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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

DRAGON FRUIT *

UPOV Code: HYLOC_UND

Hylocereus undatus (Haw.) Britton & Rose

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by an expert from Mexico

to be considered by the

*Technical Committee at its forty-seventh session,
to be held in Geneva from April 4 to 6, 2011*

Alternative Names: *

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Hylocereus undatus</i> (Haw.) Britton & Rose	Dragon Fruit, Strawberry pear	Pitahaya, Fruit du dragon, Œil de dragon	Pitahaya, Drachen-Frucht	Pitahaya

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.

* 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.]

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1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Hylocereus undatus* (Haw.) Britton & Rose.

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 one-year-old plants or, if accepted by the competent authority, stem segments measuring 40 cm in length, sufficient to produce 6 plants.

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

6 one-year-old plants, or if accepted by the competent authority,

10 stem segments

2.4 The plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.

2.5 The plant 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*

3.1.1 The minimum duration of tests should normally be two independent growing cycles. In particular, it is essential that the plants produce a satisfactory crop of fruit in each of the two growing cycles.

3.1.2 The growing cycle is considered to be the period ranging from the beginning of active vegetative growth or flowering, continuing through active vegetative growth or flowering and fruit development and concluding with the harvesting of fruit.

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 is essential that the plants produce a satisfactory crop of fruit in

the main fruiting period in each of the two growing years, since the species may have waves of fruiting within a year.

3.4 *Test Design*

3.4.1 Each test should be designed to result in a total of at least 6 plants.

3.4.2 The design of the tests should be such that plants or parts of plants 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 Plants / Parts of Plants to be Examined

Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 5 plants or parts taken from each of 5 plants and any other observations made on all plants in the test, disregarding any off-type plants.

In the case of observations of parts taken from single plants, the number of parts to be taken from each of the plants should be 2.

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 plants or parts of plants

MS: measurement of a number of individual plants or parts of plants

VG: visual assessment by a single observation of a group of plants or parts of plants

VS: visual assessment by observation of individual plants or parts of plants

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 plants (G) or for single, individual plants (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of plants or parts of plants (G), or may be recorded as records for a number of single, individual plants or parts of plants (S). In most cases, “G” provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant 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 of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 6 plants, no 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 plant 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) Young stem: reddish color (characteristic 1)
- (b) Stem: distance between areoles (characteristic 6)
- (c) Stem: margin of rib (characteristic 8)
- (d) Fruit: length (characteristic 27)
- (e) Fruit: main color of middle bracts (characteristic 33)
- (f) Fruit: color of flesh (characteristic 37)

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.

6.5 *Legend*

(*) Asterisk 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)-(f) See Explanations on the Table of Characteristics in Chapter 8.1

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

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 Young stem: reddish color	Jeune tige : couleur rougeâtre	Jungtrieb: rötliche Farbe	Tallo joven: color rojizo		
QN	absent or weak	absente ou faible	fehlend oder sehr gering	ausente o débil	Blanca	1
	medium	moyenne	mittel	medio	AgoCoa, Roja, Solferina	2
	strong	forte	stark	fuerte	Pilas, Tepec, Zita	3
2. (+)	VG/ Stem: length of MG segment	Tige : longueur du segment	Trieb: Länge des Segments	Tallo: longitud del segmento		
QN	(a) short	courte	kurz	corto	Solferina, Tepec	3
	medium	moyenne	mittel	medio	Chiyuramiyarabi, Roja, Zita	5
	long	longue	lang	largo	Blanca, Pilas	7
3. (+)	VG/ Stem: width MG	Tige : largeur	Trieb: Breite	Tallo: anchura		
QN	(a) narrow	étroite	schmal	estrecho	Pilas, Roja, Zita	3
	medium	moyenne	mittel	medio	Solferina, Tare	5
	broad	large	breit	ancho	AgoCoa, Blanca	7
4.	VG Stem: waxiness	Tige : pruine	Trieb: Wachsschicht	Tallo: cerosidad		
QN	(a) weak	faible	gering	débil	AgoCoa, Roja, Solferina	1
	medium	moyenne	mittel	media	Nopa C1, Zita	2
	strong	forte	stark	fuerte	Pilas, Tepec, Timbi	3
5. (+)	VG Stem: texture of surface	Tige : texture de la surface	Trieb: Beschaffenheit der Oberfläche	Tallo: textura de la superficie		
QN	(a) smooth	lisse	glatt	lisa	AgoCoa, Blanca, Solferina	1
	medium	moyenne	mittel	media	Tepec	2
	rough	rugueuse	rauh	rugosa	Pilas, Zita	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
6.	VG/ Stem: distance (*) MG between areoles (+)	Tige : distance entre les aréoles	Trieb: Abstand zwischen den Areolen	Tallo: distancia entre las aréolas		
QN	(a) short	courte	kurz	corta	Tare, Tepec	3
	medium	moyenne	mittel	media	AgoCoa, Romo A1, Solferina	5
	long	longue	lang	larga	Blanca, Pilas, Zita	7
7.	VG/ Stem: arch height (*) MG (+)	Tige : hauteur de l'arche	Trieb: Bogenhöhe	Tallo: altura del arco		
QN	(a) low	petite	gering	bajo	Nopa C1, Tepec, Zita	1
	medium	moyenne	mittel	medio	AgoCoa, Pilas, Roja	2
	high	grande	hoch	alto	Solferina	3
8.	VG Stem: margin of rib (*) (+)	Tige : bord de la nervure	Trieb: Rand der Rippe	Tallo: borde de la nervadura		
QN	(a) concave	concave	konkav	cóncavo	QR03	1
	flat	plate	flach	plano	Tare	2
	convex	convexe	konvex	convexo	Pilas, Solferina, Zita	3
9.	VG Stem: intensity of grey color of areoles	Tige : intensité de la couleur grise des aéroles	Trieb: Intensität der Graufärbung der Areolen	Tallo: intensidad del color gris de las aréolas		
QN	(a) light	faible	hell	claro	Blanca	1
	medium	moyenne	mittel	medio	Chiyuramiyarabi	2
	dark	forte	dunkel	oscuro		3
10.	VG Areola: number of spines	Aréole : nombre d'épines	Areola: Anzahl der Stacheln	Aréola: número de espinas		
QN	few	rars	gering	bajo		1
	medium	moyennes	mittel	medio		2
	many	nombreuses	groß	alto		3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
11.	VG/ Spine: length MG	Épine : longueur	Stachel: Länge	Espina: longitud		
QN	(b) short	courte	kurz	corta	Tepec	3
	medium	moyenne	mittel	media	Chiyuramiyarabi, Roja, Solferina	5
	long	longue	lang	larga	Pilas, Zita	7
12.	VG Spine: main color	Épine : couleur principale	Stachel: Hauptfarbe	Espina: color principal		
PQ	(b) grey	gris	grau	gris		1
	medium brown	brun moyen	mittelbraun	marrón medio		2
	dark brown	brun foncé	dunkelbraun	marrón oscuro		3
13.	VG Flower bud: shape (+)	Bouton : forme	Blütenknospe: Form	Botón floral: forma		
PQ	(c) ovate	ovale	eiförmig	oval	Chiyuramiyarabi, Solferina	1
	elliptic	elliptique	elliptisch	elíptico	AgoCoa, Blanca	2
	circular	circulaire	kreisförmig	circular	Roja, Tepec	3
	oblate	oblong	breitrund	achatado	Chiyuramiyarabi, Solferina	4
14.	VG Flower bud: shape of apex (+)	Bouton : forme du sommet	Blütenknospe: Scheitelform	Botón floral: forma del ápice		
QL	(c) acute	pointu	spitz	agudo	Chiyuramiyarabi, Solferino	1
	rounded	arrondi	abgerundet	redondeado	Blanca, Roja	2

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
15.	VG Flower bud: color	Bouton : couleur	Blütenknospe: Farbe	Botón floral: color		
PQ	(c) cream	crème	cremefarben	crema		1
	yellowish green	vert jaunâtre	gelblichgrün	verde amarillento	Chiyuramiyarabi	2
	green	vert	grün	verde	AgoCoa, Blanca, Solferina	3
	light red	rouge clair	hellrot	rojo claro		4
	medium red	rouge moyen	mittelrot	rojo medio	Roja, Tepec, Zita	5
16.	VG/ Flower bud: length MG of pericarpel	Bouton : longueur du péricarpe	Blütenknospe: Länge des Perikarps	Botón floral: longitud del pericarpio		
(+)						
QN	short	court	kurz	corto	Tepec, Zita	1
	medium	moyen	mittel	medio	AgoCoa, Pilas, Roja	2
	long	long	lang	largo	Blanca	3
17.	VG/ Flower bud: width MG of pericarpel	Bouton : largeur du péricarpe	Blütenknospe: Breite des Perikarps	Botón floral: anchura del pericarpio		
(+)						
QN	narrow	étroit	schmal	estrecho	Pilas, Tepec	1
	medium	moyen	mittel	medio	AgoCoa, Roja, Solferina	2
	broad	large	breit	ancho	Blanca	3
18.	VG/ Flower bud: length MG of perianth	Bouton : longueur du périanthe	Blütenknospe: Länge der Blütenhülle	Botón floral: longitud del perianto		
(+)						
QN	short	court	kurz	corto	Roja, Zita	1
	medium	moyen	mittel	medio	Pilas, Tepec	2
	long	long	lang	largo	AgoCoa, Blanca, Solferina	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
19. (*) (+)	VG Flower: intensity of red color of bract	Fleur : intensité de la couleur rouge de la bractée	Blüte: Intensität der Rotfärbung des Deckblatts	Flor: intensidad del color rojo de la bráctea		
QN	(d) weak	faible	gering	débil	Blanca	1
	medium	moyenne	mittel	medio	AgoCoa, Solferina	2
	strong	forte	stark	fuerte	Pilas, Tepec, Zita	3
20.	VG Petal: color	Pétale : couleur	Blütenblatt: Farbe	Pétalo: color		
PQ	(d) white	blanc	weiß	blanco	Blanca, Chiyuramiyarabi, Solferina	1
	cream	crème	cremefarben	crema	Pilas, Roja, Tepec	2
	yellow	jaune	gelb	amarillo		3
	yellowish green	vert jaunâtre	gelblichgrün	verde amarillento		4
21. (+)	VG Sepal: main color	Sépale : couleur principale	Kelchblatt: Hauptfarbe	Sépalo: color principal		
PQ	(d) white	blanc	weiß	blanco		1
	green	vert	grün	verde	Blanca, Chiyuramiyarabi	2
	red	rouge	rot	rojo		3
22. (+)	VG Sepal: pattern of secondary color	Sépale : distribution de la couleur secondaire	Kelchblatt: Muster der Sekundärfarbe	Sépalo: distribución del color secundario		
PQ	(d) none	aucune	fehlend	ninguno		1
	edged	bordée	gerändert	ribeteado	Blanca, Chiyuramiyarabi	2
	striped	rayée	gestreift	rayado	Pilas, Roja, Solferina	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
23.	VG/ Flower: length of MG style	Fleur : longueur du style	Blüte: Länge des Griffels	Flor: longitud del estilo		
(+)						
QN	(d) short	court	kurz	corto		1
	medium	moyen	mittel	medio		2
	long	long	lang		Blanca, Pilas, Solferina	3
24.	VG Flower: number of stigma lobes	Fleur : nombre de lobes du stigmat	Blüte: Anzahl der Narbenlappen	Flor: número de lóbulos del estigma		
(+)						
QN	(d) few	faible	gering	bajo	Tepec	3
	medium	moyen	mittel	medio	Roja, Solferina, Zita	5
	many	élevé	groß	alto	AgoCoa, Blanca	7
25.	VG Flower: color of stigma lobe	Fleur : couleur du lobe du stigmat	Blüte: Farbe der Narbenlappen	Flor: color del lóbulos del estigma		
QL	(d) cream	crème	cremefarben	crema	AgoCoa, Roja	1
	green	vert	grün	verde	Blanca, Chiyuramiyarabi	2
26.	VG Flower: position of anthers in relation to stigma	Fleur : position des anthères par rapport au stigmat	Blüte: Stellung der Staubbeutel im Vergleich zur Narbe	Flor: posición de las anteras en relación con el estigma		
QN	below	en dessous	unterhalb	por debajo		1
	same level	au même niveau	auf gleicher Höhe	al mismo nivel		2
	above	au dessus	oberhalb	por encima		3
27.	VG/ Fruit: length MG	Fruit : longueur	Frucht: Länge	Fruto: longitud		
(*)						
QN	(e) short	courte	kurz	corto	Tepec	3
	medium	moyenne	mittel	medio	Pilas, Zita	5
	long	longue	lang	largo	Blanca, Roja, Solferina	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
28.	VG/ Fruit: width	Fruit : largeur	Frucht: Breite	Fruto: anchura		
(*)	MG					
QN	(e) narrow	étroit	schmal	estrecho	Tepec	3
	medium	moyen	mittel	medio	Pilas, Zita	5
	broad	large	breit	ancho	AgoCoa, Roja, Solferina	7
29.	MS Fruit: ratio	Fruit : rapport	Frucht: Verhältnis	Fruto: relación		
(*)	length/width	longueur/largeur	Länge/Breite	longitud/anchura		
(+)						
QN	(e) moderately elongated	modérément allongé	mäßig langgezogen	moderadamente alargado	AgoCoa, Chiyuramiyarabi, Roja	3
	medium	moyen	mittel	mediano	Solferina	5
	moderately compressed	modérément comprimé	mäßig zusammengedrückt	moderadamente comprimido	Zita	7
30.	VG Fruit: number of	Fruit : nombre de	Frucht: Anzahl	Fruto: número		
	bracts	bractées	Deckblätter	de brácteas		
QN	(e) few	rares	gering	bajo	Solferina	1
	medium	moyennes	mittel	medio	AgoCoa, Blanca	2
	many	nombreuses	groß	alto	Pilas, Roja, Zita	3
31.	VG/ Fruit: length of	Fruit : longueur des	Frucht: Länge der	Fruto: longitud		
(+)	apical bracts	bractées apicales	apicalen	de las brácteas		
			Deckblätter	apicales		
QN	(e) short	courte	kurz	cortas	Solferina, Tepec, Zita	3
	medium	moyenne	mittel	medias	AgoCoa, Pilas, Roja	5
	long	longue	lang	largas	Blanca	7
32.	VG Fruit: position of	Fruit : position des	Frucht: Stellung der	Fruto: posición		
(+)	bracts towards the	bractées vers la	Deckblätter zur	de las brácteas		
	peel	peau	Schale	hacia la cáscara		
QN	adpressed	appliquée	anliegend	alineadas		1
	slightly held out	légèrement divergente	leicht abstehend	ligeramente divergentes		2
	strongly held out	fortement divergente	stark abstehend	muy divergentes		3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
33. (*) (+)	VG Fruit: main color of middle bracts	Fruit : couleur principale des bractées médianes	Frucht: Hauptfarbe der mittleren Deckblätter	Fruto: color principal de las brácteas medias		
PQ	(e) yellowish green	vert jaunâtre	gelblichgrün	verde amarillento	AgoCoa, Chiyuramiyarabi	1
	green	vert	grün	verde	Blanca	2
	pink	rose	rosa	rosa		3
	red	rouge	rot	rojo	Roja, Solferina, Tepec	4
34. (+)	VG/ MG Fruit: width of the base of the bracts	Fruit : largeur de la base des bractées	Frucht: Breite der Basis der Deckblätter	Fruto: anchura de la base de las brácteas		
QN	narrow	étroite	schmal	estrecha		1
	medium	moyenne	mittel	media		2
	broad	large	breit	ancha		3
35. (*) (+)	VG/ MG Fruit: thickness of peel	Fruit : épaisseur de la peau	Frucht: Dicke der Schale	Fruto: grosor de la cáscara		
QN	(e) thin	fine	dünn	fina	Solferina, Zita	1
	medium	moyenne	mittel	media	Chiyuramiyarabi, Pilas, Tepec	2
	thick	épaisse	dick	gruesa	Blanca	3
36. (*) (+)	VG Fruit: color of peel (excluding bracts)	Fruit : couleur de la peau (à l'exclusion des bractées)	Frucht: Fleischfarbe (ohne Deckblätter)	Fruto: color de la cáscara (sin las brácteas)		
PQ	(e) whitish	blanchâtre	weißlich	blanquecino	Ixchel	1
	yellow	jaune	gelb	amarillo	Itzel	2
	green	verte	grün	verde		3
	medium pink	rose moyen	mittelrosa	rosa medio	AgoCoa, Chiyuramiyarabi	4
	dark pink	rose foncé	dunkelrosa	rosa oscuro	Blanca, Roja	5
	red	rouge	rot	rojo	Solferina, Zita	6
	purple	pourpre	purpur	púrpura	Pilas, Tepec	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
37.	VG Fruit: color of flesh	Fruit : couleur de la chair	Frucht: Farbe des Fleisches	Fruto: color de la pulpa		
(*)						
PQ	(e) white	blanche	weiß	blanco	Blanca	1
	light grey	gris clair	hellrot	gris claro		2
	light pink	rose clair	hellrosa	rosa claro	Chiyuramiyarabi	3
	medium pink	rose moyen	mittelrosa	rosa medio	AgoCoa, Solferina	4
	dark pink	rose foncé	dunkelrosa	rosa oscuro	Roja	5
	medium red	rouge moyen	mittelrot	rojo medio		6
	dark red	rouge foncé	dunkelrot	rojo oscuro	Zita	7
	purple	pourpre	purpur	púrpura	Pilas, Tepec	8
38.	MG Fruit: sweetness (total soluble solids)	Fruit : goût sucré (teneur en matières solubles)	Frucht: Süße (gesamte gelöste Stoffe)	Fruto: dulzura (total de sólidos solubles)		
(+)						
QN	(e) low	faible	gering	bajo	Blanca	1
	medium	moyenne	mittel	medio	AgoCoa, Solferina, Zita	2
	high	forte	hoch	alto	Roja	3
39.	VG Fruit: apical cavity	Fruit : cavité apicale	Frucht: apicale Höhlung	Fruto: cavidad apical		
QN	absent or shallow	absente ou peu profonde	fehlend oder flach	ausente o poco profunda		1
	medium	moyenne	mittel	media		2
	deep	profonde	tief	profunda		3

8. Explanations on the Table of Characteristics

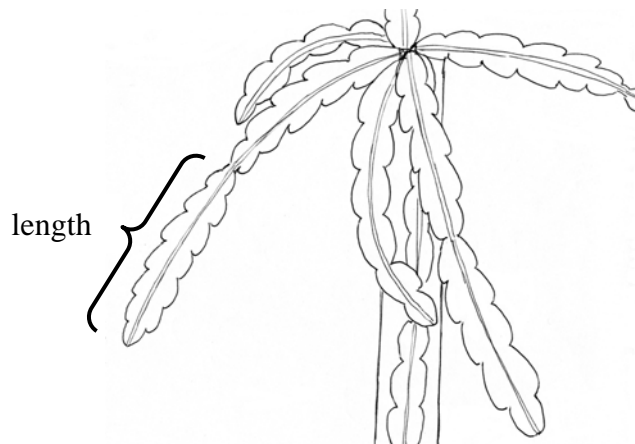
8.1 *Explanations covering several characteristics*

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

- (a) Stem: Unless otherwise stated all observations on the stem should be made on mature stems segment at the end of the year's growth.
- (b) Areoles and spines: Unless otherwise stated, all observations on the areole and spines should be made on intact mature stems.
- (c) Unopened Flower: Unless otherwise stated all observations on the unopened flower should be made 15 days before anthesis.
- (d) Flower: All observations on flower should be made at full flower opening.
- (e) Fruit: All observations on the fruit should be made on 5 intact fruits which are fully mature for consumption 3 to 5 days after first color change.
- (f) Fruit diameter/thickness of peel/total soluble solids: The observations of fruit diameter, thickness of peel, and total soluble solids should be made in the middle part of the fruit.

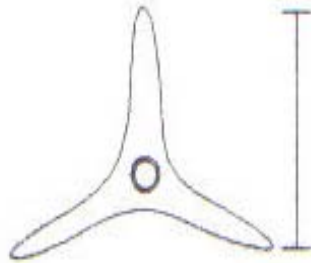
8.2 *Explanations for individual characteristics*

Ad. 2: Stem: length of segment



Ad. 3: Stem: width

To be taken at the middle part of the annual stem section.

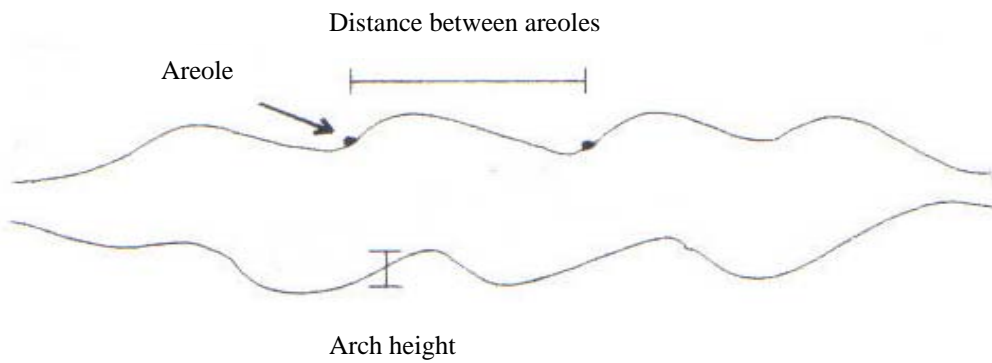


Ad. 5: Stem: texture of surface

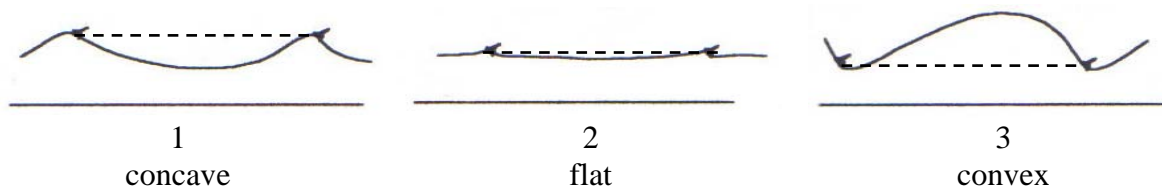
The texture of the surface of the stem should be observed, excluding the areole.

Ad. 6: Stem: distance between areoles




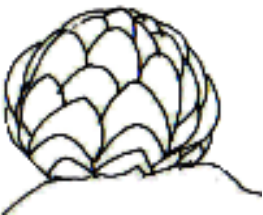
Ad. 7: Stem: arch height



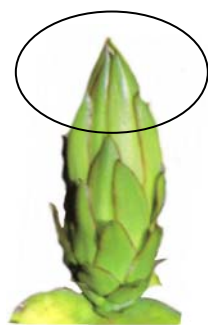
Ad. 8: Stem: margin of rib



Ad. 13: Flower bud: shape

		← Broadest part →		
		below middle	middle	above middle
ratio width/length	↑ elongated	 1 ovate	 2 elliptic	
	medium		 3 circular	
	↓ compressed		 4 oblate	

Ad. 14: Flower bud: shape of apex



1
acute



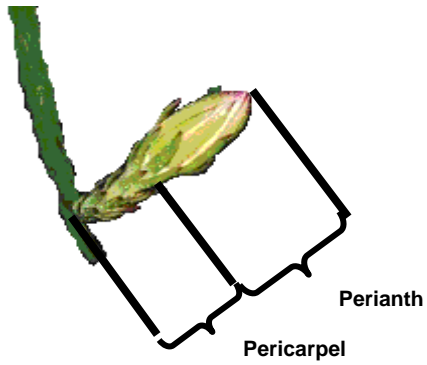
2
rounded

Ad. 16: Flower bud: length of pericarpel

Ad. 17: Flower bud: width of pericarpel

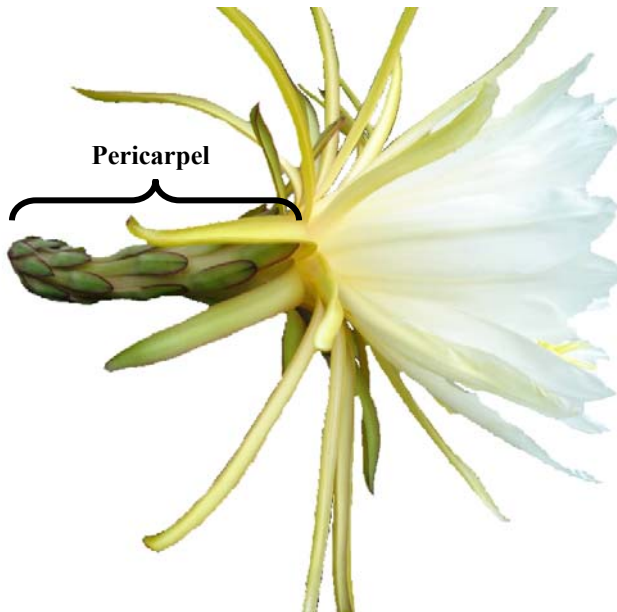
Ad. 18: Flower bud: length of perianth

To be observed just before the opening of the bud.



Ad 19: Flower: intensity of red color of bract

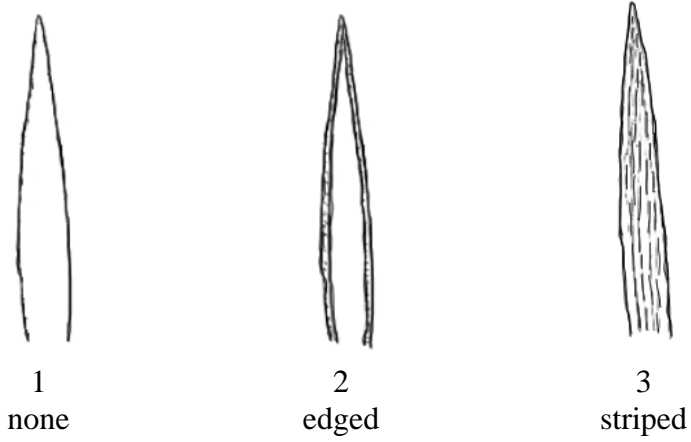
To be observed at the pericarpel region.



Ad 21: Sepal: main color

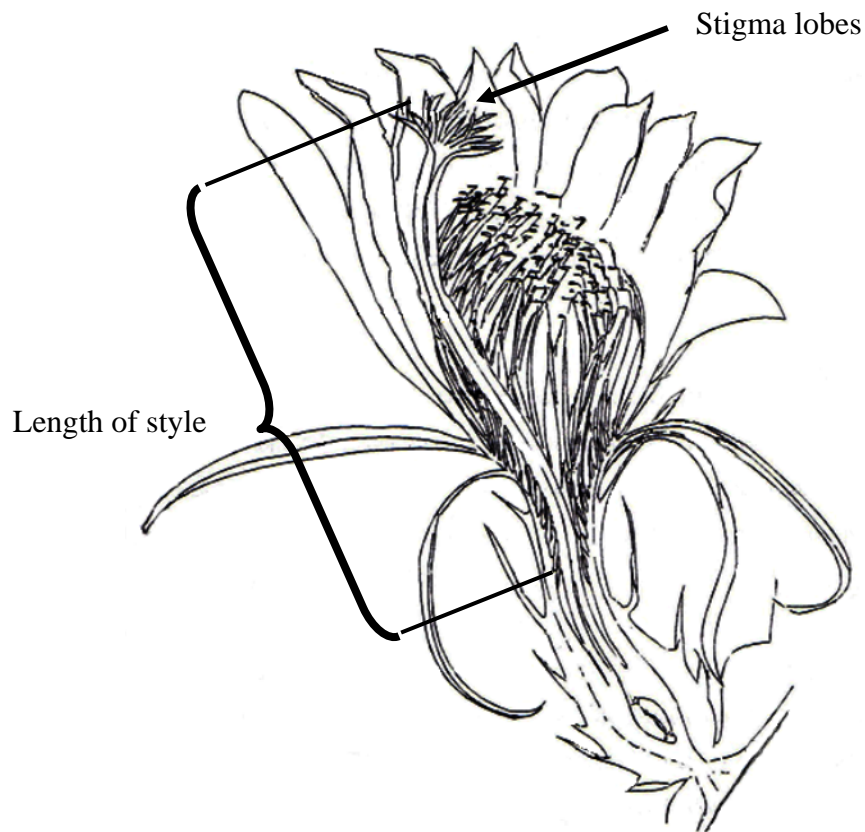
The main color is the color with the largest surface area.

Ad. 22: Sepal: pattern of secondary color



Ad. 23: Flower: length of style

Ad. 24: Flower: number of stigma lobes



Ad. 29: Fruit: ratio length/width



3
moderately elongated



5
medium



7
moderately compressed

Ad. 31: Fruit: length of apical bracts

Ad. 32: Fruit: position of bracts towards the peel



1
adpressed

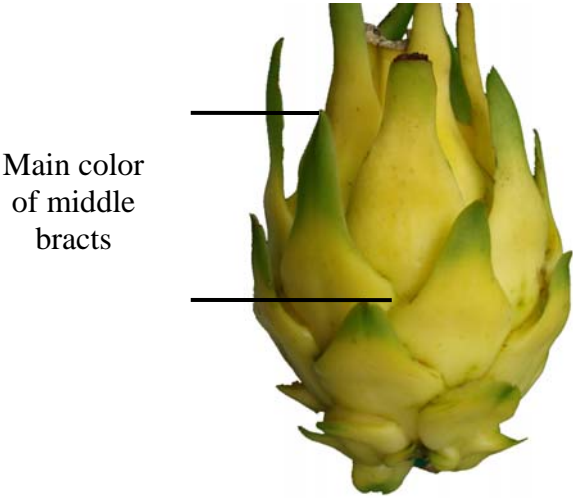
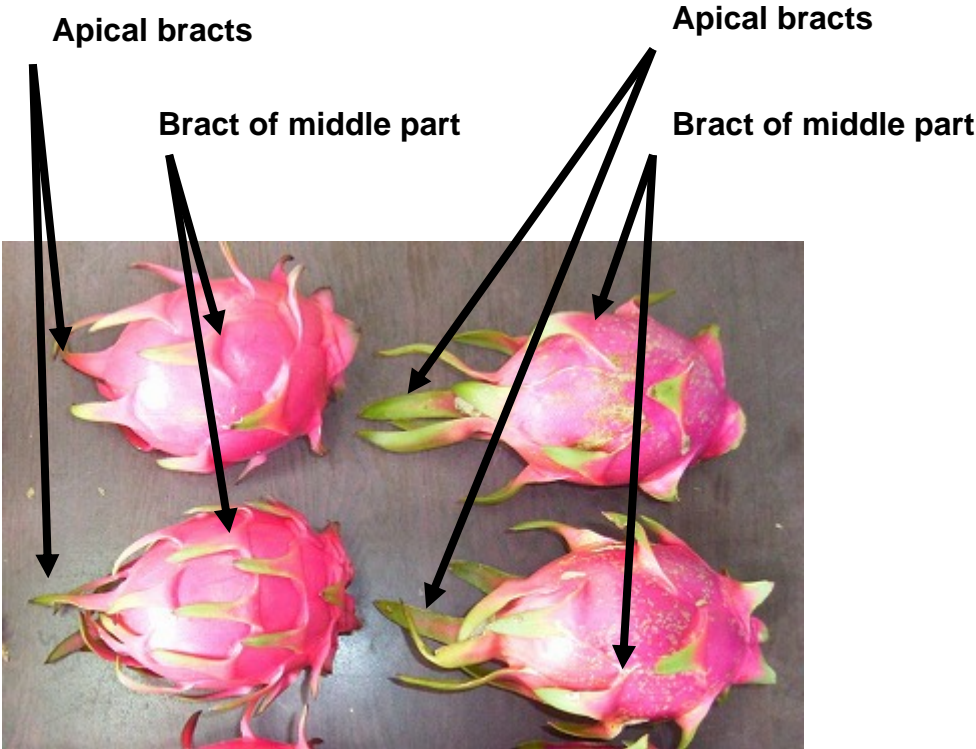


2
slightly held out



3
strongly held out

Ad. 33: Fruit: main color of middle bracts



Ad. 34: Fruit: width of the base of the bracts



1
narrow



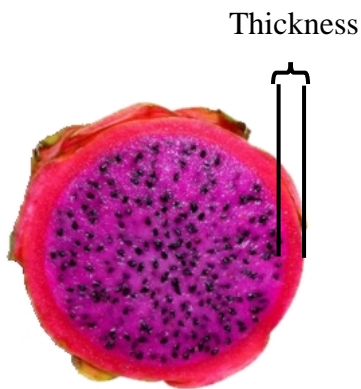
2
medium



3
broad

Ad. 35: Fruit: thickness of peel

To be determined by cutting in transversal section of the fruit.



Ad. 38: Fruit: sweetness (total soluble solids)

For total soluble solids the middle part of the fruit must be used with the help of a refractometer.

9. Literature

Castillo-Martínez, R., Livera-Muñoz, M., Márquez-Guzmán, G.J. 2005: Caracterización morfológica y compatibilidad sexual de cinco genotipos de pitahaya (*Hylocereus undatus*). *Agrociencia* 39: 183-194.

Grimaldo J., O. 2001: Caracterización citológica y morfológica de 21 genotipos de pitahaya (*Hylocereus undatus*). Tesis Doctoral. Colegio de Postgraduados. Montecillo, México. 81 p.

Ortiz Hernández, Y.D., 2000: Hacia el conocimiento y conservación de la pitahaya (*Hylocereus* spp.). IPN-SIBEJ-CONACYT-FMCN. Oaxaca, México, 124 p.

Ramírez Mireles, F. de J., 1999: Caracterización y compatibilidad en pitahaya *Hylocereus*. sp. Tesis de Maestría en Ciencias en Horticultura, Departamento de Fitotecnia, Universidad Autónoma Chapingo. Chapingo, México, 108 p.

Khaimov, A., Mizrahi, Y. 2006: Effects of day-length, radiation, flower thinning and growth regulators on flowering of the vine cacti *Hylocereus undatus* and *Selenicereus megalanthus*. *Journal of Horticultural Science & Biotechnology* 81(3): 465-470.

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	<input type="text" value="Hylocereus undatus (Haw.) Britton & Rose"/>	
1.2 Common name	<input type="text" value="Dragon fruit"/>	
2. Applicant		
Name	<input type="text"/>	
Address	<input type="text"/>	
Telephone No.	<input type="text"/>	
Fax No.	<input type="text"/>	
E-mail address	<input type="text"/>	
Breeder (if different from applicant)	<input type="text"/>	
3. Proposed denomination and breeder's reference		
Proposed denomination (if available)	<input type="text"/>	
Breeder's reference	<input type="text"/>	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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#4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing

(a) controlled cross
(please state parent varieties)

(.....) x (.....)
female parent male parent

(b) partially known cross
(please state known parent variety(ies))

(.....) x (.....)
female parent male parent

(c) unknown cross

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)

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:
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4.2 Method of propagating the variety

4.2.1 Vegetative propagation

- (a) cuttings
- (b) *in vitro* propagation
- (c) other (state method)

4.2.2 Other
(please provide details)

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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 Young stem: reddish color (1)		
absent or weak	Blanca	1 []
medium	AgoCoa, Roja, Solferina	2 []
strong	Pilas, Tepec, Zita	3 []
5.2 Stem: distance between areoles (6)		
very short		1 []
very short to short		2 []
short	Tare, Tepec	3 []
short to medium		4 []
medium	AgoCoa, Romo A1, Solferina	5 []
medium to long		6 []
long	Blanca, Pilas, Zita	7 []
tall to very long		8 []
very long		9 []
5.3 Fruit: length (27)		
very short		1 []
very short to short		2 []
Short	Tepec	3 []
short to medium		4 []
medium	Pilas, Zita	5 []
medium to long		6 []
long	Blanca, Roja, Solferina	7 []
long to very long		8 []
very long		9 []

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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Characteristics	Example Varieties	Note
5.4 Fruit: main color of middle bracts (33)		
yellowish green	AgoCoa, Chiyuramiyarabi	1[]
green	Blanca	2[]
pink		3[]
red	Roja, Solferina, Tepec	4[]
5.5 Fruit: color of flesh (37)		
white	Blanca	1[]
light grey		2[]
light pink	Chiyuramiyarabi	3[]
medium pink	AgoCoa, Solferina	4[]
dark pink	Roja	5[]
medium red		6[]
dark red	Zita	7[]
purple	Pilas, Tepec	8[]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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
		<i>e.g. note 3</i>	<i>e.g. note 5</i>
<i>Example</i>	<i>Fruit: length</i>	<i>e.g. short</i>	<i>e.g. medium</i>

Comments:

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

A representative color image of the variety should accompany the Technical Questionnaire.

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:
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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 plant 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]