

THE PLACE OF THE MUSHROOM IN THE VEGETABLE KINGDOM

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Introduction:

Mushrooms are the fruiting bodies of a fungus, just like apples are the fruiting bodies of an apple tree. A mushroom is a kind of fungus with the Latin name of *Agaricus bisporus*. Other cultivated mushrooms in the Netherlands are the oyster mushroom (*Pleurotus ostreatus*) and the shiitake (Japanese mushroom) (*Lentinula edodes*). In the vegetable kingdom the mushroom is ranked with the heterotrophic organisms (lower plants). In contrast to the higher, green plants, these heterotrophs are not capable of photosynthesis. Fungi are the scavengers of nature. In mushroom cultivation too, waste products such as chicken manure, horse manure, straw, gypsum and waste water (from their own composting) are used to produce a high-quality substrate from which the mushrooms will grow. Ammonia is removed by means of an ammonia washer from the process air before it is returned to nature. Even the ammonia from the air is used as a source of nitrogen in composting. The fungus, also called mycelium, uses the compost as a source

of energy for its combustion, in which energy is released that is used for growth.

Mushrooms, good for your health: -

Mushrooms are good for your health. They contain few calories, but are rich in fibres, vitamins and minerals. In the table below states the nutritional value per 100 grams of mushrooms in comparison with vegetables.

Nutritional value of mushrooms: -

Mushrooms contain an extra number of vitamins B2 and B3. These vitamins take care of the metabolism and the release of energy from carbohydrates, proteins and fats. Vitamin B2 is also necessary for a healthy skin. Folic acid is necessary for growth and the production of blood. It is one of the few vitamins of which, on average, we take in too little from our food. Potassium is necessary for a healthy blood pressure and for muscle and nerve activity. Phosphorous takes care of healthy bones and teeth and of energy metabolism. Copper is necessary for your immune system, nerves and for the synthesis

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of body cells. All these nutritional values occur in high concentrations in mushrooms.

Introduction composting and cultivation: -

Mushrooms grow on compost. The compost is produced at specialized companies. From the moment the raw materials are mixed, up to delivery of the compost to the mushroom farms. The process takes four to six weeks, depends depending on the raw materials and the system used at the Compost yard. When the compost has been delivered at the mushroom farm, it still takes 16 to 20 days before a start can be made with mushroom harvesting. Harvesting takes place during two to three weeks. After this it is no longer cost-effective to harvest.

The composting diagram: -

In the diagram below you can read the various phases. All these phases take place at the composting company.

Phase I

Producing fresh compost: -

Depending on the raw materials this phase takes a minimum of 5 up to even 18 days.

The most important objectives in this phase are:

- Mixing the straw or horse manure (this can replace the straw to a large extent) chicken manure, gypsum and water, so that the compost becomes homogeneous;
- Opening up the straw, so that the straw absorbs water and the mushroom fungus, the mycelium, can grow in the straw.

After this phase, the compost is called “phase I-compost”, “fresh compost”.

Filling the room: -

The phase-III-compost is transported to the farm. At the farm the cultivation room is filled with compost with a special filling

	Mushrooms (uncooked)	Vegetables (uncooked)	Mushrooms fried	Vegetables cooked
Kcal	14	14	54	29
Protein (gr)	2.3	1	2.6	1.8
Fat (gr)	0	0	4	0.3
Fibre (gr)	1.5	1.3	2.5	2.7
Vitamin B2 (mg)	0.30	0.03	0.29	0.07
Vitamin B3 (mg)	4	0.4	3.8	0.6
Folic acid (ug)	32	20	8	36
Vitamin C (mg)	4	8	1	16
Potassium (mg)	400	230	410	247
Phosphorus (mg)	125	28	101	46
Magnesium (mg)	9	10	12	15
Iron (mg)	0.2	0.4	0.3	0.6
Copper (mg)	0.72	0.04	0.29	0.06

machine. A cultivation room is a climate-controlled room with racks (Dutch shelf system). During filling the compost is put in a layer of 20 cm with on top a layer of 5 cm of casing soil. This layer is pulled into the shelf system of the cultivation room. Casing soil consists of a peat mixture, mixed by a specialized company. At farms where they do phase III themselves, the compost remains in the room, but after 14-18 days, a layer of casing soil is put on the compost.

Mycelium growth in the casing soil and recovering period:-

After filling the room and/or covering the compost, the mycelium starts growing from the compost into the casing soil. This process takes 4-7 days. During mycelium growth into the casing soil, the casing soil is irrigated. By irrigating during the mycelium growth phase, the mycelium cannot grow to the surface of the casing soil.

After mycelium growth in the casing soil recovery growth phase takes place. This phase takes 1 to 2 days. During the recovery growth phase, no irrigation takes place and a humid, warm (summer) climate is created. As a result of this climate the mycelium grows to the surface of the casing soil.

Cooling down: -

When the mycelium has grown to the surface, the grower starts cooling down. Cooling down is an imitation of harvest

conditions. Because of colder air and lower CO₂, the fluffy mycelium starts to contract. If the mycelium has contracted, 5-6 days after cooling down, it forms pins, which in the mushroom industry called pin or pinhead. These pins, (as big as pin-heads) are the mushroom primordia. This period is called pin formation. After this Relative Humidity (RH) in the room is slowly lowered, so that the pins start growing into mushrooms. From pin to harvestable mushroom takes 5 to 7 days. The period after growing out of the pins is sometimes called "phase IV".

Harvest phase: -

Harvesting mushrooms takes place in "flushes". The first flush is picked in 3 to 5 days and yields 15 to 20 kg/m². If the mushrooms are mechanically harvest, in the form of once-over harvesting, this yields 22 to 26 kg/m². The second flush comes after about 5-7 days and yields a little less, 9-11 kg/m² for hand-harvesting, 10-15 kg/m² for mechanical harvesting. The third flight at most yields 10-15% of production and is of lower quality, because diseases and pests are increasing very strongly. Depending on the economic situation, a third flush is harvested. It takes about 6 to 8 days before the third flush can be harvested. During hand-picking the flush is harvested in 2 days.

Total production is between 27 and 35 kg/m². Hand-picking mushrooms can be

stored and consumed fresh. Mechanically harvested mushrooms are harvested in a once-over operation and directly processed and preserved.

Reference:-

1. Adhikari MK. 1981. Chyau: Ayurvediyavishleshanekevivechana (Mushrooms: An Ayurvedic concepts) J Nep Pharm Asso. 9: 17-21.
2. Ajith TA, Janardhanan KK. 2007. Indian Medicinal Mushrooms as a Source of Antioxidant and Antitumor Agents. J Clin Biochem Nutr. 40: 157-162.
3. Annual report 2016 - 2017. All India Coordinated Research Project on Mushroom, ICAR-Directorate of Mushroom Research, Kamal, S. Attri, BL. (ed.), Chambaghat, Solan -173 213 (HP).
4. Annual report 2017- 2018. Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare. Government of India Krishi Bhawan, New Delhi-110 001.
5. Bisaria R, Vasudevan P, Bisaria, VS. 1990. Utilization of spent agro-residues from mushroom cultivation for biogas production. App Microbiol and Biot. 33:607-60
6. Adhikari MK. 1981. Chyau: Ayurvediyavishleshanekevivechana (Mushrooms: An Ayurvedic concepts) J Nep Pharm Asso. 9: 17-21.
7. Ajith TA, Janardhanan KK. 2007. Indian Medicinal Mushrooms as a Source of Antioxidant and Antitumor Agents. J Clin Biochem Nutr. 40: 157-162.
8. Annual report 2016 - 2017. All India Coordinated Research Project on Mushroom, ICAR-Directorate of Mushroom Research, Kamal, S. Attri, BL. (ed.), Chambaghat, Solan -173 213 (HP).
9. Annual report 2017- 2018. Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare. Government of India Krishi Bhawan, New Delhi-110 001.
10. Bisaria R, Vasudevan P, Bisaria, VS. 1990. Utilization of spent agro-residues from mushroom cultivation for biogas production. App Microbiol and Biot. 33:607-60
11. Cotter, Tradd. Organic Mushroom Farming and Mycoremediation: Simple to Advanced and Experimental Techniques for Indoor and Outdoor

Cultivation. Chelsea Green Publishing.
2014.

12. Stamets, P., Chilton, J.S. *The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home.* Olympia, Washington. Agarikon Press, 1984.

13. Stamets, Paul. *Growing Gourmet and Medicinal Mushrooms.* Ten Speed Press. 3rd edition, 2000.

14. Stamets, Paul. *Mycelium Running: How Mushrooms Can Help Save the World.* Ten Speed Press. 2005.

15. Krawczyk, Joe, and Kozak, Mary Ellen. *Growing Shiitake Mushrooms in a Continental Climate.* ABC. Printers, Marinette, Wisconsin. Second edition 1993.

16. Harris, Bob. *Growing Wild Mushrooms: A Complete Guide to Cultivating Edible and Hallucinogenic Mushrooms.* Homestead Book Company. Revised edition 1989.

17. Harris, Bob. *Growing Shiitake Commercially: A Practical Manual for Production of Japanese Forest Mushrooms.* Mushroom People; 2 Reprint edition. 1993.