

UNOFFICIAL TRANSLATION



**MINISTERIAL REGULATION
ON THE ESTABLISHMENT OF THAI AGRICULTURAL STANDARD ON
CODE OF PRACTICE FOR MUSHROOM CULTURE
AS A MANDATORY STANDARD
B.E. 2560 (2017)**

By virtue of Section 5 paragraph one and Section 15 paragraph two of the Agricultural Standards Act, B.E. 2551 (2008), the Minister of Agriculture and Cooperatives hereby issues this Ministerial Regulation as follows:

Section 1 This Ministerial Regulation shall come into force after three hundred and sixty-five days as from the date of its publication in the Royal Gazette.

Section 2 The Thai Agricultural Standard TAS 2507-2016 in accordance with the Notification of the Ministry of Agriculture and Cooperatives on the Establishment of Thai Agricultural Standard: Code of Practice for Mushroom Culture under the Agricultural Standards Act, B.E. 2551 (2008) dated 11 August B.E. 2559 (2016) shall be established as a mandatory standard.

Given on the 24th Day of March B.E. 2560 (2017)

(General Chatchai Sarikalya)
Minister of Agriculture and Cooperatives

Remark : Rationale for the promulgation of this Act is that: Mushroom culture is the production input that is necessary for the enhancement and improvement of the production of standardized products. Unless good code of practice for their production is in place, the mushroom cultures are less in quality and at risk of pest contamination, which can affect farmers who make use of the aforesaid mushroom cultures. Hence, there is a need to control the production practices of mushroom cultures according to the principles and good hygiene in order to obtain the good quality mushroom cultures that meet the standard. Furthermore, it will increase the production competitiveness of the agricultural products of Thailand. Consequently the Notification of the Ministry of Agriculture and Cooperatives on the Establishment of Thai Agricultural Standard: Code of Practice for Mushroom Culture under the Agricultural Standards Act, B.E. 2551 (2008) was promulgated on 11st August 2016. The public hearing for stakeholders was conducted to follow Section 18 under the Agricultural Standard Act B.E. 2551. Thus, it is deemed necessary to establish the Thai Agricultural Standard: Code of Practice for Mushroom Culture as a mandatory standard.

THAI AGRICULTURAL STANDARD

CODE OF PRACTICE FOR MUSHROOM CULTURE

1. SCOPE

This Thai Agricultural Standard establishes code of practice for the production of all mushroom cultures for commercial purpose covering from raw material preparation, pure mushroom culture production, mushroom spawn production by sub-culturing into substrate, to product storage awaiting for distribution, to produce good quality mushroom culture, true to strains of fungi and free of pest contamination.

2. DEFINITIONS

For the purpose of this standard, the following shall apply:

2.1 Mushroom culture means pure mushroom culture and mushroom spawn.

2.2 Pure mushroom culture means mycelium of mushroom that grows on culture media for spawn production.

2.3 Mushroom spawn means mycelium of mushroom grown in substrate, such as grains or other materials used for propagation or production of mushroom.

2.4 Subculture means transfer of mushroom culture into fresh culture media or substrate to increase its quantity to be used for propagation or collection, or rejuvenation.

2.5 Pest means viruses, microorganisms, mites, insects and other animals injurious to mushroom.

2.6 Carrier or vector means animal that brings in pests injurious to mushroom culture such as mite, fly, rat, cockroach and common fruit fly (*Drosophila melanogaster*).

3. REQUIREMENTS

Requirements of code of practice for mushroom culture are as in Table 1.

Table 1 Items and requirements for code of practice for mushroom culture

(Section 3)

Items	Requirements
1.Establishment: design and facilities	<p>1.Premises, tools and equipment and facilities should be located, designed and constructed so as to :</p> <p>(1) prevent pest and carrier/vector accumulations.</p> <p>(2) conveniently maintain, clean and disinfect.</p>
1.1 Location	<p>1.1 The establishment is located in the area that poses no risk of accumulated source of pest and carrier or vector. If there is risk, appropriate preventive measures shall be in place.</p>
1.2 Design of premises	<p>1.2 The internal design and layout of the premises should facilitate the operation and be able to prevent cross contamination between and during the operations.</p> <p>1.2.1 General working areas and areas required for cleaning should be clearly separated and sequence of operational workflow is designed to prevent the contamination.</p>
1.3 Internal structure of premises and fittings	<p>1.3 It should be appropriately designed for easy maintenance and cleaning to prevent pests and carrier or vector accumulation.</p> <p>1.3.1 Floor should be well drained and cleanable.</p> <p>1.3.2 Surfaces of floor, walls and ceiling or roof of sub-culturing area or room should be smooth, not be an accumulated source of filth, good air circulation, and easy to maintain and clean.</p> <p>1.3.3 Drainage should be sloped to provide an effective drain of water.</p>
1.4 Tools and equipment	<p>1.4 Tools and equipment are appropriately designed to ensure that risk of being an accumulated source of pests and contamination in culture media and substrate are minimized.</p> <p>1.4.1 Surface of table or internal of transfer chamber for sub-culturing shall be non absorbent. The surface should be smooth without cracks where it may be an accumulated source of waste substrate or filth.</p>

Items	Requirements
	1.4.2 Autoclave shall be made of metal with pressure resistant equipped with safety valve for pressure control. It can work at the temperature setting not less than 121°C and the level of pressure not less than 15 psi. The temperature and pressure used in each batch shall be recorded.
1.5 Facilities	<p>1.5 The facilities should be adequate and suitably to ensure the cleanliness during operations and to reduce the risk of contamination.</p> <p>1.5.1 Adequate clean water should be available for the operations.</p> <p>1.5.2 Lighting equipment used during sub-culturing should be located at the suitable spots. Lighting shall be sufficient for the operations.</p> <p>1.5.3 Adequate toilets and wash basins shall be provided for workers. It shall be located in the area where there is no risk of contamination.</p>
2. Control of operation	2. Requirements of quality control and reduction of contamination risk in the operations shall be available. Those requirements start from preparation of fruit body of mushroom or pure mushroom culture, culture media and substrate; isolation and sub-culturing; and product storage including documentation and records for the purposes of reviewing the effectiveness of the control, to ensure that mushroom culture produced is of good quality, true to strains of fungi and free of pest contamination.
2.1 Preparation of fruit body of mushroom or pure mushroom culture	2.1 Selection of fruit body of mushroom shall follow the required quality criteria or characteristics. In case the pure mushroom culture is used, it shall come from reliable sources.
2.2 Culture media preparation	<p>2.2 Culture media shall be prepared and stored in accordance with specified method to control quality and prevent pest contamination.</p> <p>2.2.1 Culture media shall be sterilized in an autoclave at the temperature not less than 121°C and at the level of pressure not less than 15 psi. for at least 20 min.</p> <p>2.2.2 The prepared culture media shall be stored to prevent deterioration or contamination.</p>

Items	Requirements
2.3 Substrate preparation	<p>2.3 Substrate shall be prepared and stored in accordance with specified method to control the quality and prevent pest contamination.</p> <p>2.3.1 The substrate shall be sterilized in an autoclave at the temperature not less than 121°C and at the level of pressure not less than 15 psi for at least 20 min.</p> <p>2.3.2 The substrate for straw mushroom spawn production may be prepared by pasteurization at the temperature below 100 °C for an appropriate period of time.</p> <p>2.3.3 The prepared substrate shall be stored to prevent deterioration or contamination.</p>
2.4 Isolation and sub-culturing	<p>2.4 Isolation of pure mushroom culture from fruit body of mushroom and sub-culturing shall be performed by using suitable methods to control quality of mushroom culture and to minimize risk of contamination.</p> <p>2.4.1 Isolation and sub-culturing shall be performed in accordance to the specified method and recorded.</p> <p>2.4.2 Isolation and sub-culturing shall be performed by using an aseptic technique.</p>
2.5 Storing	<p>2.5 Mushroom culture shall be stored appropriately for its good development. Suitable measures to prevent and reduce risk of contamination as well as mingling of mushroom culture from each kind and/or strain during storage shall be in place.</p> <p>2.5.1 Storage area for pure mushroom culture or mushroom spawn shall be clean with optimum temperature for the mycelia development of each mushroom kind and/or strain without direct exposure of sunlight.</p> <p>2.5.2 Each kind and/or strain of mushroom culture should be stored separately to prevent the mixing up by clearly identify kind and/or strain of mushroom with production date.</p> <p>2.5.3 Preventive measures for pests and carriers or vectors infestation during storage shall be in place.</p>
2.6 Quality control	<p>2.6 Quality control methods to ensure the quality and absence of contamination for mushroom culture during storage awaiting for distribution shall be in place. Samples from each lot shall also be kept as evidence.</p>

Items	Requirements
	<p>2.6.1 The contaminated, pest infested or poorly developed mushroom culture shall be sorted out and recorded.</p> <p>2.6.2 Each lot of mushroom culture produced shall be randomly sampled and kept as evidence.</p>
2.7 Documents and records	<p>2.7 Documentation of important working procedures of quality control including records needed for reviewing the effectiveness of operations shall be kept orderly and easy to access. The records shall be kept for at least one year.</p> <p>2.7.1 The following documents and records shall be made available:</p> <p>2.7.1.1 Document on quality criteria, or characteristics of fruit body of mushroom as material, or evidence showing sources of pure mushroom culture. (Section 2.1)</p> <p>2.7.1.2 Specified document on the preparation methods for culture media and substrate as well as the isolation and sub-culturing method. (Sections 2.2, 2.3 and 2.4.1)</p> <p>2.7.1.3 Records on the operation dates of important working procedures for verification of each mushroom culture production lot are as follows:</p> <p>(1) date of isolation of fruit body of mushroom.</p> <p>(2) date of sub-culturing pure mushroom culture into the substrate.</p> <p>(3) date of mushroom culture distribution.</p> <p>2.7.1.4 Records on the sorting out of contaminated, pest infested or poorly developed mushroom culture and disposal method. (Section 2.6.1 and 3.2)</p> <p>2.7.1.5 Records on the cleaning program. (Section 3.1)</p>
3. Establishment: maintenance and cleaning	3. Effective system shall be in place to support the maintenance of tools and equipment for their cleanliness and readiness to use. The control of risk arising from the accumulation of pests and carriers or vectors shall be carried out continuously.

Items	Requirements
	<p>3.1 Cleaning and disinfection programs at the major points shall be provided to ensure that all sections of the establishment are appropriately cleaned including the maintenance and cleaning of tools and equipments. The implementation according to the cleaning and disinfection programs shall be monitored and recorded.</p> <hr/> <p>3.2 Suitable disposal methods for contaminated or pest infested or undesired mushroom culture shall be in place so that they would not be the accumulated sources of pests. The disposal methods shall be recorded.</p>
4.Training	<p>4. Relevant personnel working on mushroom culture production shall receive specific training or supervised to gain knowledge and appropriate skills on the production steps and hygienic practices. Training should be repeated at least once a year to prevent adverse effect arising from the contamination of mushroom culture.</p>