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Spawn Production Technology of Button and Oyster Mushrooms

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Introduction:

Mushroom cultivation has become increasingly popular due to its nutritional advantages, economic opportunities, and contribution to sustainable farming practices. Spawn, which acts as the seed for growing mushrooms, is created by cultivating mycelium on an appropriate substrate like grains, sawdust, or agar. Button mushrooms and oyster mushrooms are two of the commonly grown varieties. The quality of the spawn is crucial for successful mushroom production. Although both button and oyster mushrooms need high-quality spawn, their cultivation methods differ according to their specific physiological needs. This review explores the technology behind spawn production for these two widely cultivated mushroom types.

Methods of spawn production: -

Mother Culture Preparation

Healthy mushroom fruiting bodies are used to obtain pure mycelial cultures through tissue culture or spore germination. The culture is kept on potato dextrose agar (PDA) or malt extract agar (MEA) in aseptic conditions.

Substrate Selection for Spawn Production

Button Mushroom: Cereal grains, especially wheat and rye, are the commonly used substrates for button mushroom spawn. These grains offer a well-rounded combination of carbohydrates, proteins, and minerals essential for the growth of mycelium.

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Oyster Mushroom: For oyster mushroom spawn, a range of substrates can be utilized, such as cereal grains (wheat, millet, sorghum), sawdust, and agricultural by-products like rice straw and corn cobs. The selection of substrate is influenced by factors like availability and cost.

Substrate Preparation and Sterilization

To prepare the substrate, grains or other materials are first cleaned and then soaked in water before being boiled to achieve partial hydration. After boiling, any excess water is drained off, and the substrate is combined with gypsum ($CaSO_4$) and calcium carbonate ($CaCO_3$) to ensure the pH remains balanced. The mixture is then placed into glass jars or polypropylene bags and sterilized in an autoclave at 121°C for 15 to 30 minutes to eliminate any competing microorganisms. Proper sterilization is essential to avoid contamination during the spawn production process.

Inoculation and Incubation

Once the substrate has been sterilized, it is allowed to cool before being inoculated with mushroom mycelium. This mycelium can be sourced from a pure culture or a mother spawn. It's crucial to perform the inoculation under aseptic conditions to prevent any contamination.

The inoculated substrate is then incubated at the ideal temperatures for mycelial growth. For button mushrooms, this temperature is usually around 24-26°C, while for oyster mushrooms, it tends to be a bit higher, around 25-28°C. The duration of the incubation period can vary, but it usually takes about 15-20 days for complete colonization.

Quality Control:

Implementing quality control measures is vital to ensure that the spawn remains free from contamination and exhibits robust mycelial growth. The spawn should display a consistent color and a strong, healthy mycelial network. Any evidence of contamination or weak mycelial growth should be promptly discarded.

Recent advancements in spawn production technology have aimed at boosting efficiency, cutting costs, and improving the quality of spawn.

- **Liquid Spawn:** Liquid spawn is created by cultivating mycelium in a liquid medium, which can then be used to inoculate the substrate. This approach facilitates quicker mycelial growth and simplifies the scaling of production compared to solid substrates.

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- **Automated Inoculation Systems:** Automated inoculation and incubation systems have been introduced to enhance efficiency and lower labor costs. These systems maintain consistent and sterile conditions throughout the spawn production process.
- **Use of Biotechnological Tools:** Researchers are investigating genetic engineering and molecular biology techniques to create strains that exhibit faster mycelial growth, increased yields, and greater resistance to diseases.
- **Sustainable Substrates:** Ongoing research is focused on identifying and optimizing sustainable and cost-effective substrates, such as agricultural by-products and industrial waste, for use in spawn production.

Challenges in Spawn Production:

Despite these advancements, spawn production technology still faces several challenges:

- **Contamination:** Bacterial and fungal contamination poses a significant threat in spawn production. Competing microorganisms can be particularly problematic in large-scale operations. Contaminants like Trichoderma, Penicillium, Bacillus, and Pseudomonas can outcompete mushroom mycelium, leading to a decline in spawn quality.
- **Nutrient Imbalance:** The nutrient composition of the spawn substrate is crucial for the growth and health of mushroom mycelium. Nutrient imbalances can result in poor colonization, sluggish growth, or contamination problems. Some substrates may be deficient in essential nutrients, necessitating supplementation to ensure optimal mycelial development.
- **Strain Degeneration:** Strain degeneration is a frequent challenge in long-term spawn production, resulting in lower yields, slower growth, and diminished resistance to contamination. Over time, mushroom strains may lose their vigor.

Conclusion: -

The technology used in spawn production plays a crucial role in the successful cultivation of button and oyster mushrooms. Choosing high-quality mother cultures, optimizing substrates, and employing proper sterilization, inoculation, and incubation techniques are vital for achieving high yields and ensuring disease-free spawn. Recent technological advancements, such as liquid spawn and automation, have the potential to transform spawn production, enhancing both efficiency and scalability. Nonetheless,

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challenges like contamination, nutrient imbalances, and strain degeneration must be tackled to support the ongoing growth and sustainability of the mushroom industry. Future research should aim at developing innovative and sustainable solutions to improve spawn production technology.

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