouraging the growth of more "fastidious" fungi. Crush one tablet, dissolve in a few ml of water, and add a couple drops to each liter of media you make. Eric Garrett, Columbus OH.

Adding 2 grams of powdered charcoal to a liter of your agar medium tends to enhance the natural mycelium color. For example, *Laetiporus sulphureus* will tend to grow out orange and *Lepista nuda* blue. Gregory Natale, Pittsburgh PA.

PLATES/SLANTS TIPS

If you don't have a filter hood to provide a sterile environment for mushroom work, inoculate your agar media dishes and spawn jars in your open microwave cooker, after running it dry for a couple of minutes to sterilize the air. Bill Russell, State College PA.

After inoculating my Petri plates I wrap strips of duct tape around them to hold them closed. It helps keep contaminants out by preventing accidentally lifting the lid and they're easily marked for identification. David Abbott, Stokesdale NC.

I have altered the procedure for cooling my knife. Instead of using & wasting an agar dish (which sometimes promotes bacterial transfer), I cool it momentarily in the chamber air and then dip it in 9% Clorox solution which I put in the chamber in a shot glass. No problems! David Germonpaez, St Clair MI

Keep some pre-poured plates in the fridge wrapped in saran wrap. This is always great if you find or grow a superior specimen and you want to make a quick tissue culture. Mike Stocks, Latham NY.

Put glass petri dishes in heavy plastic zip lock bags then microwave on high 3 minutes to sterilize them. Let cool then give them 3 more minutes to be sure they're sterilized. Rick Gibson, New Freeport PA.

Sometimes a transfer from a healthy culture fails to "take off". Take the transfer tube or plate from the incubator and set it out in a room away from direct sunlight for a few days. Often this exposure gives the needed jog. Bill Russell, State College PA.

To store an agar medium until you need to pour it, tightly cap your flask of freshly sterilized medium and put in your refrigerator. When you need to use it, loosen the cap, put the flask in your microwave and heat it until it boils. Then pour your plates or slants. Glen Bailey, Elkin NC.

A contaminated culture can be purified by cutting a square of agar with the least amount of visible contamination, and placing it face down on another agar media petri dish or dishes (aseptically). As the mycelium grows through, a barrier is formed separating any contaminants from the desired culture. Keep repeating until a pure culture is obtained. Ken Christian, Reading PA.

To avoid and even clean up bacterial contamination, I dip agar and tissue transfers in a solution of 1/2 tsp Aureomycin/ 500 ml distilled water before moving to a fresh plate. Aureomycin is available from farm supply stores. David Germonpaez, St Clair MI.

One-piece canning lids work great on small canning jelly jars containing prepared agar or small mouth quart jars of cooked grain. They allow for long term storage on un-inoculated media to keep handy. When sterilizing, leave the lids loose and after they cool, screw the lids down tight. Before sterilizing grain using this method, be sure to pre soak grain for 24 hours to avoid bacteria contamination. K. McDonald, Louisville KY.

SPORES TIPS

Spore prints are often contaminated with bacteria. Agar with gentamycin sulfate (approx. 100g/l) will allow them to germinate unfettered. Rick Gibson, New Freeport PA.

Spores can be frozen without loss of viability by suspending in a 10% aqueous solution of sterilized glycerol (glycerin U.S.P.; available at most pharmacies). Eric Garrett, Columbus OH.

If you want to measure the size of mushroom spores and you don't have an ocular micrometer for your microscope, add a bit of blood to your spore suspension and you can accurately estimate their dimensions by comparison. Human red blood cells average about 7 microns in diameter. Bill Russell, State College PA.

Both PDY and MYA germinate mushroom spores well. Rick Gibson, New Freeport PA.

SPAWN TIPS

Plastic 1 gal. milk or water jugs can be used as spawn-making containers and/or growing containers. Most plastic jugs will withstand 1 hr at 15 psi if there is plenty (1" or so) of water in the pressure cooker and a spacer or wash cloth is placed on the bottom. A nail-sized hole can be punched in the lid and stuffed with cotton or a mini-synthetic filter disc can be made and inserted on the inside of the cap. Fill the jug with the premixed dry spawn material - grain or otherwise - to about 40% of capacity, depending on how much your spawn material expands when soaked. Soak for 24 hours. Invert in the sink in a drainer/ strainer and drain thoroughly. Wipe off the top and screw on the lid loosely - do not tighten! Cover with aluminum foil and sterilize. When removing the jugs from the pressure cooker I always tighten the lids first, otherwise you may squeeze them and suck in contaminated air. Charles Stuart, West Chester OH.

An old teaspoon can be sterilized and used to transfer sterilized grain or whatever from container to container. Charles Stuart, West Chester OH.

Use a B vitamin complex in your grain spawn when sterilizing. It seems to yield faster mycelium growth. Jeff Forbes, Bethel Park PA.

Keeping Relative Humidity below 50% in the lab and spawn incubation room will help prevent contamination. Ken Christian, Reading PA.

Try using old coffee grounds as a spawn medium. Both wood growers like Shiitake and compost growers like *Stropharia rugosoannulata* love it. Added wheat bran should make it even better. Joe Kish, Canby OR.

Have mold problems in your spawn or cultivation medium? Next time, get it ready for heat-treatment but let it set at room temperature for 24 hrs before pasteurizing or sterilizing. This delay lets any mold spores germinate. They're much easier to zap than ungerminated spores. Bill Russell, State College PA.

When using liquid cultures to do mass inoculations, a small amount of your final substrate should be suspended in your broth. This allows the mycelia to transcribe and translate the necessary enzymes needed to digest the final substrate, therefore reducing incubation time. For example, add some hardwood sawdust to the broth for the fermentation of *Lentinus edodes*. Ken Christian, Reading PA.

Try inoculating small jugs of sterilized peat/lime casing soil with grain, then transferring a spoonful of the soil (once colonized) to larger containers of grain. Shake. The many soil particles quickly spread the mycelium. Charles Stuart, West Chester OH.

CULTIVATION TIPS

Another way to sterilize oak chips is on a cookie sheet for 20 minutes at 350° F. Joe Kish, Canby OR.

If you have a big lawn, here's a cheap & easy way to pasteurize large quantities of substrate. Make a 3'x3', 2' deep bed of grass clippings and water it. Set a large plastic garbage bag 1/3 to 1/2 full of moist substrate on the bed and adjust the bag to make an evenly thick layer. Seal loosely. Next, mound grass clippings 2' deep over the bag and water. Cover with a blanket. Let set 3 days. The high temperature from composting will pasteurize the substrate. Bill Russell, State College PA.

Cottonseed meal mixed 4-7 to 1 with lime is an excellent nutritive additive to straw substrates and it doesn't easily contaminate. Avoid clumping - mix well. Charles Stuart, West Chester OH.

Sandwich size zip lock plastic bags work great as humidity tents when fruiting mushrooms in quart jars. Simply place an open bag on top of the mouth of the jar when the culture is ready to fruit. The cultures easily receive the proper light and the humidity can be adjusted by increasing or decreasing ventilation. Moving the bag further down on the jar will decrease ventilation. Clear grocery bags make good humidity tents when fruiting mushrooms in buckets or pails. K. McDonald, Louisville KY.

When you just can't pasteurize your compost, but the insects are intolerable, try pouring some boiling water over the substrate and then letting it drip dry. That's not much of a pasteurization, but you won't see anything walking around after that. Joe Kish, Canby OR.

“Liquid Seaweed” extract from feed and seed stores is a good nutritional additive to spawning and fruiting substrates. David Germonpaez, St Clair MI.

If you have to park your car in the summer sun with the windows rolled up for security, you can use the high heat build-up to pasteurize plastic bags of spawning or growing substrate. Just put the bags in your car for 3 days and shake them up daily. Bill Russell, State College PA.

A cheap tray for your spawn is a dish washing pan. I use the 14"x12"x7" size. I fill it about 5" deep with pasteurized straw. Then I cover it with plastic. I use about 1" casing. It will yield about 1 lb of mushrooms with 4 or 5 flushes. Jeff Forbes, Bethel Park PA.

5 mg. of pure aureomycin (chlorotetracycline HCL) dissolved in water or wort and added to 1 qt. of compost will help control unwanted bacterial contaminants. It is available at most pet and feed stores in bulk and is cheap. The Alchemist.

Can't find hardwood chips for a small mushroom crop? Get a bag of backyard broiler's hickory chips from your supermarket. Bill Russell, State College PA.

Try using compost as a casing mixture in garden-grown mushrooms. Often it gives surprisingly good results. David Abbott, Stokesdale NC.

I hate mixing casing soils and buffering them. Instead, I use ProMix or another semi-synthetic soil mix available at most nurseries. Wetted down overnight right out of the bag and sterilized or pasteurized, it makes an excellent casing that supports heavy flushes of almost all mushroom species. Make sure you get a neutral mix, as some are formulated for acid-loving plants. It may be a good idea to verify the PH after soaking just to be sure. Mike Stocks, Latham NY.

Complete sterilization of composts and casing at 15 psi for one hour is 100% superior to pasteurization. Growth will be the same and with less contamination. The Alchemist.

The spun polypropylene "Floating Row Cover" material, available at gardening stores under various trade names, is an excellent cover for mushrooms grown outdoors, whether in beds, rows or mini-environments. It shades direct sunlight, inhibits dehydration, protects from heavy rainfall and discourages cats from using your mushroom bed as a toilet. Inexpensive and effective-especially if you are a support or A-frame creating a mini- greenhouse. Mike Wells, Portland OR.

A double or triple layer of coffee filter paper seems to be about as effective a contamination filter for spawn jar lids as the expensive, thick commercial filter pads. Bill Russell, State College PA.

To grow oysters outdoors, I mix pasteurized straw with just plain wet straw in a 1 to 3 ratio, using the pasteurized straw (and the spawn) as the core. I cover with a sheet and keep it wet until it's run through. David Abbott, Stokesdale NC.

PH of casing should be nearly neutral, PH 7.0. However, PH of composts can vary, usually between PH 6.0 to PH 7.0 depending on the species grown. The Alchemist.

PH factor of composts and casings determine a mushroom's ability to fruit and sporulate abundantly. Hydrion PH papers 4.5 to 7.5 meets most needs. The Alchemist.

I've never had much luck growing anything on sterilized grain. Instead, I go down to the local nursery and make a deal with them: I buy 4 bales of straw and they shred it for me and re-pack it in heavy plastic bags. Total cost: \$6.00 per bail. I then soak what I need overnight, drain for 2 hours, sterilize or pasteurize and inoculate. Adjuncts and supplements such as cottonseed meal, alfalfa or grain may also be combined for higher yields if properly sterilized. This works very well with most "exotic" spp. and yields much larger specimens. Also, if you have a lawnmower, you can shred it yourself for free! Mike Stocks, Latham NY.

Chopped corn cob pet litter mixed with bran is an excellent spawn/fruiting substrate mix for a variety of species. Mix in the same proportions as sawdust/bran: 4:1 or 5:1. Soak 24 hrs. Drain. Sterilize. Charles Stuart, West Chester OH.

Many times when cultivating on non-pasteurized compost you have problems with tiny mycelium-eating mites that turn beautiful healthy pinheads into decomposing disappointments. To combat this situation I have noticed that when you add predator long legged mites carefully selected from compost you are not using you can, depending on the size of the container, dramatically reduce the population of the mycelium eating mites. Eric Thorin, Eveleth MN.

For indoor cultivation, a 15 watt (18") gro-lux fluorescent light source mounted 3 feet above the casing will supply all lighting requirements needed for primordia formation and good mushroom growth. The Alchemist.

If you grow wood-rotters, it may be hard to be sure you are getting the right substrate (i.e. wood chips or sawdust). First, determine if you need hardwood, softwood or a mixture for your species. Then get out the phone book and look under "Mills" or "Lumber" or "Logging" for what is known in most places as a "Wet Miller". These are the people who take big logs, strip the bark and then mill the logs to size. Wet millers usually sell their chips to paper companies and almost always have separate mills for hardwoods & softwoods (they require different tooling). If you explain what you want the chips for and that you might be interested in purchasing a quantity if they meet your needs, they are usually more than willing to let you come and take a "sample" (my sample consisted of 8 giant trash bags!). Just be sure to arrive on the day they finish milling so you get the wettest, cleanest and freshest chips and sawdust, and bring trash bags and a clean shovel. If you have a really big outdoor bed, some places are even willing to deliver chips to your door! It is always a good idea to soak your chips a day or two to insure maximum water content. I live in Albany, NY, a place you wouldn't expect to find any logging or lumbering - but I had to drive only 15 minutes to get excellent chips! Mike Stocks, Latham NY.

EQUIPMENT TIPS

The local Kmart store supplied me with a nice humidity indicator and temperature guage made by Springfield that has two dials for about \$6.50. The thermometer reads in both C and F. The hygrometer is scaled from 10% to 100 %RH. It's a beautiful instrument that can sit on a table or hang from a wall. Joe Kish, Canby OR

Cut off the bottom half of a large mouth quart jar and then sand the newly cut top portion smooth. You can now take an autoclavable plastic bag, thread the top end of the bag through the "bottom" of the jar, and fold it over the threaded glass rim. Screw on the jar lid. The top portion of the bag will be sandwiched between the glass and the ring. This will give you the ability to work with bulk substrates like quart jars. K. McDonald, Louisville KY.

Use a large box, 2'x2'x18", as your inoculation chamber. Cut out the top and cover with clear plastic. Make two hand openings in the front, big enough for your plates or jars. Cover these openings with a loose piece of plastic. Use an ion generator or Lysol to sterilize the interior. Wear rubber gloves and wipe everything that goes into the box with alcohol. I've had no contamination problem in two years. Jeff Forbes, Bethel Park PA.

A crock pot is great for pasteurizing small batches of straw. Check the garage sales. Mike Wells, Portland OR.

Don't use an alcohol lamp for a flame sterilizer. It's not hot enough. Instead, use a propane torch with the flame set low. You'll be surprised at how much time you'll save when you do culture work. Otto Snow, FL.

Cheepo thermostats for small incubators: Aquarium heaters. Carefully break the glass off below the heating element. Remove heater element and re-wire in series into one leg of your 120 VAC supply. Install with control knob outside. Neon indicator plus thermometer will determine setting. They hold to about 2 degrees F. Mike Wells, Portland OR.

Cheepo incubator heater elements: Yogurt makers. Either intact, or remove the heating element. Mike Wells, Portland OR.

To prevent CO2 buildup in small enclosed growing areas, like aquaria, tubs etc., converting a small aquarium pump into a vacuum pump works well to remove the heavier CO2 from the enclosed growing atmosphere. Just seal the pump in an air tight container withsealed holes for the cord, intake hose and outlet hose. Eric Thorin, Eveleth MN.

A great way to control humidity is to connect a 120 VAC humidistat to an electric crock pot of water that's set for warm. A reservoir of water may be needed, such as an inverted gallon jug to supply it, as the water evaporates fast. A Barber-Coleman room Humidistat, Item Number 11-1725, costing \$9.99 may be obtained from Surplus Center, 1015 West "O" Street, P.O.Box 82209, Lincoln, NE 68501-2209, (402) 474-4055. They require \$1.50 handling plus UPS. Joe Kish, Canby OR

Cheepo hygrometers: You can spend a lot of money to buy one to determine the relative humidity of whatever environment you are measuring...or...you can pick up a couple of matched, inexpensive thermometers and make your own. Mount them side-by-side with one open to ambient air and the other, by whatever means you devise, mounted next to a small reservoir of water. A narrow piece of wicking (such as used in kerosene lamps) should encircle the base of the wet-bulb thermometer and lead down to the water reservoir. At any given time there will be a differential reading between the dry thermometer and the wet-bulb thermometer. And that differential is the indicator of humidity. Mike Wells, Portland OR.

Cheepo incubators: Thick-walled Styrofoam containers used to transport frozen meats. Check with your butcher. Mike Wells, Portland OR.

Use a PH testing device carried at garden supply centers for your casings and substrate tests. They are accurate to about 0.2% from tests we've made and cost only \$20 -\$25. Prepare your casing, balance moisture and test PH according to the instructions that come with the device. Glen Bailey, Elkin NC.

Before you leave Kmart with your humidity-temperature gauge, select an accurate one by comparing in-store readings with an expensive model on the shelf. Sam Thomas, Yuma AZ.

You don't need a pressure cooker or autoclave to sterilize agar media. Simple put the mix in a microwave cooker and run for a minute. If it boils over, use lower cooking temperature. Bill Russell, State College PA.

After sterilization, I usually leave my cooker sealed and cover with a clean trash bag and wait until the next morning to inoculate. Spraying Lysol inside the bag first doesn't hurt. Charles Stuart, West Chester OH.

Friends working at "old" hospitals can sometimes get liquidated useful equipment very cheap or sometimes even free. Ken Christian, Reading PA.

Buy a min and max thermometer (\$10-\$15) and check the temperatures at various points in your house. You will find constant temperature at various spots which you can use to advantage in mushroom growing. For example, my hot water tank is always between 75°-82°- great for spawn run and agar growth. The basement bathroom floor is 55°-62° in winter which is great for fruiting. The closet upstairs is 78°-86° from April through July. You will find patterns of temperatures useful to mushroom cultivation in your home too.

Jeff Forbes, Bethel Park PA.

CHEMICALS TIPS

70% isopropyl alcohol is as efficacious as 90%. It costs less, is easier on the hands and has a lower flash point. Mike Wells, Portland OR.

Spray your arms and hands with Lysol before doing sterile culture work but use caution if working around an open flame as the Lysol is flammable. Use hand cream liberally afterwards to avoid the drying effects of the Lysol - especially in the dry winter months.

Charles Stuart, West Chester OH.

For disinfecting laboratory counter tops, a combination of two solutions is more effective than one. Alternate between a 3% solution of original formula Lysol brand disinfectant (concentrated liquid) and 10% solution of household bleach. NOTE: do not mix, rather, keep two separate bottles handy. Wipe first with one, allow to dry, then wipe with the other. Eric Garrett, Columbus OH.

Iodophors are very effective sanitizers and cleaning agents that contain iodine and phosphoric acid. At concentrations of 12.5 ppm (1/2 fluid oz or one tablespoon per five gallons), they kill bacteria, are non-corrosive, non-staining, and don't need to be rinsed off as they quickly evaporate. They should only be used with cold water; they stain above 120°F. Available from brewing supply dealers. Joe Kish, Canby OR.

Best way to adjust PH is with a nutrient acid that's also a vitamin. Ascorbic acid is also vitamin C. Joe Kish, Canby OR

MISCELLANEOUS TIPS

Every mushroom cultivator should read "Growing Wild Mushrooms" by Bob Harris. The Alchemist.

When using the standard two-piece lids on jars, I like to wrap the tops tightly with aluminum foil before sterilizing for an extra measure against contamination. K. McDonald, Louisville KY.

According to Jack Czarnecki (Joe's Restaurant) there are a few poisonous puffballs. As a general rule, anything over softball size is usually safe. (And it should be cream cheese-white inside). Ken Christian, Reading PA.

Around here the power company is constantly cutting trees that encroach on their sacred right-of-way. I take an ax and cut wedges out of the remaining stumps, fill with spawn, and fit the wedge back in. I've tried this with Shiitake, *Hericium* and other wood growers. Sometimes it works just fine for outdoor mushroom cultivation! David Abbott, Stokesdale NC.

When collecting wild specimens that require you to climb hills, trek through thickets and brush and over long distances, I have found that a light sturdy wicker basket is an adequate tool for any situation and is extra beneficial in permitting moisture exchange allowing the specimens to not get icky on the return trip. Eric Thorin, Eveleth MN.

Regular body heating pads or reptile heating pads are useful in small incubation chambers. Aquarium heaters submerged in a large narrow mouth jar of water can be used to heat and humidify small incubation chambers. K. McDonald, Louisville KY.

Instead of using commercial jar lid filters for making spawn, etc., I use coffee filters. First I cut the filters to fit the jar (or any other container) mouth. To prevent molding, I soak them in a solution of 1/4 tsp Potassium sorbate (available from home wine-making suppliers) in a cup of water. After drying, I put them in the jar lid and screw the lid on the jars. Finally, for more insurance against contamination, I add a drop of tincture merthiolate (if you can still find it) to the filter through the hole in the jar lid. Bill Russell, State College PA.

When coming across wood-inhabiting species in the forest that you want to culture but the specimens are too decomposed, one can always - if it is a small completely dead tree - cut the colonized section out and bring it home. If you duplicate the fruiting conditions, your efforts often are rewarded with fresh, viable specimens. Eric Thorin, Eveleth MN.

Use large plastic bags as sterile inoculation chambers for small grain to grain transfers. Simply place items inside the plastic bag, spray thoroughly with Lysol, and tie off. After a few minutes, perform the transfers by working from the outside of the bag. Your sterile environment inside the bag will be undisturbed - your hands and contaminants will be outside. Don't use this method near open flames, since the Lysol spray is flammable. K. McDonald, Louisville KY.

In my area there are a lot of farms with cows. The manure from these cows contaminates the water supply, not only of that farm, but also that of adjacent areas. A lot of farms are now installing expensive cement manure handling systems to prevent this, but in many cases this is too little too late. I am now experimenting with using king Stropharia (*Stropharia rugoso-annulata*) and other fungi as a "Myco-filtration" system of water supplies cheaply. As you know, *S. rugoso-annulata* has a very tenacious mycelial network and holds woodchips very well. When a bed of woodchips containing *Stropharia* mycelium is laid across a known water run off about one to two feet deep(?), the contaminants (ie. *E. coli*) are filtered out of the water and probably eaten by the mycelium. Perhaps other readers are doing similar research and can help to develop a marketable system of "Myco-filtration". Ken Christian, Reading PA.

When making tissue transfers from a fresh mushroom specimen to an agar plate, first sterilize the tissue pieces by briefly dipping them in a solution of 1 part Clorox to 10 parts water. Do not puncture the pieces during the transfer to avoid pushing contaminants into the tissue. Rather, slice the pieces from the mushroom with a sterile blade, lift them into the Clorox solution, and lift them out and onto the agar. This method greatly increases your chances of getting uncontaminated tissue cultures. Bill Russell, State College PA.

INDIVIDUAL SPECIES TIPS

GROWING OYSTERS (*Pleurotus ostreatus*) IN A JAR OF PAPER TOWELS AND BRAN

This method is good for the city dweller without access to wood. It's also good for high contamination areas - better than most newspaper methods which can produce a lot of contamination. Needed: Paper towels, bran, quart Mason jar, screw ring top, filter disc, distilled water.

- 1) Lightly stuff bottom of jar with paper towels.
- 2) Add a thin layer of bran.
- 3) Lightly stuff a layer of paper towels.
- 4) layer of bran.
- 5) Continue to layer until you reach the top of the jar.
- 6) Use no bran on top. (Prone to contamination).
- 7) Add Distilled water until the towels are saturated.
- 8) Turn jars upside down to drain excess water.
- 9) Put lids & filters on jars and sterilize for 1 hour at 15 PSI.
- 10) Cool jars and inoculate from top with agar tissue culture.
- 11) Put a dome of aluminum foil over the lid to prevent evaporation. Incubate.
- 12) Remove lid and set out to fruit.

Gordon Young, Florence MA.

GROWING OYSTER MUSHROOMS INDOORS ON A ROLL OF BATHROOM TISSUE.

Oyster mushrooms (strains of *Pleurotus ostreatus*) are delicious and grown by amateur and professional mushroom cultivators everywhere. It's a popular species for cultivation because it grows fast and can often overwhelm contaminants before these invaders can get a hold. In addition, fresh spawn is easily available; search the Internet for the closest suppliers.

It's fun to grow Oysters indoors on a roll of bathroom tissue. Start by unwrapping a roll of white, unscented toilet tissue, and slip two rubber bands over it to keep it from unraveling. Next, set it in a crock pot or soup pot. Add cold distilled, purified, or rain water to cover the roll. Set the crock pot or stove to "low" and hold for two hours, covered, for pasteurization. Then put the roll in a colander to drain and cool. Keep it covered with a plastic bag over the roll to reduce contamination as you move to the next step. (If the roll comes sealed in a plastic wrapper, you can usually omit pasteurizing. See directions below.)

Thoroughly fill clean a kitchen spray bottle, such as a used Windex bottle, with pure water. When the toilet tissue roll has cooled, lay a 2 feet long strip of paper towel on a clean surface and spray to evenly moisten (not soak) it. Then sprinkle a 1/8 inch layer of spawn evenly over the moist towel. Set the roll on its side at one end of the paper towel strip. Roll up the paper towel with the toilet tissue roll so the roll is evenly covered with spawn. Tie or use rubber bands around the roll to hold it all in place.

Next, fold the paper towel cover over one end of the tissue roll, and turn the roll with the open end up. Fill the interior of the roll with spawn, and fold the paper towel over the end to completely enclose the roll. Slip the roll in a transparent plastic bag to prevent drying out, set on a dinner plate, and put it in your 75-80 degree incubator or a dark, warmish place such as an overhead kitchen cabinet or the top shelf of a closet. Don't seal the bag; let it breathe. In about 2 weeks, take it out of the incubator and place it in your refrigerator for a week. Do not remove the plastic bag. Then put it out at ordinary room temperature, exposed to daylight, and watch for the mushrooms to form after several days. Keep it loosely covered with the plastic bag. If mushrooms do not begin to appear after a week or two, supplement the daylight with fluorescent light to about 10 hours per day.

Moving on to bigger and better paper roll gardens:

After you're successful with a toilet tissue oyster mushroom garden, you may want to try growing your oysters on a roll of paper towels. Because these are bigger than a toilet tissue roll, you should expect more mushrooms. But its larger size makes some problems in preparation and management, such as finding a pot large enough to pasteurize the roll. However, you can simplify things.

The first simplification is to avoid pasteurization. If you select paper towels that come packaged in a sealed plastic wrapper, you can avoid the hot water pasteurizing bath. The towels are quite sterile when packaged at the factory, and the sealed plastic wrapper protects them from contamination.

Remove the plastic wrapper and immerse the roll in a container of freshly boiled and cooled pure water. The container may simply be a large, new plastic bag, fresh from the box. The roll will soak quickly. After draining in a colander, loosely covered with a plastic bag, it will be ready for spawn inoculation.

In place of the moist paper towel wrapper used to hold the spawn around the toilet tissue roll described above, you may use a moist sheet of newspaper. A sheet from the inside of a fresh newspaper is practically sterile and chemical-free. Do not use colored newspaper. Follow the directions given above for applying the spawn, and proceed to fruit your oysters as described above.

If your paper rolls develop overwhelming green mold, seal the plastic bag, and immediately discard outside the house or growing area. To help avoid this problem next time, increase the ventilation by opening the plastic bag cover further. Or punch holes in it.

Good luck with your indoor Oyster mushroom crop!

MUSHROOM MARKETING TIPS

Currently, selling wild mushrooms picked from the wild is illegal in most places unless certain rules are followed. The FDA Food Code now requires food to be able to be tracked to its place where it was collected.

SELL YOUR FRESH WILD MUSHROOMS DIRECTLY TO RESTAURANTS by Bill Russell

You don't need to be a large-scale mushroom grower to profit from your skills. Do as we do. Sell your wild finds, or small backyard or indoor crops of wild mushrooms to local restaurants. You can deliver super fresh, wild exotic mushrooms species that no one else may be able to supply. We get up to \$30 per pound, depending on the variety. We have supplied mushrooms to restaurants this way for many years with no problems. Restaurants may buy from one to ten pounds, or even more weekly, so tell them when you're expecting a home-grown crop and how much you expect to deliver, or they will order whatever is available from a commercial mushroom wholesaler.

To start, make a reputation of "Mushroom Expert". Give mushroom talks and walks to Scouts, senior citizens, church groups, state parks, etc. Call your newspaper and get yourself and your mushroom garden in print. Call your TV and radio stations. Put up a website. Then approach the best local restaurants and talk to the head chefs directly. You'll find that some chefs are very knowledgeable about mushrooms.

Be sure to offer only species without a reputation for causing discomfort to an occasional consumer. These riskier mushrooms include the Chicken Mushroom (*Laetiporus sulfureus*), The Oak Loving Collybia (*Gymnopus confluens*), and certain Boletes, such as the Two-Colored Bolete (*Boletus bicolor*).

Chefs tend to think of food as art. So, when you approach a restaurant for sales, present your samples attractively and artistically, and they will be more likely to buy your product.

MAXIMIZE YOUR MUSHROOM CROP PROFITS by Bill Russell

Here's a way to get top dollar for your edible mushroom crops, large or tiny. The concept is to present attractive small packages of dried "exotic" mushrooms in appropriate stores and shops. It has worked well for me for various specialized home products. Key words here are "attractive" and "appropriate". Instead of appealing to the competitive wholesale, supermarket, and restaurant trade, you design your product for specialty stores, such as international foods, gifts, tourist, crafts, gourmet food, kitchenware, cheese, and natural foods shops. These outlets can give you the highest profit with little, if any, competition. But accessing this market requires imagination and creativity: qualities that mushroom growers have in abundance.

Here are the steps to develop this marketing concept:

- 1) Dry your mushroom crop.
- 2) Weigh them out and seal in small plastic bags.
- 3) Attach an appropriate and attractive hang-tag on each bag.
- 4) Display the bags on a free, attractive, and appropriate display panel.
- 5) Provide free hand-out information with the display .
- 6) Offer your display to an appropriate shop.
- 7) Restock regularly, and collect payment for what you deliver.
- 8) Be professional.

Vegetable driers work well for mushrooms, and are available through department stores, natural food shops, etc. Or, make your own from coarse screens, a heat source such as light bulbs, and perhaps a small fan.

Small plastic locking bags are available from suppliers for stationery shops, restaurants, jewelry and grocery stores., For small scale operations, get the bags from hobby shops.