

# Oyster Mushroom Cultivation

## Part II. Oyster Mushrooms

### *Chapter 5*

#### Substrate

## **NON-STERILIZED WHEAT STRAW**

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Oyster mushroom growing requires several essential steps including pasteurization or sterilization. Pasteurization or sterilization is often the most expensive step because it requires fuel-consumption for steaming or boiling. Though this is important for obtaining high yields, it is a very tricky and labor-intensive process. If mushrooms could be cultivated without pasteurization or sterilization, the whole process would be much easier, faster, and less expensive. I have used natural sources such as lime stone and pulse powder to successfully dispense with the pasteurization or sterilization steps.

I have been made many experiments with growing oyster mushrooms on different kinds of substrate materials such as cotton waste, rice straw, sawdust with poultry manure, dried grass, waste cloth, oak and others. Nevertheless, all the materials required sterilization at high temperature. Without sterilization high yields couldn't be produced. For example, cotton waste is one of the best substrate materials, but it requires a long time for sterilization. However, wheat straw showed great results (almost 100% success) without pasteurization or sterilization. Moreover, it is very simple to grow oyster mushroom in large quantities.

Since I have no idea about the scientific analysis of wheat straw itself, I cannot explain why wheat straw is so appropriate for oyster mushroom cultivation. However, wheat straw was the best of all the non-sterilized substrates in my experiments. I would like to share my experience with you step by step.

Subject matter : Growth of oyster mushrooms using wheat straw by adding the cheapest possible material such as lime stone ( $\text{CaCO}_3$ , Calcium Carbonate) and yellow pulse in ground powder form.

### **Ingredients and material**

Wheat Straw (Chopped): 40kg

Pulse Powder: 1kg

Water: 100L + more

Bricks (for grounds shelving)

Lime Stone ( $\text{CaCO}_3$ ): 20kg

Wheat Bran or Rice Bran: 4kg

Polythene Sheet (If necessary)

Note: The above ratio is for the example showing a simple production. Increase materials in the same ratio, if necessary.

**# Step 1**

Pour water into a large container or drum and add 40kg of wheat straw and leave until the wheat straw is soaked (Fig. 2, 3). Fill 100L of water into another container (Fig. 1) and add 5kg of lime stone to another container and let it dissolve (Fig. 4, 5, 6). The dissolving lime emits heat and gases. Add the soaked wheat straw to this solution (Fig. 8, 9). Lime stone acts as an anti bacterial agent and kills all the viruses harmful to the initial growth of the mycelium. It also lowers the acidity of the wheat straw which is not good for the growth of the mycelium.



Figure 1. Fill two containers with 100L water respectively



Figure 2, 3. Pour the wheat straw on one container and soak it



Figure 4, 5, 6. Add lime stones to the other container and they dissolve emitting heat and gas



Figure 7. Reaction to water added



Figure 8, 9. Add soaked wheat straw to the lime stone solution

**# Step 2**

Take the soaked wheat straw out of the water (Fig. 10) to mix with 4kg of wheat bran or rice bran (Fig. 11). Mix them thoroughly on a clean floor with a polythene sheet on it (Fig. 12).



Figure 10. Take the straw out of the water



Figure 11, 12. Add 4kg of rice or wheat bran and mix them thoroughly



### # Step 3

Make a closed tray pattern on the clean floor with bricks in a circular shape. Spread the remaining 10kg of dry lime stone inside the circle of bricks (Fig. 13). Pour the soaked wheat straw mixed with wheat bran on the lime stone layer (Fig. 14, 15). Pour in water until the base gets wet to speed up the chemical reaction of the dry lime stone (Fig. 16). By this chemical reaction a lot of heat and gases are produced which are helpful in pasteurizing the material.



Figure 13. Spread lime stone



Figure 14. Take the mixture of wheat straw and rice bran



Figure 15, 16. Pour the mixture inside the brick circle and pour water

**# Step 4**

Quickly cover the substrate with a plastic sheet to keep in the heat and humidity for 24 hours (Fig17, 18). The substrate should be covered no longer than 24 hours. The substrate is ready for spawning the next day. You can save energy costs by using this step.



Figure 17, 18. Cover the substrate with a plastic sheet to keep the heat, gas and humidity

**# Step 5**

After 24 hours, move the substrate to a shelf, tray, or bags for spawning. In my case, a brick shelf was used inside an available growing room (Fig. 19). Spread the ready substrate on the shelf bricks equally (Fig. 20) and pour on more water. Sprinkle the spawn on the substrate evenly (Fig. 21). The last ingredient to add is yellow pulse powder (Fig. 23). This powder is also equally spread on the shelf over the spawned substrate (Fig. 24).



Figure 19. Make shelf bricks on floor      Figure 20, 21. Pour the ready substrate and sprinkle spawn on the substrate



Figure 22. Yellow pulse



Figure 23. Yellow pulse powder



Figure 24. Spread yellow pulse powder on the substrate

**# Step 6**

Cover the all the shelves tightly with a plastic sheet in order that no air can enter and so the required humidity level is maintained (Fig25, 26).



Figure 25, 26. Cover the shelf with a plastic sheet

**# Step 7**

After 7-8 days, the mycelium starts growing and spreads all over the shelf. During mycelial growth, keep the temperature of the room at 10-15°C for the best results and to provide the most favorable environmental conditions.

**# Step 8**

About 50 days later, the whole shelf will be colonized with a white milky color by the mycelium. The wheat straw mixture is no longer seen. Remove the polythene sheet from the top of the substrate and induce pinning.

**# Step 9**

It is time to start spraying water 3-4 times each day on the substrate. Maintain proper ventilation to control the flow of air because mushrooms are more nourished and grow better with air that contains good oxygen content. If the amount of carbon dioxide increases in the room, the size of the mushrooms starts decreasing and yields lessen.

**# Step 10**

In 8 -10 days, the mushrooms will appear on the shelf. This is a delicate stage for the growth. Continue water spraying daily. Make sure to spray water to keep the humidity at 90-100% and the temperature at 15-20°C. The mushrooms will be ready to be picked after 2-3 days. You can harvest mushrooms for up to 3-4 months continuously. It can be extended to 1-2 years if good climatic conditions are maintained. Mushrooms are harvested whenever they are fully grown. Usually 1-2kg of mushroom is picked from 1kg bag.

The above steps have proven to give the best results on an even larger production scale with a healthy and fruitful harvest.



Figure 27, 28. Oyster mushroom grown on non-sterilized substrate in bag cultivation.

**Foot note**

The experiences of the editor Jozef Poppe have shown since 40 years the proof that a pasteurization of wheat straw during 2 minutes between 65 and 70 degrees Celcium gives a perfect incubation in 3 weeks and a fast harvest 3 weeks later.