



Disclaimer: unless otherwise agreed by the Council of UPOV, only documents that have been adopted by the Council of UPOV and that have not been superseded can represent UPOV policies or guidance.

This document has been scanned from a paper copy and may have some discrepancies from the original document.

---

Avertissement: sauf si le Conseil de l'UPOV en décide autrement, seuls les documents adoptés par le Conseil de l'UPOV n'ayant pas été remplacés peuvent représenter les principes ou les orientations de l'UPOV.

Ce document a été numérisé à partir d'une copie papier et peut contenir des différences avec le document original.

---

Allgemeiner Haftungsausschluß: Sofern nicht anders vom Rat der UPOV vereinbart, geben nur Dokumente, die vom Rat der UPOV angenommen und nicht ersetzt wurden, Grundsätze oder eine Anleitung der UPOV wieder.

Dieses Dokument wurde von einer Papierkopie gescannt und könnte Abweichungen vom Originaldokument aufweisen.

---

Descargo de responsabilidad: salvo que el Consejo de la UPOV decida de otro modo, solo se considerarán documentos de políticas u orientaciones de la UPOV los que hayan sido aprobados por el Consejo de la UPOV y no hayan sido reemplazados.

Este documento ha sido escaneado a partir de una copia en papel y puede que existan divergencias en relación con el documento original.

UPOV

TC/35/13

English only

DATE: June 4, 1999

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

**TECHNICAL COMMITTEE**

**Thirty-Fifth Session**  
**Geneva, March 22 to 24, 1999**

REVISED WORKING DOCUMENT FOR THE PREPARATION OF A NEW  
GENERAL INTRODUCTION FOR THE CONDUCT OF TESTS FOR DISTINCTNESS,  
UNIFORMITY AND STABILITY OF NEW VARIETIES OF PLANTS

*prepared by the Office of the Union*

This document should be read in conjunction with document TC/35/9. It contains the following:

Annex I: Amended Annex I of TC/35/9: Working Paper for the Drafting of a Revised Text of the General Introduction Containing Additional Explanations

Annex II: Amended Annex II of TC/35/9: List of Documents Complementing the General Introduction for the Conduct of Tests for Distinctness, Uniformity and Stability of New Varieties of Plants.

The amendments made result from comments received on document TC/35/9 and from discussions held in the meeting of the Editorial Committee on March 24 and 25, 1999 and in a meeting of a small *ad hoc* group which met in Geneva on May 10 and 11, 1999.

[Two Annexes follow]

## ANNEX I

WORKING PAPER FOR THE DRAFTING OF A REVISED TEXT OF THE  
GENERAL INTRODUCTION CONTAINING ADDITIONAL EXPLANATIONS\*

## LIST OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>3</b>
<b>2. RELEVANT ARTICLES IN THE UPOV CONVENTION .....</b>	<b>5</b>
2.1 DEFINITION OF A PLANT VARIETY .....	5
2.2 CONDITIONS OF PROTECTION.....	6
2.3 DISTINCTNESS .....	6
2.4 UNIFORMITY.....	7
2.5 STABILITY .....	7
<b>3. PRINCIPLES FOR THE CONDUCT OF TEST FOR DISTINCTNESS; UNIFORMITY AND STABILITY OF NEW VARIETIES OF PLANTS .....</b>	<b>7</b>
<b>4. ASSESSMENT OF VARIETIES .....</b>	<b>9</b>
4.1 CHARACTERISTICS.....	9
4.2 ARTIFICIAL FACTORS, SECONDARY ORGANISM, CHEMICALS.....	9
4.3 COMPARISON WITH SIMILAR VARIETIES.....	9
4.4 COOPERATION IN GROWING TESTS.....	11
4.4.1 <i>International Cooperation Between Testing Authorities</i> .....	11
4.4.2 <i>Cooperation with Breeders and Applicants</i> .....	12
<b>5. DEFINITION AND OBSERVATION OF CHARACTERISTICS .....</b>	<b>14</b>
5.1 SELECTION OF CHARACTERISTICS .....	14
5.2 QUALITATIVE AND QUANTITATIVE CHARACTERISTICS.....	17
5.3 COMBINED CHARACTERISTICS.....	18
5.4 OBSERVATION OF CHARACTERISTICS.....	18
5.5 APPLICATION OF STATISTICAL METHODS TO MEASURE CHARACTERISTICS.....	18
5.5.1 <i>General</i> .....	18
5.5.2 <i>Measured Quantitative Characteristics</i> .....	19
5.5.3 <i>Visually Assessed Characteristics</i> .....	19
5.6 ENVIRONMENTAL INFLUENCE ON CHARACTERISTICS.....	20
5.7 NON-TRADITIONAL NON-MORPHOLOGICAL CHARACTERISTICS AND NEW METHODS FOR VARIETY TESTING.....	20
<b>6. TESTING DISTINCTNESS .....</b>	<b>21</b>
6.1 GENERAL.....	21
6.2 DETERMINING MINIMUM DISTANCES .....	22
6.3 CRITERIA FOR DISTINCTNESS.....	23

---

\* This draft contains in square brackets, after the new paragraph number, the number of the respective paragraph of document TG/1/2 (if existing). Explanations in italics contain supplementary information which will be included in a separate document; explanations in smaller script contain information to facilitate the drafting, which will be deleted once the drafting is finalized.

In this document reference is made to articles of the Act of 1991 of the UPOV Convention. The rules comprise also all preceding Acts of the Convention for those States that have not yet adhered to the Act of 1991.

6.4	TRULY QUALITATIVE CHARACTERISTICS .....	24
6.5	PSEUDO-QUALITATIVE CHARACTERISTICS.....	24
6.6	MEASURED QUANTITATIVE CHARACTERISTICS.....	24
6.7	NORMALLY VISUALLY OBSERVED QUANTITATIVE CHARACTERISTICS .....	25
6.8	COMBINED DATA .....	26
<b>7.</b>	<b>TESTING UNIFORMITY .....</b>	<b>26</b>
7.1	GENERAL.....	26
7.2	DEFINITION OF OFF-TYPE .....	26
7.3	VEGETATIVELY PROPAGATED VARIETIES .....	27
7.4	TRULY SELF-POLLINATED VARIETIES.....	28
7.5	MAINLY SELF-POLLINATED VARIETIES AND INBRED LINES OF CROSS-POLLINATED VARIETIES .....	28
7.6	CROSS-POLLINATED VARIETIES, MAINLY CROSS-POLLINATED VARIETIES AND SYNTHETIC VARIETIES.....	28
7.7	HYBRID VARIETIES.....	29
<b>8.</b>	<b>TESTING STABILITY .....</b>	<b>30</b>
<b>9.</b>	<b>MAINTENANCE OF REFERENCE COLLECTIONS .....</b>	<b>30</b>
<b>10.</b>	<b>COMPOSITION OF UPOV TEST GUIDELINES .....</b>	<b>31</b>
10.1	INTRODUCTION .....	31
10.2	COVER PAGE.....	31
10.2.1	<i>Original Language</i> .....	31
10.2.2	<i>Reference to the Basic Principles of DUS Testing (General Introduction)</i> .....	31
10.3	INDIVIDUAL CHAPTERS OF THE TEST GUIDELINES.....	32
10.3.1	<i>Subject of these Guidelines (Chapter I)</i> .....	32
10.3.2	<i>Material Required (Chapter II)</i> .....	32
10.3.3	<i>Conduct of Tests (Chapter III)</i> .....	33
10.3.4	<i>Methods and Observations (Chapter IV)</i> .....	33
10.3.5	<i>Grouping of Varieties (Chapter V)</i> .....	34
10.3.6	<i>Characteristics and Symbols (Chapter VI)</i> .....	34
10.3.6.1	Characteristics with an Asterisk.....	35
10.3.6.2	Characteristics Without an Asterisk .....	36
10.3.6.3	Characteristics Not Included in the UPOV Test Guidelines But Used for Distinctness by Some Member States.....	36
10.3.6.4	Characteristics for Supporting Evidence.....	37
10.3.6.5	States of Expression, Notes, Example Varieties, Explanations.....	37
10.3.7	<i>Table of Characteristics (Chapter VII)</i> .....	37
10.3.7.1	General.....	37
10.3.7.2	Layout.....	38
10.3.7.3	Order of Characteristics.....	38
10.3.7.4	Order of States of Expression Inside a Characteristic .....	40
10.3.7.5	Categories of Characteristics.....	40
10.3.7.5.1	Qualitative Characteristics .....	40
10.3.7.5.1(a)	Pseudo-Qualitative Characteristics .....	41
10.3.7.5.2	Quantitative Characteristics .....	41
10.3.7.6	Harmonization of the States of Expression .....	42
10.3.7.7	Example Varieties .....	43
10.3.8	<i>Explanations on the Table of Characteristics (Chapter VIII)</i> .....	44
10.3.9	<i>Literature (Chapter IX)</i> .....	45
10.3.10	<i>Technical Questionnaire (Chapter X)</i> .....	45
10.4	ANNEXES TO TEST GUIDELINES (SPECIAL CATEGORY OF CHARACTERISTICS) .....	46
<b>11.</b>	<b>CONDUCT OF TEST IN THE ABSENCE OF UPOV TEST GUIDELINES .....</b>	<b>47</b>

## 1. INTRODUCTION

1. This document contains the basic UPOV principles for the testing of plant varieties. The document TGP/1 reproduces the text of this general introduction but enlarged by remarks of comments to certain paragraphs in order to facilitate their understanding. Further details are contained in a separate document of the collection with the Code "TGP/..." (TGP = Test Guidelines Protocols) as mentioned in the Annex to this document. Those documents will contain a glossary of the appropriate terms used.

2. [1] The International Convention for the Protection of New Varieties of Plants provides that protection shall only be granted after examination of the variety. The prescribed examination should be adapted to the special requirements of each genus or species, and must of necessity take account of any special requirements for growing the plants.

*Explanation: UPOV decided to stick to the term "variety" despite the rather common use of the word "cultivar."*

*Remark: Before the development of the UPOV system, many countries had their own regulations regarding the examination of varieties. The technical criteria for the grant of rights differed from one country to another and even the variety concept was not seen in the same light in all countries. The technical standards and testing procedures depended largely on the expertise of the official concerned. This lack of harmonization caused problems, especially when a breeder sought protection for his variety in several countries. A variety which had been considered distinct, uniform and stable in one country might be rejected in another or vice versa. It was realized that harmonization was urgently required and this responsibility was taken on by UPOV, as a result of the adoption of the International Convention for the Protection of New Varieties of Plants in 1961, which has in the meantime been revised several times, the most recent revision dates back to 1991.*

3. Protection may only be granted to a variety on the condition that it has been proved clearly distinguishable from any variety of common knowledge and that it is sufficiently uniform and stable in its relevant characteristics. The testing system for determining Distinctness, Uniformity and Stability is generally referred to as "DUS" testing. It is a technical examination performed according to standardized procedures according to principles established by UPOV. It comprises a comparative growing trial, which involves sampling, observation and measurement, processing and evaluation. These trials are conducted either by the official national government authorities themselves or on their behalf by specialized bodies, or, to varying degrees of control by national government authorities, by the applicants or breeders themselves. In order to interpret the DUS criteria on a common basis, UPOV has set up some basic principles which are summarized in this document.

4. [2] With these basic principles and the individual Guidelines for the Conduct of Tests for Distinctness, Uniformity and Stability prepared for each genus or species or for several species, in short called UPOV Test Guidelines, UPOV member States have a common basis for establishing variety descriptions in a standardized form and for testing varieties which facilitates international cooperation in examination between their authorities. These basic principles and the Test Guidelines are also helpful to applicants for the grant of rights by giving them information on the characteristics to be studied and on the questions which they will be asked about their varieties.

5. The individual Test Guidelines are prepared in several Technical Working Parties specialized in different groups of species (Agricultural Crops, Fruit Crops, Ornamental Plants and Forest Trees, Vegetables). Normally discussions start in the Technical Working Parties on the basis of a recommendation of an expert and on the basis of a draft prepared by an inventory of the existing testing work done or national test guidelines existing, either made directly by that expert or by correspondence in a subgroup of experts from several interested States or States actually doing tests for that species. Once finalized in the Technical Working Party, which may take from one to several years, the draft is sent for comments to the international professional organizations and to important institutions working in the field of the species concerned. On the basis of the comments received, the Draft Test Guidelines are finalized by the Technical Working Party and presented to the UPOV Technical Committee for final adoption and publication. The Technical Committee, established by the UPOV Council, is also the supervisory body of the Technical Working Parties and has the authority to take all decisions on technical matters and has thus also developed and adopted the present basic principles for the testing. The same procedure applies to the periodic revision of existing UPOV Test Guidelines. During each session the respective Technical Working Parties review the existing Test Guidelines and decide which of them would require revision.

6. The Test Guidelines are a tool for assessing distinctness, uniformity and stability in giving the experts standardized means of collecting information. They are meant for harmonizing descriptions as a first step towards establishing distinctness. They are silent on the size of the difference needed to ensure distinctness.

*Explanation: The present valid text is contained in document TG/1/2 adopted by UPOV in 1979. UPOV is preparing a CD-ROM (TG-ROM) which will comprise all adopted Test Guidelines in electronic form.*

*In the case of "characteristics other than truly qualitative or quantitative," it is aimed at forming the states in such a way that as far as possible a clear difference can be presumed with a difference of two states of expression.*

*As a result, some countries regard varieties falling in consecutive states of truly qualitative characteristics to be distinct (1 and 2), while only every second state of a quantitative characteristic is regarded as distinct (1 and 3, 2 and 4). The majority of the UPOV member States do not follow this idea. There is a frequent misinterpretation of the use of the Test Guidelines which may stem from the title of the Test Guidelines. The function of the Test*

*Guidelines is mainly for description purposes. It has to be avoided that experts would mix description and distinction of a variety. It is possible that two varieties have identical descriptions but are nevertheless sufficiently distinct to be different varieties, or that two samples of plant material could have different descriptions but are not sufficiently distinct to be from two varieties eligible for protection. Therefore the yard stick of two states of expression in quantitative characteristics is for the drafter of the Test Guidelines and not for the user.*

7. The list of individual Test Guidelines adopted by UPOV can be found in document TGP/2.

8. [3] The basic principles and the individual Test Guidelines prepared for each genus or species or a further subdivision, should not be considered an absolutely rigid system. There may be cases or situations which are not covered within the present framework, and these should be dealt with in a manner which is in keeping with these principles.

## 2. RELEVANT ARTICLES IN THE UPOV CONVENTION

### 2.1 Definition of a Plant Variety

9. Article 1 of the UPOV Convention gives a broad definition of a plant variety, including varieties not necessarily meeting the conditions for the grant of a breeder's right.

10. Article 1(vi) states:

"(vi) "variety" means a plant grouping within a single botanical taxon of the lowest known rank, which grouping, irrespective of whether the conditions for the grant of a breeder's right are fully met, can be

- defined by the expression of the characteristics resulting from a given genotype or combination of genotypes,
- distinguished from any other plant grouping by the expression of at least one of the said characteristics and
- considered as a unit with regard to its suitability for being propagated unchanged;"

11. The technical criteria for a variety eligible for protection under the UPOV Convention are set at a higher level than the general definition of variety stated above. From a technical point of view the main Articles in the UPOV Convention are Articles 5 to 9.

## 2.2 Conditions of Protection

### 12. [6] Article 5 reads as follows:

"(1) [*Criteria to be satisfied*] The breeder's right shall be granted where the variety is

- (i) new,
- (ii) distinct,
- (iii) uniform and
- (iv) stable.

"(2) [*Other conditions*] The grant of the breeder's right shall not be subject to any further or different conditions, provided that the variety is designated by a denomination in accordance with the provisions of Article 20, that the applicant complies with the formalities provided for by the law of the Contracting Party with whose authority the application has been filed and that he pays the required fees."

13. The requirement of novelty is a matter of facts outside the variety or facts concerning actions done with the variety and does not depend on the descriptive features of the variety. The requirements of distinctness, uniformity and stability are requirements calling for technical judgements concerning the variety. These requirements are further defined in Articles 7 to 9.

## 2.3 Distinctness

### 14. Article 7 reads as follows:

"The variety shall be deemed to be distinct if it is clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application. In particular, the filing of an application for the granting of a breeder's right or for the entering of another variety in an official register of varieties, in any country, shall be deemed to render that other variety a matter of common knowledge from the date of the application, provided that the application leads to the granting of a breeder's right or to the entering of the said other variety in the official register of varieties, as the case may be."

*Remark: For a definition of common knowledge see paragraph 25 and document TGP/3.*



2.4 Uniformity

15. Article 8 reads as follows:

"The variety shall be deemed to be 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."

2.5 Stability

16. Article 9 reads as follows:

"The 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."

3. PRINCIPLES FOR THE CONDUCT OF TEST FOR DISTINCTNESS;  
UNIFORMITY AND STABILITY OF NEW VARIETIES OF PLANTS

17. The following basic principles should be applied to all technical tests for distinctness, uniformity and stability undertaken with respect to applications for plant variety protection, irrespective of whether UPOV has established individual Test Guidelines or not.

18. In case UPOV has established separate Test Guidelines, these Test Guidelines and the basic principles as especially laid down in Chapter 10 below should be followed in the testing.

19. In case UPOV has not, or not yet, established individual Test Guidelines for a given species the same principles apply and especially those for the selection of suitable characteristics. More details are also laid down in Chapter 11 of these basic principles.

20. A State which receives a first application for a variety of a species for which it did not yet perform tests should follow the steps listed below:

- (a) verify whether UPOV Test Guidelines have been established, if not
- (b) search for States which have granted protection for varieties of that species, if not
- (c) preferably discuss with offices of neighboring countries or of the region or of States with comparable climate whether Test Guidelines could be established together for that species, if not
- (d) prepare own Test Guidelines and inform the Office of UPOV of it.

21. The only binding obligations on UPOV member States are those contained in the text of the Convention itself. UPOV can moreover only make recommendations on that text or prepare guidelines for the interpretation of that text. These basic principles and their incorporation into the individual UPOV Test Guidelines are intended to give guidance for the interpretation of the above Articles 7, 8 and 9 of the UPOV Convention. Their purpose is to ensure that the Articles in question are applied in as harmonized a form as possible and that decisions are taken in a similar way leading to the same or similar results.

*Remark: How far the UPOV Test Guidelines are reflected in national practice or national law will depend on the individual situation in each member State, on its national legislation and on the status which might be given to them in that legislation. In some States they are no more than just guidelines which, if considered necessary, could be ignored, while in others they have a certain force. In most States it is the authority responsible for the granting of rights or for the testing of varieties, or the expert responsible for the testing of a given species, who will determine how far the UPOV Test Guidelines are actually applied in national tests.*

*In practice the UPOV Test Guidelines are taken over in many member States entirely without any change (no deletion of characteristics, no addition). In other member States all characteristics with an asterisk and a selection of those without an asterisk are taken over. As they are not exhaustive, further characteristics may be added. In principle the UPOV Test Guidelines are broadly accepted and guaranteed on account of the broad participation in their preparation and continuous updating, which also proves their quality. The use of the UPOV Test Guidelines is independent of whether a given State has a system of official growing tests done by government testing authorities or a breeder testing system where the applicant is responsible for the growing test and the submission of a test report.*

*Although the UPOV Test Guidelines are only guidelines, they nevertheless play a certain role in court cases on infringements, as they represent an official opinion internationally agreed upon and based on the technical knowledge of experts from the UPOV member States responsible for plant variety protection and for the testing of the species concerned.*

#### 4. ASSESSMENT OF VARIETIES

##### 4.1 Characteristics

22. [6] The word "characteristics" has been taken out of the Article 7 of the 1991 Act of the UPOV Convention on distinctness but is still maintained in the definition of the variety and in the articles on uniformity and on stability and thus remains also the basis for distinctness. The three requirements of

- distinctness
- uniformity and
- stability

are therefore assessed in UPOV member States on the basis of characteristics and their expressions.

##### 4.2 Artificial Factors, Secondary Organism, Chemicals

23. The expressions of a characteristic or several characteristics of a variety may be affected by factors foreign to the normal organisms, as there are endophytes, viruses, growth retardants, past effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc. Depending on the species concerned, the testing authority has to ensure that the varieties under test are either all free from a given factor, organism or chemical or that all varieties under test including all reference varieties contain those parts in order that the results can be compared with each other. Therefore, many individual Test Guidelines require virus free material or material not obtained from tissue culture or material of a specific age after grafting or the plant material sent in is only used as mother plants from which vegetative material is taken by the national office in order to exclude any effect of the preceding possibly different treatment by different applicants.

##### 4.3 Comparison with Similar Varieties

24. To test whether a candidate variety meets the technical criteria, it is compared with varieties of common knowledge in a growing trial. In case of growing trials performed by government testing authorities, a Technical Questionnaire, completed by the applicant and submitted with the application, indicates characteristics of importance for selecting varieties most similar to the candidate. These varieties are included in the trial, together with the candidate, for side-by-side comparison.

25. Common knowledge for UPOV purposes is explained in document TGP/3 in detail.

*Remark: To be considered as a distinct variety, a variety must be identified as comparable to local population(s) from common knowledge, registered or not registered. For at least one reliable characteristic, the average of the*

*candidate variety must be significantly different from the one of the local population; and the improvements of the uniformity, observed in the candidate variety (by reducing the standard variation) is not considered as sufficient to assess distinction..*

26. The similar varieties to be taken into account for comparison should not, however, be limited to national borders. An application for protection or for entry into an official register anywhere in the world causes the variety to be regarded as a matter of common knowledge. However, in practice testing experts know that varieties which were selected in an environment which is significantly different from that in which the variety is to be tested are bound to be different from the variety under test. This enables them to limit the size of the reference collection against which candidate varieties must be tested.

*Explanation: In order to keep up with the increasing number of varieties worldwide, UPOV collects and publishes information on varieties on the UPOV-ROM Plant Variety Database, a central computerized database which is updated bimonthly and which will be updated on a monthly basis in the future. The database is free of charge to the UPOV member States submitting their updated data, but it is also available to other States or the general public for a yearly subscription price of 750 CHF (see Circular U 2631). In addition to the database the UPOV-ROM also contains for those who do not yet have access to Internet several documents and other information as the texts of the Convention, lists of publications, lists of member States, etc., which are offered on the UPOV Website.*

*Remark: A red rose candidate variety, for example, need not be compared with all known rose varieties but only with those with red flowers. Other characteristics, such as growth habit, may limit the extent of the trial even further. In case of growing trials performed by the applicant, on instructions of the national competent authorities, the same procedure will have to be followed by the applicant.*

*With the entering into force of the 1991 Act of the UPOV Convention, more and more States are offering protection to the whole plant kingdom and will increasingly have to rely on the applicant or botanical gardens, gene banks, specific institutes or regional groups to maintain part of their reference collection.*

27. Prescreening of all existing varieties of a species on a worldwide level may become very cumbersome but will also be more and more necessary as the number of varieties increase and the markets become more global, especially with the ornamental and vegetable, but also other species. To facilitate this task, characteristics least influenced by the environment are used in the first instance, corresponding to the normal selection of grouping characteristics. In addition, other characteristics may be used as supplementary information, confirming differences in morphological characteristics [if these characteristics have been approved by UPOV].

28. Rules for prescreening are laid down in detail in document TGP/4.

*Explanation: Caution should be applied with the use of electrophoretic characteristics as mostly there is no direct correlation between morphological expressions and certain electrophoretic bands. This will be even more crucial in case it is intended to use other methods such as DNA profiling, for the purpose of prescreening.*

The Technical Working Party for Fruit Crops (TWF) and the Technical Working Party on Ornamental Plants and Forest Trees (TWO) are strictly opposed to the use of electrophoretic characteristics and even more to other methods as DNA profiling as long as there is no strong correlation to existing morphological characteristics.

The TWO prefers digital image for prescreening to any other new methods, as a picture together with the grouping characteristics would give information closer to the testing. If accepted at all, the TWO therefore recommends digital image for identification and prescreening before the possible use of electrophoresis.

In the Technical Working Party for Agricultural Crops (TWA) the knowledge of the genetic control of electrophoretic bands is a prerequisite for their possible use. If the genetic background of a given band is not known, it cannot be used for distinctness purposes.

#### 4.4 Cooperation in Growing Tests

29. The UPOV Convention does not oblige the national authorities to perform the testing themselves. They may delegate the task to another party, or make use of results already obtained by another party.

*Remark: The task of those national authorities who choose to accept full responsibility for the technical examination, including their own growing tests, is becoming increasingly demanding, especially since their lists of protectable plant species are continually being extended. These lists have been totally abandoned under the 1991 Act of the Convention and varieties of all botanical taxa must be eligible for protection within a period of ten years after its coming into effect in a particular State. It is unthinkable that official testing stations will be able to provide testing facilities with growing tests for all taxa applied for and member States are increasingly considering the adoption of systems of cooperation with breeders and applicants or with the competent authorities of other States.*

##### 4.4.1 International Cooperation Between Testing Authorities

30. Cooperation with other member States in DUS testing alleviates the problem by sharing the time, expense and expertise involved in carrying out the DUS tests or the maintenance of live collections of reference varieties required for each genus or species in which varieties are tested. For details of international cooperation see document TGP/5.

*Explanation: International cooperation often begins as a mere exchange of varietal data which may then develop in a more formal bilateral testing agreement. UPOV has prepared a Model Administrative Agreement for International Cooperation in the Testing of Varieties (Section 19 of the UPOV Collection of Important Documents) to facilitate the conclusion of bilateral agreements for the testing of varieties.*

*Document C/32/5 prepared for the ordinary Council session in 1998 gives further information on cooperation in examination and will be updated every year.*

*UPOV has also prepared a model for a UPOV Report on Technical Examination and UPOV Variety Description (Section 23 of the UPOV Collection).*

*The ultimate form of international cooperation is a "centralized" testing system where the full procedure is carried out by one authority on behalf of other member States, irrespective of the origin of the varieties or their applicants. This can be done for a given region or—in case of glass house plants—for most, if not all, member States.*

*Chrysanthemums, for example, are tested in the United Kingdom on behalf of most other member States. South Africa has offered reciprocal facilities for some of its indigenous ornamental genera. A great advantage of central testing is that it provides a single basis for decisions on distinctness, uniformity and stability for all varieties of a given genus or species.*

*UPOV has established a document, TC/34/4 comprising a List of Species in Which Practical Technical Knowledge has Been Acquired or for Which National Guidelines Have Been Established, giving technical experts useful information on whom to contact in other member States with respect to a given species.*

*A list of e-mail addresses of technical experts in UPOV member States is available in document TWC/16/8 or a more updated version on the Internet: <http://www.bioss.sari.ac.uk/links/upov/upemail.html>.*

#### 4.4.2 Cooperation with Breeders and Applicants

31. Close cooperation with breeders has always been promoted by UPOV, even in the case of member States with a strict system of government grown test. Basically, breeders and applicants are required to provide the testing authorities with all necessary information, documentation and propagating material but, to varying degrees, they may actively partake in the growing test process.

32. In most countries, plant breeders' rights are exclusively administered by the official authority, although the breeders' facilities are sometimes used under certain circumstances to grow the plants. At the other extreme the applicant or breeder may be asked to do the full growing test according to prescribed Test Guidelines and submit a test report.

*Remark: There are well-established industries, which have available carefully controlled evaluation trials. Instead of going to the expense of establishing its own examination plots, the official testing authority makes use of these existing facilities. This is also to the advantage of the breeders or applicants, since it is time-saving, especially in the case of trees which take some years to reach fruiting maturity. Normally, a flexible relationship exists between the testing officials and the breeders and often reference varieties are selected for inclusion in the trials by personal communication, even before the application for plant breeders' rights has been filed.*

*Cooperation is particularly useful for those species for which breeding activity is limited to a few breeders who are highly specialized in their particular field.*

*In minor crops with few varieties, where the applicant had a satisfactory trial with the full range of reference varieties concerned, officials have been able to perform the observations on the breeder's premises.*

*Document TC/32/4 on the Level of Involvement of the Applicant in the Growing Test gives useful information on the different possibilities of involvement of applicants in the growing tests.*

33. Some member States have a system where breeders or applicants even perform the whole growing test and observations leading to a test report themselves where this is subject to the strict technical procedures and high degree of legal certainty required by UPOV. The decision is entirely based on the test results supplied by the breeder or applicant. UPOV has prepared a list of conditions for the examination of a variety based upon trials carried out by or on behalf of breeders.

34. Details on the conditions fixed by the Council for the examination of a variety based upon trials carried out by or on behalf of the applicant or breeder are laid down in document TGP/6.

*Remark: When a non-official testing authority or the applicant or breeder does the growing tests, the establishment of a variety database under the responsibility of the national authority should be foreseen to secure the list of reference varieties used in a particular examination.*

## 5. DEFINITION AND OBSERVATION OF CHARACTERISTICS

Remark: A chapter on the grouping of varieties should be added.

5.1 Selection of Characteristics

35. [7] The characteristics listed in the Test Guidelines are those which are considered to be important for the description of varieties and therefore also for distinguishing one variety from another and for the examination of uniformity and stability. They are not necessarily qualities which give an idea of a certain value that the variety may possess. Such characteristics may be morphological, physiological, biochemical or of another nature but they must be capable of precise recognition and description and must lead to consistent and repeatable results. The Tables of Characteristics of the individual Test Guidelines are not exhaustive but may be enlarged by further characteristics if this proves to be useful and the characteristics meet the conditions set out in the Convention.

*Remark: The normal requirements which any characteristic has to fulfill to be included in the Test Guidelines should be enumerated.*

*Some member States accept a large number of characteristics for description and for DUS testing, which means that the breeder has to make his variety uniform for all those characteristics. Other States may accept a smaller number in order to avoid an unnecessary workload for the breeder but with the consequences that it may be more difficult to distinguish a candidate variety within that limited number of characteristics.*

36. The basic requirements a characteristic has to fulfill before it can be included in the UPOV Test Guidelines or used for DUS testing are the following:

- (a) it must be capable of precise recognition and description;
- (b) it must lead to consistent and repeatable results;
- (c) it must enable a clear differentiation in the collection of varieties of the species concerned;
- (d) it must make it possible to fulfill the usual uniformity requirements;
- (e) it must be clearly defined in the observation and the evaluation of the results.

*Remark: Further recommended requirements are that the characteristics are not or only little affected by the environment, that there is a clear differentiation in the states of expression, that it is reliable, that a standardized agreed method exists and is laid down (in case of laboratory test or disease tests). Some also require that the observation and evaluation of the characteristic should be possible with reasonable effort and*



*expenditure and that the breeder must be able to maintain his variety uniform and stable in those characteristics with reasonable effort. Different degrees of uniformity are not acceptable for distinctness and a characteristic can only be used if both the candidate and the closest variety are uniform in that characteristic.*

37. There are four main groups of characteristics:

(a) Characteristics which UPOV considered important for the testing of DUS and for which UPOV agreed that they should be used on a routine basis for all varieties in every growing period over which the examinations are made and should always be included in the variety descriptions, except when the state of expression of a preceding characteristic or regional environmental conditions render this impossible (they are marked in the UPOV Test Guidelines by an asterisk (\*)).

(b) Characteristics which UPOV regarded as important for the testing of DUS but which were not considered necessary to be observed every year on a routine basis by all member States (they are included in the UPOV Test Guidelines without an asterisk).

(c) Characteristics important for the testing of DUS but only of importance in one or a few States or only needed very rarely for distinction (they are not included in the UPOV Test Guidelines).

(d) Characteristics which UPOV considered not sufficient to establish distinctness (they are not included in the UPOV Test Guidelines). In a few cases they have been added in an annex as supporting evidence characteristics if they fulfilled certain minimum criteria.

*Remark: In the case of electrophoresis characteristics the additional criteria are that there has to be a good knowledge of the genetic background, a standardized method and a positive result of a ring test between member States on the method.*

*Some of these characteristics may be very useful in identifying plant material as belonging or not to a variety which by other means has already proved to be an independent variety.*

38. From another angle one can divide the characteristics observed as follows:

- (a) grouping characteristics,
- (b) routine characteristics,
- (c) non-routine characteristics,
- (d) characteristics observed for non-DUS purposes (identification, supporting evidence, VCU, etc.).

39. Grouping characteristics should only be selected from the first group (routine asterisk characteristics). They should also be included in the Technical Questionnaire.

*Remark: The fact that a given characteristic has an asterisk does not necessarily mean that it is more important or better for DUS testing than a characteristic without an asterisk or even a characteristic not included in the UPOV Test Guidelines, as long as it fulfills the normal criteria for use for DUS testing. The asterisk only establishes a common basis to facilitate comparison of variety descriptions across borders.*

40. Routine characteristics should in the first instance cover all characteristics with an asterisk in the UPOV Test Guidelines. Further routine characteristics may be selected from the non-asterisk characteristics. Only exceptionally, routine characteristics should be selected from characteristics not included in the UPOV Test Guidelines. It is recommended that in such a case UPOV should be informed and those characteristics should be proposed for inclusion in the UPOV Test Guidelines on the occasion of the next revision.

41. Non-routine characteristics are characteristics used only for distinction on a case by case basis, when routine characteristics are not sufficient for distinguishing a candidate variety from a very close existing variety. These characteristics must fulfill all basic requirements any characteristic has to fulfill before it can be used for DUS testing. The only difference to routine characteristics is that in the majority of the other cases they are not needed and thus not observed in order to save unnecessary efforts. They cannot be selected from the group of characteristics which can be used only as supporting evidence.

*Remark: Many characteristics on resistance to diseases are non-routine characteristics. Electrophoretic characteristics are not non-routine characteristics but only characteristics for supporting evidence and not for distinction.*

42. Although some degree of fluctuation in the expression of genetically controlled differences is expected under different environmental circumstances, priority is given to those inherited characteristics that are least susceptible to environmental influences. Precisely defined testing procedures are also of importance in minimizing the influence of environmental conditions. In testing one has to be careful that expressions of characteristics are not due to factors such as disease or mineral deficiency. Rootstocks may also have an effect and certain expressions of vegetatively propagated varieties occurring during the youth phase of a tree may disappear with age.

*Remark: Under the UPOV system, characteristics are selected from the point of view of suitability for description and for DUS testing and not for their commercial value. The superiority or usefulness of a variety is not a criterion for protection, since the economic value of its so-called performance characteristics may change from time to time and from country to country. In certain ornamental varieties it would be almost impossible to assess value because of personal preference. It is for the users of the variety*

*to decide on its superiority or usefulness and not for the testing authorities. Performance characteristics may, however, be used for description and for DUS testing, if they fulfill the normal requirements fixed for any other characteristics. Disease resistance characteristics as well as characteristics from chemical constituents may be included, provided that they can be precisely tested and that they are necessary for establishing distinctness. It is important that each of these characteristics should be well defined and that an accepted, standardized method is established for its evaluation and included in the Test Guidelines. In case they are the only distinguishing characteristic, a bulk sample alone is not sufficient as uniformity has to be checked first to ensure that the characteristic can be used for distinction.*

## 5.2 Qualitative and Quantitative Characteristics

43. [8] [9] To enable varieties to be tested and a variety description to be established, characteristics in the UPOV Test Guidelines are subdivided into their different states of expression, called in short "states," and the wording of each state is followed by a "Note." For a better definition of the states of a characteristic, example varieties are indicated in the UPOV Test Guidelines whenever possible. The characteristics used to distinguish varieties may be either qualitative or quantitative. For detailed information see document TGP/7.

44. [10] "Truly qualitative characteristics" are those which show discrete discontinuous states with no arbitrary limit on the number of states (e.g. number of whirls: one (1), two (2), three (3)). These are qualitative characteristics with clear-cut (discrete) discontinuous states of expression, each state being self-explanatory and independently meaningful. Each state is clearly different from the other and as a rule these characteristics are not influenced by environment.

45. "Pseudo-qualitative characteristics" are characteristics which do not fit this definition of truly qualitative characteristics but are handled as qualitative when it is more reasonable to disregard continuous variation for practical purposes and the states created are meaningful and sufficiently different from one another (e.g. shape: ovate (1), elliptic (2), round (3), obovate (4), or expression: absent or very weakly expressed (1), weakly expressed (2), strongly expressed (3)).

46. [11] "Quantitative characteristics" are those which can be recorded on a one-dimensional scale and show continuous variation from one extreme to the other. They are divided into a number of states for the purpose of description. The division is made primarily for description and not for distinctness purposes. The Test Guidelines are silent on the difference needed for distinctness. The states of expression should, however, be meaningful.

### 5.3 Combined Characteristics

47. [12] Characteristics which are assessed separately may subsequently be combined, for example the length/width ratio. Combined characteristics have to be treated in the same way as other characteristics.

### 5.4 Observation of Characteristics

48. [13] In order to obtain comparable results in the various member States the scope of the test has to be harmonized as far as possible and considered useful (for example, size of plots, sample size, number of replications, duration of tests, etc.).

*Remark: Some Technical Working Parties insist on a fixed sample size to reach comparable results, others prefer minimum sizes which may be enlarged if the national authority considers it useful.*

49. [14] Qualitative characteristics are normally recorded visually, whereas quantitative characteristics can be measured; in most cases, however, a visual assessment or, if applicable, other sensory observations (for example, taste, smell) are sufficient, especially where measurements are impractical and can only be made with considerable effort. When a fixed scale is used, for a qualitative or quantitative characteristic, throughout the trials and over the years, the environmental influence on the varieties is reflected in the figures.

### 5.5 Application of Statistical Methods to Measure Characteristics

#### 5.5.1 General

50. [15] For measured quantitative characteristics, statistical methods should be applied. Statistical operations on the figures of test results must be preceded by a test on the properties of the scale (e.g. nominal, ordinal or interval); for example, do the observations show normal (Gaussian) distribution and, if not, why not? Especially for characteristics which have been created by combining given characteristics, the question of whether the assumptions of the statistical methods to be used are fulfilled must be addressed. Combined characteristics can only be used for distinctness if the uniformity test on the combined characteristic itself, and not only on the components, has been successful.

*Explanation: Document TWC/14/14 on Similarity, Clustering and Dendrograms gives some information on the mentioned methods. Document TC/32/6 provides some information on the use of sequential analysis. Further information on statistical documents prepared by the Technical Working Party on Automation and Computer Programs (TWC) can be found in documents TWC/15/2 and TWC/15/3.*

51. Experts should be conscious of certain basic rules of statistics (e.g. statistics cannot be applied if there was no randomized layout of the trial or if there was a non-even distribution). Document TGP/8 gives guidance on good statistical practices.

#### 5.5.2 Measured Quantitative Characteristics

52. UPOV recommends the use of several statistical methods. One method developed by UPOV is called Combined Over-Years Distinctness (COYD) Analysis and the Combined Over-Years Uniformity (COYU) Analysis. These are statistical tools primarily intended to be used for cross-fertilized, seed-propagated varieties. In cases where certain standards required for the COYD Analysis cannot be met, UPOV recommends the use of the long term Least Significant Distance Analysis. The COY method as well as other appropriate statistics are described in detail in document TGP/9.

*Explanation: The method is reproduced in document TC/33/7. A computer program is explained in document TWC/15/17. Document TWC/14/7 gives some further explanations on the use of COY.*

*Most vegetatively propagated varieties are not planted at random blocks, which means that the requirements for the application of the long-term LSD are not met.*

A screen-based input module for COYD has still to be prepared by the TWC as well as a computer-generated demonstration of COYD.

The Technical Working Party on Automation and Computer Programs (TWC) will have to prepare a more detailed summary on the COY analysis and may propose an alternative for measurements over a single year only which is common in ornamental and fruit crops (see also paragraph 65 below).

#### 5.5.3 Visually Assessed Characteristics

53. [16] In so far as visual characteristics have been recorded with a scale which does not fulfill the assumptions of the usual parametric statistics, normally only non-parametric statistical procedures are applicable. The calculation of the mean value, for example, is only permitted if the Notes are taken on a graded scale which shows equal intervals throughout the scale. In the case of non-parametric procedures the use of a scale which has been established on the basis of example varieties representative of the different states of the characteristics is recommended. The same variety should then always receive about the same Note and thereby facilitates the interpretation of data. More details on the handling of visually assessed characteristics are given in document TGP/10.

Explanation: The TWC has to draft an adequate method giving advice on the handling of visually assessed characteristics.

Question: Do countries strictly adhere to the practice mentioned in the last sentence? If certain reference varieties are left out from a test in a particular year,

e.g. those with a light green leaf color, would the other example varieties then shift to fill the total scale or not?

## 5.6 Environmental Influence on Characteristics

54. [17] Quantitative characteristics and in limited circumstances also qualitative characteristics may be, to a greater or lesser extent, subject to environmental influence which may modify the expression of genetically controlled differences. The characteristics which are least influenced by environment are preferred. If in certain cases the expression of a characteristic has been influenced more than usual by environmental factors, it should not be used.

## 5.7 Non-traditional Non-morphological Characteristics and New Methods for Variety Testing

55. The classical methods of DUS testing are based almost exclusively on morphological and physiological characteristics. In the course of time, however, technology and procedures have been evolving that have broadened the range of characteristics available and offered the potential for more rapid results. In the light of the increasing number of varieties that need to be distinguished, the need has also increased for methods which are less influenced by the environment and thus may be more objective. In some UPOV Test Guidelines, characteristics obtained from electrophoresis have already been annexed to the Test Guidelines thereby creating a separate group of characteristics which on their own may not be sufficient to establish distinctness. The current procedures are laid down in document TGP/11.

*Explanation: Document TWC/16/11 on Digital Images in Plant Variety Testing gives some information on image analysis. Document BMT/3/2 on Identification Methods Based on Molecular Marker explains briefly the most important DNA profiling methods at present under study.*

*Various, recently developed, techniques in image analysis, electrophoresis and molecular and biochemical techniques are already being used by breeders for rapid identification of varieties. UPOV is investigating the possibility of introducing them into the DUS testing system, either*

*(i) in combination with traditional morphological and physiological characteristics as a means of selecting most similar varieties which have to be grown next to the candidate variety for close comparison, or*

*(ii) as supplementary information in addition to other differences (in morphological or physiological characteristics) in DUS tests.*

*The UPOV Working Group on Biochemical and Molecular Techniques and DNA Profiling in Particular ("BMT") has the objective of harmonizing these*

*developments in the different member States in accordance with the UPOV Convention.*

## 6. TESTING DISTINCTNESS

### 6.1 General

56. [18] According to Article 7 of the Convention, the variety must be clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of filing of the application.

57. [19] The varieties with which a variety under test has to be compared are the varieties whose existence is a matter of common knowledge. The first basis for comparison is normally those varieties which are considered to be similar to the variety under test and are available in the examining State, for example in a reference collection, or can be easily obtained. For more detailed information on common knowledge see document TGP/2.

Explanation: Some Technical Working Parties asked for the General Introduction to contain more information and explanation on how to define "common knowledge." For that purpose, all experts from the Technical Working Party on Ornamental Plants and Forest Trees (TWO) will send to the expert from the United Kingdom comments and prepared definitions on what they consider to be common knowledge for the preparation of a document by the end of January 1999. The Working Party was aware that also legal aspects were involved and not too precise information could be given (see also paragraph 25).

Remark: *In the Acts preceding the Act of 1991 of the UPOV Convention it was stated that the variety had to be clearly distinguishable "by one or more important characteristics." The word "characteristic" is still kept in the definition of a variety but it is no longer included in the requirement for distinctness and even more the word "important" is no longer kept.*

58. This basic concept for the testing of DUS are characteristics but the UPOV Convention is open to other possibilities as well. In the first instance it is possible to combine several characteristics to obtain a clear difference as long as this is definable and reproducible. It is also possible to have a recourse to other methods which could support small morphological differences observed or differences in characteristics difficult or expensive to observe. These possibilities would, however, require approval by UPOV beforehand. At present UPOV has not approved any of them. Approval would have to be given case by case and would be listed in a separate document. Therefore, so far distinction is still based on clear differences in characteristics.

Remark: A combination of characteristics is to be understood as a combination of two characteristics (e.g. ratio length/width) or in some cases three characteristics. It does not mean the application of methods like the multivariate analysis which would just give a global measure of distance without indication of a real characteristic.

59. For the decision on distinctness, only those characteristics in which both the candidate variety as well as its closest similar varieties are uniform can be used. If in one of the two varieties the expression of the characteristic is not uniform, the characteristic has to be rejected. Different degrees of uniformity are not accepted as a characteristic for distinctness.

Explanation: For characteristics observed using bulk samples some rules still have to be established on whether uniformity is only tested in cases of doubt or in cases where the characteristic is the only characteristic for establishing distinctness, especially if tests are very expensive (e.g. fragrances for Lavender).

## 6.2 Determining Minimum Distances

60. In order to sustain a reliable plant breeders' rights system in which each protected variety has a clear identity, the DUS testing has to be reliable and repeatable. The minimum degree of distinctness from the nearest (or most similar) variety for the purpose of protection has been discussed for many years within UPOV, using the term "minimum distances." Minimum distances between varieties should not become so small that plagiarism is promoted and protection eventually becomes meaningless. A larger distance in most cases leads to a stronger protection. If, however, the umbrella of protection around each variety is too large it leads to less encouragement and opportunity for crop development and may lead to monopoly, inhibiting the release of other new varieties in the given species. The new criterion of essential derivation as specified in Article 14.5 of the Convention has reinforced the protection of breeders.

Explanation: *Connection between the states of expression and minimum distance of distinctness:* The main aim of the Test Guidelines is to establish a harmonized description. For the decision on distinction uniformity and stability they only represent the first step. The Test Guidelines are silent on the minimum distance required in each characteristic and thus a decision on distinctness can never be based on the description resulting from the Test Guidelines. However, to make this first step meaningful and start to develop the possibility of distinction the following should be observed:

(a) *In truly qualitative characteristics each state is clearly separated from the other without any transition; the minimum distance is therefore always one Note. There are, however, very few truly qualitative characteristics.*

(b) *In quantitative characteristics which are observed visually, it should, if possible, be aimed at setting a scale of states where a difference of two Notes could lead to a clear difference (this is meant by the requirement that the states be meaningful). However, these two Notes are no absolute standard for the minimum distance. Depending on the testing place, the year or other environmental conditions, variety collection or special pair of varieties, the minimum distance may be more or less than two Notes, e.g. three, four or five Notes in a characteristic affected to a larger degree by the environment or may be one only or even inside one Note, distinction may be*



*possible. It is up to the expert doing the observations to take the necessary precautions or additional tests (e.g. side-by-side comparison). The variety description based on the Test Guidelines should therefore never be used alone for the decision on distinctness and a general yard stick of two Notes is only an aim for the experts who draft the Test Guidelines but never for the user.*

*(c) In quantitative characteristics which are measured it should be aimed at setting a scale of states in a meaningful way, based on the statistical exceptions in the characteristics, e.g. a difference between two Notes of at least 2 LSD.*

*(d) Characteristics which are handled like qualitative characteristics but which are not really qualitative characteristics, should be handled in such a way that possible fluctuations are taken into account when distinctness is assessed. Therefore one cannot automatically presume that the minimum distance is one Note. The sequence of the states should in such characteristics rather be chosen in such a way that as a rule a minimum distance of two Notes can be expected. Accordingly, the states may be for instance for growth habit: erect (1), semi-erect (2), prostrate (3), in one species and erect (1), semi-erect (3), intermediate (5), semi-prostrate (7), prostrate (9) in another species, and for a third species the states may be set up in yet a different way. The same reservations as for quantitative characteristics apply, however, and the description based on the Test Guidelines should not be used alone to take a decision on distinctness.*

61. Atypical plants should be limited to such a degree that accurate description and the assessment of distinctness and uniformity is possible and that stability is ensured.

### 6.3 Criteria for Distinctness

62. [20] Two varieties have to be considered distinct if the difference

- has been determined in at least one testing place,
- is clear and
- is consistent.
- 

*Question: Examiners of field crops, vegetables and fruit follow strictly two growing cycles. Why do ornamental experts not follow two cycles as a basic principle or why do examiners of field crops, vegetables and fruit feel forced to do so?*

#### 6.4 Truly Qualitative Characteristics

63. [21] In the case of truly qualitative characteristics the difference between two varieties has to be considered clear if the respective characteristics show expressions which fall into two different states.

*Remark: In truly qualitative characteristics each state is clearly separated from the other without any transition; the minimum distance is therefore always one Note. There are, however, very few truly qualitative characteristics.*

#### 6.5 Pseudo-qualitative Characteristics

64. In the case of other qualitatively handled characteristics a possible fluctuation has to be taken into account in establishing distinctness and thus a different state may not be sufficient to establish distinctness.

*Remark: See also explanation after paragraph 4.*

#### 6.6 Measured Quantitative Characteristics

65. [22] Quantitative characteristics could be either observed visually or could be measured. When distinctness depends on measured characteristics, a statistical criterion is needed which will determine whether any differences that occur in the characteristics of the variety under test are both clear and consistent from one year to the next year. UPOV has proposed several statistical methods for the handling of quantitatively measured characteristics. In the simplest method the difference between two varieties is considered clear if it occurs with one per cent probability of error, for example, on the basis of the method of the Least Significant Difference and the differences are consistent if they occur with the same sign in two consecutive, or in two out of three, growing seasons.

*Remark: In measured quantitative characteristics it should be aimed at setting a scale of states in a meaningful way, based on the statistical exceptions in the characteristics, e.g. a difference between two Notes of at least 2 LSD.*

The TWC is asked to improve this paragraph and the following paragraphs.

66. The above method does not require the size of the differences to be consistent over the year. Therefore another method which takes into account the variation between years has been developed which is called the Combined Over Years (COY) method. It gives an answer to this problems and is based on the Student's two-tailed t-test of the variety means arising from the analysis of variance of the variety-by-years table of a characteristic's means. A refinement to the COYD analysis is included, which should be used to adjust the COYD analysis when environmental conditions cause a significant

change in the spacing between variety means in a year, such as when a late spring causes the convergence of heading dates. It is supplemented by a further Least Significant Difference (LSD) method for the cases of those few varieties leading to less than about 20 degrees of freedom in the growing tests. Its main use is for measurements in cross-fertilized varieties, but if so desired it can also be used for measurements in vegetatively propagated or self-fertilized varieties. For more details on the handling of measured quantitative characteristics see document TGP/9.

Explanation: The Technical Working Party on Automation and Computer Programs (TWC) will have to prepare an enlarged summary on COYD including also a more simple test (e.g. t-test) as often only data from one year are available. It should be in line with paragraph 52 unless it is also reworded.

#### 6.7 Normally Visually Observed Quantitative Characteristics

67. [23] Quantitative characteristics do not necessarily imply measuring or counting. A large part of the quantitative characteristics is observed visually. If a normally visually observed quantitative characteristic is the only distinguishing characteristic in relation to another variety, in case of doubt, it should be measured where this is possible with reasonable effort.

68. [24] A direct comparison is always recommended between two similar varieties since direct pair-wise comparisons show the least bias. In each comparison it is acceptable to note a difference between two varieties as soon as this difference can be seen with the eye and could be measured although the measurement might be impractical and require unreasonable effort.

Explanation: The Technical Working Party on Automation and Computer Programs (TWC) will have to propose the most appropriate method for direct pair-wise comparisons between two similar varieties.

69. [25] The simplest criterion for establishing distinctness is that of consistent differences (significant differences with the same sign) in pair-wise comparisons, provided that they can be expected to recur in the following trials. The number of comparisons has to be sufficient to allow a reliability comparable with measured characteristics.

70. For more details on the handling of visually observed characteristics see document TGP/10.

*Explanation: In the species so far dealt with by the Technical Working Party on Ornamental Plants and Forest Trees (TWO), decisions on distinctness and uniformity are taken on the basis of visual observations. Measurements, if taken at all, are only a further tool and are only used to support the visual observation of the expert. Therefore the application of simple statistical methods such as t-test or LSD is sufficient.*

The TWC will have to develop methods for the handling of visually assessed characteristics.

Question: It is proposed to consider changing the wording in the technical notes of the Test Guidelines reading "All observations determined by measurement ..." Normally decisions are not determined by measurement in ornamental plants. It could rather say "All measurements ..." If decisions were to be made on those measurements, would ten measurements on typical organs (one from each of ten plants) be enough, statistically? (The variation on each plant is not taken into consideration).

## 6.8 Combined Data

71. [26] Cases can arise in which differences between two varieties may be observed in several separately assessed characteristics. If the combination of such data is used to establish distinctness (e.g. length/width ratio, but not multivariate components or a linear combination of characteristics), it should be ensured that the degree of reliability is comparable with that provided for measured or normally visually observed characteristics.

## 7. TESTING UNIFORMITY

### 7.1 General

72. [27] According to Article 8 of the Convention, the variety "shall be deemed to be 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." That means the approach to vegetatively propagated varieties, truly self-pollinated varieties, mainly self-pollinated varieties, cross-pollinated varieties, synthetic varieties and hybrid varieties is necessarily very different.

*Remark: The way of propagation should be taken into consideration ONLY and not the genetic structure.*

73. [27] To be considered uniform, the variation shown by a variety, depending on the breeding system of that variety and off-types (see next paragraph) due to occasional mixture, mutation or other causes, must be as limited as necessary to permit accurate description and assessment of distinctness and to ensure stability. This requires a certain tolerance which will differ according to the reproductive system of the variety—vegetatively propagated, self-fertilized or cross-fertilized. The degree of variation and the number of off-types appearing should not exceed the tolerance indicated in the appropriate UPOV Test Guidelines.

### 7.2 Definition of Off-type

74. For the assessment of uniformity

"Any 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 plant or of part of the plant, used in the testing of distinctness, taking into consideration the particular species."

*Explanation: The TWO discussed an alternative clarifying better that an off-type in some organs and not necessarily in all of them, could make the plant an off-type (e.g. in case of a mutation on part of the whole plant). That wording could read:*

*"Any plant is to be considered an off-type if it can be clearly distinguished from the variety in the expression of any characteristic used in the testing of distinctness, whether expressed on all organs to which its expression refers or even only on one or several organs of that plant, taking into consideration the particular species."*

75. With this definition, it is made clear that for the definition of off-types the same criteria apply as for the testing of distinctness.

76. The trials may also contain plants which are very different from those of the variety; these could be disregarded as long as their number does not interfere with the test. In choosing the term "could be disregarded" UPOV makes it clear that it would depend on the judgment of the crop expert whether they are disregarded or not. That would in practice mean that in vegetatively propagated varieties, with a low number of plants, already one single plant would interfere in the test and could not be disregarded.

*Remark: In several UPOV Test Guidelines characteristics on the amount of certain substances are included. In the normal case the characteristic is only observed as a bulk sample which makes it impossible to judge uniformity. In case that characteristic is the only distinguishing characteristic, separate samples have to be taken in order to check first whether the candidate variety and the closest variety to it which otherwise could not be distinguished are both uniform in that characteristic. If one of them is not uniform, the characteristic cannot be used for distinctness and the candidate variety has to be rejected for lack of distinctness.*

### 7.3 Vegetatively Propagated Varieties

77. [28] For vegetatively propagated varieties of most species, the acceptable number of off-types tolerated in samples of various sizes is based on a population standard of 1 percent and on an acceptance probability of at least 95 percent as a result of experience. The population standard can be expressed as the percentage of off-types to be accepted if all individuals of the variety could be examined. The probability of correctly accepting a uniform variety is called the acceptance probability. Based on statistical calculations for population standards and acceptance probabilities as reproduced in a separate document, in each of the individual UPOV Test Guidelines, the Technical Working Parties state whether the population standard to be used is 1% and

the acceptance probability is 95% or whether the species or a certain type of variety of that species justifies a different population standard and acceptance probability. The Test Guidelines then also state for the respective sample size the maximum number of off-types tolerated. More detailed information can be found in document TGP/12.

*Explanation: Document TC/34/5 on the Testing of Uniformity of Self-Fertilized and Vegetatively Propagated Species Using Off-types gives more detailed information.*

#### 7.4 Truly Self-Pollinated Varieties

78. [28] For truly self-pollinated varieties, the same criteria and tolerances apply as for vegetatively propagated varieties (see the previous paragraph).

#### 7.5 Mainly Self-Pollinated Varieties and Inbred Lines of Cross-Pollinated Varieties

79. [29] For the purpose of DUS testing mainly self-pollinated varieties are those varieties which are not fully self-pollinated but which are treated as self-pollinated for testing. For those and for inbred lines of cross-pollinated varieties, a higher tolerance is admitted and the population standard for the calculation of the maximum number of off-types allowed for truly self-pollinated varieties is, as a rule, doubled.

*Remark: Please note that the number of off-types tolerated is, no longer, doubled (as in the past) but is the population standard.*

Question: Does this also include species with pollen incompatibility and other pollination barriers that do not really fit into the cross pollination variety definition? These types of species can be very uniform but do not self-fertilize.

#### 7.6 Cross-Pollinated Varieties, Mainly Cross-Pollinated Varieties and Synthetic Varieties

80. [30] Cross-pollinated varieties, mainly cross-pollinated varieties and synthetic varieties, normally exhibit wider variations within the variety than vegetatively propagated or self-pollinated varieties and it is sometimes difficult to distinguish off-types. Therefore no fixed tolerance can be determined but relative tolerance limits are used through comparison with comparable varieties already known. That means that the candidate variety should not be significantly less uniform than the comparable varieties. For more detailed information on comparable varieties and relative tolerance see document TGP/12.

*Remark: Comparable varieties are varieties of the same type, e.g. single hybrids, three-way hybrids. Depending on the number of varieties, differentiation could go into very detail, e.g. of a given group (only fruiting varieties, only table grapes, only all tall varieties, early emerging or early flowering varieties).*

81. [31] For measured characteristics, the acceptable level of variation for the variety should not significantly exceed the level of variation found in comparable varieties already known. UPOV has proposed several statistical methods for the handling of uniformity of measured quantitative characteristics. One method which takes into account variations between years is the Combined Over Years Uniformity (COYU) method, which is a further development of the same method used for distinctness, but in this case for uniformity.

*Explanation: At present in case only data from one year are available, at present, States use different methods: 1.6 times the average of the variance of varieties used for comparison; variation between standard deviations of varieties, etc.*

The Technical Working Party on Automation and Computer Programs (TWC) is still discussing which method to recommend but the experts have still various opinions on the validity of the different methods.

Remark: Other methods than COYU have still to be listed by the TWC.

82. For more details on the handling of uniformity of measured quantitative characteristics see document TGP/8.

83. [32] Visually assessed characteristics have to be handled in the same way as those which are measured. The number of plants visually different from those of the variety should not significantly exceed the number found in comparable varieties already known. For more details on the handling of visually assessed characteristics see document TGP/10.

## 7.7 Hybrid Varieties

84. [33] Single cross varieties have to be treated as "mainly self-pollinated varieties," but an additional tolerance in the variety has to be allowed for the occurrence of inbred plants. It is not possible to fix a percentage as the decisions differ according to the species and the breeding method. However, the percentage of inbred plants should not be so high as to interfere with the trials. The maximum number tolerated will be fixed in the Test Guidelines concerned by the Technical Working Parties.

85. [34] For other categories of hybrids, a segregation of certain characteristics is acceptable if it is in agreement with the formula of the variety. If the heredity of a clear-cut segregating characteristic is known, this characteristic has to be treated as a qualitative characteristic. If the described characteristic is not a clear-cut characteristic, it has to be handled as in the case of other kinds of cross-pollinated varieties; that is to say, the uniformity has to be compared with that of comparable varieties already known. For the fixing of a tolerance for the occurrence of inbred plants or parent plants, the same considerations apply as in the case of a single cross variety.

86. Hybrids from non-uniform parent lines should be treated as cross-pollinated varieties as long as no other proof is given.

*Remark: Consistency (stability) of the variety must be ensured by examination of the uniformity of its parents or of the variety itself. Where neither is possible or achievable, the variety cannot be described. Non-uniformity for specific characteristics is different from general non-uniformity in this context.*

## 8. TESTING STABILITY

87. [35] According to Article 9 of the Convention, the 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.

88. [36] It is not generally possible during a period of 2 to 3 years to perform tests on stability which lead to the same certainty as the testing of distinctness and uniformity. However, if the variety is not stable, it will disappear, as it will no longer conform to the variety description and it will not be possible to maintain it.

89. [37] Generally, when a submitted sample has been shown to be uniform, the material can also be considered stable. Nevertheless, during the testing for distinctness and uniformity, careful attention has to be paid to stability. As far as necessary, stability has to be tested by growing a further generation or new seed stock to be supplied by the applicant to verify that it exhibits the same characteristics as those shown by the previous material supplied.

*Remark: This is self-policing. If the "variety" is unstable it will no longer be the variety.*

## 9. MAINTENANCE OF REFERENCE COLLECTIONS

90. [38] Each country is expected to maintain, or to arrange for another country to maintain on its behalf, reference collections of viable seed or of vegetative plant material of the varieties to which it has granted protection. The reference collections should also contain seed or vegetative plant material of any other varieties which are likely to be useful as a reference. Seed or vegetative plant material should preferably be obtained from the breeder and, when it is necessary to renew the seed or plant material in stock, the new lot should be checked against material in stock in a growing test before use. For more details see also document TGP/3 on common knowledge.

*Explanation: At present only living material of the variety capable of reproducing the variety can be considered as reference material. If an old variety is no longer available as living material but only as a description, it does no longer form part of common knowledge. A description of an old variety or a test report alone or only knowledge of an expert panel, as*



*detailed as it may be even with herbarium material, is not enough for the decision of distinctness if no more living material exists.*

## 10. COMPOSITION OF UPOV TEST GUIDELINES

### 10.1 Introduction

91. It is not possible to prepare Test Guidelines for all species in a general way. It is necessary to prepare them for each species separately or in a few cases for one whole genus or in extreme cases even for a higher unit. Different groups inside a species can only be separated into different Test Guidelines if they can be clearly separated and there is no risk that a candidate variety tested according to the wrong Test Guidelines would be declared distinct if in reality it is not.

*Remark: The more hybrids exist between species, the less groupings are possible. In annual species more groups are possible than in perennials, in seed propagated varieties more than in vegetatively propagated varieties.*

*In addition to the basic principles for testing also some basic general rules are established which apply to all individual Test Guidelines. One important rule is the composition and layout of the documents. This has changed with time. While some older documents still have a different layout, all newer ones are grouped into 10 chapters.*

92. Document TGP/2 contains a list of all Test Guidelines adopted by UPOV.

### 10.2 Cover Page

#### 10.2.1 Original Language

93. [39] The Test Guidelines are in most cases originally drafted in English and adopted in that version, and then translated into the other UPOV languages ( French, German and Spanish).

#### 10.2.2 Reference to the Basic Principles of DUS Testing (General Introduction)

94. Each individual Test Guidelines document makes reference to the General Introduction on its first page to ensure that harmonized basic principles to be followed in the application of the Test Guidelines are remembered.

*Remark: The reference may be needed especially for a user of the Test Guidelines who may be only interested in a single species and will not be as familiar with the general UPOV philosophy.*

### 10.3 Individual Chapters of the Test Guidelines

95. [40] The UPOV Test Guidelines contain 10 Chapters. These individual chapters give technical recommendations and special guidance with respect to the species dealt with. In Chapter VII, which is the main chapter, the characteristics which should be observed are listed. The chapters are as follows:

Chapter I:	Subject of these Guidelines
Chapter II:	Material Required
Chapter III:	Conduct of Tests
Chapter IV:	Methods and Observations
Chapter V:	Grouping of Varieties
Chapter VI:	Characteristics and Symbols
Chapter VII:	Table of Characteristics
Chapter VIII:	Explanations of the Table of Characteristics
Chapter IX:	Literature
Chapter X:	Technical Questionnaire

#### 10.3.1 Subject of these Guidelines (Chapter I)

96. [5] Normally, separate Test Guidelines are prepared for each species. However, inclusion of two or more species or even a whole genus or even a larger unit in one Test Guidelines document or subdivision of a species into different Test Guidelines may be considered necessary. A subdivision is only possible if the borderline between the groups inside a species can be clearly defined.

Explanation:

*In Latin names no abbreviations are used, even if a number of species from the same genus is listed, e.g. *Vitis candicans*, then *Vitis labrusca* – not *V. labrusca*.*

*Family names are normally included in Test Guidelines of ornamental species.*

*Botanical names in italics are only used for taxa from the genus downwards. Family names are not written in italics.*

#### 10.3.2 Material Required (Chapter II)

97. This chapter indicates the recommended quantity and quality of material to be submitted to the testing authority, e.g. so many grams of seed or so many seeds, plants or cuttings. It makes remarks on the health of material required, e.g. visibly healthy, not lacking in vigor or affected by any important pests or diseases, or is more precise, e.g.

free of all known viruses, or viruses or diseases specifically mentioned. It also states that the material should not have been chemically or otherwise treated (no short day or long day treatment, no cold treatment, etc.) unless requested by the authority. It also states, for several species, that the material should preferably not originate from *in vitro* propagation as that may affect certain expressions of the variety (see also paragraph 23 on artificial factors, secondary organisms, chemical, etc.).

### 10.3.3 Conduct of Tests (Chapter III)

98. This chapter indicates the way in which the test should be conducted, how many growing periods or years the plants should be observed, in how many places (mostly one place only) and how many plants with how many replications should be observed. In order to achieve comparable results, it is important that the same number of plants and the same number of replications are observed in different countries, otherwise, especially when applying statistics, a larger number of plants or more replications would lead to smaller differences which would still be considered statistically significant. It further states that when separate plots are grown for visual assessment and measuring they have to be subject to the same treatment and also that if additional special tests have been established, they have to follow the same basic principles.

*Explanation: Uniformity is observed on any characteristic of the plant, not only on characteristics listed in the Test Guidelines. Any difference in an obvious characteristic has to be considered, whether in the Test Guidelines or not. Differences in non-obvious characteristics will, however, seldom be observed.*

*When distinctness and uniformity are determined by visual assessment, the whole plot is observed. Measurements are made only on a restricted number, e.g. 10 plants.*

*Measurements from identified off-types should not be included in the calculations of distinctness.*

### 10.3.4 Methods and Observations (Chapter IV)

99. [40] This chapter explains how the variety should be observed, how many of the grown plants should be observed for distinctness, which organs from which part of the plant should be observed (e.g. main stem, side branches, leaves from the outer side of a plant, from a fixed height or from the middle part of a branch, terminal flowers or fruits or whether the terminal flower or fruit should be excluded), at what time the observations of a given organ should be made, etc. Chapter IV also fixes the statistical threshold for observations made by measurements (e.g. in vegetatively or self-fertilized species, it fixes the population standard and acceptance probability and fixes the number of off-types tolerated for a given sample size. In principle all information applicable to a number of characteristics is included here, while more particular (or more detailed)

information valid for only one or a few characteristics is included in Chapter VIII (Explanations on the Table of Characteristics).

*Explanation: All Test Guidelines for vegetatively-propagated or self-fertilized varieties have to contain a paragraph fixing the population standard and the acceptance probability.*

### 10.3.5 Grouping of Varieties (Chapter V)

100. This chapter first gives general information on the criteria for selecting grouping characteristics to place most similar varieties close to each other in the growing test and thereafter lists the most appropriate characteristics which should be used for such grouping. With only a few varieties, grouping may not be very important and for this reason in some Test Guidelines no grouping characteristics are indicated. Depending on the species, different characteristics are selected, mainly qualitative ones and preferably those quantitative characteristics which are less affected by environment, e.g. color in ornamental species, earliness in cereals or size for trees or bushes of some fruit species (see also paragraphs 38 and 39).

*Explanation: The purpose of grouping characteristics is to help in planning the layout of the trial and in selecting appropriate example varieties.*

*Qualitative characteristics should be used in the first instance as grouping characteristics. In case of doubt, candidate varieties have to be tested in more than one group.*

*In the Technical Notes the grouping characteristics should have the same wording and states of expression as in the Table of Characteristics.*

*Grouping characteristics should normally cover most of the characteristics of the list of characteristics appearing in the Technical Questionnaire. These are mainly based on information supplied by the applicant. They must be of such a nature that the breeder/applicant will interpret them correctly and will be able to provide correct information.*

*The grouping characteristics are normally listed chronologically as in the Table of Characteristics. Another order is, however, acceptable if so desired by the Technical Working Party concerned.*

### 10.3.6 Characteristics and Symbols (Chapter VI)

101. [41] It may not always be necessary to use all the characteristics listed in the individual Test Guidelines to describe a variety and to establish that it is distinct. This chapter therefore explains the different groups of characteristics mentioned in the chapters which follow. In principle, two groups are included in the document:

#### 10.3.6.1 Characteristics with an Asterisk

102. The first group are those characteristics which all experts accepted at the time of preparation of the Test Guidelines and which all agreed to use every time in a description in order to harmonize descriptions issued by the member States under the terms of the Convention. The use of those characteristics is "obligatory" in so far as one can speak of an obligatory characteristic in a document which *per se* is only a recommendation (see also paragraph 37).

103. This group of characteristics has been marked with an asterisk (\*) to show that the characteristics should be included in the variety description of all varieties in every growing period over which examinations are made, except when the state of expression of a preceding characteristic or regional environmental conditions renders this impossible.

104. A characteristic should only receive an asterisk if

- (a) it is important for description;
- (b) it is needed as a minimum information for the exchange of information on the variety;
- (c) if all experts agree to the asterisk (in case one State objects to the indication of an asterisk to a given characteristic and states the reasons (e.g. no discriminating power under his country's conditions), no asterisk should be given);
- (d) at least the range of example varieties remains the same in the different countries in case the expressions change from country to country;

*Remark: questioned by some experts and proposed to be deleted as the example varieties may change from one country to another.*

(e) in the case of a pest or disease resistance characteristic that it has the states "absent, present," characteristics with degrees of resistance should not receive an asterisk.

Question: This position is a danger for future breeding. Most parts of the new breeding programs are done with polygenic resistance and, more and more, situations as "absent/present" will be replaced by "level of resistance compared to .....", even in "said" monogenetic resistance. Expression of monogenetic resistance is increasingly influenced by new genetic background and modifiers.

*See also paragraph 37.*

### 10.3.6.2 Characteristics Without an Asterisk

105. The second "non-obligatory" group covers those characteristics which many experts consider useful for description and for DUS testing but which not all experts of the member States can accept as routine characteristics, either because they consider them unnecessary and only increase the workload, or because the environment of their country does not enable them to observe these characteristics.

*Explanations: With respect to the selection criteria for the second group of characteristics different opinions exist so far.*

*(a) In order to reach harmonization between the member States one group of experts would prefer to reach a situation where the number is almost fixed for all States and only in exceptional cases further characteristics are added (e.g. if the applicant declares that his variety is different only in that new characteristic) and that this addition is brought to the attention of the respective Technical Working Party for inclusion into the Test Guidelines.*

*(b) Another group prefers a short list (especially for TWA species), but feels free to add new characteristics at any time. Therefore some States use a large number of additional characteristics not included in the UPOV Test Guidelines for certain species.*

*(c) A third group (especially for TWF and some TWO species) prefers a large list of non-asterisk characteristics out of which each State selects those which are suited to its special situation and environment. A characteristic should not just be deleted because it is not needed in one State but is useful in another State with the argument that that State is free to add it at any time on the national level. A large list is preferred to ensure that in case the characteristic is used, all States use it in the same way. That procedure is preferred to a short list to which every State adds numerous additional characteristics but several States may add the same characteristic with a different wording and different states of expression.*

*(d) There is another group of a few States and a regional grouping which prefers a short list as internally they/it have/has decided to use in principle and if possible all characteristics of the UPOV Test Guidelines irrespective of whether they are marked with an asterisk or not.*

### 10.3.6.3 Characteristics Not Included in the UPOV Test Guidelines But Used for Distinctness by Some Member States

106. There is still another group of additional characteristics during the trial becoming of importance for the distinctness of the candidate variety. These characteristics are not mentioned in the Test Guidelines. They have to fulfill the same requirements as any

other characteristic accepted for inclusion in the UPOV Test Guidelines and especially the requirement of uniformity and reproducibility (see also paragraph 36).

#### 10.3.6.4 Characteristics for Supporting Evidence

107. A third group of characteristics has been agreed upon by UPOV and has been added to the UPOV Test Guidelines in an Annex. For these characteristics, the majority of the UPOV member States are of the view that it is not possible to establish distinctness solely on the basis of a difference found in these characteristics. They can thus only be used as supporting evidence in addition to a difference found in a characteristic from the Table of Characteristics. More information can be found in document TGP/14 on supporting evidence.

*Explanation: These characteristics are so far limited to characteristics derived by using electrophoresis. The size of that difference required, especially whether it could be lower than if there were no supporting evidence by this third category of characteristics, has not yet been fixed by UPOV.*

#### 10.3.6.5 States of Expression, Notes, Example Varieties, Explanations

108. In the Table of Characteristics, a scale of possible states of expression (so-called "states") is indicated for each characteristic. The states are accompanied by "Notes" containing code numbers which permit the computerization of variety descriptions. As far as possible, "Example Varieties" are also cited for each state. Some characteristics are marked with the sign (+), which indicates that the characteristic is illustrated by explanations and drawings or that testing methods are indicated in the chapter entitled "Explanations and Methods."

109. Chapter VI also explains other signs added to the characteristics in the Table of Characteristics in Chapter VII making reference to Chapter VIII which gives explanations and details on those characteristics.

### 10.3.7 Table of Characteristics (Chapter VII)

#### 10.3.7.1 General

110. [41] The Table of Characteristics represents the main part of the Test Guidelines. It contains a list of all characteristics recommended by UPOV for the description of varieties and for the testing of distinctness, uniformity and stability, in short called DUS testing. For each characteristic listed, several individual columns with information are provided and different states of expression are indicated. For more details on the different categories of characteristics and the harmonization of states of expression see document TGP/7.

### 10.3.7.2 Layout

111. In the new layout—some documents still follow the different older layout—the first column contains the chronological numbering of the characteristics and also some other signs. It also indicates whether the characteristic is an "obligatory" one by marking or not marking it with an "asterisk." It may furthermore contain a plus (+), making reference to more detailed information on the characteristic in chapter VIII (Explanations on the Table of Characteristics). Thereafter follows the full text of the characteristic with its different states of expression, in four separate columns, one for each of the official UPOV languages. Thereafter follows a column with example varieties for most states of expression. The "example varieties" are varieties which are considered representative for the given state of expression. The final column of the Table of Characteristics indicates, opposite the states of expression for each characteristic, numerical Notes (numbers) for the purpose of electronic data processing.

*Remark:* In the past UPOV had issued all Test Guidelines in a single trilingual version covering the English, French and German text in one single document. With the introduction of Spanish the Test Guidelines would have become too voluminous and it was therefore decided to prepare separate versions for each of the languages.

112. The use of Notes facilitates the storage of data and their handling and the comparison of variety descriptions. It also facilitates the treatment of data in the computer. Finally it enforces discipline, as it requires the experts to look at all characteristics in a more systematic way, especially at the time of preparation of Test Guidelines.

*Explanation:* The layout, in the trilingual versions,—at present still used in a large number of the older adopted UPOV Test Guidelines—shows differences in the first column where it is indicated whether the characteristic is an "obligatory" one by marking or not marking it with an "asterisk." Thereafter follows the column with chronological numbering of the characteristics, followed by the column with the full text of the characteristic in all three languages. The next column indicates the different states of expression in English, followed by a column in French and another in German. All other parts are the same as in the new layout.

*With the use of Notes it is, for example, possible to present, on one single page in a table, the full variety descriptions of 50 to 100 varieties. This facilitates a general overview of the range of the collection in a given species.*

### 10.3.7.3 Order of Characteristics

113. [43] In the Test Guidelines, the morphological characteristics are normally arranged in the botanical order of organs. Where applicable, distinctions are made



between different stages in the life of a plant, such as dormant and growing periods, juvenile and mature stages or the grains submitted by the applicant and the grains harvested from the plants in the growing trials. For the different organs the following order is used:

- grain (seed submitted)
- seedling
- plant (e.g. attitude)
- root
- root system or other subterranean organs
- stem (stipule)
- leaf (blade, petiole) [petiole, blade?]
- inflorescence
- flower (calyx, sepal, corolla, petal, stamen, pistil)
- fruit
- grain (harvested)

114. Within the above order, the following subdivision of the characteristics of different organs of the plants has been adopted:

- attitude
- height
- length
- width
- size
- shape
- color
- other details (such as surface, etc., and characteristics of part of the organ such as base, top and margin).

115. Physiological characteristics should be included at the end of the Table unless specific growth stages are involved in which case they may be included in their correct chronological position (e.g. time of bud burst) in order that one should not forget to do that observation at the right phenological stage.

116. [42] In certain cases this order has been replaced by a chronological order of recording, starting from the time of planting or sowing (in some cases even before) until harvest (or even thereafter), especially if the recording follows an existing code of growth stages of the species concerned, or it has been combined with the botanical order of organs, whereby inside one organ a chronological order of recording is applied.

*Explanation: Numbering of characteristics: It is proposed to use, throughout the drafting of new Test Guidelines in each new version in square bracket, the number the characteristic had in the first draft. In the revision of the existing Test Guidelines the number in the adopted Test Guidelines should always be added in brackets until a new final version has been reached.*

#### 10.3.7.4 Order of States of Expression Inside a Characteristic

117. [44] As far as it is possible to build up an order for the expressions inside a characteristic, the smaller, lesser or lower expressions should be assigned the lower Note. The order of the states should be as far as possible:

- from small to large
- from light to dark (e.g. flower color)
- from green to ripe (e.g. fruit color)
- from low to high
- from narrow to broad
- from young to old
- from base to apex

118. In case of colors the chronological appearance of the color (e.g. as the fruit ripens) could also be used. The same sequence should be used for organs with similar states within a single document (e.g. color of leaf and color of stem).

119. In the case of shape characteristics the order should as a general rule be from the lesser expression to the higher or larger expression. Shapes of apex should start from pointed to rounded or from raised to depressed expression.

120. More details on the order of states of expression are contained in document TGP/7.

*Remark: In certain characteristics there appears to be a clash between two recommended orders: Ex. Shape of base: pointed (1), rounded (2), flattened (3), depressed (4). In this case the "narrow to broad" should overrule the "low to high."*

#### 10.3.7.5 Categories of Characteristics

##### 10.3.7.5.1 Qualitative Characteristics

121. [44] Truly qualitative characteristics are classified by consecutive numbers according to the state commencing with Note 1 and often with no upper limit, for example:

<u>Plant: sex</u>	<u>Note</u>
dioecious female	(1)
dioecious male	(2)
monoecious unisexual	(3)
monoecious hermaphrodite	(4)

122. There are a few exceptions to that rule, thus—in order to avoid confusion—in the case of ploidy, the number of chromosomes sets is accepted as Note (e.g. diploid (2), tetraploid (4)).

#### 10.3.7.5.1(a) Pseudo-Qualitative Characteristics

123. Pseudo-qualitative characteristics are characteristics which are handled as qualitative characteristics when it is more reasonable to disregard the continuous variation for practical purposes and the states created are meaningful and sufficiently different from one another, for example:

<u>Leaf: shape</u>	<u>Note</u>
ovate	1
elliptic	2
round	3
obovate	4

or

<u>Expression</u>	<u>Note</u>
absent or very weakly expressed	1
weakly expressed	2
strongly expressed	3

#### 10.3.7.5.2 Quantitative Characteristics

124. [45] As a general rule, states are formed in such a way that for the weak and strong expressions a reasonable word pair is chosen, for example:

weak/strong  
short/long  
small/large

125. [45] These word pairs are given the Notes 3 and 7 and the word "medium" is given the Note 5. The remaining states of the scale indicated by the Notes 1 to 9 are formed according to the following example:

<u>State</u>	<u>Note</u>
very weak	1
very weak to weak	2
weak	3
weak to medium	4
medium	5
medium to strong	6
strong	7

strong to very strong	8
very strong	9

126. [46] In all cases of quantitative characteristics the full scale 1, 2, 3, 4, 5, 6, 7, 8, 9 is applicable. However, for practical purposes of presentation, only the Notes 3, 5, 7 or 1, 3, 5, 7, 9 are indicated in the Test Guidelines to state that the quantitative scale is applicable. This is only made for reasons of simplification and in order to save typing work and space in the documents. It means, however, that in each case the full scale (1 to 9) is applicable.

*Remark: As always the whole 1 to 9 scale is applicable, there is no difference whether a certain state is mentioned or not. Further states are only indicated if additional information on example varieties is needed. The indication of the Note 1 does not require the indication of Note 9 for symmetry or vice-versa. Normally the indication of the Notes 3, 5, 7 is sufficient to state that the 1 to 9 scale is applicable.*

127. [47] In alternative observations, with a clear-cut separation between absence and presence, the state "absent" is coded by Note 1 and the state "present" by Note 9. If in a characteristic it is necessary to make a distinction between complete absence and different degrees of presence, the characteristic is split into one alternative characteristic with the states "absent (1)" and "present (9)" and in another quantitative characteristic with the Notes from 1 to 9.

128. For those characteristics where it is not possible to make a clear-cut distinction between "absent" and "very weak," the Note 1 receives the meaning "absent or very weak" and then represents the first state in the scale 1 to 9 for quantitative characteristics.

129. For quantitative characteristics, at least for a few states of expression (e.g. 3, 5, 7) example varieties should—as far as possible—always be indicated.

#### 10.3.7.6 Harmonization of the States of Expression

130. Many quantitative characteristics are presented in a qualitative way. However, attention has to be paid when the description is used as a first step for the establishing of distinctness as it makes a difference whether the characteristic is a truly qualitative characteristic or not.

131. The harmonization of states of expression is handled in detail in document TGP/7.

*Explanation: Document TC/33/9 on the Harmonization of States of Expression and Notes of Characteristics Appearing in UPOV Test Guidelines contains translations into the four UPOV languages (English, French, German and Spanish) of the main terms used in the Table of Characteristics.*

10.3.7.7 Example Varieties

132. [48] Wherever possible, example varieties are indicated describing different states of expression of the different characteristics. Figures—if used at all—have been used only for the first editions of the Test Guidelines, to be abandoned at their next revision. Actual measurements are only valid for a given testing place or even for a given year of testing at that place and are therefore unsuitable in UPOV Test Guidelines. This does not mean that they are not used or could not be used for decision on DUS. Example varieties can only be combined for one characteristic if all varieties have been tested at the same place and, if placed for one single state, have shown the same expression at that single place.

*Remark: In order to avoid different environmental influences in any single characteristic of a given document it is not possible to combine varieties proposed by experts from different States unless they have been grown side-by-side for comparison in one place.*

133. Example varieties should not change their order under different environmental conditions.

134. Preferably species should not be listed as examples at all. They may only be provisionally indicated as examples if there is no doubt that the whole species shows the expression it represents and only if no example variety exists.

*Remark: A species cannot be indicated next to an example variety. As soon as a variety exists in a given species, only that variety has to be indicated and no longer that species or another species.*

135. [48] UPOV is aware of the fact that many example varieties indicated have only regional importance and some may also change slightly in their expression from place to place, but so far they are considered to fulfill the purpose of explaining the given expression much better than any measurement. Example varieties are used only as a help. The testing would become too difficult if an example variety had to be used for each characteristic and for each state. Example varieties are those varieties which were available to the expert who first drafted the document. It is also not possible to use the same example varieties on a worldwide level. Each State will have to prepare its own list of example varieties which are grown in its region or country. Thus the example varieties mainly represent or give an idea of the state of expression of a given characteristic at the testing place of the expert who prepared the draft for the Test Guidelines or the revision of existing Test Guidelines or at testing places with similar environment. The national authorities will choose out of the example varieties indicated in the Test Guidelines or from further varieties grown in their region the ones which they consider most appropriate.

*If new seed is no longer available for an example variety, the example variety should be deleted.*

*If more than one example variety is indicated, the example varieties should be stated in alphabetical order.*

*If varieties are indicated for different groups, they should either be separated by a semi-colon or receive an abbreviation in brackets (e.g. (w) = white, (r) = red. They can, however, only be stated if they represent exactly the same expression (e.g. in case of length the same cm or mm under the same conditions). If this is not the case, the characteristic has to be split into two characteristics.*

#### 10.3.8 Explanations on the Table of Characteristics (Chapter VIII)

136. [50] The Table of Characteristics of the Test Guidelines is normally followed by a chapter entitled "Explanations on the Table of Characteristics." It gives explanations useful for the understanding of the meaning of a given characteristic, defining the exact time, place or position of the observation and the way in which it has to be made (e.g. visual observation or measurement, in the middle part of a shoot, on the current year's shoot). It may highlight precautions to be taken. Very often it provides drawings pointing to the exact position in the plant where the observation has to be made, explaining the part of the plant to be observed or the different states of expression (e.g. "dentation," "serration," "crenation," etc., in relation to incisions of the margins) or explains with drawings the meaning of certain shapes. For pest and disease resistance characteristics, it describes the standardized method of observation and fixes the pathotypes and explains where to obtain samples. For laboratory methods it also describes the method. For certain crops it reproduces a growth stage code which then is used in the Table of Characteristics to indicate the time of observation.

137. More detailed information on the use of shapes can be found in document TGP/15 and more detailed information on the observation colors in document TGP/16.

Explanation: *Remarks or explanations should be placed in the Test Guidelines as follows:*

*(a) short remarks for 1 to 3 characteristics should be placed in brackets after the wording of the characteristic in Chapter VII, Table of Characteristics;*

*(b) remarks or explanations for certain organs or groups of characteristics should be placed in Chapter IV, Methods and Observations;*

*(c) longer remarks or explanations for one or a few characteristics should be placed in Chapter VIII, Explanations to the Table of Characteristics.*

*Drawings for "length," "width" or "size": There is no need for drawings for length, width or size, they have no meaning, except in some special cases in order to indicate from where to where certain measurements should be made.*

#### 10.3.9 Literature (Chapter IX)

138. This chapter cites the titles of literature on the species concerned or on the testing of species covering also the species concerned, which may be helpful to the testing authorities in the execution of the test or which could be useful for those experts who have to build up a testing system on the given species. If the list of literature indicated is rather long, a reduced number of the most important publications should be highlighted.

*Explanation: Document TC/31/7 on Reference Books and Documents for Testing of Varieties contains lists of literature grouped according to species. However, it dates back to 1994 and needs updating to represent the latest stage of development.*

#### 10.3.10 Technical Questionnaire (Chapter X)

139. [51] This chapter finally gives the layout of a standardized UPOV Technical Questionnaire on the species, which has to be completed in connection with an application for plant breeders' rights. A standard Technical Questionnaire is reproduced in document TGP/17. In the Technical Questionnaire, certain indications have to be given in the following eight sections:

140. Section 1 on Genus/Species is asking for the Latin and common names of the species or genus to which the candidate variety belongs.

141. Section 2 asks for the applicant's name and address.

142. Section 3 asks for the proposed denomination or breeder's reference of the candidate variety.

143. Section 4 on Information on Origin, Release, Maintenance and Reproduction of the Variety asks for the breeding history, the parents of the variety, whether they are known or unknown (discovery), whether the variety results from a crossing or a mutation, the type of variety (e.g. hybrid or open pollinated variety and in case of a hybrid also information on the inbred lines and the formula), the method of propagation (e.g. whether by *in vitro* propagation or not). For some species, like apples or peaches needing foreign pollenizers for the production of fruits, it asks for the name of pollenizer varieties.

144. Section 5 on Characteristics of the Variety to be Indicated requests information on the expression of the variety in a limited number of characteristics, including at least the so-called "grouping characteristics" which is considered necessary to place the variety in the right order in official government growing trials. In particular cases, in addition to the characteristics of the Table of Characteristics, indications are also used which give valuable information on the variety (for example, the "Horticultural Classification of Lily for Registration" in case of a lily variety). This limited number of characteristics is mainly applicable for countries doing official government growing tests. In other systems where the applicant does more of the testing, or even the whole growing test himself, the applicant will of course have to use all characteristics of the Table of Characteristics of Chapter VII prescribed by the national competent authority or even further characteristics as agreed upon by that authority.

145. Section 6 on Similar Varieties and Differences from these Varieties requires information on similar varieties and differences from these varieties. The applicant is asked to state the denomination of the similar variety, the characteristic in which the similar variety is different, the state of expression in that characteristic of the similar variety and of the candidate variety. This information is important for the testing authorities to avoid them failing to grow, from the start, a similar variety known to the breeder or applicant.

146. Section 7 on Additional Information Which may Help to Distinguish the Variety asks for any additional information to be given which may help to distinguish the variety, mainly information on resistance to pests and diseases, on special conditions for the growing (e.g. time of sowing or planting, any special conditions for the examination of the variety). Several Technical Questionnaires for ornamental and fruit species also ask for a representative color photo of the candidate variety to provide helpful additional information and also to prove that the variety really existed at the time of application. It should be particularly noted that for countries offering official government growing tests the applicant is not required to provide a full description at the time of application. A full official description eventually becomes available as the end product of the growing test.

147. Section 8 on Authorization for Release requests the applicant to indicate whether the variety requires prior authorization for release under legislation concerning the protection of the environment, human and animal health and whether such authorization has been obtained. This is mainly to ensure that in the case of a "GMO" (Genetically Modified Organism) the testing authorities are warned in case they have to take certain precautions during the testing or obtain necessary authorizations but it covers also other possible environment or health problems. A "GMO" variety has, apart from those precautions, to be tested according to the same principles as any other variety.

#### 10.4 Annexes to Test Guidelines (Special Category of Characteristics)

148. In some Test Guidelines, a third category of characteristics (next to the asterisk and non-asterisk characteristics) has been added in an Annex. That Annex is not an official part of the Test Guidelines and is only added for information:



"because the majority of the UPOV member States is of the view that it is not possible to establish distinctness solely on the basis of a difference found in these characteristics. Such characteristics should therefore only be used as a complement to other differences in morphological or physiological characteristics. UPOV reconfirms that these characteristics are considered useful but that they might not be sufficient on their own to establish distinctness. They should not be used as a routine characteristic but at the request or with the agreement of the applicant of the candidate variety."

*Explanation:* At present only characteristics derived by using electrophoresis are added to the Test Guidelines as an annex for a few species.

149. UPOV agreed to only include such characteristics in an Annex if—in addition to the normal condition for the inclusion of any characteristics in UPOV Test Guidelines—certain further conditions have been fulfilled. The main additional conditions that have to be fulfilled are that a good knowledge on the genetic background of the different results and a good harmonized method existed, which has proved to give comparable results in other member States.

*Explanation:* In the Test Guidelines for Wheat, for example, only one electrophoretic method has been annexed, namely that on glutenins, as the conditions were fulfilled only for glutenins. The method on gliadins, although widely used for purposes other than plant variety protection, was rejected, mainly because not enough knowledge on the genetic background was available.

150. More information on supporting evidence can be found in document TGP/14.

## 11. CONDUCT OF TEST IN THE ABSENCE OF UPOV TEST GUIDELINES

151. UPOV provides assurance on the testing of distinctness, uniformity and stability in the absence of UPOV Test Guidelines for a given species through the following recommended procedure:

(a) An office is invited to consult document TGP/5 to find out whether other UPOV member States have already carried out testing for the required species or have national Test Guidelines.

(b) Where such experience or national Test Guidelines exist, countries are invited to contact those States and seek to harmonize their testing procedures as far as possible and, preferably, inform UPOV of the existence of that harmonized testing procedure or, if appropriate, recommend that UPOV prepares UPOV Test Guidelines for that species.

(c) Where there is no other practical testing experience or where there are no national Test Guidelines available in other countries, States should establish their own

testing procedure. It would be recommended that UPOV is informed of it to spread the information to all member States for cases where other States also consider preparing their own Test Guidelines for the same species.

(d) When preparing their testing procedures, offices are invited to establish those procedures according to the principles set out in this General Introduction, particularly those in Sections 4 to 9.

(e) The testing procedure should follow as far as possible the requirements of UPOV Test Guidelines as far as experience and information allows. However, as a minimum the testing procedure should incorporate the following steps:

Subject of Test Guidelines	(see 10.3.1 above)
Material Required	(see 10.3.2 above)
Conduct of Tests	(see 10.3.3 above)
Methods and Observations	(see 10.3.4 above)
Table of Characteristics	(see 10.3.7 above)
Technical Questionnaire	(see 10.3.10 above).

*Remark: The easiest way to establish a testing procedure would be to start with an existing UPOV Test Guidelines document which is the closest to the species concerned or closest to the handling of varieties of that species (e.g. varieties are also seed propagated or vegetatively propagated, are also a tree, grafted, etc.) and to make the necessary changes in that document to adjust it to the species concerned.*

[Annex II follows]

## ANNEX II

LIST OF DOCUMENTS COMPLEMENTING THE GENERAL INTRODUCTION FOR  
THE CONDUCT OF TESTS FOR DISTINCTNESS,  
UNIFORMITY AND STABILITY OF NEW VARIETIES OF PLANTS

PLANNED DOCUMENT	PRESENT DOCUMENT	TITLE
TGP/1:	TG/35/13	General Introduction enlarged by comments
TGP/2:	UPOV Website	List of Test Guidelines adopted by UPOV
TGP/3:	(to be prepared by TWO)	Common Knowledge
TGP/4:	(to be prepared by TWA, TWC, see TWA/26/5)	Rules for the Prescreening of Varieties
TGP/5:		<u>Available Knowledge on DUS Testing, Cooperation in Examination</u>
(a):	C/32/5	Cooperation in Examination
(b):	UPOV Collection, Section 19	Model Administrative Agreement for International Cooperation in the Testing of Varieties
(c):	UPOV Collection, Section 23	UPOV Report on Technical Examination and UPOV Variety Description
(d):	TC/35/4	List of Species in Which Practical Technical Knowledge has Been Acquired or for Which National Guidelines Have Been Established and E-mail Addresses
(e):	TC/31/7 (to be updated)	Reference Books and Documents for the Testing of Varieties
TGP/6:		<u>DUS Testing Done by the Applicant/Breeder</u>
(a):	UPOV Collection, Section 16	Conditions for the Examination of a Variety Based Upon Trials Carried Out by or on Behalf of Breeders
(b):	TC/32/4	Level of Involvement of the Applicant in the Growing Test
TGP/7:	TC/35/8 (to be revised)	Categories of Characteristics and Harmonization of States of Expression
TGP/8:	(to be prepared by the TWC)	Definition of Good Statistical Practices

PLANNED DOCUMENT	PRESENT DOCUMENT	TITLE
<b>TGP/9:</b>  (a):  (b):  (c):  (d):  (e):  (f):	TC/33/7  (to be prepared by the TWC)  TWC/15/17  (to be prepared by the TWC)  (to be prepared by the TWC)  (other methods still to be listed by TWC)	<u>Handling of Measured Quantitative Characteristics</u>  Combined-over-years Distinctness and Uniformity Criterion (COY)  Summary on COYD and on COYU  Distinctness, Uniformity and Stability Trial Analysis System for Windows (DUSTW)  Screen-based Input Module for COYD  Computer-generated Demonstration of COYD  Other Statistical Methods
<b>TGP/10:</b>	(to be prepared by the TWC)	Handling of Visually Assessed Characteristics
<b>TGP/11:</b>  (a)  (b)	(to be prepared by the TWA, TWC, TWF, TWO, TWV)  BMT/3/2	<u>Non-traditional Non-morphological Characteristics and Methods for Variety Testing</u>  Biochemical characteristics, electrophoresis, molecular marker, digital images, etc.  Identification Methods Based on Molecular Techniques
<b>TGP/12:</b>	TC/34/5 (enlarged summary to be prepared by TWC)	Testing of Uniformity of Self-Fertilized And Vegetatively Propagated Species Using Off-Types
<b>TGP/13:</b>	(to be prepared by TWA and TWC)	Relative Tolerance, Comparable Varieties
<b>TGP/14:</b>	(to be prepared by TWA, TWC)	Supporting Evidence
<b>TGP/15:</b>	TC/35/14, TWF/29/3	Harmonization of Terms and Drawings for Plane Shapes and Solid Shapes Used in the UPOV Test Guidelines (TC/35/14)

PLANNED DOCUMENT	PRESENT DOCUMENT	TITLE
<b>TGP/16:</b>  <b>(a):</b>  <b>(b):</b>	  (to be prepared by TWO)  TWO/27/3	<u>Observation of Colors</u>  Use of Color Charts, etc.  Grouping of Colors of the RHS Colour Chart
<b>TGP/17:</b>	UPOV Collection, Section 12 (needs updating)	Technical Questionnaire to be completed in Connection with an Application for Plant Breeders' Rights
<b>TGP/18:</b>	(to be prepared by TWA, TWC, TWF, TWO, TWV)	Definition of Technical, Botanical and Statistical Terms Used in UPOV Documents
<b>TGP/19:</b>  <b>(a):</b>  <b>(b):</b>  <b>(c):</b>	  TWC/14/14  TC/32/6  TWC/16/11	<u>Further Statistical Methods</u>  Similarity, Clustering and Dendrograms  Sequential Analysis  Digital Images in Plant Variety Testing
?	TWC/15/2	Documents Produced by the Technical Working Party on Automation and Computer Programs
?	TWC/15/3	Topic Index to Documents Produced by the Technical Working Party on Automation and Computer Programs

[End of document]