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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

TECHNICAL WORKING PARTY FOR FRUIT CROPS

**Forty-First Session
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**ASSESSING UNIFORMITY BY OFF-TYPES ON THE BASIS OF MORE THAN ONE
SAMPLE OR SUB-SAMPLES**

Document prepared by the Office of the Union

1. The purpose of this document is to report on developments concerning the questionnaire “Population standards used for assessing uniformity by off-types on the basis of more than one sample”.

Background

2. At its twenty-second session, held in Tsukuba, Japan, from June 14 to 17, 2004, the Technical Working Party on Automation and Computer Programs (TWC) agreed to produce a questionnaire to seek information on population standards used in the assessment of uniformity by off-types, in particular when tests from more than one year were used.

3. At the twenty-fifth session of the TWC, held in Romania, from September 3 to 6, 2007, the TWC discussed the draft questionnaire on off-types contained in document TWC/25/18. The TWC noted that the questionnaire was intended to address only situations where uniformity by off-types was assessed on the basis of more than one sample, or on a sub-sample of a single sample, and agreed that the title of the questionnaire should be amended accordingly. The TWC agreed that the results of the questionnaire should be

reviewed with a view to incorporating guidance in document TGP/8, Part II, “I. The Method of Uniformity Assessment on the Basis of Off-Types”.

4. At its twenty-sixth session, held in Jeju, Republic of Korea, from September 2 to 5, 2008, the TWC considered document TWC/26/8 “Population standards used for assessing uniformity by off-types on the basis of more than one sample”, prepared by experts from Germany, the United Kingdom and the Office of the Union.

5. The TWC agreed that a questionnaire could be issued on the basis of the Annex to document TWC/26/8, with certain minor amendments. However, the TWC noted that the example provided in the Annex to document TWC/26/8 indicated that it would be useful for the TWC to discuss the use of such an approach.

6. The Technical Committee (TC), at its forty-fifth session, held in Geneva from March 30 to April 1, 2009, considered the draft questionnaire “Population standards used for assessing uniformity by off-types on the basis of more than one sample”, as presented in the Annex to document TC/45/3.

7. The TC agreed that the draft questionnaire, as presented in the Annex to document TC/45/3, should be circulated for consideration by the Technical Working Parties (TWP) at their sessions in 2009 and requested the Office of the Union to provide a new draft of the questionnaire, based on the TWP comments, for approval at the forty-sixth session of the TC in 2010. The TC agreed that the approved questionnaire should be issued by the Office of the Union to the TC representatives of the members of the Union and the replies presented for consideration by the TC at its forty-seventh session. On the basis of the replies, the TC would consider whether that matter should be included in a future revision of document TGP/8 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”.

Developments in the TWP sessions in 2009

Technical Working Party for Vegetables

8. At its forty-third session, held in Beijing, China, from April 20 to 24, 2009, the Technical Working Party for Vegetables (TWV) considered the draft questionnaire presented in the Annex to document TWV/43/14 “Assessing Uniformity by Off-Types on the Basis of More Than One Sample or Sub-Samples”. The TWV agreed that the questionnaire should provide a further example to illustrate options where uniformity was assessed in a plant sample of 40 plants in each of two independent growing cycles, in two separate plantings. In the first option, the uniformity would be assessed in 80 plants over the two growing cycles. In the second option, the uniformity would be assessed in 40 plants in each of the two years, with a decision rule that failure in one year would lead to a third year of examination, with the final decision being based on two years out of three.

Technical Working Party on Automation and Computer Programs

9. At its twenty-seventh session, held in Alexandria, Virginia, United States of America, from June 16 to 19, 2009, the TWC considered the draft questionnaire presented in the Annex to document TWC/27/13 “Assessing Uniformity by Off-Types on the Basis of More Than One Sample or Sub-Samples”. With regard to the draft questionnaire in the Annex to that

document, it was agreed that paragraph 1.4 should read as follows “Please complete the attached form with information on how uniformity is assessed by off types for cases where more than one sample or sub-sample are used, as explained in paragraph 1.3.”.

Technical Working Party for Agricultural Crops

10. At its thirty-eighth session, held in Seoul, Republic of Korea, from August 31 to September 4, 2009, the Technical Working Party for Agricultural Crops (TWA) considered document TWA/38/12. The TWA agreed that the draft questionnaire presented in document TWA/38/12 should, before the example, present a blank questionnaire to clarify the questions on which information was requested. The TWA considered that the decision rule presented in the example in the Annex to the document was not clear and proposed that it be clarified, particularly for the decision rule at the end of each growing cycle, and agreed that reference should be made to growing “cycles” rather than “years”.

11. The TWA considered that the experts from each Technical Working Party should be invited to complete the questionnaire with information for relevant crops/species. In that regard, it agreed that the TWA experts should be invited to supply information on potato and wheat or, if not suitable for the member of the Union concerned, to complete the questionnaire for another vegetatively propagated root crop and self-pollinated cereal.

Technical Working Party for Ornamental Plants and Forest Trees

12. At its forty-second session, held in Angers, France, from September 14 to 18, 2009, the Technical Working Party for Ornamental Plants and Forest Trees (TWO) considered document TWO/42/12 and agreed that it would not be relevant to request information on assessing uniformity by off-types on the basis of more than one sample or sub-samples for ornamental plants or forest trees.

Technical Working Party on Fruit Crops

13. At its fortieth session, held in Angers, France, from September 21 to 25, 2009, the Technical Working Party for Fruit Crops (TWF) considered document TWF/40/12 and agreed that TWF experts should be invited to supply information on apple by means of the questionnaire.

14. The Annex to this document includes a revised version of the draft questionnaire “Population standards used for assessing uniformity by off-types on the basis of more than one sample” on the basis of the comments made by the TWPs during its sessions in 2009.

Developments in the Technical Committee at its forty-sixth session

15. At its forty-sixth session, held in Geneva from March 22 to 24, 2010, the Technical Committee (TC) considered document TC/46/14. The TC agreed that the TWV, at its forty-fourth session, to be held in Veliko Tarnovo, Bulgaria, from July 5 to 9, 2010, should be invited to agree a vegetable crop for inclusion in the questionnaire. The Office of the Union would complete and issue the questionnaire after a vegetable crop had been selected by the TWV. The TC agreed that the translation of the questionnaire should be checked by the relevant language experts of the Editorial Committee and also agreed that paragraph 1.4

should be elaborated to explain that the process and the way in which the data was obtained and used in the decision-making process should be reflected in the responses to the questionnaire.

16. The TC requested the Office of the Union to send the questionnaire to the TC representatives of the members of the Union for completion, and to provide a document compiling the replies for consideration at the forty-seventh session of the TC. The TC also requested that the document identify any matters that might be considered in relation to the revision of document TGP/8 (see document TC/46/15 “Report on the conclusions”, paragraphs 86 to 88).

17. The Annex to this documents contains the questionnaire on “Population standards used for assessing uniformity by off-types on the basis of more than one sample”, incorporating the change in paragraph 1.4, as requested by the TC (see paragraph 15 above).

Developments in the TWP Sessions in 2010

18. At its thirty-ninth session, held in Osijek, Croatia, from May 24 to 28, 2010, the Technical Working Party for Agricultural Crops (TWA) considered document TWA/39/9 (see document TWA/39/27 “Report”, paragraph 78).

19. The TWA considered the questionnaire presented in document TWA/39/9 and requested the Office to amend the probability of the Example of 2-step test assessment of uniformity in Barley, on page 8 of the document, to read 1% instead of 0.1%. That amendment has been incorporated in the Annex, page 8, to this document.

20. The Technical Working Party on Automation and Computer Programs (TWC), at its twenty-eighth session, held in Angers, France, from June 29 to July 2, 2010, made no comments on the questionnaire.

21. At its forty-fourth session, held in Veliko Tarnovo, Bulgaria, from July 5 to 9, 2010, the Technical Working Party for Vegetables (TWV) agreed that Cauliflower should be added as a vegetable example for the questionnaire “Population standards used for assessing uniformity by off-types on the basis of more than one sample”, with the necessary information to be provided by experts from France (see document TWV/44/34 “Report”, paragraph 87).

[Annex follows]

ANNEX

DRAFT QUESTIONNAIRE

Population standards used for assessing uniformity by off-types on the basis of more than one sample

1.1 Please complete the following tables and return to UPOV by e-mail to upov.mail@upov.int.

1.2 The acceptable number of off-types tolerated in samples of various sizes is often based on a fixed “population standard” and “acceptance probability”. The “population standard” is the maximum percentage of off-types to be accepted if all individuals of the variety could be examined. The “acceptance probability” is the minimum probability of accepting a variety with the population standard of off-types.

1.3 The UPOV Test Guidelines recommend the population standard and acceptance probability and provide the maximum acceptable number of off-types for an appropriate sample size. In some cases, the proportion of off-types in a variety may be assessed in more than one sample (e.g. one growing cycle with more than one sample per growing cycle, one sample per growing cycle with two growing cycles, etc.). Some of the possible situations are described in document TGP/10 draft 7 Examining Uniformity, Section 6. Furthermore, in some cases, to examine uniformity in an efficient manner, a strategy of sequential sampling may be used. In cases where uniformity is assessed on the basis of more than one sample, clear decision rules need to be defined for the varieties concerned (see document TGP/8/1 draft 15, PART II, section 8.1.7).

1.4 Please complete the attached forms with information on how uniformity is assessed by off-types for wheat, potato, apple and [a vegetable crop to be proposed by the TWV]^{*}, where more than one sample or sub-sample is used, as explained in paragraph 1.3. Please use the questionnaire to explain the process and the way in which the data is obtained and used in the decision-making process. Illustrative examples of how to complete the form are provided at the end of this questionnaire.

* Information for other crops can be provided if the indicated crops are not appropriate for the member of the Union concerned.

Draft Questionnaire

Crop/Species: **WHEAT¹**

Test Guidelines: **TG/3/11 + CORR.**

Country/Organization:	
Person completing the form	
Name:	
E-mail:	
Tel. No.:	
Fax No.:	

Explanation of the methodology for assessing uniformity by off-types on the basis of more than one sample or sub-samples²

Sample size:

Population standard:

Acceptance probability:

Uniformity standard:

Decision rule:

¹ If wheat is not suitable for the member of the Union concerned, to complete the questionnaire for another self-pollinated cereal.

² Examples on how to present the method are provided in the notes at the end of the questionnaire.

Crop/Species: **POTATO³**

Test Guidelines: **TG/23/6**

Country/Organization:	
Person completing the form	
Name:	
E-mail:	
Tel. No.:	
Fax No.:	

Explanation of the methodology for assessing uniformity by off-types on the basis of more than one sample or sub-samples⁴

Sample size:

Population standard:

Acceptance probability:

Uniformity standard:

Decision rule:

³ If potato is not suitable for the member of the Union concerned, to complete the questionnaire for another vegetatively propagated root crop.

⁴ Examples on how to present the method are provided in the notes at the end of the questionnaire.

Crop/Species: **APPLE⁵**

Test Guidelines: **TG/14/9**

Country/Organization:	
Person completing the form	
Name:	
E-mail:	
Tel. No.:	
Fax No.:	

Explanation of the methodology for assessing uniformity by off-types on the basis of more than one sample or sub-samples⁶

Sample size:

Population standard:

Acceptance probability:

Uniformity standard:

Decision rule:

⁵ If apple is not suitable for the member of the Union concerned, to complete the questionnaire for another vegetatively propagated fruit crop.

⁶ Examples on how to present the method are provided in the notes at the end of the questionnaire.

Crop/Species: **VEGETABLE CROP⁷**

Test Guidelines: **TG/XX/YY**

Country/Organization:	
Person completing the form	
Name:	
E-mail:	
Tel. No.:	
Fax No.:	

Explanation of the methodology for assessing uniformity by off-types on the basis of more than one sample or sub-samples⁸

Sample size:

Population standard:

Acceptance probability:

Uniformity standard:

Decision rule:

⁷ If the vegetable crop is not suitable for the member of the Union concerned, to complete the questionnaire for another vegetatively propagated vegetable crop.

⁸ Examples on how to present the method are provided in the notes at the end of the questionnaire.

Notes to the questionnaire “Population standards used for assessing uniformity by off-types on the basis of more than one sample”

The following are illustrative examples of explanations of methodologies for assessing uniformity by off-types on the basis of more than one sample or sub-samples, to guide the completion of the questionnaire.

Example 1:

Species CROP A

Test Guidelines: TG/XY/ZY.

The minimum duration of tests should normally be two independent growing cycles. Each test should be designed to result in a total of at least 40 plants, which should be divided between two or more replicates.

Sample size: 80 plants (obtained in two independent growing cycles with 40 plants in each growing cycle).

Population standard: 1 %

Acceptance probability: 95 %

Uniformity standard: the number of off-type plants or parts of plants should not exceed 2 in 80 plants.

Decision rule: A variety is considered uniform if the total number of off-types at the end of the two growing cycles does not exceed 2 in 80 plants

Example 2:

Species: CROP B

Test Guidelines: TG/XY/ZY

The minimum duration of tests should normally be two independent growing cycles. Each test should be designed to result in a total of at least 40 plants, which should be divided between two or more replicates.

Sample size: 40 plants or parts of plants

Population standard: 1 %

Acceptance probability: 95 %

Uniformity standard: the number of off-type plants or parts of plants should not exceed 2 in 40.

Decision rule: A variety is considered within the uniformity standard in a given growing cycle if the number of off-type plants or parts of plants should not exceed 2 in 40 in that growing cycle.

A variety is considered uniform if it is within the uniformity standard in both of the two growing cycles

A variety is considered non uniform if it fails to meet the uniformity standard in both of the two growing cycles

If at the end of the two growing cycles the variety is within the uniformity standard in one growing cycle but is not within the uniformity standard in the other growing cycle, then uniformity is assessed in a third growing cycle. If in the third growing cycle the variety is within the uniformity standard, the variety is considered uniform. If at the end of the third growing cycle the variety fails to meet the uniformity standard, the variety is considered non uniform.

Example 3

Species: **BARLEY** (*Hordeum vulgare* L. sensu lato)

Test Guidelines: **TG/19/10**

I - For the assessment of uniformity of characteristics observed on a sample size of 2000 plants or part of plants.

Sample size: 2000 plants

Population standard: 0.1 %

Acceptance probability: 95 %

Uniformity standard: the number of off-type plants or parts of plants should not exceed 5 in 2000.

II – Example of 2-step test for the assessment of uniformity of characteristics observed on a sample size of 100 plants or parts of plants

Sample size: 100 plants or parts of plants

Population standard: 1 %

Acceptance probability: 95 %

Uniformity standard:

First step, 20 plants or parts of plants are observed.

- No off-type plants in 20 plants = the variety does not exceed the number of allowed off-types for this characteristic for this growing cycle.
- More than 3 off-type plants = the variety exceeds the number of allowed off-types for this characteristic for this growing cycle.
- 1 to 3 off-type plants = go to second step

Second step: further 80 plants or parts of plants are observed

- 3 or less off-type plants in 100 (20 of step 1 + 80 of step 2) plants = the variety does not exceed the number of allowed off-types for this characteristic for this growing cycle.
- More than 3 off-type plants in 100 (20 of step 1 + 80 of step 2) plants = the variety exceeds the number of allowed off-types for this characteristic for this growing cycle.

Decision rule: A variety is considered within the uniformity standard in a given growing cycle if the number of off-types in all samples does not exceed the number of allowed off-types in either of the samples.

A variety is considered uniform if it is within the uniformity standard in both of the two growing cycles

A variety is considered non uniform if it fails to meet the uniformity standard in both of the two growing cycles

If at the end of the two growing cycles the variety is within the uniformity standard in one growing cycle but is not within the uniformity standard in the other growing cycle, then uniformity is assessed in a third growing cycle. If in the third growing cycle the variety is within the uniformity standard, the variety is considered uniform. If at the end of the third growing cycle the variety fails to meet the uniformity standard, the variety is considered non uniform