



PROTOCOL FOR TESTS ON DISTINCTNESS, UNIFORMITY AND STABILITY

Panicum miliaceum L.

COMMON MILLET

UPOV Code: PANIC_MIL

Adopted on 11/04/2024

Entry into force on 01/04/2024

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CPVO-TP/248/1

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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 *Panicum miliaceum* 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/248/1 dated 28/03/2007 (<https://www.upov.int/edocs/tgdocs/en/tg248.pdf>) for the conduct of tests for Distinctness, Uniformity and Stability.

1.2 Entry into Force

The present protocol enters into force on **01.04.2024**. 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 growing cycle.

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 four weeks after the date of the request for technical examination by the CPVO and in any case preferably before the submission period of the plant material.

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

In cases where the Examination Office identifies issues during the course of the technical examination that may lead to a negative report, the Examination Office shall inform the CPVO and in urgent cases the applicant/holder as soon as such issues become obvious.

1.3.3 Sample keeping in case of problems

As far as feasible the Examination Office shall keep a representative sample of any relevant testing material of the candidate variety and reference variety(ies) if the technical examination has resulted in a negative report. As soon as possible, the CPVO shall inform the Examination Office when the material can be destroyed.

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 <https://public.plantvarieties.eu/publication> in the special issue S2/S3 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 vigour, 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 submission of plant 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 in writing.

3. METHOD OF EXAMINATION

3.1 Number of growing cycles

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

The testing of a variety may be concluded when the entrusted examination office 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" http://www.upov.int/edocs/tqpdocs/en/tqp_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 1000 plants, which should be divided between at least 2 replicates.

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 characteristics 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 variety collection shall cover at least those common knowledge varieties that are suitable to grow in the 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 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.

The inventory shall take into account the list of varieties which are the subject of an on-going application for protection or official registration (candidate varieties).

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.

Living material in variety collections representing varieties for which a DUS test was carried out at that EO shall be renewed after verification in a side-by-side comparison. In case where no living material is available anymore in the collection, such verification could be done with any other test that has proven to give similar results 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.

4.1.3.1 If distinctness is assessed using the 2 x 1% criterion, the difference between two varieties is clear if the respective characteristics are significantly different in the same direction at the 1% level in at least two out of three years. 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.

4.1.3.2 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 prescribed 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 20 plants or parts taken from each of 20 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. colour 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 Uniformity is assessed by visual observation and the detection of off-types.

4.2.3 For the assessment of uniformity in a sample of 1000 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 1000 plants, 3 off-types are allowed.

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 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) Time of panicle emergence (characteristic 1)
- b) Panicle: angle of branches (characteristic 7)
- c) Glume: anthocyanin coloration (characteristic 15)
- d) Plant: natural height (characteristic 20)
- e) Grain: colour (characteristic 23)

- 5.4 If characteristics other than those mentioned in the list of grouping characteristics and/or from the table of characteristics and/or from the Technical Questionnaire – sections 5 and 7. 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

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. All relevant states of expression are presented in the characteristic.

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 |
| (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 | Note |
|---------------|---------------|---------------|-------------------------------------|-------------------------------------|------|
| 1. (+) | 9. (*) | | Time of panicle emergence | | |
| QN | | MG | very early | Omske 9 | 1 |
| | | | very early to early | | 2 |
| | | | early | Kyivske 96 | 3 |
| | | | early to medium | | 4 |
| | | | medium | GL Rebecca, GL Ronja, Kharkivske 56 | 5 |
| | | | medium to late | | 6 |
| | | | late | Kharkivske kormove | 7 |
| | | | late to very late | | 8 |
| G | | | very late | Illichovske | 9 |
| 2. (+) | 1. | 56-59 | Flag leaf: attitude of blade | | |
| PQ | | VG | erect | Saratovske 8 | 1 |
| | | | erect to semi-erect | | 2 |
| | | | semi-erect | Kyivske 87, Veselopodilske 16 | 3 |
| | | | semi-erect to horizontal | | 4 |
| | | | horizontal | Kyivske 96, Myronivske 51 | 5 |
| | | | horizontal to semi-drooping | | 6 |
| | | | semi-drooping | Voronizke 899 | 7 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|-----------|------------|---------------|---|------------------------------|------|
| 3. | 3. | 56-59 | Flag leaf: intensity of anthocyanin coloration | | |
| QN | (*) | VG | absent or very weak | | 1 |
| | | | very weak to weak | | 2 |
| | | | weak | Lilove, Veselopodolyanske 30 | 3 |
| | | | weak to medium | | 4 |
| | | | medium | Veselopodolyanske 403 | 5 |
| | | | medium to strong | | 6 |
| | | | strong | Irtyshe 201 | 7 |
| | | | strong to very strong | | 8 |
| | | | very strong | | 9 |
| 4. | 4. | 56-59 | Flag leaf: length | | |
| QN | | MS | very short | | 1 |
| | | | very short to short | | 2 |
| | | | short | Charivne, Veselopodilske 16 | 3 |
| | | | short to medium | | 4 |
| | | | medium | Kyivske 87, Myronivske 51 | 5 |
| | | | medium to long | | 6 |
| | | | long | Kharkivske 71 | 7 |
| | | | long to very long | | 8 |
| | | | very long | | 9 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|--------------------------------------|--------------------------|---------------------------|-----------------------------------|--|------|
| 5. QN | 5. | 56-59 MS | Flag leaf: width | | |
| | | | very narrow | | 1 |
| | | | very narrow to narrow | | 2 |
| | | | narrow | Kharkivske 10, Omske 9 | 3 |
| | | | narrow to medium | | 4 |
| | | | medium | Novo Kyivske 01, Veselopodolyanske 16 | 5 |
| | | | medium to broad | | 6 |
| | | | broad | Kharkivske 86, Omriyane | 7 |
| | | | broad to very broad | | 8 |
| | | | very broad | | 9 |
| 6. QL | 22. | 60-65 VG | Stigma: colour | | |
| | | | light pink | Kharkivske 31, Kyivske 96 | 1 |
| | | | violet | GL Rubin, Lilove | 2 |
| 7. (+) QN | 11. (*) | 65-69 VG | Panicle: angle of branches | | |
| | | | very acute | Pikulovytske | 1 |
| | | | moderately acute | GL Rebecca, GL Ronja | 2 |
| | | | right angle | Chornomorske, GL Rubin | 3 |
| | | | moderately obtuse | Kyivske 87, Veselopodilske 16 | 4 |
| G | | | very obtuse | Omske 9 | 5 |
| 8. (+) PQ | 12. (*) | 65-69 VG | Panicle: attitude | | |
| | | | erect | Omske 9 | 1 |
| | | | semi-erect | Charivne, Veselopodolyanske 305-54 | 2 |
| | | | moderately drooping | GL Rebecca, GL Ronja, Kyivske 96 | 3 |
| | | | strongly drooping | Kharkivske 57 | 4 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|-------------------------------------|------------|-------------------------------|---|---|------|
| 9. (+) QN | 13. | 65-69 MS | Panicle: length (excluding peduncle) | | |
| | | | very short | Pikulovytske | 1 |
| | | | very short to short | | 2 |
| | | | short | Charivne | 3 |
| | | | short to medium | | 4 |
| | | | medium | Kyivske 96 | 5 |
| | | | medium to long | | 6 |
| | | | long | Myronivske 94, Novokyivske 01 | 7 |
| | | | long to very long | | 8 |
| | | very long | Kyivske 87, Veselopodolyanske 176 | 9 | |
| 10. (+) QN | 14. | 65-69 MS | Panicle: width | | |
| | | | very narrow | | 1 |
| | | | very narrow to narrow | | 2 |
| | | | narrow | Kharkivske 57, Novokyivske 01 | 3 |
| | | | narrow to medium | | 4 |
| | | | medium | Myronivske 94, Slobozhanske | 5 |
| | | | medium to broad | | 6 |
| | | | broad | Kyivske 87, Veselopodolyanske 305-54 | 7 |
| | | | broad to very broad | | 8 |
| | | very broad | | 9 | |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note | | |
|--------------------|--------------------|---------------|---|-----------|-----------------------|------------------------------|---|
| 11. (+) | 15. (*) | 65-69 | Panicle: density | | | | |
| | | | QN | VG | very lax | 1 | |
| | | | | | very lax to lax | 2 | |
| | | | | | lax | Myronivske 51 | 3 |
| | | | | | lax to medium | | 4 |
| | | | | | medium | Charivne | 5 |
| | | | | | medium to dense | | 6 |
| | | | | | dense | Pikulovytske | 7 |
| | | | | | dense to very dense | | 8 |
| | | very dense | | 9 | | | |
| 12. (+) | 16. | 65-69 | Panicle: degree of curvature of lateral branches | | | | |
| | | | QN | VG | absent or very weak | Charivne | 1 |
| | | | | | very weak to weak | | 2 |
| | | | | | weak | Raduha, Kharkivske 71 | 3 |
| | | | | | weak to medium | | 4 |
| | | | | | medium | Novokyivske 01, Slobozhanske | 5 |
| | | | | | medium to strong | | 6 |
| | | | | | strong | Kharkivske 31, Myronivske 51 | 7 |
| | | | | | strong to very strong | | 8 |
| | | very strong | Veselopodolyanske 3 | 9 | | | |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|---|------------|-------------------------------|--|-------------------------------------|------|
| 13. (+) QN | 17. | 65-69 VG | Panicle: number of pillows | | |
| | | | none or very few | Charivne, Omriyane | 1 |
| | | | very few to few | | 2 |
| | | | few | Myronivske 51, Novokyivske 01 | 3 |
| | | | few to medium | | 4 |
| | | | medium | Sredneruske | 5 |
| | | | medium to many | | 6 |
| | | | many | Imunne 366, Zoryane | 7 |
| | | | many to very many | | 8 |
| | | very many | Syayvo, Veselopodolyanske 632 | 9 | |
| 14. (+) QN | 18. | 65-69 VG | Panicle: length of primary branches | | |
| | | | very short | Pikulovytske | 1 |
| | | | very short to short | | 2 |
| | | | short | Charivne, Kharkivske 8 | 3 |
| | | | short to medium | | 4 |
| | | | medium | Myronivske 51, Veselopodilske 16 | 5 |
| | | | medium to long | | 6 |
| | | | long | Slobozhanske, Veselopodolyanske 176 | 7 |
| | | | long to very long | | 8 |
| | | very long | Voronizhske 884 | 9 | |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|------------|----------------|---------------|--------------------------------------|---|------|
| 15. | 21. (*) | 70-85 | Glume: anthocyanin coloration | | |
| QN | | VG | absent or very weak | GL Rebecca, GL Ronja, Myronivske 51 | 1 |
| | | | very weak to weak | | 2 |
| | | | weak | Veselopodolyanske 403 | 3 |
| | | | weak to medium | | 4 |
| | | | medium | GL Rubin, Podolyanske 24/273 | 5 |
| | | | medium to strong | | 6 |
| | | | strong | Lilove | 7 |
| | | | strong to very strong | | 8 |
| G | | | very strong | | 9 |
| 16. | 6. | 70-79 | Stem: number of nodes | | |
| QN | | MS | very few | Omske 9 | 1 |
| | | | very few to few | | 2 |
| | | | few | Kyivske 96, Myronivske 5 | 3 |
| | | | few to medium | | 4 |
| | | | medium | Kharkivske 86, Novo Kyivske 01, Veselopodilske 16 | 5 |
| | | | medium to many | | 6 |
| | | | many | Kharkivske kormove | 7 |
| | | | many to very many | | 8 |
| | | | very many | | 9 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note | |
|---|--------------------------|----------------------------------|--|---|------|--|
| 17. (+) QN | 7. (*) | 70-79 VG/MS | Stem: length of upper internode | | | |
| | | | very short | | 1 | |
| | | | very short to short | | 2 | |
| | | | short | Veselopodolyanske 53 | 3 | |
| | | | short to medium | | 4 | |
| | | | medium | Myronivske 51, Novo Kyivske 01, Slobozhanske | 5 | |
| | | | medium to long | | 6 | |
| | | | long | Charivne, Kharkivske 7 | 7 | |
| | | | long to very long | | 8 | |
| | | very long | | 9 | | |
| 18. (+) QN | 8. | 70-79 VG/MS | Stem: thickness of internode | | | |
| | | | very thin | | 1 | |
| | | | very thin to thin | | 2 | |
| | | | thin | Omske | 3 | |
| | | | thin to medium | | 4 | |
| | | | medium | Veselopodolyanske 63 | 5 | |
| | | | medium to thick | | 6 | |
| | | | thick | Myronivske 94, Veselopodilske 16 | 7 | |
| | | | thick to very thick | | 8 | |
| | | very thick | | 9 | | |
| 19. (+) QN | 19. (*) | 81-92 VG | Spikelet: shape | | | |
| | | | narrow elliptic | Sonyachne | 1 | |
| | | | broad elliptic | GL Rebecca, GL Ronja, GL Rubin, Lilove, Veselopodolyanske 176 | 2 | |
| | | circular | Charivne | 3 | | |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|---|--------------------------|----------------------------------|---|---|------|
| 20. (+) QN | 10. (*) | 81-92 MG | Plant: natural height | | |
| | | | very short | | 1 |
| | | | very short to short | | 2 |
| | | | short | Karlik 305, Orlovskiy karlik | 3 |
| | | | short to medium | | 4 |
| | | | medium | Kharkivske 86, Kyivske 96 | 5 |
| | | | medium to long | | 6 |
| | | | long | Kharkivske 57, Veselopodilske 16 | 7 |
| | | | long to very long | | 8 |
| G | | very long | | 9 | |
| 21. (+) QN | 23. (*) | 90-92 MS/VG | Grain: size | | |
| | | | very small | | 1 |
| | | | very small to small | | 2 |
| | | | small | Omske 9 | 3 |
| | | | small to medium | | 4 |
| | | | medium | Myronivske 51, Syayvo | 5 |
| | | | medium to large | | 6 |
| | | | large | Kyivske 96, Veselopodolyanske 176 | 7 |
| | | | large to very large | | 8 |
| very large | Horlinka | 9 | | | |
| 22. (+) QN | 24. (*) | 90-92 VG | Grain: shape | | |
| | | | narrow elliptic | Kostiantynivske | 1 |
| | | | broad elliptic | Kyivske 87, Kyivske 96, Myronivske 51, Myronivske 94 | 2 |
| | | circular | Charivne, Novokyivske, Veselopodolyanske 63201 | 3 | |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|------------|--------------------|---------------|------------------------------------|-------------------------------|------|
| 23. | 25. (*) | 90-92 | Grain: colour | | |
| PQ | | VG | white | Tonkoplivchaste 048 | 1 |
| | | | whitish | Novokyivske 01 | 2 |
| | | | light yellow | Veselopodolyanske 38 | 3 |
| | | | medium yellow | Myronivske 51 | 4 |
| | | | dark yellow | Saratovske | 5 |
| | | | golden | Zolotyste | 6 |
| | | | light red | Tavriyske | 7 |
| | | | medium red | Lilove | 8 |
| | | | dark red | Veselopodolyanske 305-54 | 9 |
| | | | red brown | Chornosimyanne 1 | 10 |
| | | | brown | Amurske mistseve | 11 |
| G | | | black | Hexiaoyingmizi | 12 |
| 24. | 26. | 90-92 | Grain: presence of spotting | | |
| QL | | VG | absent | Denkivske, Lana | 1 |
| | | | present | Charivne | 9 |
| 25. | 28. (*) | 90-92 | Weight per 1000 grains | | |
| QN | | MG | very low | Tonkoplivchaste 048 | 1 |
| | | | very low to low | | 2 |
| | | | low | Ostrohovske 9 | 3 |
| | | | low to medium | | 4 |
| | | | medium | Sonyachne | 5 |
| | | | medium to high | | 6 |
| | | | high | Kharkivske 86, Myronivske 51 | 7 |
| | | | high to very high | | 8 |
| | | | very high | Kyivske 96, Veselopodilske 16 | 9 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note | | |
|--------------------------|--------------------------|----------------------|---|-----------------|---------------------|-----------------------|---|
| 26. | 29. (*) | 90-92 | Kernel (not polished): colour | | | | |
| | | | QN | VG | whitish | Veselopodolyanske 176 | 1 |
| | | | | (a) | light yellow | Kyivske 96 | 2 |
| | | | | | medium yellow | Omriyane | 3 |
| 27. (+) | 30. | 92 | Kernel: intensity of brown colour of hilum | | | | |
| | | | QN | VG | very light | | 1 |
| | | | | (a) | very light to light | | 2 |
| | | | | | light | Sonyachne | 3 |
| | | | | | light to medium | | 4 |
| | | | | | medium | Myronivske 51 | 5 |
| | | | | | medium to dark | | 6 |
| | | | | | dark | Novokyivske 01 | 7 |
| | | | | | dark to very dark | | 8 |
| | | | | | very dark | | 9 |
| 28. (+) | 31. | 92 | Kernel: type of endosperm | | | | |
| | | | QL | VG | waxy | | 1 |
| | | | | (a) | non waxy | | 2 |

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:

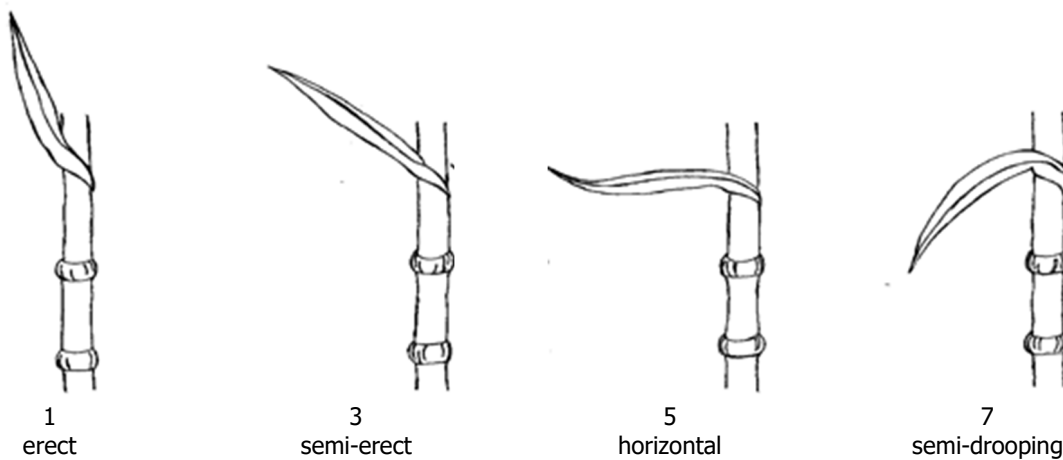
- a) To be observed on dehusked grain without polishing.

8.2 Explanations for individual characteristics

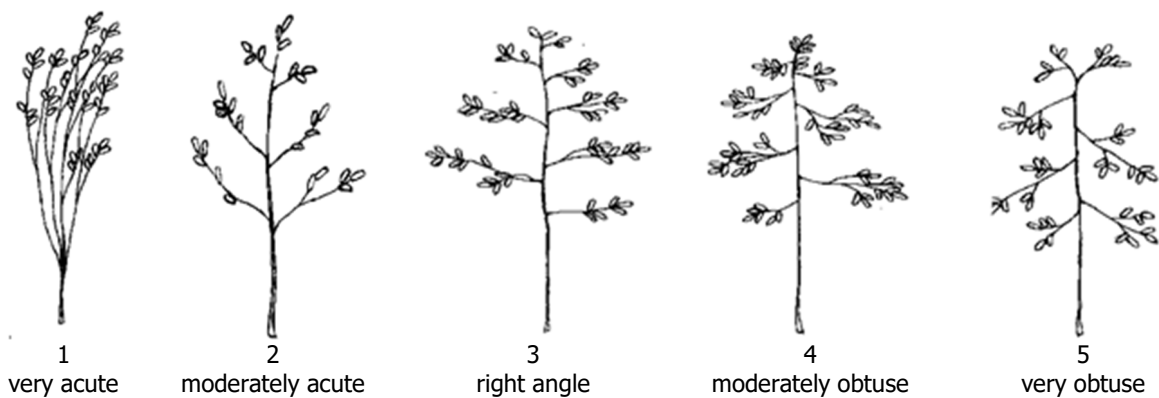
Ad. 1: Time of panicle emergence

The time of panicle emergence is when the first spikelet is visible in 50% of the plants.

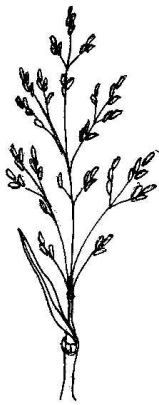
Ad. 2: Flag leaf: attitude of blade



Ad. 7: Panicle: angle of branches



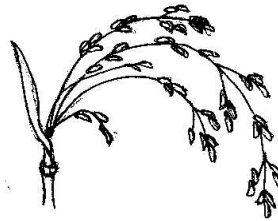
Ad. 8: Panicle: attitude



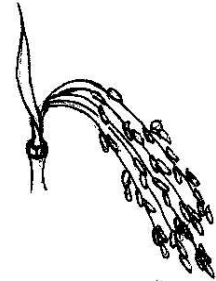
1
erect



2
semi-erect



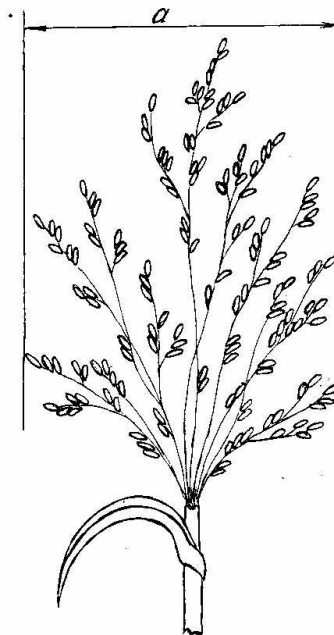
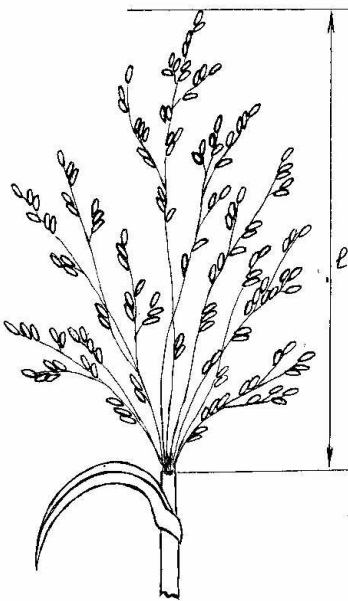
3
moderately drooping



4
strongly drooping

Ad. 9: Panicle: length (excluding peduncle)

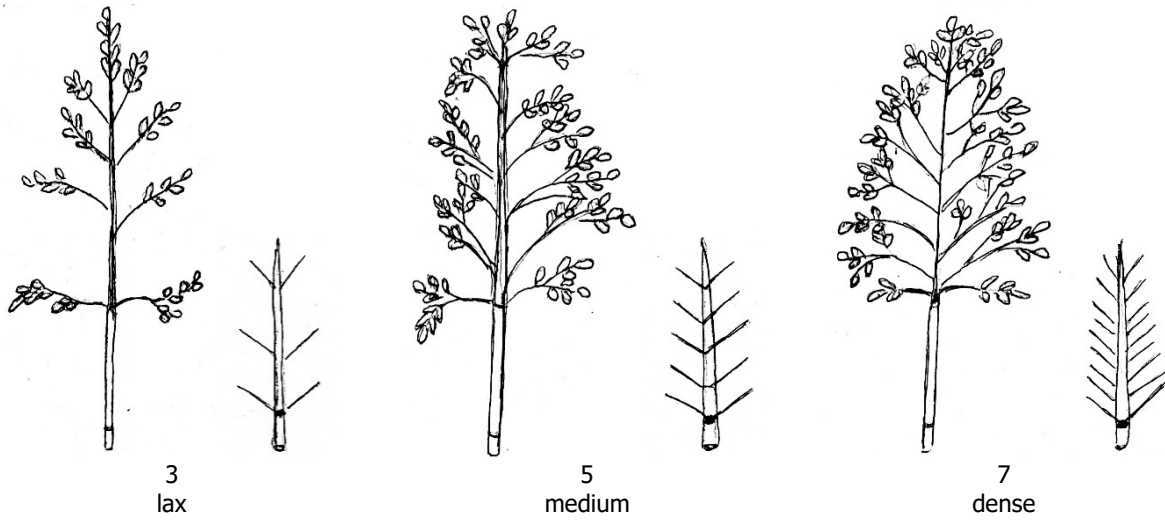
Ad. 10: Panicle: width



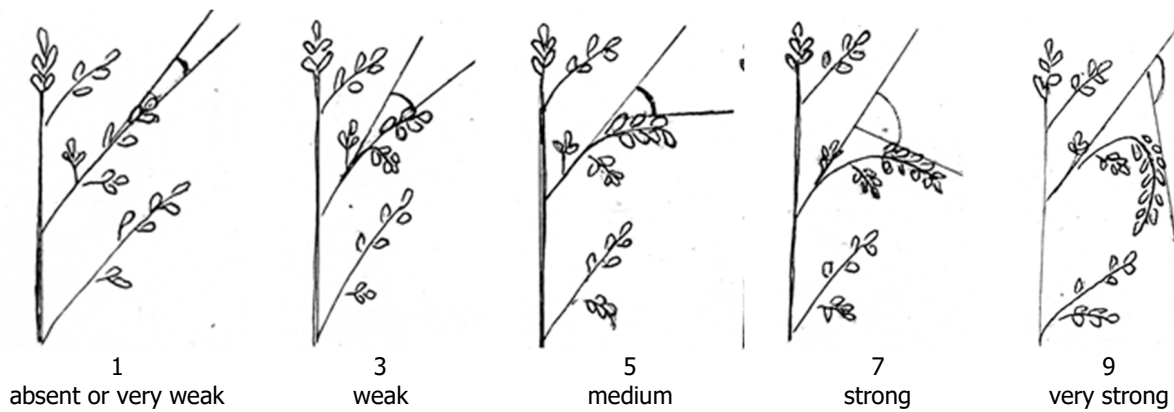
To be observed on 20 harvested panicles on a table.

Ad. 11: Panicle: density

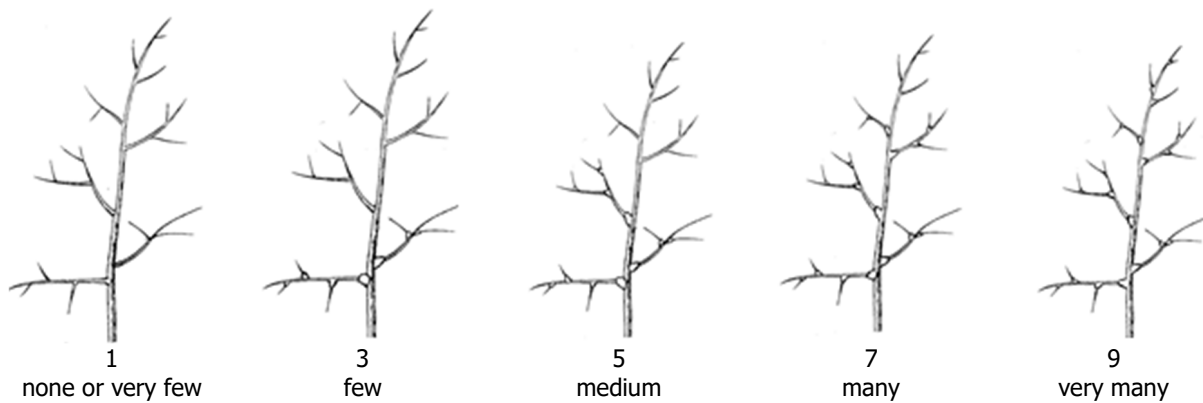
The density of the panicle is determined by the division of the number of primary branches into the length of a principal axis of panicle.



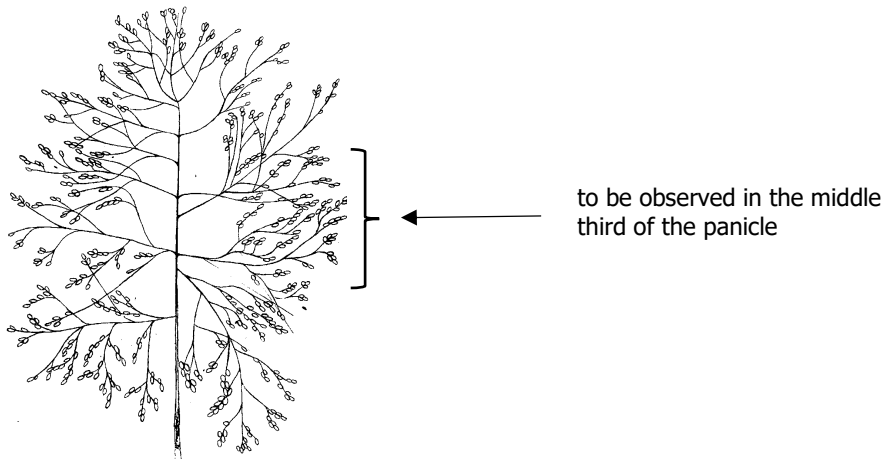
Ad. 12: Panicle: degree of curvature of lateral branches



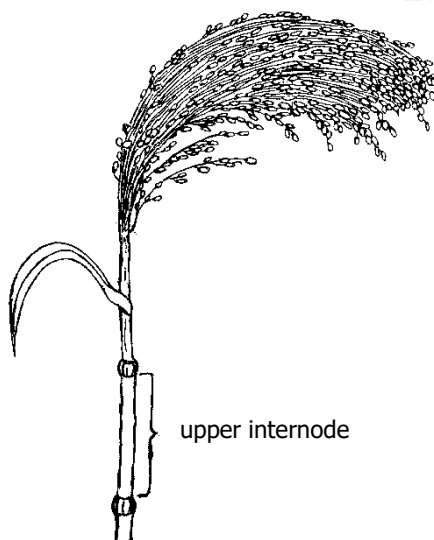
Ad. 13: Panicle: number of pillows



Ad. 14: Panicle: length of primary branches

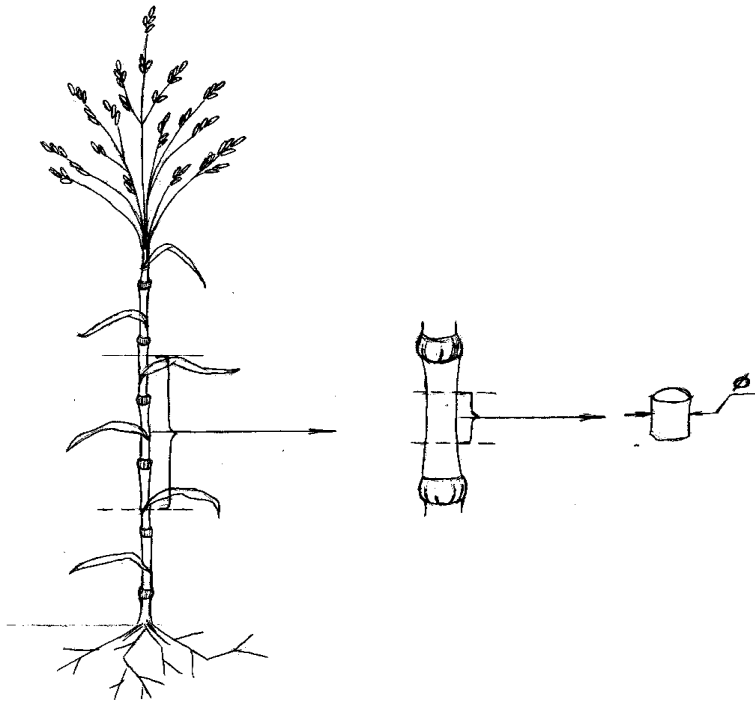


Ad. 17: Stem: length of upper internode

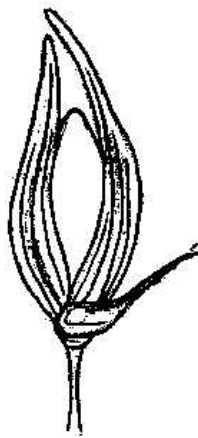


Ad. 18: Stem: thickness of internode

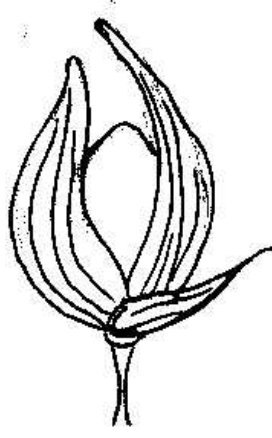
To be observed on the middle third of the plant.



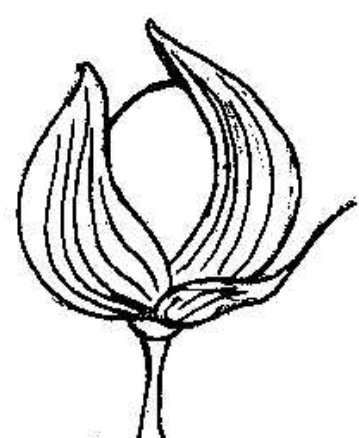
Ad. 19: Spikelet: shape



1
narrow elliptic

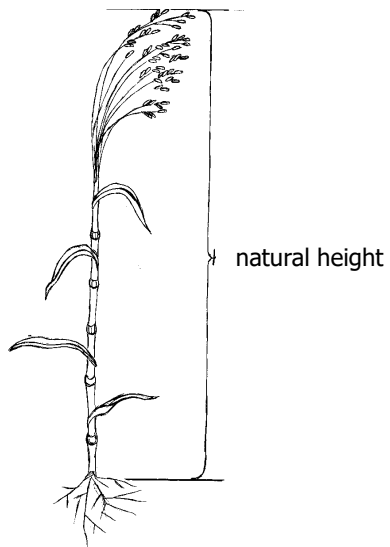


2
broad elliptic



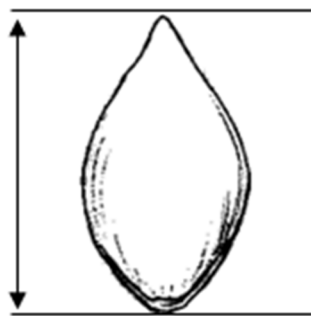
3
circular

Ad. 20: Plant: natural height



Ad. 21: Grain: size

The grain size should be assessed by its length.



Ad. 22: Grain: shape



1
narrow elliptic

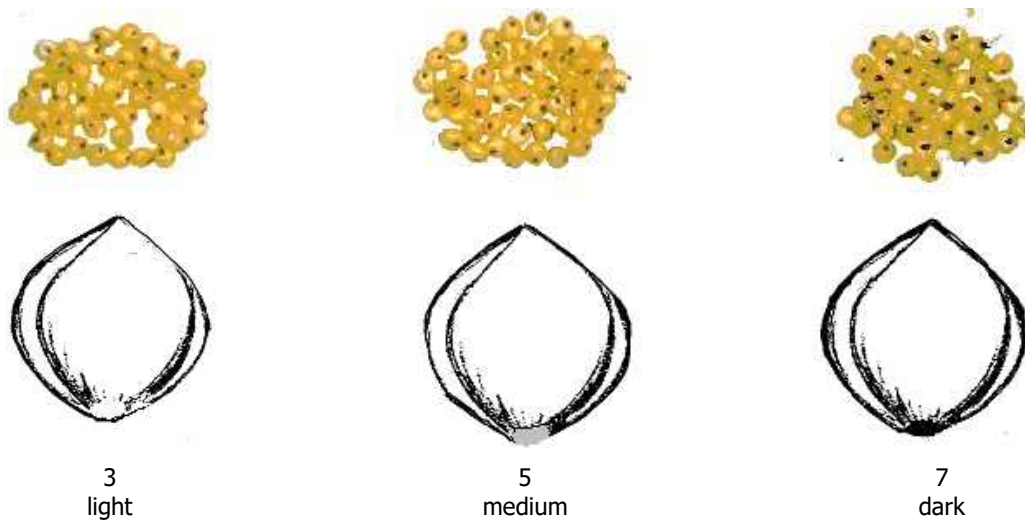


2
broad elliptic



3
circular

Ad. 27: Kernel: intensity of brown colour of hilum



Ad. 28: Kernel: type of endosperm

The characteristic is observed by reaction to Potassium Iodide solution: waxy type endosperm is stained reddish purple; non-waxy type endosperm is stained blue purple.

8.3 Explanations on growth stages

Decimal Code for the Growth Stages of Cereals

| 2-digit Code (Zadoks Scale) | General Description | Feekes Scale |
|--------------------------------|-----------------------------------|--------------|
| 1 | 2 | |
| Germination | | |
| 00 | Dry seed | |
| 01 | Start of imbibition | |
| 02 | | |
| 03 | Imbibition complete | |
| 04 | | |
| 05 | Radicle emerged from caryopsis | |
| 06 | | |
| 07 | Coleoptile emerged from caryopsis | |
| 08 | | |
| 09 | Leaf just at coleoptile tip | |
| Seedling growth | | |
| 10 | First leaf through coleoptile | 1 |
| 11 | First leaf unfolded | 1 |
| 12 | 2 leaves unfolded | |
| 13 | 3 leaves unfolded | |
| 14 | 4 leaves unfolded | |
| 15 | 5 leaves unfolded | |
| 16 | 6 leaves unfolded | |
| 17 | 7 leaves unfolded | |
| 18 | 8 leaves unfolded | |
| 19 | 9 or more leaves unfolded | |
| Tillering | | |
| 20 | Main shoot only | |
| 21 | Main shoot and 1 tiller | |
| 22 | Main shoot and 2 tillers | |
| 23 | Main shoot and 3 tillers | 3 |
| 24 | Main shoot and 4 tillers | 3 |
| 25 | Main shoot and 5 tillers | 3 |
| 26 | Main shoot and 6 tillers | 3 |
| 27 | Main shoot and 7 tillers | 3 |
| 28 | Main shoot and 8 tillers | 3 |
| 29 | Main shoot and 9 or more tillers | |
| Stem elongation | | |
| 30 | Pseudo stem erection (2) | 4-5 |
| 31 | 1st node detectable | 6 |
| 32 | 2nd node detectable | 7 |
| 33 | 3rd node detectable | |
| 34 | 4th node detectable | |
| 35 | 5th node detectable | |
| 36 | 6th node detectable | |
| 37 | Flag leaf just visible | 8 |
| 38 | | |
| 39 | Flag leaf/collar just visible | 9 |

| 2-digit Code (Zadoks Scale) | General Description | Feekes Scale |
|--------------------------------|--|--------------|
| Booting | | |
| 40 | | |
| 41 | Flag leaf sheath extending | |
| 42 | | |
| 43 | Boots just visible swollen | 10 |
| 44 | | 10 |
| 45 | Boots swollen | 10 |
| 46 | | |
| 47 | Flag leaf sheath | 10.1 |
| 48 | | -/- |
| 49 | First awns visible | -/- |
| Inflorescence emergence | | |
| 50 | First spikelet of inflorescence just visible | -/- |
| 51 | -/- -/- -/- | -/- |
| 52 | 1/4 of inflorescence emerged | 10.2 |
| 53 | -/- -/- -/- | -/- |
| 54 | 1/2 of inflorescence emerged | 10.3 |
| 55 | -/- -/- -/- | -/- |
| 56 | 3/4 of inflorescence emerged | 10.4 |
| 57 | -/- -/- -/- | -/- |
| 58 | Emergence of inflorescence completed | 10.5 |
| 59 | -/- -/- -/- | -/- |
| Anthesis | | |
| 60 | Beginning of anthesis | 10.51 |
| 61 | -/- -/- -/- | -/- |
| 62 | | |
| 63 | | |
| 64 | Anthesis half-way | 10.52 |
| 65 | -/- -/- -/- | -/- |
| 66 | | |
| 67 | | |
| 68 | Anthesis complete | 10.53 |
| 69 | -/- -/- -/- | -/- |
| Milk development | | |
| 70 | | |
| 71 | Caryopsis watery ripe | |
| 72 | | |
| 73 | Early milk | 11.1 |
| 74 | | |
| 75 | Medium milk | 11.1 |
| 76 | | |
| 77 | Late milk | 11.1 |
| 78 | | |
| 79 | | |

| 2-digit Code (Zadoks Scale) | General Description | Feekes Scale |
|--------------------------------|---|--------------|
| Dough development | | |
| 80 | | |
| 81 | | |
| 82 | | |
| 83 | Early dough | 11.2 |
| 84 | | |
| 85 | Soft dough | 11.2 |
| 86 | | |
| 87 | Hard dough | 11.2 |
| 88 | | |
| 89 | | |
| Ripening | | |
| 90 | | |
| 91 | Caryopsis hard (difficult to divide by thumbnail) (3) | 11.3 |
| 92 | Caryopsis hard (can no longer be dented by thumbnail) (4) | 11.4 |
| 93 | Caryopsis loosening in daytime | |
| 94 | Over-ripe, straw dead and collapsing | |
| 95 | Seed dormant | |
| 96 | Viable seed giving 50% germination | |
| 97 | Seed not dormant | |
| 98 | Secondary dormancy induced | |
| 99 | Secondary dormancy lost | |
| T1 | Unrooting of seedlings | |
| T2 | | |
| T3 | Rooting | |
| T4 | | |
| T5 | | |
| T6 | | |
| T7 | Recovery of shoots | |
| T8 | | |
| T9 | Resumption of vegetative growth | |

9. LITERATURE

- Артюшенко З.Т., Федоров А. А. Атлас по описательной морфологии высших растений. – Л.: Наука. -1986. -392с.
- Гуляев Г.В., Мальченко В.В. Словарь терминов по генетике, цитологии, селекции, семеноводству и семеноведению.- М.: Россельхозиздат. - 1975.- 215с.
- Доспехов Б. А. Методика полевого опыта. М.: Агропромиздат, 1985. - 351с.
- Зайцев Г.Н. Математическая статистика в экспериментальной ботанике. - М.: Наука, 1984. - 423с.
- Культурная флора СССР. Крупяные культуры. Л.: Колос, 1975.- Т.3. - 7-118с.
- Лякин Г.Ф. Биометрия.- М.: Высшая школа, 1990. - 349с.
- Словарь ботанических терминов. Под общей редакцией Дудки И.А. - К.: Наукова думка.- 1984.- 308с.
- Федоров А.А. , Артюшенко З.Т. Атлас по описательной морфологии высших растений. Соцветие. - Л.: Наука. - 1979. 296с.
- Шмидт В. М. Математические методы в ботанике. Издательство Ленинградского университета, 1984.- 285с.
- Широкий унифицированный классификатор СЭВ и Международный классификатор СЭВ. Вид *Panicum Miliaceum* L. - Л., 1982. – 24с.
- 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-248/1 – *Panicum miliaceum* L. – common millet

Link to e-TQ:

<https://online.plantvarieties.eu/backOfficeFormQuestions?viewFormId=15388&viewFormType=TQ&viewFormLang=EN&speciesIds=PAN03&status=1,2&order=formName>