



THAI AGRICULTURAL STANDARD

TAS 2504-2012

**GOOD AGRICULTURAL PRACTICES
FOR BAG MUSHROOM CULTIVATION**

**National Bureau of Agricultural Commodity and Food Standards
Ministry of Agriculture and Cooperatives**

ICS 67.020.20

ISBN

UNOFFICAL TRANSLATION



THAI AGRICULTURAL STANDARD

TAS 2504-2012

**GOOD AGRICULTURAL PRACTICES
FOR BAG MUSHROOM CULTIVATION**

National Bureau of Agricultural Commodity and Food Standards

Ministry of Agriculture and Cooperatives

50 Phaholyothin Road, Ladyao, Chatuchak, Bangkok 10900

Telephone (662) 561 2277 Facsimile (662) 561 3357

www.acfs.go.th

**Published in the Royal Gazette, Announcement and General Publication Volume 129,
Special Section 165๓ (Ngo),**

Dated 30 October B.E. 2555 (2012)

Technical Committee on the Elaboration of the Thai Agricultural Standard on Mushrooms

- | | | |
|-----|--|----------------------|
| 1. | Khunying Prapaisri Pitakpaivan | Chairperson |
| 2. | Mrs. Ancharee Chaingkul
Department of Agriculture | Member |
| 3. | Mrs. Orasa Dissataporn
Department of Agricultural Extension | Member |
| 4. | Mr. Korakod Chayutrarat
Cooperative Promotion Department | Member |
| 5. | Miss Tassanee Pradyabumrung
National Bureau of Agricultural Commodity and Food Standards | Member |
| 6. | Mr. Apirusht Somrith
Plant Protection Research and Development Office, Department of Agriculture | Member |
| 7. | Associate Professor Niwat Sanoamuang
Faculty of Agriculture, Khonkaen University | Member |
| 8. | Associate Professor Prapaporn Tangkijchote
Faculty of Agriculture, Kasetsart University at Kamphaengsaen Campus | Member |
| 9. | Assistant Professor Songsak Janaudom
Research and Mushroom Association of Thailand | Member |
| 10. | Mr. Charnyut Parnutat
Expert in production of mushroom compost | Member |
| 11. | Mrs. Ahchara Payapanon
Expert in mushroom farm management | Member |
| 12. | Mr. Pramote Thaithatkul
Expert in production of mushroom spawn | Member |
| 13. | Mrs. Thitilat Puangpohthong | Member |
| 14. | Mr. Phurtipong Chaiyavej | Member |
| 15. | Mrs. Kunsiri Viengvisas
Office of Standard Development,
National Bureau of Agricultural Commodity and Food Standards | Member and Secretary |

Mushroom is popular food due to the fact that it is high in nutritional values and is safe for consumption because the pesticide usage is minimal. Thailand has a potential in producing various varieties of mushroom especially mushroom grown in a plastic bag e.g. Hed-Nang-Fa (*Pleurotus sajor-caju*), Oyster mushroom (*Pleurotus ostreatus*) and Abalone mushroom (*Pleurotus abalonus*). However, mushroom growers are still lack of guidelines and good management in order to obtain good quality, clean and safe mushroom suitable for consumption. Therefore, the Agricultural Standards Committee deems it necessary to establish an agricultural standard on good agricultural practices for bag mushroom cultivation as a guideline for mushroom growers.

This standard is based on the following documents:

National Bureau of Agricultural Commodity and Food Standards. 2006. The study on the criteria to identify quality characteristics, classification and code sizes of mushrooms. The collaborative project with Kasetsart University.

TAS 9001-2009. Thai Agricultural Standard on Good Agricultural Practices for Food Crop. National Bureau of Agricultural Commodity and Food Standards.



**NOTIFICATION OF MINISTRY OF AGRICULTURE AND COOPERATIVES
ON THE ESTABLISHMENT OF THAI AGRICULTURAL STANDARD: GOOD
AGRICULTURAL PRACTICES FOR BAG MUSHROOM CULTIVATION
UNDER THE AGRICULTURAL STANDARDS ACT B.E. 2551 (2008)**

Whereas the Agricultural Standards Committee deems it necessary to establish an agricultural standard on Good Agricultural Practices for Bag Mushroom Cultivation as a voluntary standard in accordance with the Agricultural Standards Act B.E. 2551 (2008) to promote such agricultural commodity to meet its standards on quality and safety.

By virtue of Sections 5, 15 and 16 of the Agricultural Standards Act B.E. 2551(2008), the Minister of Agriculture and Cooperatives hereby issues this Notification on the Establishment of Thai Agricultural Standard: Good Agricultural Practices for Bag Mushroom Cultivation (TAS 2504-2012), as voluntary standard, details of which are attached herewith.

Notified on 20 August B.E. 2555 (2012)

Mr. Theera Wongsamut
Minister of Agriculture and Cooperatives

THAI AGRICULTURAL STANDARD
GOOD AGRICULTURAL PRACTICES FOR BAG MUSHROOM CULTIVATION

1. SCOPE

This agricultural standard covers good agricultural practices for bag mushroom cultivation from the spawn incubation to the post-harvest practices in order to ensure good quality, clean and safe mushroom suitable for consumption.

2 DEFINITIONS

For the purposes of this standard, the definitions referred to in the TAS 9001-2009 as well as the followings are applied:

2.1 Bag mushroom cultivation means mushroom that is produced by the method of growing mushroom mycelium on substrate in plastic bag such as Oyster mushroom (*Pleurotus ostreatus*), Hed-Nang-Fa (*Pleurotus sajor-caju*), jelly mushroom (*Auricularia polytricha* Mont.), shiitake mushroom (*Lentinus edodes* (Berk.) Sing), Hed-Khon-Khao (*Lentinus polychrous* Lev.) and Ling zhi (*Ganoderma lucidum* (Fr.) Karst.).

2.2 Spawned substrate means a loaf of substrate comprising of various materials for example sawdust, rice straw, and other supplements such as rice bran, gypsum salt, limestone which are packed in the plastic bag and has been pasteurised by steam and inoculated with mushroom spawn.

2.3 Mushroom farm/Establishment means the place where mushroom is cultivated covering houses of spawn incubation, fruiting, quality sorting and storage for further distribution.

2.4 House of spawn incubation means the place where spawned substrates are incubated to promote mycelium growth.

2.5 House of fruiting means the place where fully developed spawned substrates are stacked, ready for the induction and harvesting of fruiting bodies.

2.6 Mushroom pests mean living organisms such as virus, microorganisms, mites, insects, and other animals that cause damage to mushroom.

2.7 Carrier animals mean animals that carry mushroom pests to damage mushrooms such as mites, fly, rodent, cockroach, and pomance fly.

3. REQUIREMENTS

3.1 Requirements of good practices for bag mushroom cultivation are classified into 3 levels as follows:

3.1.1 Major requirements mean the mandatory provisions that shall be complied with. In case of non-compliance, it will cause direct or serious effect on quality of mushroom and consumer safety. It also includes the requirements under relevant laws and regulations.

3.1.2 Minor requirements mean the provisions that should be complied. In case of noncompliance, it will directly affect to the production yield of mushroom or cause indirect effect on quality of mushroom and consumer safety. .

3.1.3 Recommendations mean the provisions that are recommended for practices to support this Good Agricultural Practices of Bag Mushroom Cultivation.

3.2 Judgment Criteria

Judgment criteria for the assessment of compliance are as follows:

3.2.1 All of the major requirements shall be fully complied with; and

3.2.2 The minor requirements shall be complied with not less than 60% of total numbers of minor requirements or not less than 60% of the total score of all minor requirements (the improvement up to 70% of all minor requirements is required within 2 years.)

3.3 Requirements for Good Agricultural Practices for Bag Mushroom Cultivation shall be as in Table 1.

Table 1 Requirements and Levels

(Section 3.3)

Items	Requirements	Levels
1. Water sources	1.1 Water used in production shall come from the sources where their environment does not cause contamination of hazardous substances. In case of risk, water shall be analysed for hazardous substance contamination and/or pathogens by either official or accredited laboratories. Analytical result shall be kept as evidence.	Major
	1.2 If it is necessary to use water that is at risk of hazardous substances contamination, there shall be clear evidence or proof showing that such water has been treated and it can be used in the production. Monitoring of water quality shall be conducted regularly and recorded.	Major
	1.3 Take sample of water to monitor its quality by sending to official or accredited laboratories for hazardous substance analysis. Analytical result record shall be kept as evidence.	Minor
2. Mushroom farm 2.1 General requirements	2.1.1 Shall be located in the area that does not pose any risk of contamination of hazardous substances at the level that is harmful to consumer such as dumping sites, chemical or hazardous substance production plants, animal	Major

Items	Requirements	Levels
	housing, or cropping area that uses hazardous substances that cause residues left over or contamination to mushroom.	
	2.1.2 Separate house of spawn incubation from house of fruiting.	Major
	2.1.3 Protect spawned substrates from mushroom pests and carrier animals.	Major
	2.1.4 Keep the farm area clean and provide adequate spaces to facilitate operations	Minor
	2.1.5 Close the house of spawn incubation and house of fruiting for cleaning, disinfection and pest eradication.	Minor
	2.1.6 Clean and check tools after each operation.	Recommendation
	2.1.7 Availability of cleaning schedule for mushroom farm and tools.	Recommendation
2.2 House of spawn incubation	2.2.1 The environmental conditions inside the house shall be appropriate for mycelial running and well ventilated.	Major
	2.2.2 Floor shall be smooth, well drained, and easily cleaned such as concrete floor.	Minor
2.3 House of fruiting	2.3.1 The environmental conditions inside the house shall be appropriate for the fruiting of each mushroom variety. Wall and roof materials shall be able to prevent moisture loss. Temperature, lighting, and ventilation shall be appropriate to mushroom varieties.	Minor
	2.3.2 Floor shall be smooth, well drained, and easily cleaned such as concrete floor.	Major
	2.3.3 Place numbers of spawned substrates per house appropriately to the fruiting of each variety and to facilitate operations.	Recommendation
	2.3.4 No debris of mushroom and substrate left over as it may be a source of mushroom pest accumulation.	Major
3. Management of mushroom pests and carrier animals 3.1 General requirements	3.1.1 Workers shall have knowledge on the prudent use of pesticides.	Major

Items	Requirements	Levels
	3.1.2 Monitor mushroom pests and carrier animals by regular checking of the occurrence of mushroom pests and carrier animals.	Minor
	3.1.3 Check and sort out contaminated spawned substrate caused by mushroom pests and destroy.	Major
	3.1.4 If pesticide is used, follow the recommendations of the Department of Agriculture (DOA), Ministry of Agriculture and Cooperatives or instruction on the label registered with the DOA. In case there is evidence or doubt of improper use, the produce shall be analysed for pesticide residues.	Major
3.2 House of spawn incubation	3.2 Do not use pesticides in the house of spawn incubation. If it is necessary to use for the prevention of mushroom pests outbreak, section 3.1.4 shall be applied.	Major
3.3 House of fruiting	3.3 Do not use pesticides in the house of fruiting during fruiting stage.	Major
4. Production steps at the house of spawn incubation	4.1 Select spawned substrate from reliable source, characteristic of the required variety, no trace of mushroom pests especially mites and other fungi.	Major
	4.2 Examine the characteristics of spawned substrate. Mycelial growth shall start from the inoculated point and spread out radially and evenly. The colour and mycelium characteristics are of the required variety.	Recommendation
	4.3 Place numbers of spawned substrates per house appropriately to the mycelial growth, type of each variety and to facilitate operations.	Recommendation
5. Harvest and postharvest handling 5.1 General requirements	5.1 Use clean tools and containers that pose no adverse effect on quality of mushroom. In order to prevent contamination, separate tools and containers using for harvest from those of waste and pesticides.	Major
5.2 House of fruiting	5.2.1 Refrain from watering at least 1 hour before harvesting (except for jelly mushroom) and prevent harvested mushroom from being wet.	Minor

Items	Requirements	Levels
	5.2.2 Carefully harvest mushroom to prevent any damage to its quality.	Minor
	5.2.3 There shall be no debris of caps or stalk of mushroom left on spawned substrate after harvest.	Minor
	5.2.4 If there are debris of mushroom including spent substrates, no matter they are left over outside or inside the house, they shall be destroyed to prevent mushroom pests accumulation.	Major
5.3 Quality sorting	5.3.1 Trim mushroom base to clean, and remove substrate and pack in clean container to prevent contamination of microorganisms, debris, dirt and filth as well as other hazardous substances	Major
	5.3.2 Classify the quality of mushroom according to Thai agricultural standards or requirements of the trading partners.	Recommendation
6. Storage and collecting areas	6.1 Storage area shall be clean, hygienic without any contamination, well ventilated, and provided with measures to prevent deterioration of mushroom.	Major
	6.2 Containers shall be clean, appropriate to the variety and quantity of mushroom, without causing any damage to the quality of mushroom.	Major
	6.3 Clean tools used for moving mushroom within the mushroom farm before and after use.	Minor
7. Workers	7.1 Workers shall have appropriate knowledge or be trained for proper operations at least once a year.	Major
	7.2 Personal hygiene of the workers shall be properly taken care of to prevent contamination to the produce.	Major
8. Record keeping	8.1 Information of the following shall be recorded: 8.1.1 Cleaning of the mushroom farm.	Minor
	8.1.2 Cleaning of the tools and equipment.	Recommendation

Items	Requirements	Levels
	8.1.3 Numbers of spawned substrates in each house, numbers of houses, and production yield from each house.	Minor
	8.1.4 Dates of spawned substrates introduction to the houses, fruiting, harvesting, and removal of the spent substrates.	Minor
	8.1.5 The monitoring and the occurrence of mushroom pests and carrier animals affecting spawned substrates.	Minor
	8.1.6 Humidity and temperature in house of fruiting.	Minor
	8.1.7 Evidence of the sources of inputs, such as spawned substrates, pesticides, application of pesticides, types, quantity and dosage.	Minor
	8.1.8 Date of pesticide application (day/month/year) and storage condition.	Major
	8.1.9 Date of training or teaching for workers (day/month/year) including the details or the evidence of training or the evaluation of workers.	Recommendation
	8.1.10 Information of buyers or marketplace of each lot.	Recommendation
	8.1.11 Closing time of the houses for cleaning, disinfection and pest eradication (day/month/year).	Minor
	8.2 Keep record at least 1 year.	Major