



Post Harvest Control for Maintenance of Quality Mushrooms

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INTRODUCTION

The mushroom industry has caught the attention of entrepreneurs, especially the young ones. There are 17 types of mushroom that are suitable for growth in Malaysia, whereby seven of them can be commercially produced. The grey oyster, black jelly, shiitake and Ganoderma mushrooms are four of the popular ones. These types are also most sought after globally. Ganoderma and the grey oyster mushrooms are grown in the lowlands, with shiitake and the black jelly being found in the highlands.



Mushrooms after harvesting continue to grow, undergo respiration and become mature. This situation will lead to the mushrooms easily losing their weight, become yellowish, begin to wither and will finally be damaged. Most mushrooms have a short storage period and this will affect their quality.

Post-harvest management of mushrooms is an important factor that has to be implemented to guarantee their quality before they are marketed. This is the main activity to ensure that the quality of the mushrooms does not deteriorate, other than looking after their growth at the farm until the marketing for consumers. The objective of the post-harvest technology is to determine a longer storage period and to upkeep a high quality for mushroom products.

POST-HARVEST CONTROL

Just like fruits and vegetables, mushrooms also undergo respiration and become mature after harvesting. This has a significant effect on the quality and storage life of the mushrooms. The

post-harvest physiological process that influences these characteristic, and how it can be controlled so that the situation is improved are therefore necessary. The change in quality can be seen from the colour, odour, taste, moisture, soft texture, and the mushroom cap that is rather fragile. There are several post-harvest management carried out by entrepreneurs to maintain the quality and extend the shelf-life, as follow:

a. Harvesting

The farm operation normally requires the use of plastic containers after the mushrooms are harvested. The baskets should be properly ventilated and be easily arranged on storage shelves. Avoid the use of plastic containers immediately after the mushrooms are harvested to prevent the effect of the tropical heat in the farm. The containers should always be placed in a cool place with low temperature. The harvested product needs to be delivered as soon as possible to the packaging house (if the farm is quite a distance from it).

The transport of mushrooms from the farm also needs to be done in a shaded situation at a low temperature. The delivery should be done either in the morning or at night if there is no air conditioned transport. Polystyrene boxes with ice cubes or jelly can be used to keep the temperature suitable during delivery. Fresh mushrooms should be stored in an ideal condition to prevent post-harvest damage and before they are consumed. Refrigeration or cold storage is one of the ways perfect for post-harvest maintenance.

Mushroom Storage Life

Storage temperature (°C)	Storage Life (days)
0	21
2	8 - 11
5	4 - 6
10	2 - 3
20	1 - 2

b. Packaging

Packaging plays an important role in the control, marketing and consumption of the yield and production of mushrooms. It also protects the quality during storage and transportation for retail sale and storage for consumers. The packaging of mushroom from the farm until it reaches the consumers, including for the export market, is an important aspect in post-harvest control. Consumers are more confident with packaging that allows them to see its contents. Mushroom products will not only decrease in the volume of sales, but also in the quality of their nutritional content that is due to enzyme changes, when packaging and storage are not properly done.

Oyster mushroom that has been harvested will have its stalks cut and the straw or other growth media removed. Clean mushroom will then be put into thin polypropylene bags which are about 5% perforated for ventilation. While these air holes will result in a slight loss in weight during storage, nevertheless they will help in keeping the product fresh and firm. The storage of mushroom at very low temperatures especially in non-perforated bags will give rise to perspiration that in turn will lead to a slimy aftermath and a soft texture.

c. Transportation

The positive effects of pre-frozen and packaging are useless if the product is stored and delivered at high temperatures. Mushrooms therefore need a complete cold chain for storage and delivery. Frozen mushrooms need to be monitored for their coldness for delivery for long distances with an ambient condition. Polypacked mushrooms should be arranged in a tiered manner in wooden boxes covered with crushed ice. The delivery of larger quantities for longer distances would need a refrigerated transport. This method is very necessary even though its cost is quite high.

d. Packaging House Operation

Mushrooms which are too matured, and especially those that are over five days old, do not have an attractive appearance with their colour turning brownish and giving off an unpleasant odour. These mushrooms also do not have a long storage life. This will result in their deteriorating condition. Therefore, it is important that emphasis be made towards the storage life of mushrooms. Nevertheless, it should be noted that storage life at the maturity level of mushroom differs: harvesting 4 – 5 days after shoot growth, the storage life is 21 days at 2°C; and harvesting 6 – 7 days after shoot growth, the storage life is 16 days at 2°C.

VALUE-ADDED PRODUCTS

The national mushroom industry still includes the production and trading of fresh mushrooms. Mushroom processing is still limited to the curing and not to the actual value-added aspect. The current situation emphasizes more of the awareness towards quality and demand of food products that are ready-to-use or are ready to be cooked.

Value can be added to mushroom products at all levels of their processing, from grading until the final product snacks that are ready for consumption or the main course in dinner dishes. Attractive packaging for value-added products is an important aspect of mushroom retailing. However, good and attractive packaging has not been given due attention by the mushroom industry. The use of the standard polypouch packaging which is less attractive is still being practiced as compared to the use of the more attractive polystyrene trays that is being practiced in developed countries.

Small industrial growers, however, are putting in added values like grading and the packaging of fresh mushrooms, but the industry needs to focus on processed products. This will bring in better returns, as well as improving demands from consumers and thus will result in an effective positive flow of production. There are several value-added products that have the potential to be marketed:

- Mushroom soup powder
- Mushroom biscuits
- Mushroom nuggets
- Mushroom sauce
- Mushroom sweets
- Mushroom chips
- Canned mushroom.

The presence of these value-added products will indirectly increase the income of mushroom entrepreneurs and make the industry more competitive and viable.

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