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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

HEMP, CANNABIS *

UPOV Code(s): CANNB_SAT

Cannabis sativa L.

(synonyms: *C. sativa* subsp. *sativa*, *C. indica* (Lam.), *C. sativa* subsp. *indica* (Lam.) E. Small & Cronquist. *C. ruderalis* Janisch.)

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from the Netherlands
to be considered by the
Technical Working Party for Agricultural Crops
at its fifty-third session, to be held virtually
from 2024-05-27 to 2024-05-30

Disclaimer: this document does not represent UPOV policies or guidance

Alternative names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Cannabis sativa L.	Cannabis, Hemp	Cannabis, Chanvre	Cannabis, Hanf	Cáñamo, Cannabis

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 *Cannabis sativa* L. (synonyms: *C. sativa* subsp. *sativa*, *C. indica* (Lam.), *C. sativa* subsp. *indica* (Lam.) E. Small & Cronquist. *C. ruderalis* Janisch.).

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.

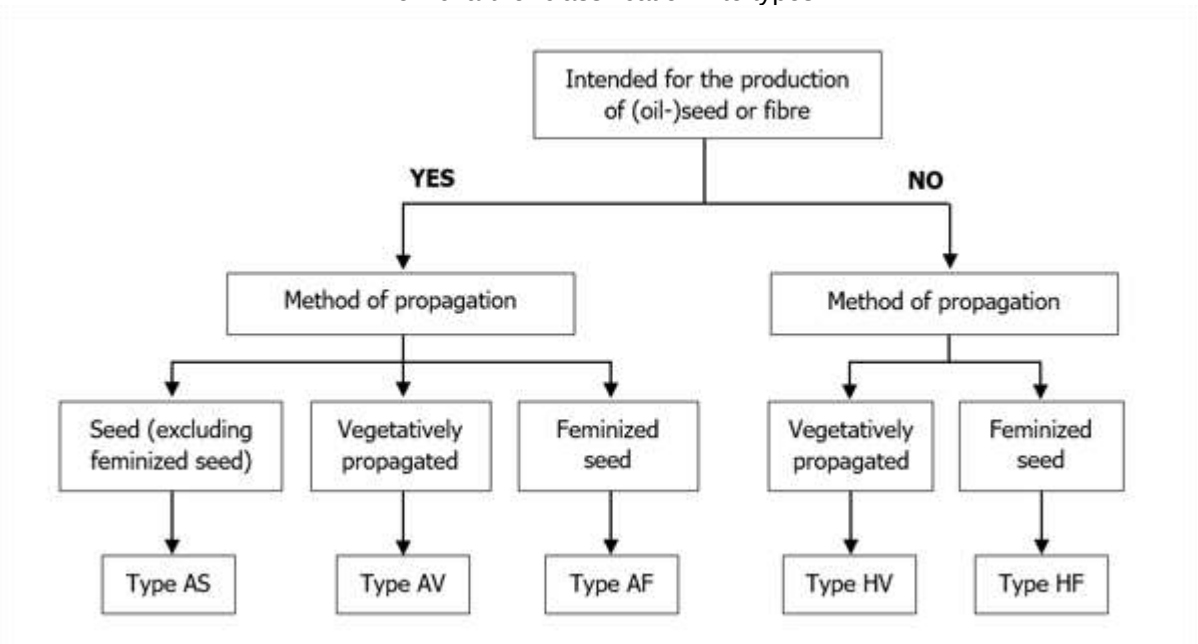
2.2 The material is to be supplied in the form of seed, feminized seed, or rooted cuttings.
Feminized seed results from a breeding scheme where female plants have received treatment to obtain functionally male, yet genetically female, pollen which is used to pollinate female plants. This results in seeds that 100% yield female plants.

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

Type AS*: 500 g seeds
Type AV*: 60 rooted cuttings
Type AF*: 500 g of feminized seeds
Type HV*: 15 rooted cuttings
Type HF*: 500 feminized seeds

* Description of types:
Type AS: Main use: fibre and (oil-)seed production.
Arable cultivation practice (large scale, field). **S**eed propagated
Type AV: Main use: fibre and (oil-)seed production.
Arable Cultivation practice (large scale, field). **V**egetatively Propagated
Type AF: Main use: fibre and (oil-)seed production.
Arable Cultivation practice (large scale, field). **F**eminized seed propagated
Type HV: Uses other than fibre or (oil)seed production.
Horticultural cultivation practice (small scale field or controlled environment), **V**egetatively propagated
Type HF: Uses other than fibre or (oil)seed production.
Horticultural cultivation practice (small scale field or controlled environment), **F**eminized seed propagated

Flow chart for classification into types:



In the case of seed, the seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority.

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.

3.1.2 The two independent growing cycles should be in the form of two separate plantings.

3.1.3 For varieties of types HV and HF, the minimum duration of tests should normally be a single growing cycle when tests are performed in a controlled environment.

3.1.4 In case of doubt to which type a variety belongs, it should be tested under consideration of all relevant types.

3.1.5 The testing of a variety may be concluded when the competent authority can determine with certainty the outcome of the test.

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

3.3.1 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.

3.3.2 The optimum stage of development for the assessment of each characteristic is indicated by a number in the Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.

3.4 Test Design

3.4.1 In the case of varieties of types AS and AF, each test should be designed to result in a total of at least 200 plants which should be divided between at least 2 replicates.

3.4.2 In the case of varieties of type AV, each test should be designed to result in a total of at least 60 plants which should be divided between at least 2 replicates.

3.4.3 In the case of varieties of type HV, each test should be designed to result in a total of at least 10 plants.

3.4.4 In the case of varieties of type HF, each test should be designed to result in a total of at least 20 plants which should be divided between at least 2 replicates.

3.4.5 A description of types AS, AV, AF, HV and HF can be found in paragraph 2.3.

3.4.6 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 or Parts of Plants to be Examined

In the case of varieties of types AS, AV and AF, unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observation made on all plants in the test, disregarding any off-type plants.

In the case of varieties of type HV, 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 observation made on all plants in the test, disregarding any off-type plants.

In the case of varieties of type HF, unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 10 plants or parts taken from each of 10 plants and any other observation made on all plants in the test, disregarding any off-type plants.

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 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 These Test Guidelines have been developed for the examination of cross-pollinated (type AS), vegetatively propagated (types AV and HV), and feminized seed propagated (types AF and HF) varieties. For varieties with other types of propagation, the recommendations in the General Introduction and document TGP/13 "Guidance for new types and species" Section 4.5 "Testing Uniformity" should be followed.

4.2.3 The assessment of uniformity for varieties of type AS should be according to the recommendations for cross-pollinated varieties in the General Introduction.

In the case of varieties of type AS, for the characteristics Leaf: variegation and Main stem: color, a population standard of 3% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 200 plants, 10 off-types are allowed.

For the assessment of uniformity of varieties of type AV, 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 plants, 2 off-types are allowed.

For the assessment of uniformity of varieties of type AF, a population standard of 2% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 200 plants, 7 off-types are allowed.

For the assessment of uniformity of varieties of type HV, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 10 plants, 1 off-type is allowed.

For the assessment of uniformity of varieties of type HF, a population standard of 2% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 20 plants, 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 seed or 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) Leaf: number of leaflets (characteristic 5)
(b) Central leaflet: width (characteristic 7)
(c) Only varieties of type AS: Time of male flowering (characteristic 8)
(d) Only varieties of types AV, AF, HV and HF: Time of female flowering (characteristic 9)
(e) Plant: proportion of monoecious plants (characteristic 12)
(f) Plant: proportion of female plants (characteristic 13)
(g) Plant: proportion of male plants (characteristic 14)
(h) Only varieties of types AS, AV and AF: Plant: natural height (characteristic 18)
(i) Only varieties of types HV and HF: Plant: height (characteristic 19)
(j) Main stem: color (characteristic 20)
(k) Only varieties of types AS, AV and AF: Inflorescence: THC content (characteristic 26)
(l) Only varieties of types HV and HF: Inflorescence: THC content (characteristic 27)
(m) Inflorescence: CBD content (characteristic 28)

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 All relevant states of expression are presented in the characteristic.

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

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1 2	**3 4**	**5 6**	**7**			
	Name of characteristics in English	**Nom du caractère en français**	**Name des Merkmals auf Deutsch**	**Nombre del carácter en español**		
	states of expression	types d'expression	Ausprägungsstufen	tipos de expresión		

1 Characteristic number

2 (*) Asterisked characteristic – see Chapter 6.1.2

3 Type of expression
QL Qualitative characteristic – see Chapter 6.3
QN Quantitative characteristic – see Chapter 6.3
PQ Pseudo-qualitative characteristic – see Chapter 6.3

4 Method of observation (and type of plot, if applicable)
MG, MS, VG, VS – see Chapter 4.1.5

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

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

7 Growth stage key See Explanations on the Table of Characteristics in Chapter 8

Consult paragraph 2.3 for an explanation of the variety types AS, AV, AF, HV and HF.
(AS): variety of type AS
(AV): variety of type AV
(AF): variety of type AF
(HV): variety of type HV
(HF): variety of type HF

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

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1.	**QL VG**		**(a)**				
		Leaf: variegation					
		absent				Aida (HV), Futura 75 (AS)	1
		present				Divina (HV)	9
2.	**QN VG**		**(a)**				
		Only varieties with leaf variegation: absent: **Leaf: intensity of green color**					
		light				Aida (HV), Fibror 79 (AS)	1
		medium				Fedora 17 (AS), Theresa (HV)	2
		dark				Finola (AS), Gill (HV)	3
3.	**QN MS/VG**		**(a), (b)**				
		Leaf: length of petiole					
		short				Fibrol (AS), MGC 1013 (HV)	1
		medium				Bedrolite (HV), Divina (HV), Fedora 17 (AS)	2
		long				Carmagnola (AS)	3
4.	**(*) QN VG**		**(a), (b)**				
		Leaf: anthocyanin coloration of petiole					
		absent or very weak				Fibrol (AS), Gill (HV)	1
		weak				Ruby (AS), Theresa (HV)	2
		medium				Dioica 88 (AS), Gayle (HV)	3
		strong				M-1337 (HV)	4
		very strong				EVLS 113 (HV), Finola (AS)	5
5.	**(*) QN MS/VG**		**(+) (a), (b)**				
		Leaf: number of leaflets					
		three or less				Bedrolite (HV), MGC 1013 (HV)	1
		five				Aida (HV), Finola (AS)	2
		seven				GRX53 (HF), Uso 31 (AS)	3
		nine				Fibror 79 (AS)	4
		eleven or more					5

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
6.		**QN MS/VG**	**(a), (b)**				
		Central leaflet: length					
		very short				Damato Red (HV)	1
		very short to short				MGC 1013 (HV)	2
		short				Divina (HV)	3
		short to medium					4
		medium				Aida (HV)	5
		medium to long					6
		long				Felina 32 (AS)	7
		long to very long					8
		very long				Carmagnola (AS)	9
7.	**(*)**	**QN MS/VG**	**(a), (b)**				
		Central leaflet: width					
		very narrow					1
		very narrow to narrow				Celeste (HV)	2
		narrow				MGC 1013 (HV)	3
		narrow to medium					4
		medium				Fibrol (AS), Theresa (HV)	5
		medium to broad				Hulkberry (HV)	6
		broad				Gill (HV), Uso 31 (AS)	7
		broad to very broad					8
		very broad				Carmagnola (AS), Enectabis (HF)	9
8.	**(*)**	**QN MG/VG**	**(+)**				
		<u>Only varieties of type AS:</u> Time of male flowering					
		very early				Uso 31 (AS)	1
		very early to early					2
		early					3
		early to medium					4
		medium				Fibrol (AS)	5
		medium to late					6
		late				Felina 32 (AS)	7
		late to very late					8
		very late				Dioica 88 (AS)	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
9.	**(*) QN MG/VG**		**(+)**				
		<u>Only varieties of types AV, AF, HV and HF:</u> Time of female flowering					
		very early				Celeste (HV)	1
		very early to early					2
		early				Theresa (HV)	3
		early to medium					4
		medium				M-1337 (HV)	5
		medium to late					6
		late				Goya (HV)	7
		late to very late					8
		very late				HURV2019PL (HF)	9
10	**QN VG**			**2102 2304**			
		<u>Only varieties of type AS:</u> Inflorescence: anthocyanin coloration of male flowers					
		absent or very weak				Santhica 27 (AS)	1
		very weak to weak					2
		weak				Uso 31 (AS)	3
		weak to medium					4
		medium				Felina 32 (AS)	5
		medium to strong					6
		strong				Adzelviesi (AS)	7
		strong to very strong				Finola (AS)	8
		very strong					9
11	**QN VG**		**(+)**	**2202b 2302b**			
		<u>Only varieties of types AV, AF, HV. and HF:</u> Female inflorescence: intensity of anthocyanin coloration					
		absent or weak				Aida (HV)	1
		medium				Stromboli (HV)	2
		strong				HURV2019PL (HF)	3

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
12	**(*)**	**QN MS/VG**	**(+)**	**2102 2202 2302 2304**			
		Plant: proportion of monoecious plants					
		absent or low					1
		low to medium					2
		medium					3
		medium to high					4
		high					5
13	**(*)**	**QN MS/VG**	**(+)**	**2102 2202 2302 2304**			
		Plant: proportion of female plants					
		absent or low					1
		low to medium					2
		medium					3
		medium to high					4
		high					5
14	**(*)**	**QN MS/VG**	**(+)**	**2102 2202 2302 2304**			
		Plant: proportion of male plants					
		absent or low					1
		low to medium					2
		medium					3
		medium to high					4
		high					5
15		**QN VG**	**(+)**	**2202b 2302b**			
		Only varieties of types HV and HF: Female flower: length of stigmas					
		short				EVLS 113 (HV)	1
		medium				Divina (HV)	2
		long				Bedrobinol (HV), HURV2019PL (HF)	3
16		**QN VG**		**2202b 2302b**			
		Only varieties of types HV and HF: Female flower: thickness of stigmas					
		thin				HURV2019CBG (HV)	1
		medium				Divina (HV)	2
		thick				HURV2019PL (HF)	3

		English		français		deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
17		**QN**	**VG**	**(+)**		**2202b 2302b**			
		<u>Only varieties of types HV and HF:</u> Female flower: contortion of stigmas							
		absent or weak						Aida (HV)	1
		medium						HURV2019PL (HF), MGC 1008 (HV)	2
		strong						MGC 1009 (HV)	3
18	**(*)**	**QN**	**MG/VG**	**(+)**		**2202 2202b 2302 2302b**			
		<u>Only varieties of types AS, AV and AF:</u> Plant: natural height							
		very short						Adzelviesi (AS), Finola (AS)	1
		very short to short							2
		short							3
		short to medium							4
		medium						Uso 31 (AS)	5
		medium to long						Fibrol (AS)	6
		long						Felina 32 (AS)	7
		long to very long						Fibror 79 (AS)	8
		very long						Dioica 88 (AS)	9
19	**(*)**	**QN**	**MG/VG**	**(+)**		**2202b 2302b**			
		<u>Only varieties of types HV and HF:</u> Plant: height							
		very short						MGC 1027 (HV)	1
		very short to short							2
		short						Chuy (HV)	3
		short to medium							4
		medium						Aida (HV)	5
		medium to long							6
		long						Bedrolite (HV), EVLS 113 (HV)	7
		long to very long						Obi (HF)	8
		very long							9

		English		français		deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
20	**(*)**	**PQ**	**VG**		**(c)**	**2202 2202b 2302 2302b**			
		Main stem: color							
		yellow						Fibror 79 (AS)	1
		medium green						Bedrobinol (HV), Felina 32 (AS), Theresa (HV)	2
		dark green						Aida (HV), Dioica 88 (AS)	3
		purple						EVLS 113 (HV), Fibranova (AS)	4
21		**QN**	**MS/VG**		**(c)**	**2202 2202b 2302 2302b**			
		<u>Only varieties of types AS, AV and AF:</u> Main stem: length of internode							
		very short						Finola (AS)	1
		very short to short							2
		short							3
		short to medium							4
		medium						Uso 31 (AS)	5
		medium to long							6
		long						Futura 75 (AS)	7
		long to very long							8
		very long							9
22		**QN**	**MS/VG**		**(c)**	**2202b 2302b**			
		<u>Only varieties of types HV and HF:</u> Main stem: length of internode							
		very short							1
		very short to short						MGC 1027 (HV)	2
		short						Beatriz (HV), Divina (HV)	3
		short to medium							4
		medium						Aida (HV), HURV2019PL (HF)	5
		medium to long						EVLS 113 (HV)	6
		long							7
		long to very long							8
		very long						Enectitaca (HF), Obi (HF)	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
23		**QN MS/VG**	**(c)**	**2202 2202b 2302 2302b**			
		<u>Only varieties of types AS, AV and AF:</u> Main stem: thickness					
		thin				Finola (AS)	1
		medium				Futura 75 (AS)	2
		thick				Dioica 88 (AS)	3
24		**QN MS/VG**	**(c)**	**2202b 2302b**			
		<u>Only varieties of types HV and AF:</u> Main stem: thickness					
		thin				Celeste (HV)	1
		medium				Aida (HV)	2
		thick				Obi (HF)	3
25		**QN VG**	**(c)**	**2202 2202b 2302 2302b**			
		<u>Only types AS, AF and HF:</u> Main stem: depth of grooves					
		shallow				Finola (AS)	1
		medium				Fedora 17 (AS)	2
		deep				Dioica 88 (AS), HURV2019PL (HF)	3
26	**(*)**	**QN MG**	**(+) (d)**	**2204 2204b 2305 2305b**			
		<u>Only varieties of types AS, AV and AF:</u> Inflorescence: THC content					
		absent or very low				Santhica 27 (AS)	1
		very low to low				Fedora 17 (AS)	2
		low				Futura 75 (AS)	3

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
27	**(*)**	**QN MG**	**(+) (d)**	**2204b 2305b**			
		<u>Only varieties of types HV and HF:</u> Inflorescence: THC content					
		absent or very low				Aida (HV), HURV2019CBG (HV), Octavia (HV)	1
		very low to low				A1 Philadelphia (HV), Sara (HV)	2
		low					3
		low to medium				Beatriz (HV), Bediol (HV)	4
		medium				HURV2019PL (HF), Toluca (HV)	5
		medium to high				Bedrobinol (HV), Raquel (HV)	6
		high				Bedrocan (HV), GRX53 (HF), Hulkberry (HV)	7
		high to very high				Nanda Devi (HV), Original Blitz (HV)	8
		very high					9
28	**(*)**	**QN MG**	**(+) (d)**	**2204 2204b 2305 2305b**			
		Inflorescence: CBD content					
		absent or very low				Bedrobinol (HV), Enectacalm (HF), Raquel (HV), Santhica 27 (AS)	1
		very low to low				Aida (HV), Fedora 17 (AS), Octavia (HV)	2
		low				Futura 75 (AS), Theresa (HV)	3
		low to medium				Beatriz (HV), Toluca (HV)	4
		medium				Bediol (HV), Sara (HV)	5
		medium to high				Sibari (HV)	6
		high				Goya (HV)	7
		high to very high				A1 Philadelphia (HV), Enectonica (HF)	8
		very high					9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
29	**QN MG**	**(+) (d)**	**2204b 2305b**			
	Inflorescence: CBG content					
	very low				A1 Philadelphia (HV), Bedrolite (HV)	1
	low				Mati (HV), Moniek (HV)	2
	medium				HURV2019CBG (HV), Juani (HV), Octavia (HV)	3
	high				Aida (HV)	4
	very high					5
30	**QN VG**	**(+) (c)**	**2204 2202b 2306 2306b**			
	Main stem: pith in cross-section					
	absent or thin				HURV2019PL (HF), Santhica 27 (AS)	1
	medium				Divina (HV), Fedora 17 (AS)	2
	thick				Finola (AS), Gill (HV), MGC 1009 (HV)	3
31	**QN MG**		**2205 2307**			
	Seed: 1,000 seed weight					
	very low				Finola (AS)	1
	low				Chamaeleon (AS), Enectitaca (HF)	2
	medium				Enectacalm (HF), Felina 32 (AS)	3
	high				Santhica 27 (AS)	4
	very high				Fibror 79 (AS)	5
32	**PQ VG**		**2205 2307**			
	Seed: color of testa					
	light grey				Finola (AS)	1
	medium grey				Enectavio (HF), Uso 31 (AS)	2
	grey brown				Enectacalm (HF), Fedora 17 (AS)	3
	yellowish brown				Fibror 79 (AS)	4
	brown				Dioica 88 (AS), Enectitaca (HF)	5

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
33	**QN VG**	**(+)**	**2205 2307**			
	Seed: marbling					
	weak				Enectacalm (HF), Finola (AS)	1
	medium				Enectavio (HF), Felina 32 (AS)	2
	strong				Dioica 88 (AS)	3

8. Explanations on the Table of Characteristics

8.1 Explanations covering several characteristics

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

(a) Observations should be made in the period between the beginning of flowering (growth stage 2101, 2201 or 2301, whichever is earliest) and the beginning of seed maturity (Type AS) or flower senescence (Types AV, AF, HV and HF).

(b) For varieties of type AS, observations should be made on the last opposite, fully expanded leaves. For varieties of types AV, AF, HV and HF observations should be made on fully developed leaves from the centre of the plant.

(c) For varieties of type AS, observations should be made on the internode below the last opposite leaves of female and/or monoecious plants. For varieties of types AV, AF, HV and HF, observations should be made on the internode below a fully developed leaf from the centre of the plant.

(d) Seed formation affects the production of cannabinoids and should therefore be avoided for types HV and HF. If grown in a controlled environment, it is advised to remove any male flowers before pollen is released.

8.2 Explanations for individual characteristics

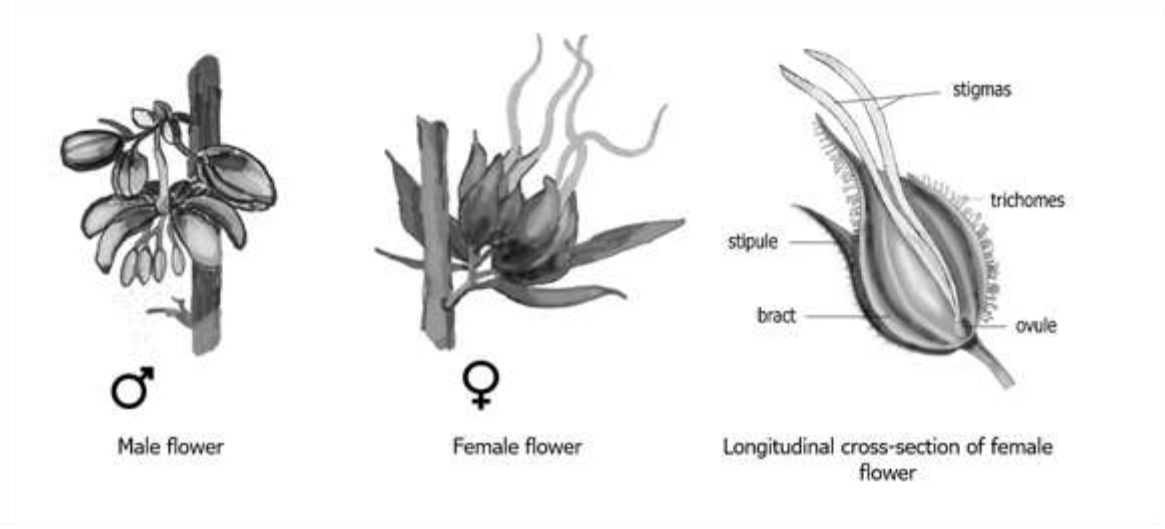
Ad. 5: Leaf: number of leaflets

The predominant number of leaflets in the centre of the plant should be observed.

Ad. 8: Only varieties of type AS: Time of male flowering

Monoecious varieties: 50 % of all plants with first male flower open
Other varieties: 50 % of all male plants with first male flower open

First male flowers mostly appear from the axils of the leaves on the main stem. Male flowers usually appear about 2 weeks before the stigmas of female flowers are visible.



Ad. 9: Only varieties of types AV, AF, HV and HF: Time of female flowering

Time of female flowering is reached when first stigmas are visible on 50% of plants.

Ad. 11: Only varieties of types AV, AF, HV. and HF: Female inflorescence: intensity of anthocyanin coloration

The color of the bracts, stipules and sugarleaves should be observed. Sugarleaves are the leaves between the clusters of female flowers.

1
absent or weak

3
strong

Ad. 12: Plant: proportion of monoecious plants

Cannabis sativa L. is dioecious by nature and is predominantly controlled by an XY chromosomal system, where XX = female and XY= male. Monoecious plants (male and female flowers on one plant) occasionally occur naturally but are specially created by breeding activity (Bócsa, 1998). The presence of 'masculinizing' and 'feminizing' genes on the sex chromosomes further regulate sex expression, resulting in varietal variation of the proportion of male/female/monoecious plants.

Monoecious plants: plants with both male and female flowers
Female plants: plants with female flowers only
Male plants: plants with male flowers only

Sex expression may be affected by environmental conditions and stress. The occurrence of a limited number of male flowers on a female flowering plant should therefore not result in labelling such plants as monoecious.

Proportion	Note	Ranges (percentage)
low	1	<= 5 %
low to medium	2	6-35 %
medium	3	36-65 %
medium to high	4	66-95 %
high	5	>= 96 %

Ad. 13: Plant: proportion of female plants

See Ad. 12

Ad. 14: Plant: proportion of male plants

See Ad. 12

Ad. 15: Only varieties of types HV and HF: Female flower: length of stigmas

1
short

3
long

Ad. 17: Only varieties of types HV and HF: Female flower: contortion of stigmas

1
absent or weak

3
strong

Ad. 18: Only varieties of types AS, AV and AF: Plant: natural height

Observations should be made on female and/or monoecious plants from soil level to the top of the plant including inflorescence.

Ad. 19: Only varieties of types HV and HF: Plant: height

See Ad. 18

Ad. 26: Only varieties of types AS, AV and AF: Inflorescence: THC content

The method to simultaneously determine the THC, CBD, and CBG content is based on a quantitative determination of Δ^9-tetrahydrocannabinol (THC), cannabidiol (CBD), and cannabigerol (CBG) by gas chromatography after extraction with a suitable solvent.

Sampling

The sample should be taken from the upper 30 cm of the main stem, containing well-developed female inflorescences.

Types AS, AV, and AF: a mixture of 20 plants
Type HV: a mixture of 5 plants
Type HF: a mixture of 10 plants

(Sugar-)leaves should be removed as much as possible.

The sample should be dried as soon as possible (within 48 hours) at a temperature below 70º C. Samples should be dried to a constant weight and to a moisture content of 8 – 13 %. After drying, samples can be stored (without crushing) at below 25º C in a dark place.

Determination of THC/CBD/CBG content (Adapted from: Commission Delegated Regulation (EU) No 639/2014 annex II (latest amended version)).

1. *Preparation of the test sample*

Remove stems and seeds over 2 mm in size from the dried samples.
Grind the dried samples to obtain a semi-fine powder (passing through a 1 mm mesh sieve).
The powder may be stored for 10 weeks at below 25º C in a dark dry place.

2. *Reagents and extraction solution*

Reagents:
- Δ^9-tetrahydrocannabinol (THC), pure for chromatographic purposes.
- Cannabidiol (CBD), pure for chromatographic purposes
- Cannabigerol (CBG), pure for chromatographic purposes
- squalane, pure for chromatographic purposes, as an internal standard.

Extraction solution:
- 35 mg of squalane per 100 ml hexane.

3. Extraction of cannabinoids
Weigh 100 mg of the powdered test sample, place in a centrifuge tube and add 5 ml of extraction solution containing the internal standard.
Place in an ultrasound bath and leave for 20 minutes. Centrifuge for 5 minutes at 3,000 r.p.m. and then remove the supernatant cannabinoid solution. Inject the solution into the chromatograph and carry out a quantitative analysis.

3. *Gas chromatography*

(a) Equipment
- gas chromatograph with a flame ionization detector and a split/splitless injector
- column allowing good separation of cannabinoids, for example, a glass capillary column 25 m long and 0.22 mm in diameter impregnated with a 5 % non-polar phenyl-methyl-siloxane phase.

(b) Calibration ranges
At least three points including points 0.04 and 0.50 mg/ml of each of the cannabinoids in the extraction solution.

(c) Experimental conditions
The following conditions are given as an example for the column referred to in a).
- oven temperature 260º C
- injector temperature 300º C
- detector temperature 300º C

(d) Injection volume: 1 µl

Results

THC, CBD, and CBG should be determined to two decimals places in grams of Δ^9-THC, CBD, and CBG respectively, per 100 grams of analytical sample dried to constant weight. A tolerance of 0.03 g per 100 grams applies.

Alternative methods may be used as long as they yield the same results.

As an indication, the range of expression of notes 1-3 of char. 26 is equivalent to the expression of note 1 of char. 27.

Ad. 27: Only varieties of types HV and HF: Inflorescence: THC content

See Ad. 26

As an indication, the range of expression of notes 1-3 of char. 26 is equivalent to the expression of note 1 of char. 27.

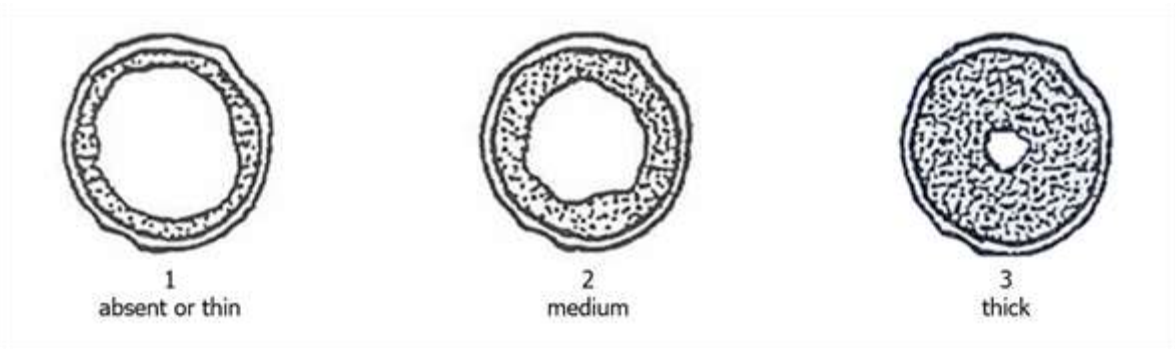
Ad. 28: Inflorescence: CBD content

See Ad. 26

Ad. 29: Inflorescence: CBG content

See Ad. 26

Ad. 30: Main stem: pith in cross-section



Ad. 33: Seed: marbling

Marbling of testa: black mosaic patterns

8.3 Growth stages

Growth stages of hemp are recorded by a four-digit code describing the principal growth stages, depending on the sex of the plant followed by detailed developmental stages (Mediavilla, Vito *et al.,* 1998). This growth scale is slightly modified by adding definitions of stages (marked by *) to accommodate types AV, AF, HV and AF when no seed is formed. Seed formation affects the production of cannabinoids and should therefore be avoided for types HV and HF (see par. 8.1 (d)). Stages with the same number indicate the same growth stage, e.g. 1006=1006b.

Principal growth stages

Four principal stages describe the life cycle of a plant and are coded by the first digit of the four-digit code.

First-digit of code	Definition
0	Germination and emergence
1	Vegetative stage
2	Flowering and seed formation
3	Senescence

Secondary growth stages

The secondary growth stages are described by the second digit, which indicates the sex of the plant, and the third and fourth digit indicating the developmental stage of the plant.

Code	Definition	Remarks
Germination and emergence		
0000	Dry seed	
0003	Cotyledons unfolded	
Vegetative stage refers to the main stem. Leaves are considered unfolded when leaflets are at least one cm long		
1002	1st leaf pair	1 leaflet
1004	2nd leaf pair	3 leaflets
1006	3rd leaf pair	5 leaflets
1006b*	5th leaf	In vegetatively propagated plants all leaves have the same phyllotaxis
10xx	Last opposite leaf pair	xx = 2 times nth leaf pair
Flowering and seed formation refers to the main stem including branches		
2000	GV point (i.e. induction of flowering)	Change of phyllotaxis on the main stem from opposite to alternate. Distance between petioles of alternate leaves at least 0.5 cm. In vegetatively propagated plants the GV point is absent, all leaves have the same phyllotaxis.
2001	Flower primordia	Sex nearly distinguishable
	Male Plant	
2100	Flower formation	First closed staminate flowers
2101	Beginning of flowering	First opened staminate flowers
2102	Flowering	50 % opened staminate flowers
2103	End of flowering	95 % of staminate flowers opened or withered
	Female Plant	
2200	Flower formation	First pistillate flowers Bract with no stigmas
2201	Beginning of flowering	Stigmas on first female flowers
2202	Flowering	50 % of bracts formed
2202b*	Flowering	50% of stigmas fully extended
2203	Beginning of seed maturity	First seeds hard
2203b*	Flowers senescence	10% of stigmas brown
2204	Seed maturity	50 % of seeds hard
2204b*	End of flowering	50% of stigmas brown
2205	End of seed maturity	95 % of seeds hard or shattered

Code	Definition	Remarks
	Monoecious plant	
2300	Female flower formation	First pistillate flowers. Perigonal bracts with no stigmas
2301	Beginning of female flowering	First stigmas visible
2302	Female flowering	50 % of bracts formed
2302b*	Female flowering	50% of stigmas fully extended
2303	Male flower formation	First closed staminate flowers
2304	Male flowering	50 % opened staminate flowers
2305	Beginning of seed maturity	First seeds hard
2305b*	Female flower senescence	10% of stigmas brown
2306	Seed maturity	50 % of seeds hard
2306b*	End of female flowering	50% of stigmas brown
2307	End of seed maturity	95 % of seeds hard or shattered
	Senescence	
3001	Leaf desiccation	Leaves dry
3002	Stem desiccation	Leaves dropped
3003	Stem decomposition	Bast fibres free

9. Literature

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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	*Cannabis sativa* L.
1.2	Common name	Cannabis, Hemp

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

(a) controlled cross [ ]

(please state parent variety)

(……..……..…) 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:

4.2 Method of propagating the variety

4.2.1 Seed-propagated varieties

(a) Cross-pollination [ ]
(b) Hybrid [ ]
(c) Feminized seed [ ]
(d) Other (please provide details) [ ]

4.2.2 Vegetative propagation

(a) Cuttings [ ]
(b) *In vitro* propagation [ ]
(c) Other (state method) [ ]

4.2.3 Other [ ]
(Please provide details)

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 (5)	**Leaf: number of leaflets**		
	three or less	Bedrolite (HV), MGC 1013 (HV)	1 [ ]
	five	Aida (HV), Finola (AS)	2 [ ]
	seven	GRX53 (HF), Uso 31 (AS)	3 [ ]
	nine	Fibror 79 (AS)	4 [ ]
	eleven or more		5 [ ]
5.2 (7)	**Central leaflet: width**		
	very narrow		1 [ ]
	very narrow to narrow	Celeste (HV)	2 [ ]
	narrow	MGC 1013 (HV)	3 [ ]
	narrow to medium		4 [ ]
	medium	Fibrol (AS), Theresa (HV)	5 [ ]
	medium to broad	Hulkberry (HV)	6 [ ]
	broad	Gill (HV), Uso 31 (AS)	7 [ ]
	broad to very broad		8 [ ]
	very broad	Carmagnola (AS), Enectabis (HF)	9 [ ]
5.3 (8)	**<u>Only varieties of type AS:</u> Time of male flowering**		
	very early	Uso 31 (AS)	1 [ ]
	very early to early		2 [ ]
	early		3 [ ]
	early to medium		4 [ ]
	medium	Fibrol (AS)	5 [ ]
	medium to late		6 [ ]
	late	Felina 32 (AS)	7 [ ]
	late to very late		8 [ ]
	very late	Dioica 88 (AS)	9 [ ]

	Characteristics	Example Varieties	Note
5.4 (9)	**<u>Only varieties of types AV, AF, HV and HF:</u> Time of female flowering**		
	very early	Celeste (HV)	1 [ ]
	very early to early		2 [ ]
	early	Theresa (HV)	3 [ ]
	early to medium		4 [ ]
	medium	M-1337 (HV)	5 [ ]
	medium to late		6 [ ]
	late	Goya (HV)	7 [ ]
	late to very late		8 [ ]
	very late	HURV2019PL (HF)	9 [ ]
5.5 (12)	**Plant: proportion of monoecious plants**		
	absent or low		1 [ ]
	low to medium		2 [ ]
	medium		3 [ ]
	medium to high		4 [ ]
	high		5 [ ]
5.6 (13)	**Plant: proportion of female plants**		
	absent or low		1 [ ]
	low to medium		2 [ ]
	medium		3 [ ]
	medium to high		4 [ ]
	high		5 [ ]
5.7 (14)	**Plant: proportion of male plants**		
	absent or low		1 [ ]
	low to medium		2 [ ]
	medium		3 [ ]
	medium to high		4 [ ]
	high		5 [ ]

	Characteristics	Example Varieties	Note
5.8 (18)	**Only varieties of types AS, AV and AF: Plant: natural height**		
	very short	Adzelviesi (AS), Finola (AS)	1 [ ]
	very short to short		2 [ ]
	short		3 [ ]
	short to medium		4 [ ]
	medium	Uso 31 (AS)	5 [ ]
	medium to long	Fibrol (AS)	6 [ ]
	long	Felina 32 (AS)	7 [ ]
	long to very long	Fibror 79 (AS)	8 [ ]
	very long	Dioica 88 (AS)	9 [ ]
5.9 (19)	**Only varieties of types HV and HF: Plant: height**		
	very short	MGC 1027 (HV)	1 [ ]
	very short to short		2 [ ]
	short	Chuy (HV)	3 [ ]
	short to medium		4 [ ]
	medium	Aida (HV)	5 [ ]
	medium to long		6 [ ]
	long	Bedrolite (HV), EVLS 113 (HV)	7 [ ]
	long to very long	Obi (HF)	8 [ ]
	very long		9 [ ]
5.10 (20)	**Main stem: color**		
	yellow	Fibror 79 (AS)	1 [ ]
	medium green	Bedrobinol (HV), Felina 32 (AS), Theresa (HV)	2 [ ]
	dark green	Aida (HV), Dioica 88 (AS)	3 [ ]
	purple	EVLS 113 (HV), Fibranova (AS)	4 [ ]
5.11 (26)	**Only varieties of types AS, AV and AF: Inflorescence: THC content**		
	absent or very low	Santhica 27 (AS)	1 [ ]
	very low to low	Fedora 17 (AS)	2 [ ]
	low	Futura 75 (AS)	3 [ ]

	Characteristics	Example Varieties	Note
5.12 (27)	**<u>Only varieties of types HV and HF:</u> Inflorescence: THC content**		
	absent or very low	Aida (HV), HURV2019CBG (HV), Octavia (HV)	1 [ ]
	very low to low	A1 Philadelphia (HV), Sara (HV)	2 [ ]
	low		3 [ ]
	low to medium	Beatriz (HV), Bediol (HV)	4 [ ]
	medium	HURV2019PL (HF), Toluca (HV)	5 [ ]
	medium to high	Bedrobinol (HV), Raquel (HV)	6 [ ]
	high	Bedrocan (HV), GRX53 (HF), Hulkberry (HV)	7 [ ]
	high to very high	Nanda Devi (HV), Original Blitz (HV)	8 [ ]
	very high		9 [ ]
5.13 (28)	**Inflorescence: CBD content**		
	absent or very low	Bedrobinol (HV), Enectacalm (HF), Raquel (HV), Santhica 27 (AS)	1 [ ]
	very low to low	Aida (HV), Fedora 17 (AS), Octavia (HV)	2 [ ]
	low	Futura 75 (AS), Theresa (HV)	3 [ ]
	low to medium	Beatriz (HV), Toluca (HV)	4 [ ]
	medium	Bediol (HV), Sara (HV)	5 [ ]
	medium to high	Sibari (HV)	6 [ ]
	high	Goya (HV)	7 [ ]
	high to very high	A1 Philadelphia (HV), Enectonica (HF)	8 [ ]
	very high		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	*Main stem: color (20)*	*yellow*	*medium green*

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

Photoperiodism regarding the induction of flowering:
(a) day-neutral (=auto-flowering) [ ]
(b) short-day [ ]
(c) other (please specify): [ ]

Main use of the variety:
(a) bast fibre and woody core [ ]
(b) (oil-) seed [ ]
(c) pharmaceuticals [ ]
(d) ornamental [ ]
(e) 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:

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.

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]