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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

SHIITAKE

UPOV Code: LENTI_EDO

Lentinula edodes (Berk.) Pegler

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GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by an expert from Japan
to be considered by the
Technical Committee at its sixty-first session,
to be held Geneva from 2025-10-20 to 2025-10-21

Disclaimer: this document does not represent UPOV policies or guidance

This document contains the following changes proposed by the Technical Working Party for Vegetables (TWV), at its fifty-ninth session[1], presented in grey highlight and ~~strikethrough~~:

(a) Deletion of characteristics and explanations Ad. 4, 5, 6, 7, 8: "Mycelium: growth rate at 10°C, 15°C, 20°C, 25°C, 30°C";
(b) Revision of characteristic and explanation Ad. 7 "Cap: height" to read "Cap: thickness";
(c) Revision of characteristic and explanation Ad. 15 "Gill: width" to read "Gill: height";
(d) Revision of characteristic and explanation Ad. 26 "Fruit body: dry weight at harvest maturity" to read "Fruit body: weight".

Alternative Names:*

Latin	*English*	*French*	*German*	*Spanish*
Lentinula edodes (Berk.) Pegler *Lentinus elodes* (Berk.) Sing.	Shiitake, Oak Mushroom	Shiitake	Pasaniapilz, Shiitake	Shiitake

* These names were correct at the time of the introduction of these Test Guidelines but may be revised or updated. [Readers are advised to consult the UPOV Code, which can be found on the UPOV Website (www.upov.int), for the latest information.]

[1] held by electronic means, from May 5 to 8, 2025.

The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

ASSOCIATED DOCUMENTS

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

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1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Lentinula edodes* (Berk.) Pegler.

2. Material Required

2.1 The competent authorities decide on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with.

2.2 The material is to be supplied in the form of spawn and as a pure culture on a suitable medium.

(a) Spawn should be of a quality which ensures that all relevant characteristics of the variety will be expressed. In particular, mycelium on grain or sawdust should be visible to the naked eye, the grain or sawdust should not be colonized to such an extent that kernels stick together. The spawn should not be older than 3 months and should have been stored under proper conditions.

(b) Pure cultures must be on slant agar tubes with an appropriate medium such as PDA (potato dextrose agar) or malt extract agar. Tubes should be covered by cotton plugs or plastic caps allowing sterile air diffusion. Cultures should be fresh, i.e. not stored for longer than 2 weeks at low temperature.

2.3 The minimum quantity of material, to be supplied by the applicant, should be:

2 liter of spawn and 3 slant tubes containing secondary mycelium by pure culture.
[see Additional information (b)]

2.4 The material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

3. Method of Examination

3.1 Number of Growing Cycles

The minimum duration of tests should normally be two independent growing cycles. The growing cycle is considered to be from spawning until the end of the first flush.

3.2 Testing Place

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in TGP/9 “Examining Distinctness”.

3.3 Conditions for Conducting the Examination

The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination.

In particular, it may be necessary for separate growing trials to be established for bed-log cultivation type and sawdust cultivation type in order to ensure the satisfactory growth of varieties of those types (see Chapter 8.3). These Test Guidelines provide information to cover such situations.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 60 bed-logs or 60 sawdust blocks, which should be divided between at least three replicates.

3.4.2 The design of the tests should be such that fruit bodies or parts of fruit bodies may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle.

3.5 Additional Tests

Additional tests, for examining relevant characteristics, may be established.

4. Assessment of Distinctness, Uniformity and Stability

4.1 Distinctness

4.1.1 General Recommendations

It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in these Test Guidelines.

4.1.2 Consistent Differences

The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

4.1.3 Clear Differences

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristic being examined, i.e. whether it is expressed in a qualitative, quantitative, or pseudo-qualitative manner. Therefore, it is important that users of these Test Guidelines are familiar with the recommendations contained in the General Introduction prior to making decisions regarding distinctness.

4.1.4 Number of Fruit Bodies / Parts of Fruit Bodies to be Examined

Unless otherwise indicated, for the purposes of distinctness, all observations on single fruit bodies should be made on 60 fruit bodies or parts taken from each of 60 fruit bodies which are taken from bed-logs or sawdust blocks respectively one by one and any other observations made on all fruit bodies in the test, disregarding any off-type fruit bodies.

4.1.5 Method of Observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the second column of the Table of Characteristics (see document TGP/9 “Examining Distinctness”, Section 4 “Observation of characteristics”):

MG: single measurement of a group of fruit bodies or parts of fruit bodies
MS: measurement of a number of individual fruit bodies or parts of fruit bodies
VG: visual assessment by a single observation of a group of fruit bodies or parts of fruit bodies
VS: visual assessment by observation of individual fruit bodies or parts of fruit bodies

Type of observation: visual (V) or measurement (M)

“Visual” observation (V) is an observation made on the basis of the expert’s judgment. For the purposes of this document, “visual” observation refers to the sensory observations of the experts and, therefore, also includes smell, taste and touch. Visual observation includes observations where the expert uses reference points (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. color charts). Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.

Type of record: for a group of fruit bodies (G) or for single, individual fruit bodies (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of fruit bodies or parts of fruit bodies (G), or may be recorded as records for a number of single, individual fruit bodies or parts of fruit bodies (S). In most cases, “G” provides a single record per variety and it is not possible or necessary to apply statistical methods in a fruit body -by- fruit body analysis for the assessment of distinctness.

In cases where more than one method of observing the characteristic is indicated in the Table of Characteristics (e.g. VG/MG), guidance on selecting an appropriate method is provided in document TGP/9, Section 4.2.

4.2 Uniformity

4.2.1 It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines:

4.2.2 For the assessment of uniformity, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 60 fruit bodies, 2 off-types are allowed.

4.3 Stability

4.3.1 In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable.

4.3.2 Where appropriate, or in cases of doubt, stability may be further examined by testing a new stock to ensure that it exhibits the same characteristics as those shown by the initial material supplied.

5. Grouping of Varieties and Organization of the Growing Trial

5.1 The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.

5.2 Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and (b) to organize the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics:

(a) Cap: shape of vertical section (characteristic 4)
(b) Cap: main color of apex (characteristic 6)
(c) Cap: presence of gill (characteristic 12)
(d) Stipe: shape in vertical section (characteristic 18)

5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction and document TGP/9 “Examining Distinctness”.

6. Introduction to the Table of Characteristics

6.1 Categories of Characteristics

6.1.1 Standard Test Guidelines Characteristics

Standard Test Guidelines characteristics are those which are approved by UPOV for examination of DUS and from which members of the Union can select those suitable for their particular circumstances.

6.1.2 Asterisked Characteristics

Asterisked characteristics (denoted by *) are those included in the Test Guidelines which are important for the international harmonization of variety descriptions and should always be examined for DUS and included in the variety description by all members of the Union, except when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate.

6.2 States of Expression and Corresponding Notes

6.2.1 States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Each state of expression is allocated a corresponding numerical note for ease of recording of data and for the production and exchange of the description.

6.2.2 In the case of qualitative and pseudo-qualitative characteristics (see Chapter 6.3), all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

State	Note
small	3
medium	5
large	7

However, it should be noted that all of the following 9 states of expression exist to describe varieties and should be used as appropriate:

State	Note
very small	1
very small to small	2
small	3
small to medium	4
medium	5
medium to large	6
large	7
large to very large	8
very large	9

6.2.3 Further explanation of the presentation of states of expression and notes is provided in document TGP/7 “Development of Test Guidelines”.

6.3 Types of Expression

An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the General Introduction.

6.4 Example Varieties

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic. For characteristics 32 and 33, the example varieties are different according to the growing type. The type is indicated after the name of the example variety as follows:

(B) bed-log cultivation type
(S) sawdust cultivation type

6.5 Legend

(*) Asterisked characteristic – see Chapter 6.1.2

QL Qualitative characteristic – see Chapter 6.3
QN Quantitative characteristic – see Chapter 6.3
PQ Pseudo-qualitative characteristic – see Chapter 6.3

MG, MS, VG, VS – see Chapter 4.1.5

(a) - (c) See Explanations on the Table of Characteristics in Chapter 8.1

(+) See Explanations on the Table of Characteristics in Chapter 8.2

See Explanations on the growing types in Chapter 8.3

7. Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1. **(+)**	**VG**	**Density of hyphae on the medium**	**Densité de l'hyphe sur le support**	**Dichte der Hyphen auf dem Medium**	**Densidad de las hifas en el medio**		
QN	**(a)**	sparse	lâche	locker	baja	HS607, Mori XR1	1
		intermediate	moyenne	mittel	intermedia	Morino Natsumi	2
		dense	dense	dicht	densa	KX-S005	3
2. **(+)**	**VG**	**Colony: tinting of surface on the medium**	**Colonie : coloration de la surface du support**	**Kolonie: Färbung der Oberfläche auf dem Medium**	**Colonia: tinte de la superficie en el medio**		
QL	**(a)**	absent	absente	fehlend	ausente	Kinko 115, Mori XR1, Morino Natsumi	1
		present	présente	vorhanden	presente	HS607, KX-S005	9
3. **(+)**	**MS**	**Mycelium: optimum temperature for growth**	**Mycélium : température optimale de culture**	**Myzel: optimale Wachstums-temperatur**	**Micelio: temperatura óptima de desarrollo**		
QN	**(b)**	21°C	21°C	21°C	21°C		1
		22°C	22°C	22°C	22°C		2
		23°C	23°C	23°C	23°C	Kinko 243	3
		24°C	24°C	24°C	24°C		4
		25°C	25°C	25°C	25°C	HS607, Kinko 115	5
		26°C	26°C	26°C	26°C		6
		27°C	27°C	27°C	27°C	Morino Natsumi	7
		28°C	28°C	28°C	28°C		8
		29°C	29°C	29°C	29°C		9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
4. **(+)**	**MS**	**Mycelium: growth rate at 10°C**	**Mycélium : vitesse de croissance à 10°C**	**Myzel: Wachstumsrate bei 10°C**	**Micelio: índice de desarrollo a 10°C**		
QN	**(b)**	very slow	très lente	sehr langsam	muy lento	Kinko 115	1
		slow	lente	langsam	lento	Kinoh1	2
		medium	moyenne	mittel	medio	HS607, Morino Natsumi	3
		fast	rapide	schnell	rápido	KX S005	4
		very fast	très rapide	sehr schnell	muy rápido	Yujiro	5
5. **(+)**	**MS**	**Mycelium: growth rate at 15°C**	**Mycélium : vitesse de croissance à 15°C**	**Myzel: Wachstumsrate bei 15°C**	**Micelio: índice de desarrollo a 15°C**		
QN	**(b)**	very slow	très lente	sehr langsam	muy lento		1
		slow	lente	langsam	lento	Kinko 115	2
		medium	moyenne	mittel	medio	HS607, Susono 360	3
		fast	rapide	schnell	rápido	Yujiro	4
		very fast	très rapide	sehr schnell	muy rápido	KX S005	5
6. **(*)** **(+)**	**MS**	**Mycelium: growth rate at 20°C**	**Mycélium : vitesse de croissance à 20°C**	**Myzel: Wachstumsrate bei 20°C**	**Micelio: índice de desarrollo a 20°C**		
QN	**(b)**	very slow	très lente	sehr langsam	muy lento	Bridge 32, Kinno 1	1
		slow	lente	langsam	lento	Kinko 115	2
		medium	moyenne	mittel	medio	ML8, Morino Natsumi	3
		fast	rapide	schnell	rápido	Morino Harumitsu	4
		very fast	très rapide	sehr schnell	muy rápido	Akiyama A 950, Hokken 600, JMS 237	5

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
~~**7.**~~ ~~**(+)**~~	~~**MS**~~	~~**Mycelium: growth rate at 25°C**~~	~~**Mycélium : vitesse de croissance à 25°C**~~	~~**Myzel: Wachstumsrate bei 25°C**~~	~~**Micelio: índice de desarrollo a 25°C**~~		
~~**QN**~~	~~**(b)**~~	~~very slow~~	~~très lente~~	~~sehr langsam~~	~~muy lento~~		~~1~~
		~~slow~~	~~lente~~	~~langsam~~	~~lento~~	~~Kinko 115~~	~~2~~
		~~medium~~	~~moyenne~~	~~mittel~~	~~medio~~	~~HS73, Susono 360~~	~~3~~
		~~fast~~	~~rapide~~	~~schnell~~	~~rápido~~	~~Hokken600, Yujiro~~	~~4~~
		~~very fast~~	~~très rapide~~	~~sehr schnell~~	~~muy rápido~~		~~5~~
~~**8.**~~ ~~**(*)**~~ ~~**(+)**~~	~~**MS**~~	~~**Mycelium: growth rate at 30°C**~~	~~**Mycélium : vitesse de croissance à 30°C**~~	~~**Myzel: Wachstumsrate bei 30°C**~~	~~**Micelio: índice de desarrollo a 30°C**~~		
~~**QN**~~	~~**(b)**~~	~~very slow~~	~~très lente~~	~~sehr langsam~~	~~muy lento~~	~~Akiyama A 526~~	~~1~~
		~~slow~~	~~lente~~	~~langsam~~	~~lento~~	~~HS73, Morino Harumitsu~~	~~2~~
		~~medium~~	~~moyenne~~	~~mittel~~	~~medio~~	~~Kinko 115~~	~~3~~
		~~fast~~	~~rapide~~	~~schnell~~	~~rápido~~	~~Mori XR1, Susono 360~~	~~4~~
		~~very fast~~	~~très rapide~~	~~sehr schnell~~	~~muy rápido~~	~~Morino Natsumi, Yujiro~~	~~5~~
4. **(*)** **(+)**	**VG**	**Cap: shape of vertical section**	**Chapeau : forme de la section verticale**	**Hut: Form im Längsschnitt**	**Sombrero: forma de la sección vertical**		
PQ	**(c)**	concave	concave	konkav	cóncava	JMS 7H-1	1
		flat	aplatie	flach	plana	Morino Harumitsu	2
		round	arrondie	rund	redonda	Kinko 115, Yujiro	3
		convex	convexe	konvex	convexa	KX-S005	4

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
5. (*) (+)	**VG/ MS**	**Cap: diameter**	**Chapeau : diamètre**	**Hut: Durchmesser**	**Sombrero: diámetro**		
QN	**(c)**	small	petit	klein	pequeño	Morino Harumitsu	3
		medium	moyen	mittel	medio	HS73, Kinko 115, Mori XR1	5
		large	grand	groß	grande	Kinko 117, Mori 505	7
6. (*)	**VG**	**Cap: main color of apex**	**Chapeau : couleur principale du sommet**	**Hut: Hauptfarbe der Spitze**	**Sombrero: color principal del ápice**		
PQ	**(c)**	white	blanc	weiß	blanco	Kinko 989	1
		yellowish brown	brun jaunâtre	gelblichbraun	marrón amarillento	Mori XR-1	2
		brown	brun	braun	marrón	Kinko 115, Susono 360	3
		reddish brown	brun rougeâtre	rötlichbraun	marrón rojizo	Akiyama A-526	4
7. (+)	**VG/ MS**	**Cap: thickness**	**Chapeau : épaisseur**	**Hut: Dicke**	**Sombrero: grosor**		
		very thin	très mince	sehr dünn	muy delgado		1
		very thin to thin	très mince à mince	sehr dünn bis dünn	muy delgado a delgado		2
QN	**(c)**	thin	mince	dünn	delgado	Morino Harumitsu	3
		thin to medium	mince à moyenne	dünn bis mittel	delgado a medio		4
		medium	moyenne	mittel	medio a grueso	Mori XR1, Morino Natsumi, Susono 360	5
		medium to thick	moyenne à épaisse	mittel bis dick	medio a grueso		6
		thick	épaisse	dick	grueso	Akiyama A-526	7
		thick to very thick	épaisse à très épaisse	dick bis sehr dick	grueso a muy grueso		8
		very thick	très épaisse	sehr dick	muy grueso		9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
8. **(+)**	**VG**	**Cap: firmness**	**Chapeau : fermeté**	**Hut: Festigkeit**	**Sombrero: firmeza**		
QN	**(c)**	soft	mou	weich	suave	Kinko 650	1
		medium	moyen	mittel	medio	HS607, Kinko 115, KX-S055, Susono 360	2
		solid	ferme	fest	sólido	Morino Natsumi	3
9. **(+)**	**VG**	**Cap: distribution of scales**	**Chapeau : répartition des écailles**	**Hut: Verteilung der Schuppen**	**Sombrero: distribución de las escamas**		
QN	**(c)**	whole	sur toute la surface	überall	en toda la superficie	Kinko 115, Mori XR1	1
		periphery	sur la périphérie	am Rand	en la periferia	Morino Natsumi, Susono 360, Yujiro	2
10. **(+)**	**VG**	**Cap: size of scales**	**Chapeau : taille des écailles**	**Hut: Größe der Schuppen**	**Sombrero: tamaño de las escamas**		
QN	**(c)**	absent or very small	absentes ou très petites	fehlend oder sehr klein	ausentes o muy pequeños	KX-S034	1
		small	petites	klein	pequeño	HS73, Mori XR1	3
		medium	moyennes	mittel	medio	Morino Natsumi, Susono 360, Yujiro	5
		large	grandes	groß	grande	Kinko 169	7
11. **(+)**	**VG**	**Cap: tinting of scales**	**Chapeau : coloration des écailles**	**Hut: Färbung der Schuppen**	**Sombrero: tinte de las escamas**		
QL	**(c)**	absent	absente	fehlend	ausente	JMS5K16, ML8, Morino Natsumi	1
		present	présente	vorhanden	presente	HS73, Yujiro	9
12. **(*)** **(+)**	**VG**	**Cap: presence of gill**	**Chapeau : présence de lamelles**	**Hut: Vorhandensein von Lamellen**	**Sombrero: presencia de láminas**		
QL	**(c)**	absent	absentes	fehlend	ausentes	FERM P-14310	1
		present	présentes	vorhanden	presentes	Kinko 115, Mori XR1	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
13.	**VG**	**Gill: shape**	**Lamelles : forme**	**Lamellen: Form**	**Láminas: forma**		
(+)							
QL	**(c)**	separate from stipe	séparées du pied	vom Stiel getrennt	separadas del estípite	Kinko 115, Yujiro	1
		attached to stipe	rattachées au pied	am Stiel anhaftend	pegadas al estípite	Hokken 600, Mori 505	2
14. **(*)** **(+)**	**VG**	**Gill: arrangement**	**Lamelles : disposition**	**Lamellen: Anordnung**	**Láminas: disposición**		
QL	**(c)**	straight	droites	gerade	rectas	Kinko 115, KX-S055, Morino Natsumi	1
		ripple or crinkle	irrégulières ou plissées	gewellt oder gekräuselt	onduladas o arrugadas	Akiyama A-526, Mori XR1	2
15.	**VG**	**Gill: height**	**Lamelles : hauteur**	**Lamellen: Höhe**	**Láminas: altura**		
(+)							
QN	**(c)**	very short	très basse	sehr niedrig	muy baja	Mori XR1	1
		very short to short	très basse à basse	sehr niedrig bis niedrig	muy baja a baja		2
		short	basse	niedrig	baja	Yujiro	3
		short to medium	basse à moyenne	niedrig bis mittel	baja a media		4
		medium	moyenne	mittel	media	Susono 360	5
		medium to tall	moyenne à haute	mittel bis hoch	media a alta		6
		tall	haute	hoch	alta	KX-S034	7
		tall to very tall	haute à très haute	hoch bis sehr hoch	alta a muy alta		8
		very tall	très haute	sehr hoch	muy alta		9
16.	**VG**	**Gill: density**	**Lamelles : densité**	**Lamellen: Dichte**	**Láminas: densidad**		
(+)							
QN	**(c)**	sparse	lâche	locker	baja	Kinko 169, Mori 476	1
		medium	moyenne	mittel	media	Yujiro	2
		dense	dense	dicht	densa	Kinko 115, Mori XR1, Morino Natsumi	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
17.	**VG**	**Gill: color**	**Lamelles : couleur**	**Lamellen: Farbe**	**Láminas: color**		
PQ	**(c)**	white	blanc	weiß	blanco	Kinko 115, Mori XR1, Morino Natsumi	1
		light yellow	jaune clair	hellgelb	amarillo claro	HS607, KX-S055	2
		light yellow orange	jaune orangé clair	hell gelborange	naranja amarillo claro	HS73	3
18. (*) (+)	**VG**	**Stipe: shape in vertical section**	**Stipe : forme de la section verticale**	**Stiel: Form im Längsschnitt**	**Estípite: forma en sección vertical**		
PQ	**(c)**	broader toward base	plus large vers la base	breiter an der Basis	ensanchada hacia la base	JMS 7H-1	1
		cylindrical	cylindrique	zylindrisch	cilíndrica	JMS5K16, Mori XR1, Morino Natsumi	2
		broader toward cap	plus large vers le chapeau	breiter am Hut	ensanchada hacia el sombrero	Susono 360	3
19. (*) (+)	**VG/ MS**	**Stipe: length**	**Stipe : longueur**	**Stiel: Länge**	**Estípite: longitud**		
QN	**(c)**	short	courte	kurz	corto	Mori XR1, Morino Natsumi, Susono 360	3
		medium	moyenne	mittel	medio	HS702, Kinko 117	5
		long	longue	lang	largo	Akiyama A-526	7
20. (+)	**VG/ MS**	**Stipe: diameter**	**Stipe : diamètre**	**Stiel: Durchmesser**	**Estípite: diámetro**		
QN	**(c)**	small	petit	klein	pequeño	Morino Natsumi	3
		medium	moyen	mittel	medio	HS73, Susono 360	5
		large	grand	groß	grande	Kinko 115	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
21. (*) (+)	**VG**	**Stipe: tinting**	**Stipe : coloration**	**Stiel: Färbung**	**Estípite: tinte**		
QL	**(c)**	absent	absente	fehlend	ausente	Mori XR1	1
		present	présente	vorhanden	presente	Kinko 115, KX-S055 Morino Natsumi	9
22. (+)	**VG**	**Stipe: density of fluff**	**Stipe : densité des peluches**	**Stiel: Dichte des Flaums**	**Estípite: densidad de la pelusa**		
QN	**(c)**	absent or sparse	absente ou lâche	fehlend oder locker	ausente o escasa	Kinko 989	1
		medium	moyenne	mittel	media	Kinko 115, KX-S055, Morino Natsumi	2
		dense	dense	dicht	densa	KB-2010	3
23. (+)	**VG**	**Stipe: tinting of fluff**	**Stipe : coloration des peluches**	**Stiel: Färbung des Flaums**	**Estípite: tinte de la pelusa**		
QL	**(c)**	absent	absente	fehlend	ausente	KX-S055, Mori XR1	1
		present	présente	vorhanden	presente	Kinko 115, Morino Natsumi	9
24. (+)	**VG**	**Stipe: firmness**	**Stipe : fermeté**	**Stiel: Festigkeit**	**Estípite: firmeza**		
QN	**(c)**	soft	mou	weich	suave	HS802, Kinno 7	1
		medium	moyen	mittel	media	HS607, Mori XR1, Susono 360	2
		solid	ferme	fest	sólida	Kinko 115	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
25.	**VG/ MS**	**Fruit body: ratio of cap diameter / stipe length**	**Organe de fructification : rapport diamètre du chapeau / longueur du stipe**	**Fruchtkörper: Verhältnis Hutdurchmesser / Stiellänge**	**Cuerpo frutal: relación entre el diámetro del sombrero y la longitud del estípite**		
QN	**(c)**	cap far smaller than stipe length	chapeau beaucoup plus petit que le stipe	Hut viel kleiner als Stiellänge	sombrero mucho más pequeño que la longitud del estípite	Kinko 610	1
		cap smaller than stipe length	chapeau plus petit que le stipe	Hut kleiner als Stiellänge	sombrero más pequeño que la longitud del estípite	Mori 252	3
		cap almost equal to stipe length	chapeau presque aussi long que le stipe	Hut fast gleich lang wie Stiellänge	sombrero casi igual a la longitud del estípite	Akiyama A-526, Susono 360	5
		cap larger than stipe length	chapeau plus grand que le stipe	Hut größer als Stiellänge	sombrero más grande que la longitud del estípite	Morino Natsumi	7
		cap far larger than stipe length	chapeau beaucoup plus grand que le stipe	Hut viel größer als Stiellänge	sombrero mucho más grande que la longitud del estípite	Morino Harumitsu	9
26.	**MG**	**Fruit body: weight**	**Organe de fructification : poids**	**Fruchtkörper: Gewicht**	**Cuerpo frutal: peso**		
(+)							
		very low	très faible	sehr niedrig	muy bajo		1
		very low to low	très faible à faible	sehr niedrig bis niedrig	muy bajo a bajo		2
QN	**(c)**	low	faible	niedrig	bajo	HS73	3
		low to medium	faible à moyen	niedrig bis mittel	bajo a medio		4
		medium	moyen	mittel	medio	Akiyama A-526, Susono 360, Yujiro	5
		medium to high	moyen à élevé	mittel bis hoch	medio a alto		6
		high	élevé	hoch	alto		7
		high to very high	élevé à très élevé	hoch bis sehr hoch	alto a muy alto		8
		very high	très élevé	sehr hoch	muy alto		9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
27. (*) (+)	**VG**	**Fruit body: period from inoculation to fruit induction**	**Organe de fructification : période entre l'inoculation et l'induction du développement des sporophores**	**Fruchtkörper: Zeitraum von Inokulation bis Fruchtinduktion**	**Cuerpo frutal: período entre la inoculación y la inducción del fruto**		
QN		short	courte	kurz	breve	A-555(B), HS73(S), Kinko 702(B)	3
		medium	moyenne	mittel	medio	HS608(B), Kinko 697(B), S-035(B),	5
		long	longue	lang	largo	HS705(S), Kinko 169(B), ML8(S) Mori-yujiro(B), S-035(S)	7
28. (*) (+)	**VG**	**Fruit body: period from fruit induction to harvest**	**Organe de fructification : période entre l'induction du développement des sporophores et la récolte**	**Fruchtkörper: Zeitraum von Fruchtinduktion bis Ernte**	**Cuerpo frutal: período entre la inducción del fruto y la cosecha**		
QN		short	courte	kurz	breve	A-555(B), HS-73(S), KX-S055(B), S-005(S)	3
		medium	moyenne	mittel	medio	A-526(B), HS72(S), HS705(S)	5
		long	longue	lang	largo	ML8(B), ML8(S), S-035(S)	7

8. Explanations on the Table of Characteristics

8.1 Explanations covering several characteristics

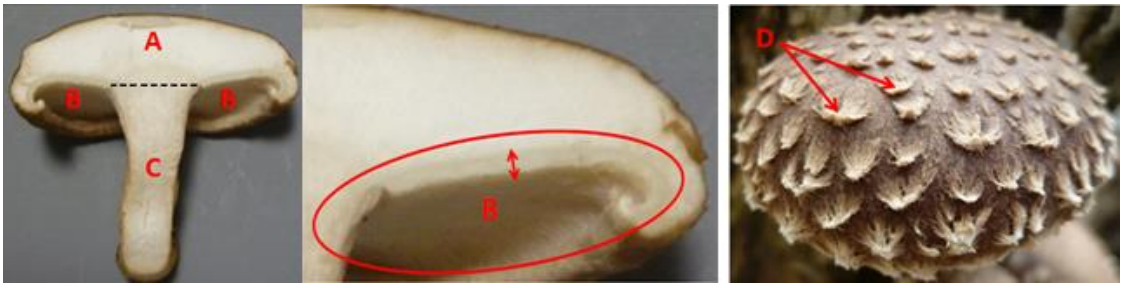
Characteristics containing the following key in the second column of the Table of Characteristics should be examined as indicated below:

(a) Hyphae and Colony: should be observed by pure cultures.
Type of medium: PDA (Potato dextrose agar)
Plate: 9cm in inside diameter and 2cm in height
Conditions: in the dark at 25 ± 1°C
Number of plates: at least 3

(b) Mycelium: should be observed by pure cultures.
Type of medium: PDA
Tube/Plate: growth tube or 9cm in inside diameter and 2cm in height
Conditions: in the dark at specified temperature
Observations: 14 days after
Number of tubes/plates: at least 6

(c) Stipe, cap and gills: Unless otherwise indicated, all characteristics of the fruit bodies (the cap, the stipe and the gills) should be recorded at 80 to 90% open gills (stage 4 [see Additional information (a)] handpicked mushrooms; freshly harvested).

(d) General illustration:

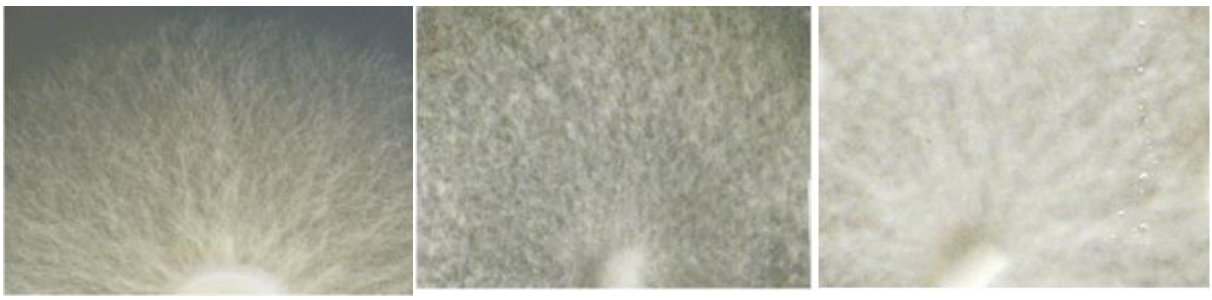


A: cap B: gill C: stipe D: scales

8.2 Explanations for individual characteristics

Ad. 1: Density of hyphae on the medium

The density of hyphae should be observed when it has developed on about 70% of the diameter of the plate (see 8.1 (a)).



1 sparse | 2 intermediate | 3 dense

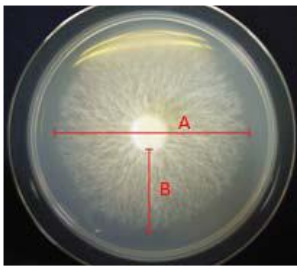
Ad. 2: Colony: tinting of surface on the medium

The presence of tinting of colony should be observed after 14 days of cultivation (see 8.1 (a)).

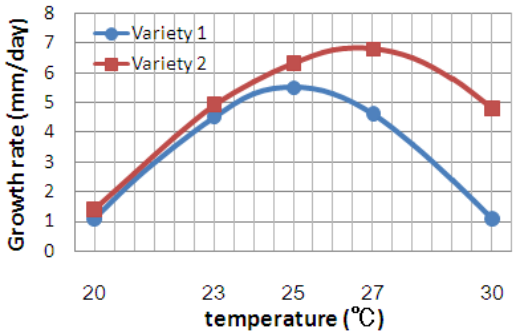
A: 1 absent
B: 9 present

Ad. 3: Mycelium: optimum temperature for growth
~~Ad. 4, 5, 6, 7, 8: Mycelium: growth rate at 10°C, 15°C, 20°C, 25°C, 30°C~~

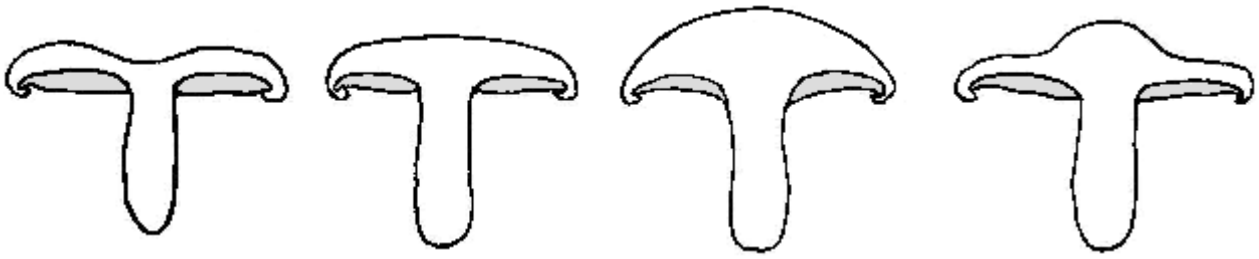
The incubation temperature of mycelium is examined at 20°C, 23°C, 25°C, 27°C and 30°C. Measure the length or diameter (see 8.1 (b) tube/plate) of mycelium between the 4th and the 14th day, cultured at each temperature. The amount of mycelium growth per day at each temperature is considered to be the growth rate. The optimum temperature for growth of mycelium is the incubation temperature which shows the highest growth rate. These characteristics should be evaluated by drawing a mycelium growth curve (see following graph).



A: diameter of mycelium
B: length of colony



Ad. 4: Cap: shape of vertical section



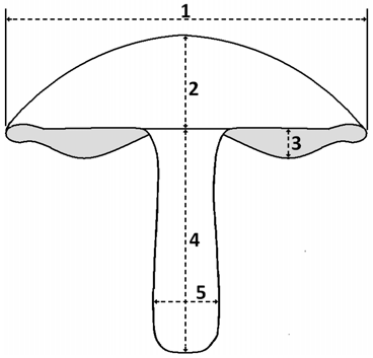
1
concave

2
flat

3
round

4
convex

Ad. 5: Cap: diameter
Ad. 7: Cap: thickness
Ad. 15: Gill: height
Ad. 19: Stipe: length
Ad. 20: Stipe: diameter
Ad. 25: Fruit body: ratio of cap diameter / stipe length

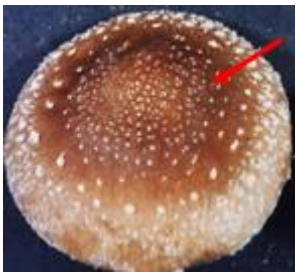


1: Cap: diameter: Measure the widest part of the cap.
2: Cap: thickness: Measure the thickest part of the cap.
3: Gill: height: Measure the highest part of the gill.
4: Stipe: length: Measure from the base of the stipe to the base of cap.
5: Stipe: diameter: Measure the widest part of the stipe.

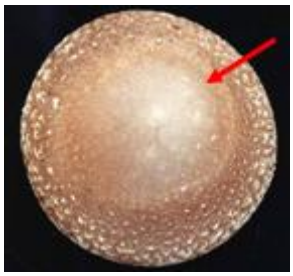
Ad. 8: Cap: firmness

Determined by hand. The hardness of the cap is compared to standard varieties.

Ad. 9: Cap: distribution of scales



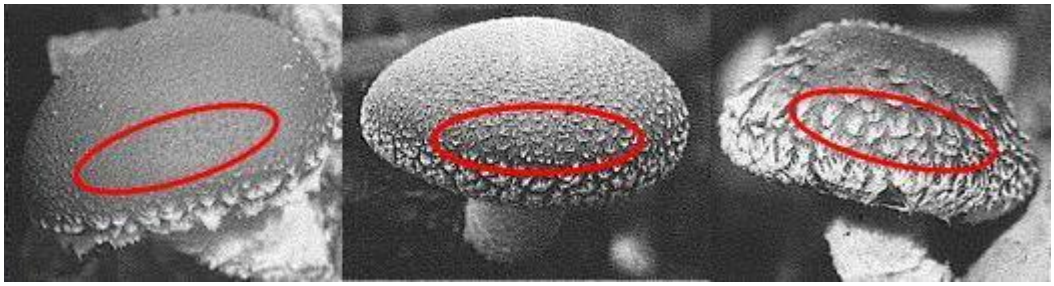
1
whole



2
periphery

Ad. 10: Cap: size of scales

Observe the size of scales in the part of the shoulder of cap.



3
small

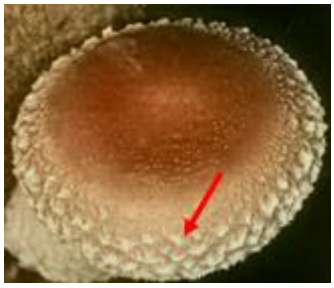
5
medium

7
large

Ad. 11: Cap: tinting of scales

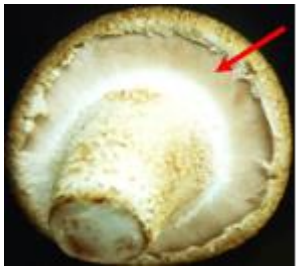
In the tinting of scales, “absent” is only pure-white, and “present” is from yellow-orange to dark-brown.

1
absent



9
present

Ad. 12: Cap: presence of gill

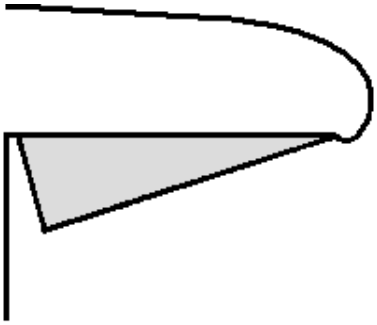


1
absent

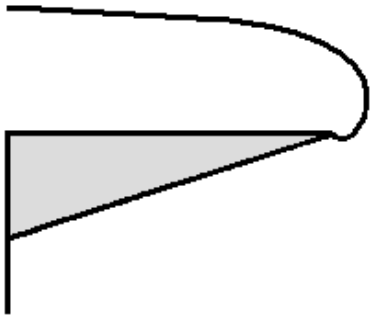
9
present

Ad. 13: Gill: shape

Observations should be made on the gill located outside of curved stipe.



1
separate from stipe



2
attached to stripe

Ad. 14: Gill: arrangement

1
straight

2
ripple or crinkle

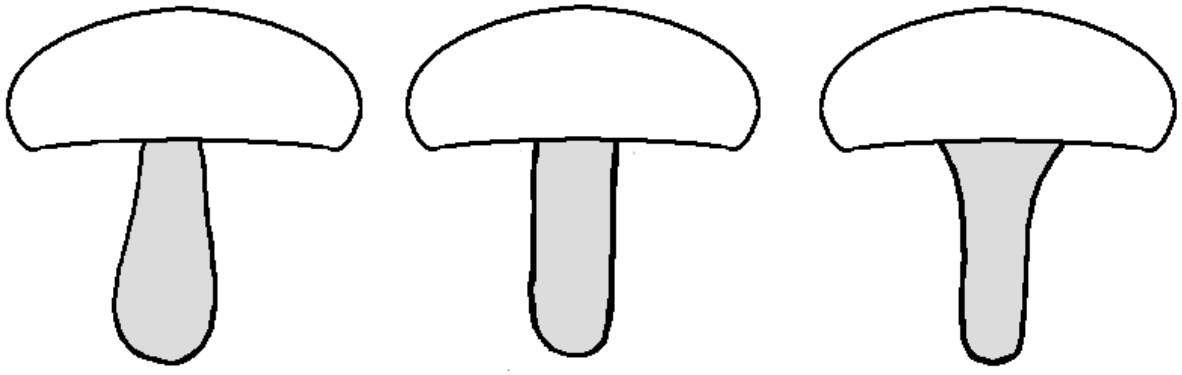
Ad. 16: Gill: density

1
sparse

2
medium

3
dense

Ad. 18: Stipe: shape in vertical section



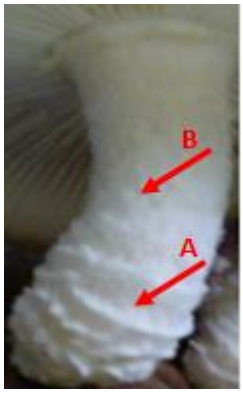
1
broader toward base

2
cylindrical

3
broader toward cap

Ad. 21: Stipe: tinting
Ad. 23: Stipe: tinting of fluff

In the tinting of stipe or fluff, “absent” is only pure-white, and “present” is from yellow-orange to dark-brown. To be observed when the stipe surface is covered with fluff. The fluff is removed for the observation. The tinting of stipe and fluff appear respectively independently.



1
absent

9
present

A: Stipe surface
B: Fluff of stype

Ad. 22: Stipe: density of fluff

1
absent or sparse

2
medium

3
dense

Ad. 24: Stipe: firmness

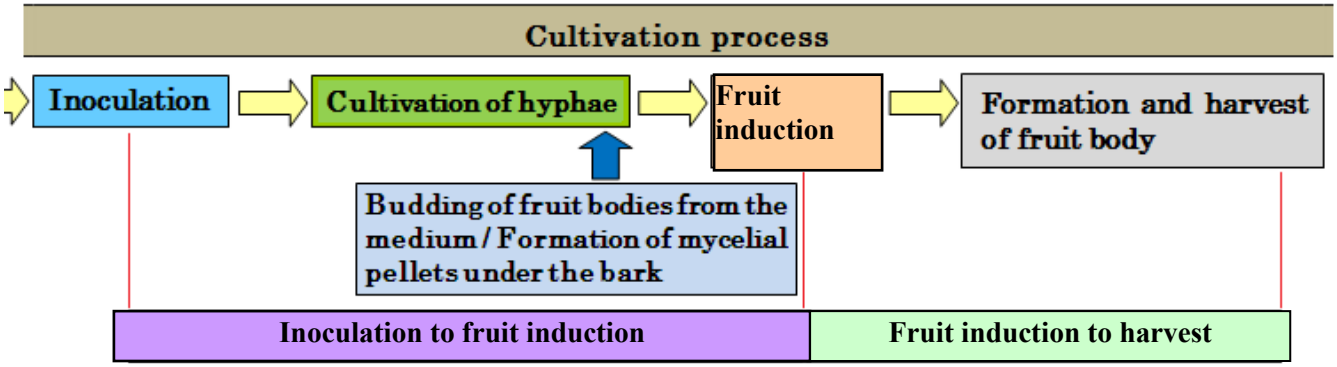
Determine by hand the hardness of the stipe is compared to standard varieties.

Ad. 26: Fruit body: weight

Observations should be made on fresh fruit at harvest maturity.

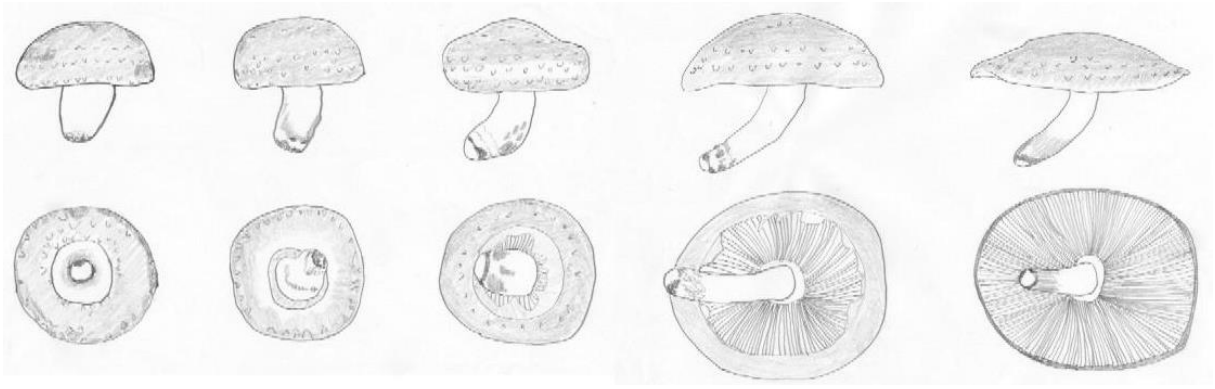
Ad. 27: Fruit body: Period from inoculation to fruit induction
Ad. 28: Fruit body: Period from fruit induction to harvest

The fruit induction is indispensable for fruit body development. Under the same conditions, the timing of fruit induction is clearly different according to each variety. In fruit induction, there is water soaking treatment, water sprinkling treatment, low temperature treatment, or physical treatment etc. Any method is stimulation for fruit body formation. In each cultivation type (bed-log cultivation, sawdust cultivation), the fruit induction should be applied at the time when the symptom of the fruit body formation is shown. (e. g. in sawdust cultivation, the budding of the fruit body is observed from the medium surface which was covered by the envelope of the hypha and became brown-colored. In case of bed-log cultivation, some mycelial pellets (each 3-5mm) are observed in the woody parts of the log between the inoculation holes of the vertical direction where the bark was peeled.) The harvesting time is considered to be the peak from which fruit bodies are harvested most.



Additional information:

(a) Stage of fruit body



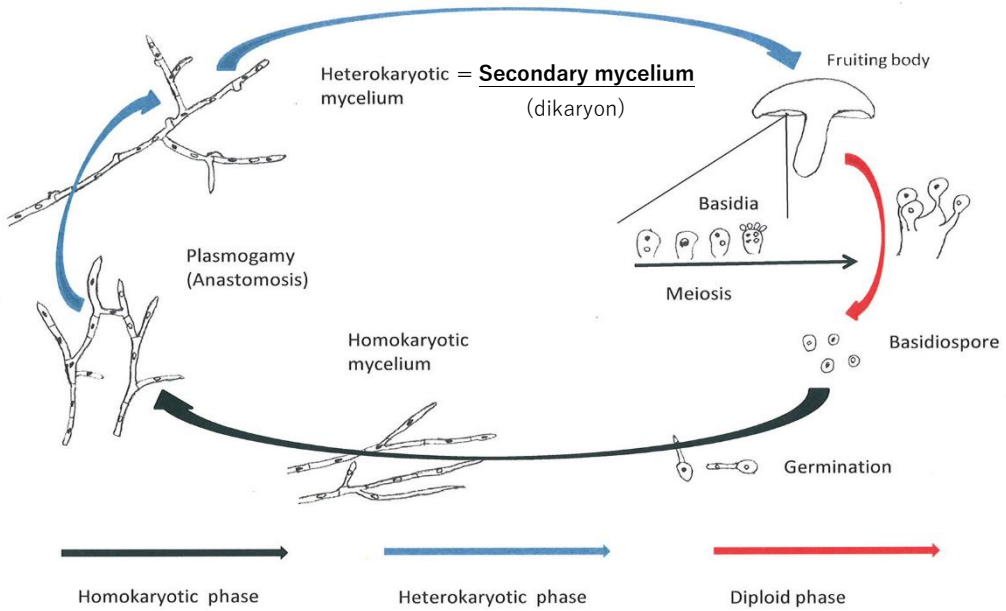
1 2 3 4 5

Explanation:

1 and 2: veil closed
3: veil breaking
4: 80 to 90% open / gills visible
5: fully open

stage 4

(b) Life cycle of *Lentinula edodes* (Berk.) Pegler



8.3 Growing Types

As explained in Chapter 3.3, it may be necessary for separate growing trials to be established for the bed-log cultivation type and the sawdust cultivation type in order to ensure the satisfactory growth of varieties of those types. The following information is provided with regard to growing conditions for different types of varieties and information which may help in deciding on the type of trial(s) which may be appropriate for a variety:

Bed-log cultivation type

Breeding is done in a rather large gene pool, in most cases much broader than the sawdust cultivation type. In general, this type of variety has the following features:

- some varieties of this type don't develop the fruit bodies in the condition of the sawdust cultivation;
- mainly used as dried shiitake mushrooms and produced in the bed-log laying yard;
- the cultivation period is longer than for the sawdust cultivation type;
- firmness of cap is comparatively hard.

Sawdust cultivation type

Breeding is done in a limited gene pool. In general, this type of variety has the following features:

- some varieties of this type don't develop the fruit bodies in the condition of the bed-log cultivation;
- tolerant of higher temperatures in general;
- mainly used as fresh shiitake mushrooms ;
- concern only types produced in sheltered conditions;
- the cultivation period is comparatively short;
- firmness of cap is comparatively soft.

9. Literature

Kirk, P.M., Cannon P.F., Minter D.W. and Stalpers J.A. (eds.), 2008: Dictionary of the Fungi 10th edition, CAB International, ISBN 978-0-85199-826-8, GB.

Ministry of Agriculture, Forestry and Fisheries, 1996: National Test Guideline for Shiitake, JP.

Pegler, D.N., 1975 (1976): The classification of the genus Lentinus Fr. (Basidiomycota), Kavaka 3:11-20.

10. Technical Questionnaire

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

	Application date: (not to be filled in by the applicant)

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Subject of the Technical Questionnaire

1.1 Botanical Name	*Lentinula edodes* (Berk.) Pegler
1.2 Common Name	Shiitake

2. Applicant

Name	
Address	
Telephone No.	
Fax No.	
E-mail address	
Breeder (if different from applicant)	

3. Proposed denomination and breeder's reference

Proposed denomination (if available)	
Breeder's reference	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

[#]4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing [ ]

4.1.2 Mutation [ ]
(please state parent variety)

4.1.3 Discovery and development [ ]
(please state where and when discovered and how developed)

4.1.4 Other [ ]
(please provide details)

4.2 Method of propagating the variety

[#] Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds).

	Characteristics	Example Varieties	Note
~~**5.1 (6)**~~	~~**Mycelium: growth rate at 20°C**~~		
	~~very slow~~	~~Bridge 32, Kinno 1~~	~~1[ ]~~
	~~slow~~	~~Kinko 115~~	~~2[ ]~~
	~~medium~~	~~ML8, Morino Natsumi~~	~~3[ ]~~
	~~fast~~	~~Morino Harumitsu~~	~~4[ ]~~
	~~very fast~~	~~Akiyama A 950, Hokken 600, JMS 237~~	~~5[ ]~~
~~**5.2 (8)**~~	~~**Mycelium: growth rate at 30°C**~~		
	~~very slow~~	~~Akiyama A 526~~	~~1[ ]~~
	~~slow~~	~~HS73, Morino Harumitsu~~	~~2[ ]~~
	~~medium~~	~~Kinko 115~~	~~3[ ]~~
	~~fast~~	~~Mori XR1, Susono 360~~	~~4[ ]~~
	~~very fast~~	~~Morino Natsumi, Yujiro~~	~~5[ ]~~
5.1 (4)	**Cap: shape of vertical section**		
	concave	JMS 7H-1	1[ ]
	flat	Morino Harumitsu	2[ ]
	round	Kinko 115, Yujiro	3[ ]
	convex	KX-S005	4[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

	Characteristics	Example Varieties	Note
5.2 (5)	**Cap: diameter**		
	very small		1[ ]
	very small to small		2[ ]
	small	Morino Harumitsu	3[ ]
	small to medium	Morino Natsumi, Yujiro	4[ ]
	medium	HS73, Kinko 115, Mori XR1	5[ ]
	medium to large	Akiyama A-526, HS607,	6[ ]
	large	Kinko 117, Mori 505	7[ ]
	large to very large	Kinko 245, Kinko 130	8[ ]
	very large		9[ ]
5.3 (6)	**Cap: main color of apex**		
	white	Kinko 989	1[ ]
	yellowish brown	Mori XR-1	2[ ]
	brown	Kinko 115, Susono 360	3[ ]
	reddish brown	Akiyama A-526	4[ ]
5.4 (12)	**Cap: presence of gill**		
	absent	FERM P-14310	1[ ]
	present	Kinko 115, Mori XR1	9[ ]
5.5 (18)	**Stipe: shape in vertical section**		
	broader toward base	JMS 7H-1	1[ ]
	cylindrical	JMS5K16, Mori XR1, Morino Natsumi	2[ ]
	broader toward cap	Susono 360	3[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

	Characteristics	Example Varieties	Note
5.6 (19)	**Stipe: length**		
	very short		1[ ]
	very short to short	Yujiro, Morino Harumitsu	2[ ]
	short	Mori XR1, Morino Natsumi, Susono 360	3[ ]
	short to medium	Kinko 115	4[ ]
	medium	HS702, Kinko 117	5[ ]
	medium to long	HS73, KX-S005, HS607	6[ ]
	long	Akiyama A-526	7[ ]
	long to very long	HS802	8[ ]
	very long		9[ ]
5.7 (21)	**Stipe: tinting**		
	absent	Mori XR1	1[ ]
	present	Kinko 115, KX-S055 Morino Natsumi	9[ ]
5.8	**Zone line of colony: dual culture of mother variety**		
	absent		1[ ]
	present	Mori XR1	9[ ]
5.9	**Zone line of colony: dual culture of father variety**		
	absent		1[ ]
	present	Mori XR1	9[ ]
5.10	**Zone line of colony: dual culture of similar variety**		
	absent		1[ ]
	present	Mori XR1	9[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

	Characteristics	Example Varieties	Note
5.11 (27)	**Fruit body: period from inoculation to fruit induction**		
	very short		1[ ]
	very short to short		2[ ]
	short	A-555(B), HS73(S), Kinko 702(B)	3[ ]
	short to medium		4[ ]
	medium	HS608(B), Kinko 697(B), S-035(B)	5[ ]
	medium to long		6[ ]
	long	HS705(S), Kinko 169(B), ML8(S), Mori-yujiro(B), S-035(S)	7[ ]
	long to very long		8[ ]
	very long		9[ ]
5.12 (28)	**Fruit body: period from fruit induction to harvest**		
	very short		1[ ]
	very short to short		2[ ]
	short	A-555(B), HS-73(S), KX-S055(B), S-005(S)	3[ ]
	short to medium		4[ ]
	medium	A-526(B), HS72(S), HS705(S)	5[ ]
	medium to long		6[ ]
	long	ML8(B), ML8(S), S-035(S)	7[ ]
	long to very long		8[ ]
	very long		9[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

6. Similar varieties and differences from these varieties

Please use the following table and box for comments to provide information on how your candidate variety differs from the variety (or varieties) which, to the best of your knowledge, is (or are) most similar. This information may help the examination authority to conduct its examination of distinctness in a more efficient way.

Denomination(s) of variety(ies) similar to your candidate variety	Characteristic(s) in which your candidate variety differs from the similar variety(ies)	Describe the expression of the characteristic(s) for the **similar** variety(ies)	Describe the expression of the characteristic(s) for **your** candidate variety
Example	*Cap: shape of vertical section*	*convex*	*flat*

Comments:

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

[#]7. Additional information which may help in the examination of the variety

7.1 In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?

Yes [ ] No [ ]

(If yes, please provide details)

7.2 Are there any special conditions for growing the variety or conducting the examination?

Yes [ ] No [ ]

(If yes, please provide details)

7.3 Other information

7.3.1 Type of cultivation

(a) bed-log cultivation [ ]

(b) sawdust cultivation [ ]

8. Authorization for release

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

If the answer to (b) is yes, please attach a copy of the authorization.

[#] Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

9. Information on plant material to be examined or submitted for examination.

9.1 The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (e.g. growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc.

9.2 The material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If the plant material has undergone such treatment, full details of the treatment must be given. In this respect, please indicate below, to the best of your knowledge, if the plant material to be examined has been subjected to:

(a) Microorganisms (e.g. virus, bacteria, phytoplasma) Yes [ ] No [ ]

(b) Chemical treatment (e.g. growth retardant, pesticide) Yes [ ] No [ ]

(c) Tissue culture Yes [ ] No [ ]

(d) Other factors Yes [ ] No [ ]

Please provide details for where you have indicated “yes”.

……

10. I hereby declare that, to the best of my knowledge, the information provided in this form is correct:

Applicant’s name

Signature Date

[End of document]