



TWO/37/7-TWF/35/7

ORIGINAL: English

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**INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS**

GENEVA

**TECHNICAL WORKING PARTY  
FOR  
ORNAMENTAL PLANTS AND  
FOREST TREES****Thirty-Seventh Session  
Hanover, Germany,  
July 12 to 16, 2004****TECHNICAL WORKING PARTY  
FOR  
FRUIT CROPS****Thirty-Fifth Session  
Marquardt (Potsdam), Germany  
July 19 to 23, 2004****CRITERIA FOR DETERMINING OFF-TYPE PLANTS***Document prepared by the Chairman of TWO*

1. At the thirty-sixth session of the Technical Working Party for Ornamental Plants and Forest Trees (TWO), held in Niagara Falls, Canada, from September 22 to 26, 2003 (see document TWO/36/7, paragraph 28), it was agreed that the Office of the Union, in conjunction with the Chairman of the TWO, would prepare and issue a questionnaire seeking information on the proportion of a plant which would need to be affected by a mutation or variation in order to be considered to be an off-type, e.g. whether a single atypical leaf or petal would render the plant an off-type. The TWO agreed that, if acceptable to the Technical Working Party for Fruit Crops (TWF), this questionnaire should also be sent to members of the TWF to obtain information on how the matter is handled for fruit crops. At its thirty-fourth session held in Niagara Falls, Canada, from September 29 to October 3, 2003 (see document TWF/34/7, paragraph 18), the TWF agreed that this questionnaire should also be sent to members of the TWF to obtain information on how the matter is handled for fruit crops. The TWO and TWF further agreed that the results of the survey would be presented to the TWO and the TWF, in 2004, at their thirty-seventh and thirty-fifth sessions, respectively.
2. A copy of the questionnaire is attached as Annex I to this document.

- Responses were received from nine states and the European Union (CPVO).

Question 1: Determining Off-Types

*What practical difficulties (if any) have you experienced in determining what are off-type plants?*

- A common problem identified in 8 responses is deciding when a variation observed in a plant becomes of importance. Is the variation observed sufficient to make the whole plant an off-type? Can we say that a whole plant is an off-type when the observed change is on a single shoot, or flower or part of a petal? This is a particular problem with variegated leaves and bicolor flowers.
- It is important to understand the potential natural variation within the crop or type (e.g. mutations), which can be difficult when there is limited crop experience or limited access to other plant material.
- The question of suitable sample size for uniformity was raised. If large plant numbers are available, e.g. in commercial production blocks, a better sample for uniformity assessment might be obtained from these, rather than using the trial plants used for distinctness.
- The wording of some characteristics might not allow for relevant species variation and could be restrictive e.g. pattern or distribution of secondary/over color.

Question 2: Type of material to be examined (Section 2.2 in Test Guidelines)

*Do you request a different type of material (e.g. propagation method, maturity, form, quality) for variegated varieties or varieties originating as mutations - compared to seedling varieties? (Please provide details)*

- Generally no. One respondent suggested that only material that will be used in commerce be used. One respondent indicated the possibility of requesting different types of material.

Question 3: Quantity of material to be supplied (Section 2.3 in Test Guidelines)

*Do you request a different quantity of material to be supplied for variegated varieties or varieties originating as mutations – compared to seedling varieties? (Please provide details)*

- Two respondents already do this for some crops and three are considering the possibility of doing so for certain types of variety or species. Several respondents stated that greater numbers are requested for mutations and sometimes for varieties or species that have had previous or known problems. The remainder follow UPOV Test Guidelines where applicable.

Question 4: Number of Growing Cycles (Section 3.1 in Test Guidelines)

*Do you use a different number of growing cycles for variegated varieties or varieties originating as mutations? (Please provide details)*

10. There is general agreement that a single growing cycle is acceptable for most ornamentals and, if there is any doubt or uncertainty after the first cycle, a second cycle is an option. Two respondents routinely test mutations over two growing cycles and two respondents stated that two growing cycles for variegated and some other types of variety may become standard.

Question 5: Number of Plants to be Examined (Section 3.5 in Test Guidelines)

*Is the number of plants / parts of plants to be examined different for variegated varieties or varieties originating as mutations – compared to seedling varieties? (Please provide details)*

11. Generally not, however several respondents stated that more plants are examined for mutations.

Question 6: Proportion of plant affected to be considered off-type (Section 4.2 in Test Guidelines)

*What proportion of a plant affected by mutation or variation (e.g. a single shoot on a plant, 10% of fruits on a tree etc.) would result in that plant being considered an off-type?*

12. Any part of a plant that is variable could potentially make that whole plant an off-type. The possible cause of the variation, such as insect or mechanical damage, and importantly, the natural species variation should be taken into account. The difficulty is not so much in recording or identifying variation but in deciding the importance. One respondent suggested that the wording of the plant characteristic is important. Whole or large part of plant variation is important for whole plant characteristics and smaller or lesser variations for plant part characteristics.

Question 7: Types of variation (Section 4.2 in Test Guidelines)

*Do you treat different mutations or variations in different ways e.g.*

- (a) variations / mutations in basal shoots;*
- (b) variations / mutations in stem shoots;*
- (c) transient variations;*
- (d) other (please specify)?*

13. The majority no, however one respondent stated (b) is the most important and two respondents indicated that differentiation could be made.

Question 8:

*If you answered yes to question 7, please provide details of how each type of variation is treated.*

14. From the three “yes” or “possible” responses in 7, statements suggested that variation in stem shoots could be more important than basal shoots. Variation in immature growth may be less important than in mature growth.

Question 9: Guidelines for determining off-types (Section 4.2 in Test Guidelines)

*Have you developed guidelines or protocols for the determination of off-types plants? (Where possible, please provide a copy in electronic form e.g. as a Word document)*

15. Overall no, with three respondents stating that consideration is being given to this. New Zealand has a written procedure for the uniformity assessment of apple varieties from mutation, a copy of which is attached as Annex II to this document.

Question 10: Population Standard (Section 4.2 in Test Guidelines)

*UPOV Test Guidelines specify a single population standard for a type of propagation. Do you consider that there should be a different population standard for:*

- (a) variegated varieties;*
- (b) varieties originating as mutations?*

16. The following responses were received:

- (i) Two respondents wished no change to (a) or (b)
- (ii) One respondent would consider the possibility
- (iii) Three respondents proposed consideration of new standards for (a) and (b)
- (iv) Three respondents proposed new standard for (a) but not (b)
- (v) One respondent proposed new standard for (b) but not (a)

Question 11: Assessment of Stability (Section 4.3 in Test Guidelines)

*Are there particular circumstances where you make an assessment of stability by either growing a further generation, or by testing a new seed or plant stock of variegated varieties or varieties originating as mutations? (Please provide details)*

17. General agreement that, as needed, propagating and/or growing a future generation or evaluating a second or more growing cycles is good practice. This would be in circumstances of doubt about uniformity and stability, such as the appearance of transient variation (variation on immature but not mature shoots) and variation in a small part of the plant.

General Comment

18. One respondent expressed concern with any possibility that the flexibility of national authorities, provided by the Convention, to determine what constitutes “relevant characteristics” would be reduced or any higher thresholds for uniformity testing would be imposed.

Conclusion

19. The respondents are generally in agreement that:

- There are genuine difficulties, particularly in deciding whether a variation is sufficient for the whole plant to be made an off-type
- Evaluation of greater plant numbers could be helpful with the option of testing more than a single growing cycle as necessary
- Any variation on a plant could indicate poor uniformity
- Observed variation is usually treated all in the same way
- Stability could be checked by re-propagation and/or growing additional plants for one or more growing cycles.

20. The proposal for the use of differing population standards for mutations and/or variegated varieties has some support. However, the views are mixed.

21. Further consideration could be given to:

- Discussion regarding population standards for variegated and mutation varieties
- Possible ways of addressing the difficulties identified in Question 1: “Determining Off-types”

*22. The TWO and TWF are invited to comment on the summary information from the questionnaire.*

[Annex I follows]

ANNEX I

QUESTIONNAIRE:

CRITERIA FOR DETERMINING OFF-TYPE PLANTS  
AND  
UNIFORMITY STANDARDS FOR OFF-TYPES

The purpose of the attached questionnaire is to serve as the basis to seek to develop a harmonized approach to the determination of off-types, setting of uniformity standards and stability assessment with particular regard to variegated varieties and varieties originating as natural or induced mutations. It considers: type and quantity of material to be examined; number of growing cycles; criteria for determining off-type plants; and uniformity standards and stability assessment.

The results of the questionnaire will be used as a basis for a document for discussion by the Technical Working Party for Ornamental Plants and Forest Trees (TWO) and the Technical Working Party for Fruit Crops (TWF) at their sessions in 2005.

Background

Uniformity

Article 8 of the 1991 Act of the UPOV Convention deems that a variety is uniform if, “subject to the variation that may be expected from the particular features of its propagation, it is sufficiently uniform in its relevant characteristics.” Section 4 of the document TG/1/3 (the “General Introduction”) “Methods for the Examination of Uniformity”, states that “Where all the plants of a variety are very similar, and in particular for vegetatively propagated and self-pollinated varieties, it is possible to assess uniformity by the number of obviously different plants – “off-types” – that occur.”

Section 6.4.1.1 “Determination of Off-Types by Visual Assessment” of the General Introduction goes on to provide a definition of an off type for self-pollinated and vegetatively propagated varieties as follows:

“A plant is to be considered an off-type if it can be clearly distinguished from the variety in the expression of any characteristic of the whole or part of the plant that is used in the testing of distinctness, taking into consideration the particular features of its propagation. This definition makes it clear that, in the assessment of uniformity, the standard for distinctness between off-types and a candidate variety is the same as for distinctness between a candidate variety and other varieties (see Chapter 5, section 5.5.2).”

This has provided a clear definition of an off type plant which is sufficiently clear in most circumstances. However, in some cases, such as for variegated varieties and, more generally, varieties originating as natural or induced mutations, the determination of what should be considered to be an off-type plant may be more difficult. For example, in the case of a variegated variety, should one reverted shoot on a plant determine that the plant is an off-type plant?

With regard to uniformity standards for off-types, section 6.4.1.3 of the General Introduction “Statistical Basis for Setting Numbers of Off-Types” explains that:

“The acceptable number of off-types tolerated in samples of various sizes is often based on a fixed “population standard” and “acceptance probability.” ... Based on statistical calculations for “population standards” and “acceptance probabilities,” the recommended “population standard” and “acceptance probability” are stated in the individual Test Guidelines. The Test Guidelines also recommend the maximum number of off-types tolerated for a given sample size. More detailed information can be found in document TGP/10, “Examining Uniformity.””

Thus, detailed recommendations concerning the number of off-types are to be provided in the individual Test Guidelines with guidance for drafters of Test Guidelines to be provided in TGP/10.

### Stability

Article 9 of the 1991 Act of the UPOV Convention requires that a variety “shall be deemed to be stable if its relevant characteristics remain unchanged after repeated propagation or, in the case of a particular cycle of propagation, at the end of each such cycle.” Section 7.3.1 of the General Introduction states that “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. Furthermore, if the variety is not stable, material produced will not conform to the characteristics of the variety, and where the breeder is unable to provide material conforming to the characteristics of the variety, the breeder’s right may be cancelled.” It goes on to state in section 7.3.1.2 that “Where appropriate, or in cases of doubt, stability may be tested, either by growing a further generation, or by testing a new seed or plant stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied. Further guidance on the examination of stability is considered in document TGP/11, “Examining Stability.”

**QUESTIONNAIRE****CRITERIA FOR DETERMINING OFF-TYPE PLANTS AND  
UNIFORMITY STANDARDS FOR OFF-TYPES**

Please return this questionnaire by **May 28, 2004**, to:

<b><u>To:</u></b>  <b>Mr. Chris Barnaby (Chairman TWO)</b> <b>E-mail: <a href="mailto:chris.barnaby@pvr.govt.nz">chris.barnaby@pvr.govt.nz</a></b>	<b><u>with a copy to:</u></b>  <b>UPOV</b> <b>E-mail: <a href="mailto:upov.mail@wipo.int">upov.mail@wipo.int</a></b>
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From:

<i>Name:</i>	
<i>Organization:</i>	
<i>Country:</i>	
<i>E-mail address:</i>	

<i>Question</i> (Relevant section in UPOV Test Guidelines)	<i>Comments</i>
<p>1. <i>Determining Off-Types</i></p> <p>What practical difficulties (if any) have you experienced in determining what are off-type plants?</p>	
<p>2. <i>Type of material to be examined (2.2)</i></p> <p>Do you request a different type of material (e.g. propagation method, maturity, form, quality) for variegated varieties or varieties originating as mutations - compared to seedling varieties? (Please provide details)</p>	
<p>3. <i>Quantity of material to be supplied (2.3)</i></p> <p>Do you request a different quantity of material to be supplied for variegated varieties or varieties originating as mutations – compared to seedling varieties? (Please provide details)</p>	
<p>4. <i>Number of Growing Cycles (3.1)</i></p> <p>Do you use a different number of growing cycles for variegated varieties or varieties originating as mutations? (Please provide details)</p>	
<p>5. <i>Number of Plants to be Examined (3.5)</i></p> <p>Is the number of plants / parts of plants to be examined different for variegated varieties or varieties originating as mutations – compared to seedling varieties? (Please provide details)</p>	



<p>6. <i>Proportion of plant affected to be considered off-type (4.2)</i></p> <p>What proportion of a plant affected by mutation or variation (e.g. a single shoot on a plant, 10% of fruits on a tree etc.) would result in that plant being considered an off type?</p>	
<p>7. <i>Types of variation (4.2)</i></p> <p>Do you treat different mutations or variations in different ways e.g.</p> <ul style="list-style-type: none"> <li>(a) variations / mutations in basal shoots;</li> <li>(b) variations / mutations in stem shoots;</li> <li>(c) transient variations;</li> <li>(d) other (please specify)?</li> </ul>	
<p>8.</p> <p>If you answered yes to question 7, please provide details of how each type of variation is treated.</p>	
<p>9. <i>Guidelines for determining off-types (4.2)</i></p> <p>Have you developed guidelines or protocols for the determination of off-types plants? (Where possible, please provide a copy in electronic form e.g. as a Word document)</p>	
<p>10. <i>Population Standard (4.2)</i></p> <p>UPOV Test Guidelines specify a single population standard for a type of propagation. Do you consider that there should be a different population standard for:</p> <ul style="list-style-type: none"> <li>(a) variegated varieties;</li> <li>(b) varieties originating as mutations?</li> </ul>	
<p>11. <i>Assessment of Stability (4.3)</i></p> <p>Are there particular circumstances where you make an assessment of stability by either by growing a further generation, or by testing a new seed or plant stock of variegated varieties or varieties originating as mutations? (Please provide details)</p>	

[Annex II follows]

## ANNEX II

### **PROCEDURE FOR THE EVALUATION OF A MUTATION/SPORT VARIETY TO ASSESS UNIFORMITY AND STABILITY**

#### **Purpose**

The purpose of the assessment is to detect evidence of mutation or other genetic instability. Such a problem might be expected to manifest itself in one of two ways:

- A part of a tree producing fruit with skin colouration or patterning outside the expected range for the candidate variety, eg block colouring instead of striping, reversion to parent variety colouring.
- A tree producing fruit with chimeral striping.

The assessment is not to measure the variation normally found within a variety such as that caused by the position of fruit on the tree.

#### **Trees assessed**

The applicant is to make available for assessment 20-30 second-generation trees in their second year of fruiting or later. No more than 20% of the trees (eg 5 out of 25, or 6 out of 30) should come from any single stick of budwood.

A true assessment requires that a minimum of 20 trees should each produce at least 40 fruit. If the number is less the assessment should be postponed until the following harvest.

#### **Procedure**

The assessment is to be carried out at the normal harvest time.

Inspect each tree before fruit is picked checking for a part of the tree that may be carrying a number of fruit with skin colouration or patterning clearly different from the norm for the variety. Such a tree part should be described and photographed. The tree should be recorded as an off-type and left unharvested in case the expert should wish to inspect it.

With each remaining individual tree (ie excluding any that may have been already recorded as an off-type), harvest and put all fruit in a separate container. Then:

- Inspect the fruit in each container looking for signs of genetic instability, in particular chimeral striping.
- Compare the fruit in each container against that in all others. This is to check whether any one tree shows divergence from the variety norm.

If off-type fruit are detected in a container count the number. The tree should be recorded as an off-type if a third or greater of the fruit in the container are off-types. For a sample size of 40 fruit, a minimum of 13 off-type fruit would lead to the tree being recorded as an off-type.

If problems are detected record a description of the nature of the problem and the numbers involved. Hold samples for possible inspection by the expert.

With 20 trees the maximum number of off-type trees is 2. The table below gives the off-types permitted with sample sizes greater than 20. (It is based upon an acceptance probability of 95% and population standard 2% - these bases obtained from UPOV document TWC/11/16 – recommendations on homogeneity.)

<b>Trees sampled</b>	<b>Maximum off-types</b>
19-41	2
42-69	3
70-99	4
100-131	5

[End of Annex II and of document]