THE RESEARCH, DEVELOPMENT AND APPLICATION OF THE FERMENTATION ACCELERATOR

A NEW MATERIAL FOR EDIBLE MUSHROOM CULTIVATION ON SEMI-STERILIZED SUBSTRATE

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1 THE CONCEPT OF CULTIVATION ON SEMI-STERILIZED SUBSTRATE

• Cultivation on semi-sterilized substrate refers to the growing method in which mycelium of the mushroom inoculated on the semi-sterilized substrate can grow well, but competitor moulds are inhibited or killed. Cultivation on sterilized substrate refers to the growing procedures of substitute substrate in which mycelium of the mushroom is inoculated on the steam sterilized substrate.
• Black wood ear and Shiitake cultivation on wood logs is a primitive cultivation technique on unsterilized substrate. It depends on hardwood logs and an optimal natural environment, so it is limited by climatic conditions, especially humidity and temperature. Shortcomings: low biological efficiency, low output, unstable quality of mushroom products, destruction of forest resources. Replaced by growing on substitute substrate (sterilized substrate).
2 THE BASIC OBJECTIVES OF MUSHROOM CULTIVATION ON SEMI-STERILIZED SUBSTRATE

• Objectives of growing on semi-sterilized substrate: simplify the procedures, save labor and cost, prevent the inoculation operator to be injured by disinfectants in the inoculation room, reduce the use of energy and maintain the eco-balance.

• The fermentation accelerator, developed by Hangzhou Huadan Agricultural Products Company Limited after over 20 years of constant research, can meet these objectives.
3 THE FUNCTIONS AND PRINCIPLES OF THE FERMENTATION ACCELERATOR

(1) To Kill
The fermentation accelerator is a product resulted from the research on the differences in biological features of various fungi. The cultivated mushrooms are macro-fungi, the fermentation accelerator will kill aspergillum, bacteria, Trichoderma spp., green moulds and Neurospora spp. etc.

(2) To accelerate fermentation
At a temperature between 70 and 80°C, the fermentation accelerator will volatilize onto the substrate to speed up fermentation and realize the effect of composting for over 1 week. The ammonia and beneficial microorganisms produced in a short time period accelerate the death of contaminants like weed moulds, realizing the effect of a thorough sterilization.
(3) **To catalyze fermentation**

- At a substrate temperature between 70 and 80°C, the fermentation accelerator can decompose the substrate into carbon dioxide, water, urease and special-effect catalytic enzyme, which will volatilize and penetrate onto the substrate. The research shows that the fermentation accelerator can increase the biological efficiency of the substrate by about 10～20% and the mushroom yield by over 10%.

- Important achievements of the Star Project of Ministry of Science & Technology
- Save labor, time & money. Safe & efficient. Sterilization at 80°C.
4 THE EFFECTS OF THE FERMENTATION ACCELERATOR

• The fermentation accelerator is suitable for all wood-rotting mushrooms cultivated with the technique of normal pressure sterilization. It can also be used to compost for Agaricus bisporous to make the substrate temperature rise and ferment in a short time period. After a long period of experimentation and extension, it showed the following effects:
• (1) Reduce sterilization temperature, shorten sterilization period, save fuel, time and labor, improve effect.
•(2) A wide-range application to almost all edible mushrooms cultivated at present.
•(3) The percentage of bran in the regular formula could be reduced to 10～15%, decreasing the cost.
•(4) The robust growth and fast colonization of the mycelium could make the spawn run the entire bag advanced by 7 days.
(5) Sterilization at a low temperature would cause less nutrient loss of the substrate, less deformed mushrooms, high quality and yield.

(6) The improved resistance to high temperatures would reduce the number of rotten bags, slow down the shrinking and loosening of growing bags, strengthen the after-effect and prolong the fruiting period.

Huge Wild Reishi
•(7) It could resist the infestation of Neurospora spp and Fastigiated bacteria.

•(8) No need to use pesticides as occurrence of pests and diseases are reduced.

•(9) The application to straw rotting mushroom cultivation could make the temperature of fermented substrate rise in a short time period, promoting the substrate fermentation.

Stone pork
5 HOW TO USE & STORE THE FERMENTATION ACCELERATOR

• The fermentation accelerator is simple to use.
• (1) Add it and other ingredients successively from a small amount to a large amount based on the percentages in the formula. The percentage of the fermentation accelerator to be added is 0.5% of the total dry weight of the substrate.

Paper cutting

Audio frequency player to stimulate mushroom growth
•(2) Mix the raw materials evenly in sequences, then stir the mixture with water: the fermentation accelerator → gypsum powder → bran → sawdust, straw.

•(3) Sterilization. ① 2~3 cm of gap should be maintained between rows of bags to facilitate efficient steam circulation and reduce the dead spaces.

• ② During sterilization, the temperature displayed on the thermometer should be the actual substrate temperature inside the bag.

• ③ Maintain the substrate temperature inside the bag at 80℃ for 5 hours, cool down naturally to a proper temperature, take out the bags from the container.
• ④ Stop the fire only when the reading of the thermometer exceeds 80 °C. The effective temperatures of the fermentation accelerator range between 50 and 150°C, so it will not lose its efficacy at a temperature of 100°C.

• (4) Inoculate based on the regular sterile operation methods. Use quality spawn at a proper fungus age.
(5) Sealing the inoculation bags. The cotton plugs and rubber bands (plastic rings) are not suitable for this purpose, it is suggested to seal the bags by tying or folding them. The sticky tape or white wax is fit for sticky sealing the inoculation holes in the bags for Shiitake and Silver ear cultivation. The incubation room should be frequently disinfected and should have a good ventilation and aeration to prevent infection.
• (6) Spawn running. The mycelium can colonize the entire bag 7 days ahead of the regular substrate. The temperatures in the artificial log pile ought to be monitored all the time to prevent from burning.

• (7) Substrate shall be prepared according to the varied requirements of the regular production for different edible mushrooms.
(8) The fermentation accelerator is very easy to be moist and stuck together, so it should be stored in a closed, shady, cool and dry place.

•(9) The fermentation accelerator can never be used by directly adding water to, as it is easy to become moist and compact even form sticky mass after moistened.
6 ADVANTAGES & BENEFITS TO USE THE FERMENTATION ACCELERATOR

• (1) Simplify procedures.
• (2) Save labor and costs. Sterilization can be realized at a lower temperature in a shorter time period, so it can reduce the consumption of energy and costs. The semi-sterilized substrate bag cultivation can save a cost of $12 \sim 35\%$ than the sterilized substrate bag cultivation.
(3) Improve the inoculation conditions. The sterile room (cabinet) for the inoculation of sterilized substrate is replaced by a clean room, which can prevent the irritant odor of the disinfectants from injuring the human body.

(4) Save time for sterilization and multiple handling procedures.

(5) The production scale can be small. The semi-sterilized substrate cultivation can be in bags or on ridged fields according to labor availability, busy or slack seasons and sizes of the incubation rooms.

(6) 95% of mushrooms can be fruited and harvested from the semi-sterilized substrate cultivation technique, which considerably increases the economic benefit.
• (7) The formulation of Enterprise Standards of the Fermentation Accelerator provides a technical support for the safe and standardized production of the new product. This research result was applied in 26 Provinces across China, with a total of 290 million bags cultivated and an accumulative of 116 million Yuan obtained from saving labor and costs and increasing efficiency. All these showed that it had prominent social and economic benefits.
• (8) Substantial economic and ecological benefits can be realized from growing mushrooms on semi-sterilized substrate adding the fermentation accelerator. For example, producing 10,000 bags of Shiitake or Black wood ear can save 720 kgs of coal and 2 labor forces and increase the output by over 10%, thus reducing a direct input of 1110 Yuan.

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