



PROTOCOL FOR TESTS ON DISTINCTNESS, UNIFORMITY AND STABILITY

Avena sativa L.; Avena nuda L.

OATS, NAKED OATS

UPOV Code: AVENA_SAT; AVENA_NUD

Adopted on 06/03/2020

Entry into force on 01/03/2020

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CPVO-TP/020/3 – Final

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1. SUBJECT OF THE PROTOCOL AND REPORTING

1.1 Scope of the technical protocol

This Technical Protocol applies to all varieties of *Avena sativa* L. and *Avena nuda* L.

The protocol describes the technical procedures to be followed in order to meet the requirements of Council Regulation 2100/94 on Community Plant Variety Rights. The technical procedures have been agreed by the Administrative Council and are based on documents agreed by the International Union for the Protection of New Varieties of Plants (UPOV), such as the General Introduction to DUS (UPOV Document TG/1/3 http://www.upov.int/export/sites/upov/resource/en/tg_1_3.pdf), its associated TGP documents (<http://www.upov.int/tgp/en/>) and the relevant UPOV Test Guideline TG/020/11 dated 30.10.2018 (<https://www.upov.int/edocs/tgdocs/en/tg020.pdf>) for the conduct of tests for Distinctness, Uniformity and Stability.

1.2 Entry into Force

The present protocol enters into force on **01.03.2020**. Any ongoing DUS examination of candidate varieties started before the aforesaid date will not be affected by the approval of the Technical Protocol. Technical examinations of candidate varieties are carried out according to the TP in force when the DUS test starts. The starting date of a DUS examination is considered to be the due date for submitting of plant material for the first test period.

In cases where the Office requests to take-over a DUS report for which the technical examination has either been finalized or which is in the process to be carried out at the moment of this request, such report can only be accepted if the technical examination has been carried out according to the CPVO TP which was in force at the moment when the technical examination started.

1.3 Reporting between Examination Office and CPVO and Liaison with Applicant

1.3.1 Reporting between Examination Office and CPVO

The Examination Office shall deliver to the CPVO a preliminary report ("the preliminary report") no later than two weeks after the date of the request for technical examination by the CPVO.

The Examination Office shall also deliver to the CPVO a report relating to each growing period ("the interim report") and, when the Examination Office considers the results of the technical examination to be adequate to evaluate the variety or the CPVO so requests, a report relating to the examination ("the final report").

The final report shall state the opinion of the Examination Office on the distinctness, uniformity and stability of the variety. Where it considers those criteria to be satisfied, or where the CPVO so requests, a description of the variety shall be added to the report.

If a report is negative the Examination Office shall set out the detailed reasons for its findings.

The interim and the final reports shall be delivered to the CPVO as soon as possible and no later than on the deadlines as laid down in the designation agreement.

1.3.2 Informing on problems in the DUS test

If problems arise during the course of the test the CPVO should be informed immediately so that the information can be passed on to the applicant. Subject to prior permanent agreement, the applicant may be directly informed at the same time as the CPVO particularly if a visit to the trial is advisable.

1.3.3 Sample keeping in case of problems

If the technical examination has resulted in a negative report, the CPVO shall inform the Examination Office as soon as possible in case that a representative sample of any relevant testing material shall be kept.

2. MATERIAL REQUIRED

2.1 Plant material requirements

Information with respect to the agreed closing dates and submission requirements of plant material for the technical examination of varieties can be found on <http://cpvo.europa.eu/applications-and-examinations/technical-examinations/submission-of-plant-material-s2-publication> in the special issue S2 of the Official Gazette of the Office. General requirements on submission of samples are also to be found following the same link.

2.2 Informing the applicant of plant material requirements

The CPVO informs the applicant that

- he is responsible for ensuring compliance with any customs and plant health requirements.
- the plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.
- 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.

2.3 Informing about problems on the submission of material

The Examination Office shall report to the CPVO immediately in cases where the test material of the candidate variety has not arrived in time or in cases where the material submitted does not fulfil the conditions laid down in the request for material issued by the CPVO.

In cases where the examination office encounters difficulties to obtain plant material of reference varieties the CPVO should be informed.

3. METHOD OF EXAMINATION

3.1 Number of growing cycles

The minimum duration of tests should normally be two independent growing cycles.

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" http://www.upov.int/edocs/tgpdocs/en/tgp_9.pdf.

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.

The optimum stage of development for the assessment of each characteristic is indicated by a number in the third column of the Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.3.

3.4 Test design

Each test should be designed to result in a total of at least 2000 plants, which should be divided between at least two replicates.

The assessment of the characteristic "seasonal type" should be designed to result in a total of at least 500 plants.

If panicle rows are used, the test should be conducted on at least 100 panicle rows.

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 Special tests for additional characteristics

In accordance with Article 23 of Implementing Rules N° 874/2009 an applicant may claim either in the Technical Questionnaire or during the test that a candidate has a characteristic which would be helpful in establishing distinctness. If such a claim is made and is supported by reliable technical data, a special test may be undertaken providing that a technically acceptable test procedure can be devised.

Special tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characters listed in the protocol.

3.6 Constitution and maintenance of a variety collection

The process for the constitution and the maintenance of a variety collection can be summarized as follows:

Step 1: Making an inventory of the varieties of common knowledge

Step 2: Establishing a collection ("variety collection") of varieties of common knowledge which are relevant for the examination of distinctness of candidate varieties

Step 3: Selecting the varieties from the variety collection which need to be included in the growing trial or other tests for the examination of distinctness of a particular candidate variety.

3.6.1 Forms of variety collection

The variety collection shall comprise variety descriptions and living plant material, thus a living reference collection. The variety description shall be produced by the EO unless special cooperation exists between EOs and the CPVO. The descriptive and pictorial information produced by the EO shall be held and maintained in a form of a database.

3.6.2 Living Plant Material

The EO shall collect and maintain living plant material of varieties of the species concerned in the variety collection.

3.6.3 Range of the variety collection

The living variety collection shall cover at least those varieties that are suitable to climatic conditions of a respective EO.

3.6.4 Making an inventory of varieties of common knowledge for inclusion in the variety collection

The inventory shall include varieties protected under National PBR (UPOV contracting parties) and Community PBR, varieties registered in the Common Catalogue, the OECD list, the Conservation variety list and varieties in trade or in commercial registers for those species not covered by a National or the Common Catalogue.

3.6.5 Maintenance and renewal/update of a living variety collection

The EO shall maintain seeds in conditions which will ensure germination and viability, periodical checks, and renewal as required. For the renewal of existing living material the identity of replacement living plant material shall be verified by conducting side-by-side plot comparisons between the material in the collection and the new material.

4. ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY

The prescribed procedure is to assess distinctness, uniformity and stability in a growing trial.

4.1 Distinctness

4.1.1 General recommendations

It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 9 'Examining Distinctness' (http://www.upov.int/edocs/tgpdocs/en/tgp_9.pdf) prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in this Technical Protocol.

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 Technical Protocols are familiar with the recommendations contained in the UPOV-General Introduction to DUS prior to making decisions regarding distinctness.

If distinctness is assessed using the 2 x 1% criterion, the varieties need to be significantly different in the same direction at the 1% level in at least two out of three years in one or more measured characteristics. The tests in each year are based on Student's two-tailed t-test of the differences between variety means with standard errors estimated using the residual mean square from the analysis of the variety x replicate plot means.

If distinctness is assessed by the combined over years distinctness analysis (COYD) the difference between two varieties is clear if the respective characteristics are different at the 1% significance level or less ($p < 0.01$) in a test over either two or three years.

If the significance level or statistical methods proposed are not appropriate the method used should be clearly described.

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 10 plants or parts taken from each of 10 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 1.

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 third 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 this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 10 'Examining Uniformity' (http://www.upov.int/edocs/tgpdocs/en/tgp_10.pdf) prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in this Technical Protocol:

4.2.2 The recommended sample size for the assessment of uniformity is indicated by the following key in the table of characteristics:

{A} sample size of 100 plants / parts of plants / panicle rows
{B} sample size of 2000 plants

For the assessment of uniformity in a sample of 2000 plants, a population standard of 0.1 % and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 2000 plants, 5 off-types are allowed.

For the assessment of uniformity in a sample of 100 panicle-rows, plants or parts of plants, a population standard of 1 % and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 100 panicle-rows, plants or parts of plants, 3 off-types are allowed. A panicle-row is considered to be an off-type panicle-row if there is more than 1 off-type plant within that panicle-row.

For characteristics with the key "A" in the list of characteristics the assessment of uniformity can be done in 2 steps. In a first step, 20 plants or parts of plants are observed. If no off-types are observed, the variety is declared to be uniform. If more than 3 off-types are observed, the variety is declared not to be uniform. If 1 to 3 off-types are observed, an additional sample of 80 plants or parts of plants must be observed.

A re-submission of plant material may be allowed for the second growing cycle if in the first growing cycle the number of off-types did not exceed 15 plants in a sample size of 2000 plants (Population standard of 0.5% with an acceptance probability of $\geq 95\%$) or 9 plants, parts of plants or panicle rows in a sample size of 100 (Population standard of 5% with an acceptance probability of $\geq 95\%$).

4.3 Stability

4.3.1 It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 11 'Examining Stability' (http://www.upov.int/edocs/tgpdocs/en/tgp_11.pdf)

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 ORGANISATION 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 organise the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics.

- a) Seed: colour of lemma (characteristic 1)
- b) Stem: hairiness of uppermost node (characteristic 7)
- c) Glume: glaucosity (characteristic 9)
- d) Grain: husk (characteristic 15)
- e) Seasonal type (characteristic 22)

5.4 If other characteristics than those from the Technical Protocol are used for the selection of varieties to be included into the growing trial, the EO shall inform the CPVO and seek the prior consent of the CPVO before using these characteristics.

5.5 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the UPOV-General Introduction to DUS and document TGP/9 "Examining Distinctness".

6. INTRODUCTION TO THE TABLE OF CHARACTERISTICS

6.1 Characteristics to be used

The characteristics to be used in DUS tests and preparation of descriptions shall be those referred to in the table of characteristics. All the characteristics shall be used, providing that observation of a characteristic is not rendered impossible by the expression of any other characteristic, or the expression of a characteristic is prevented by the environmental conditions under which the test is conducted or by specific legislation on plant health. In the latter case, the CPVO should be informed.

The Administrative Council empowers the President, in accordance with Article 23 of Commission Regulation N°874/2009, to insert additional characteristics and their expressions in respect of a variety.

6.2. States of expression and corresponding notes

In the case of qualitative and pseudo-qualitative characteristics, 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

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

6.3 Example Varieties

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.

6.4 Legend

For column 'CPVO N°':

G	Grouping characteristic	-see Chapter 5
QL	Qualitative characteristic	
QN	Quantitative characteristic	
PQ	Pseudo-qualitative characteristic	
(+)	Explanations for individual characteristics	-see Chapter 8.2

For column 'UPOV N°':

The numbering of the characteristics is provided as a reference to the UPOV guideline.

(*) UPOV Asterisked characteristic: Characteristics that are important for the international harmonization of variety descriptions.

For column 'Stage, method':

MG, MS, VG, VS

-see Chapter 4.1.5

Recommended sample size for the assessment of uniformity

-see Chapter 4.2.2

A sample size of 100 plants/parts of plants/panicle rows

B sample size of 2000 plants

(a) Explanations covering several characteristics

-see Chapter 8.1

00-99 Explanations on growth stages

-see Chapter 8.3

7. TABLE OF CHARACTERISTICS

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples varieties Spring	Examples varieties Winter	Note
1.	1.	00	Seed: colour of lemma			
	(*)	VG/A	white	Harmony	Gerald, RGT Lineout	1
QL		(a)	yellow	Canyon	Mascani, Rhapsody	2
			brown	Everest PZO	Prevision	3
G			black	RGT Iliade	Calvaro	4
2.	2.	25-29	Plant: growth habit			
(+)		VG/B	erect			1
QN			semi-erect	Canyon, Stella Doro		3
			intermediate	Matty	RGT Lineout	5
			semi-prostrate	WPB Elyann		7
			prostrate		Ombrone	9
3.	3.	25-29	Lowest leaves: hairiness of sheaths			
(+)		VG/A	absent or very weak	Harmony	Calvaro	1
QN			medium	Stella Doro	Forridena	2
			strong		RGT Lineout	3
4.	4.	25-60	Leaf blade: hairiness of margins			
(+)	(*)	VG/A	absent or very weak	Harmony	Flavia	1
QN			weak	WPB Elyann	Calvaro	3
			medium	Armani	Black Beauty	5
			strong	Stella Doro	Ombrone	7
			very strong		Charming, RGT Lineout	9

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples varieties Spring	Examples varieties Winter	Note
5.	5.	47-51	Plant: frequency of plants with recurved flag leaves			
(+)		VG/B	absent or very low		Gerald	1
QN			low	Armani	Charming	3
			medium	Apollon	Forridena	5
			high	Matty	Hendon	7
			very high	WPB Elyann		9
6.	6.		Time of panicle emergence			
(+)	(*)	MG/B	very early	Rapidena		1
QN			early	Stella Doro	Prevision	3
			medium	Ivory	Ombrone	5
			late		Forridena	7
			very late	Everest PZO	Gerald	9
7.	7.	60-69	Stem: hairiness of uppermost node			
(+)	(*)	VG/A	absent or very weak	Canyon	Calvaro	1
QN			weak	Anchuela		3
			medium		Flavia	5
			strong		Forridena, Mascani	7
G			very strong	Kankan		9
8.	8.	60-69	Flag leaf: glaucosity of sheath			
		VG/B	absent or weak	Rapidena		1
QN			medium	Lennon	Charming	3
			strong	Ivory	Ombrone	5

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples varieties Spring	Examples varieties Winter	Note			
9.	9.	65-69	Glume: glaucosity						
				(*)	VG/B	absent or very weak	Rapidena		1
				QN		weak	Canyon	Hendon	3
						medium	Harmony	RGT Victorious	5
						strong	Komfort	Black Beauty	7
G			very strong	Odal		9			
10.	10.	70-75	Panicle: attitude of branches						
				(+)	VG/B	erect	M77		1
				QN		semi-erect	RGT Iliade	Calvaro	2
						horizontal	Ivory	Balado	3
						semi-drooping			4
11.	11.	70-75	Glume: length						
					MS/A VG/A	very short			1
				QN		short	Armani	Maestro	3
						medium	Canyon	Calvaro	5
						long	Lennon	Prevision	7
		very long	Rapidena	Ombrone	9				
12.	12.	70-75	Primary grain: glaucosity of lemma						
				(+)	VG/A	absent or very weak	Canyon	RGT Lineout	1
				QN	(a)	weak	Armani, Ringsaker		3
						medium	Harmony, Riina		5
						strong	Gabby, Odal		7
		very strong			9				

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples varieties Spring	Examples varieties Winter	Note
13.	13.	80-85	Plant: length			
(+)	(*)	MG/B	very short		Balado, Hendon	1
QN			short	Kurt, Rapidena		3
			medium	Armani	Mascani	5
			long	Canyon		7
			very long		Forridena	9
14.	14.	80-85	Panicle: length			
	(*)	MS/B VG/B	very short			1
QN			short	Kurt	Calvaro	3
			medium	Harmony	Balado	5
			long	Canyon	RGT Victorious	7
			very long		Forridena	9
15.	15.	80-92	Grain: husk			
	(*)	VG/B	absent	Lennon	Hendon	1
QL G			present	Canyon	Calvaro	9
16.	16.	80-92	<u>Only for varieties with Seed: color of lemma: brown or black: Primary grain: hairiness of back of lemma</u>			
(+)		VG/A	absent	RGT Iliade	Calvaro	1
QL		(a)	present	Rapidena	Black Beauty	9
17.	17.	80-92	Primary grain: hairiness of base			
(+)		VG/A	absent or weak	Canyon	Rhapsody	1
QN		(a)	medium	Matty, Stella Doro		3
			strong	Agent	Ombrone, Prevision	5

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples varieties Spring	Examples varieties Winter	Note
18.	18.	80-92	Primary grain: length of basal hairs			
(+)		VG/A	short			1
QN		(a)	medium	Harmony	Black Beauty	3
			long	Everest PZO	Prevision	5
19.	19.	80-92	Primary grain: frequency of awns			
(+)		VG/B	absent or low	Ivory	Calvaro, Rhapsody	1
QN		(a)	medium	Ringsaker	Balado,RGT Lineout	3
			high	Charming	Ombrone	5
20.	20.	92	Primary grain: length of lemma			
		MG/A MS/A	very short	Everest PZO		1
QN		(a)	short	Ringsaker	RGT Victorious	3
			medium	Canyon	RGT Lineout	5
			long	Ivory	Rhapsody	7
			very long	Harmony	Ombrone	9
21.	21.	92	Primary grain: length of rachilla			
(+)		VG/A	short	Armani	Prevision	1
QN		(a)	medium	Canyon	RGT Lineout	3
			long		Forridena	5
22.	22.		Seasonal type			
(+)	(*)	VG	winter type		Balado,RGT Lineout	1
PQ			alternative type		Forridena	2
G			spring type	Harmony, Stella Doro		3

EXPLANATIONS ON THE TABLE OF CHARACTERISTICS

8.1 Explanations covering several characteristics

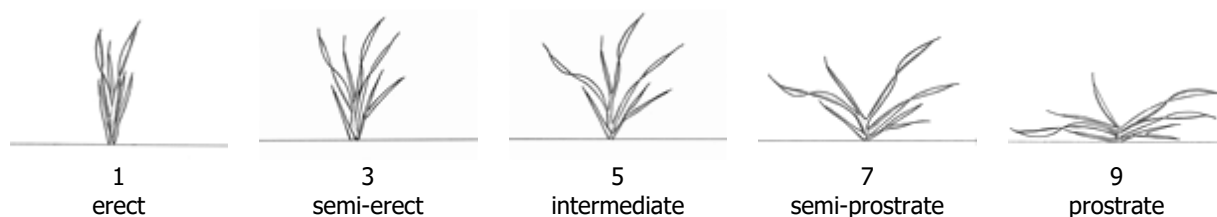
Characteristics containing the following key in the third column of the Table of Characteristics should be examined as indicated below:

- a) Characteristics which could be observed on *Avena sativa* L. only.

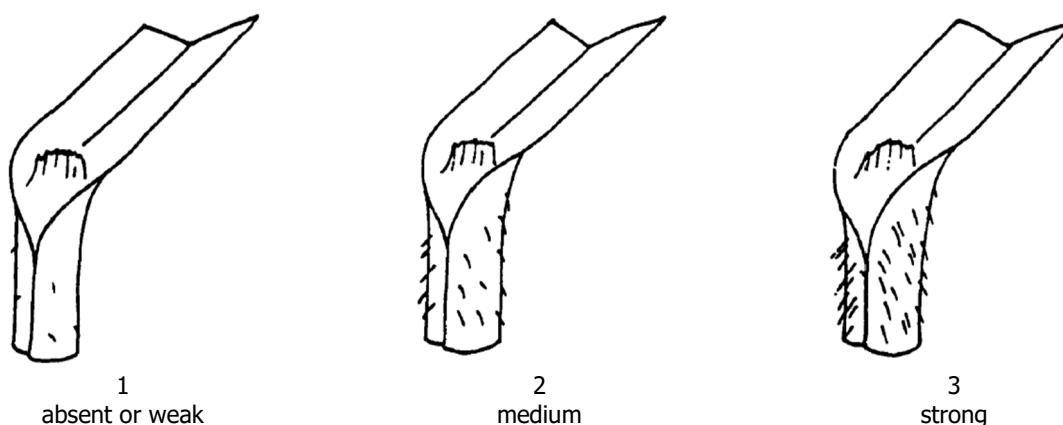
8.2 Explanations for individual characteristics

Ad. 2: Plant: growth habit

The growth habit should be assessed visually from the attitude of the leaves and tillers. The angle formed by the outer leaves and the tillers with an imaginary vertical axis should be used.

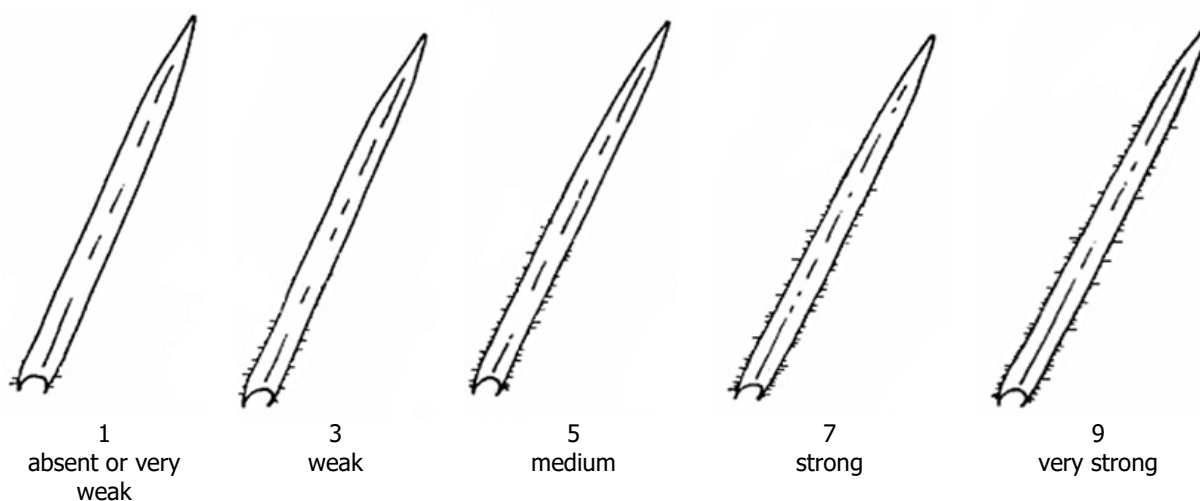


Ad. 3: Lowest leaves: hairiness of sheaths



Ad. 4: Leaf blade: hairiness of margins

To be recorded on the leaf where the strongest expression is observed.



Ad. 5: Plant: frequency of plants with recurved flag leaves

1 (absent or very low): all or almost all flag leaves are rectilinear

3 (low): about 1/4 of the plants with recurved flag leaves

5 (medium): about 1/2 of the plants with recurved flag leaves

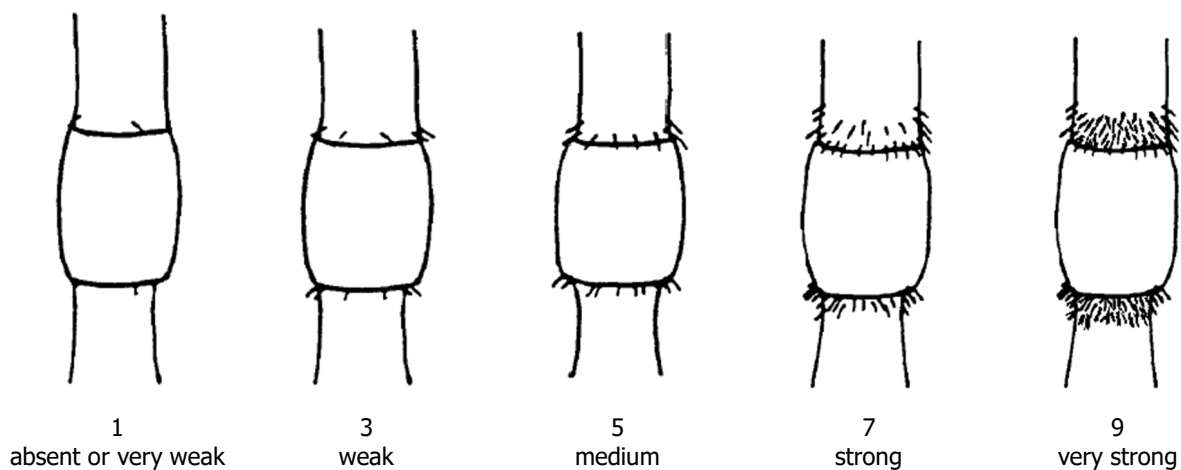
7 (high): about 3/4 of the plants with recurved flag leaves

9 (very high): almost all or all flag leaves are recurved

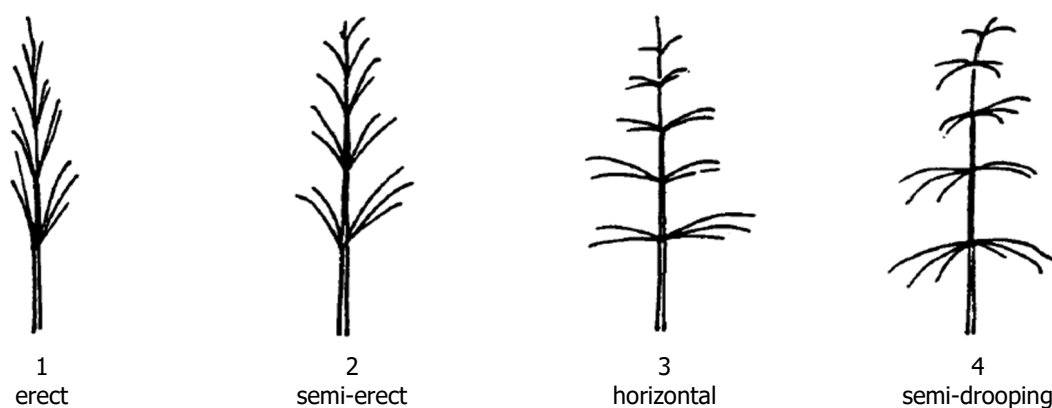
Ad. 6: Time of panicle emergence

Time of panicle emergence is reached when the first spikelet is visible on 50% of panicles.

Ad. 7: Stem: hairiness of uppermost node



Ad. 10: Panicle: attitude of branches



Ad. 12: Primary grain: glaucosity of lemma

Observation should reflect intensity and area of glaucosity.

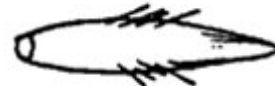
Ad. 13: Plant: length

Plant length includes stem, panicle and awns (if present).

Ad. 16: Only for varieties with Seed: colour of lemma: brown or black: Primary grain: hairiness of back of lemma



1
absent



9
present

Ad. 17: Primary grain: hairiness of base



1
absent or weak



3
medium



5
strong

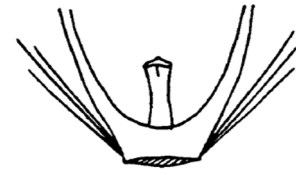
Ad. 18: Primary grain: length of basal hairs



1
short



3
medium



5
long

Ad. 19: Primary grain: frequency of awns

The mean number of awned grains in the panicle should be observed.

Ad. 21: Primary grain: length of rachilla



1
short



3
medium



5
long

Ad. 22: Seasonal type

The seasonal type (need of vernalization) should be assessed on plots sown in springtime. Example varieties should always be included in the trial. When the example varieties behave according to its description, candidate varieties can be described. At the time when the latest spring type variety is fully mature (stage 91/92 of the Zadoks decimal code) growth stage reached by the respective variety should be assessed. The states of expression are defined as follows:

Winter type (high need of vernalization): the plants have reached stage 45 of the Zadoks decimal code (boots swollen) at maximum.

Alternative type (partial need of vernalization): the plants have exceeded stage 45 of the Zadoks decimal code (as a rule they have exceeded stage 75) and have reached stage 90 at maximum.

Spring type (no need or very weak need of vernalization): the plants have exceeded stage 90 of the Zadoks decimal code.

Seasonal type is not related to winter hardiness. Spring type varieties have no need for vernalization but may have winter hardiness.

8.3 Explanations on growth stages

The descriptions of the growth stages of the Zadoks decimal code for cereals (ZADOKS et al., 1974)

Zadoks Decimal code	Description	Zadoks Decimal code	Description
	<u>Germination</u>		<u>Booting</u>
00	Dry seed	41	Flag leaf sheath extending
01	Start of imbibition	43	Boots just visibly swollen
03	Imbibition complete	45	Boots swollen
05	Radicle emerged from seed	47	Flag leaf sheath opening
07	Coleoptile emerged from seed	49	First awns visible
09	Leaf just at coleoptile tip		<u>Inflorescence emergence</u>
	<u>Seedling growth</u>	50	First spikelet of inflorescence visible
10	First leaf through coleoptile	53	1/4 of inflorescence emerged
11	First leaf unfolded	55	1/2 of inflorescence emerged
12	2 leaves unfolded	57	3/4 of inflorescence emerged
13	3 leaves unfolded	59	Emergence of inflorescence completed
14	4 leaves unfolded		<u>Anthesis</u>
15	5 leaves unfolded	60	Beginning on anthesis
16	6 leaves unfolded	65	Anthesis half-way
17	7 leaves unfolded	69	Anthesis completed
18	8 leaves unfolded		<u>Milk development</u>
19	9 or more leaves unfolded	71	Caryopses watery ripe
	<u>Tillering</u>	73	Early milk
20	Main shoot only	75	Medium milk
21	Main shoot and 1 tiller	77	Late milk
22	Main shoot and 2 tillers		<u>Dough development</u>
23	Main shoot and 3 tillers	83	Early dough
24	Main shoot and 4 tillers	85	Soft dough
25	Main shoot and 5 tillers	87	Hard dough
26	Main shoot and 6 tillers		<u>Ripening</u>
27	Main shoot and 7 tillers	91	Caryopses hard (difficult to divide with thumbnail)
28	Main shoot and 8 tillers	92	Caryopses hard (can no longer be dented with thumbnail)
29	Main shoot and 9 or more tillers	93	Caryopses loosening in daytime
	<u>Stem elongation</u>	94	Overripe, straw dead and collapsing
30	Pseudo stem erection	95	Seed dormant
31	1st node detectable	96	Viable seed giving 50% germination
32	2nd node detectable	97	Seed not dormant
33	3rd node detectable	98	Secondary dormancy induced
34	4th node detectable	99	Secondary dormancy lost
35	5th node detectable		
36	6th node detectable		
37	Flag leaf just visible		
39	Flag leaf ligule/collar just visible		

9. LITERATURE

Zadoks, J. C., Chang, T. T. and Konzak, C. F., 1974: A decimal code for the growth stages of cereals. *Weed Research*, 14: pp. 415–421

10. TECHNICAL QUESTIONNAIRE

The Technical Questionnaire is available on the CPVO website under the following reference:
CPVO-TQ/020/3