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UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

Associated Document
to the
General Introduction to the Examination
of Distinctness, Uniformity and Stability and the
Development of Harmonized Descriptions of New Varieties of Plants (document TG/1/3)

DOCUMENT TGP/9

"EXAMINING DISTINCTNESS"

Document prepared by the Office of the Union

to be considered by the

Technical Working Party for Vegetables (TWV), at its thirty-ninth session to be held in Nitra, Slovakia, from June 6 to 10, 2005

Technical Working Party on Automation and Computer Programs (TWC), at its twenty-third session to be held in Ottawa, from June 13 to 16, 2005

Technical Working Party for Fruit Crops (TWF), at its thirty-sixth session to be held in Kofu, Japan, from September 5 to 9, 2005

Technical Working Party for Ornamental Plants and Forest Trees (TWO), at its thirty-eighth session to be held in Seoul, from September 12 to 16, 2005

Technical Working Party for Agricultural Crops (TWA), at its thirty-fourth session to be held in Christchurch, New Zealand, from October 31 to November 4, 2005

SECTION 1: INTRODUCTION

1.1 Article 7 of the 1991 Act of the UPOV Convention establishes that "a 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 filing the application."

1.2 The "General Introduction to the Examination of Distinctness, Uniformity and Stability and the Development of Harmonized Descriptions of New Varieties of Plants" (document TG/1/3), hereinafter referred to as "the General Introduction", states, with respect to common knowledge (see section 5.2.2), that:

> "Specific aspects which should be considered to establish common knowledge include, among others:
>
> (a) commercialization of propagating or harvested material of the variety, or publishing a detailed description;
>
> (b) the filing of an application for the grant of a breeder's right or for the entering of a variety in an official register of varieties, in any country, which is deemed to render that variety a matter of common knowledge from the date of the application, provided that the application leads to the grant of a breeder's right or to the entering of the variety in the official register of varieties, as the case may be;
>
> (c) existence of living plant material in publicly accessible plant collections.
>
> Common knowledge is not restricted to national or geographical borders."

Further information on varieties whose existence is a matter of common knowledge is provided in document TGP/3 "Varieties of Common Knowledge".

1.3 Document TGP/4 notes that:

> "Although not exhaustive, and taking into account that these aspects have to be considered on a worldwide basis, it is clear that the list of varieties whose existence is a matter of common knowledge ("varieties of common knowledge") for a given species can be very large. Therefore, it may be appropriate to define a collection of varieties of common knowledge (a "variety collection") from within which:
>
> (a) varieties which should be included in growing tests or other trials, as a part of the examination of distinctness, can be identified; and
>
> (b) where required, the necessary material of the varieties is available for inclusion in such tests and trials."

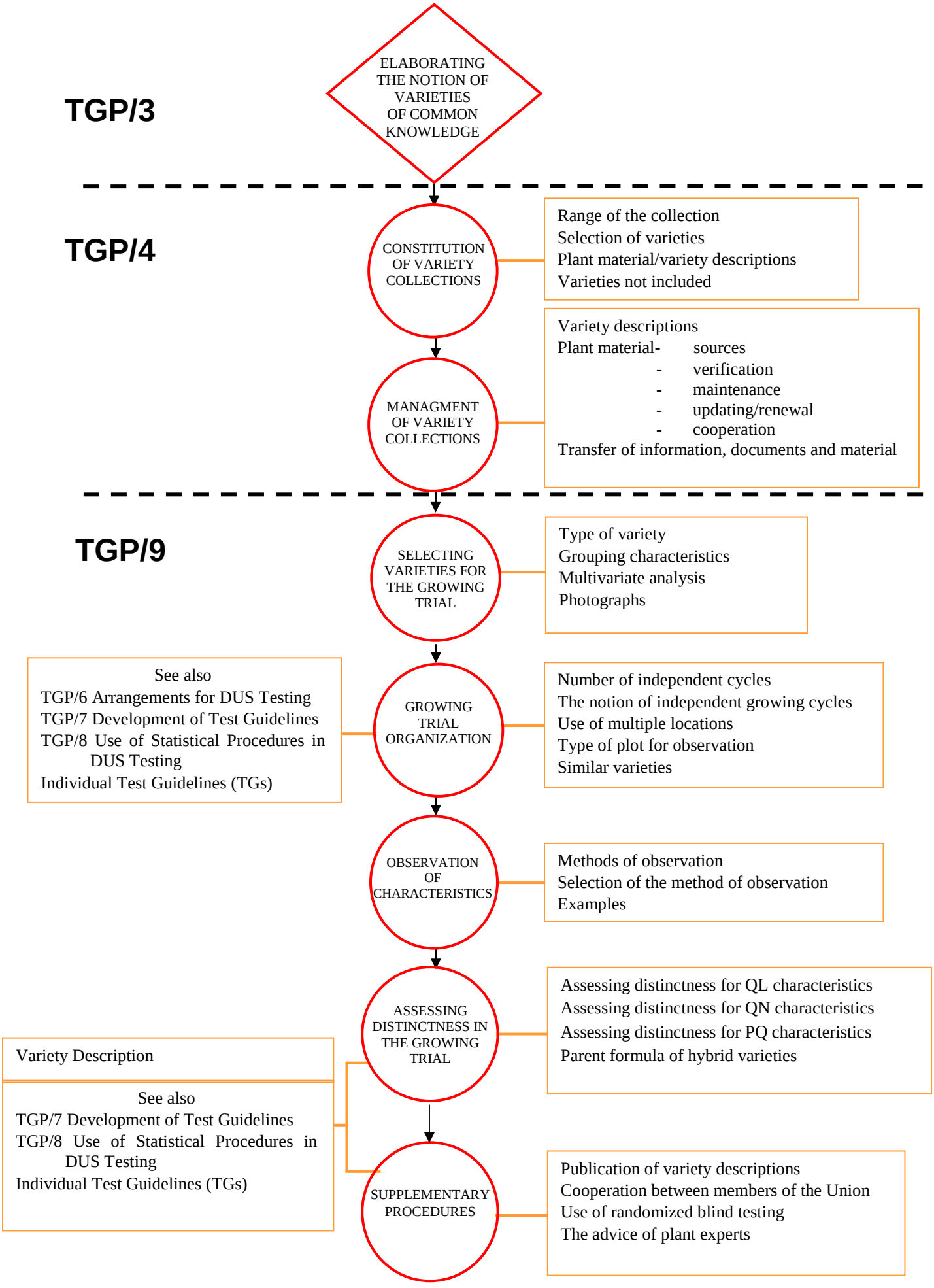
1.4 Document TGP/4 also explains that "the variety collection may not contain all varieties of common knowledge. For example, there may be reasons (e.g. phytosanitary regulations) for which plant material, even if it exists, may not be obtainable. To address such situations the General Introduction (Chapter 5.3.1.2) states the following:

> " … certain supplementary procedures may be developed to avoid the need for a systematic individual comparison. For example, the publication of variety descriptions, inviting comment from interested parties, or cooperation between members of the Union, in the form of an exchange of technical information, could be considered as

supplementary procedures. However, such an approach would only be possible where the supplementary procedures, in conjunction with the other procedures, provide an effective examination of distinctness overall. Such procedures may also be appropriate for consideration of varieties of common knowledge, for which living plant material is known to exist (see section 5.2.2) but where, for practical reasons, material is not readily accessible for examination. Any such procedures are set out in document TGP/9, "Examining Distinctness." "

1.5 The purpose of document TGP/9 is to provide guidance in the examination of distinctness in growing tests or other trials and on the use of supplementary procedures in the examination of distinctness. The following diagram presents a schematic overview of the process of examining distinctness as considered in documents TGP/3, TGP/4 and TGP/9:

SCHEMATIC OVERVIEW OF DOCUMENTS TGP/3, TGP/4 AND TGP/9



SECTION 2: SELECTING VARIETIES FOR THE GROWING TRIAL

A key step in the examination of distinctness is the selection of varieties of common knowledge, from within the variety collection (see document TGP/4), to be included in the growing test or other trials. The factors which may be used in that process are explained below.

2.1 Type of variety

Document TGP/4 "Constitution and management of variety collections" explains that a variety collection may be limited to a type or types of varieties within a species or subspecies. More information is provided in document TGP/4 section 1.2.1.

2.2 Grouping characteristics

2.2.1 Function

2.2.1.1 The selection of varieties to be grown in the trial with the candidate varieties is aided by the use of grouping characteristics.

2.2.1.2 The General Introduction sets out the functions of grouping characteristics (see document TG/1/3, section 4.8. Functional Categorization of Characteristics), as follows:

> "1. Characteristics in which the documented states of expression, even where recorded at different locations, can be used to select, either individually or in combination with other such characteristics, varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness.
>
> "2. Characteristics in which the documented states of expression, even where recorded at different locations, can be used, either individually or in combination with other such characteristics, to organize the growing trial so that similar varieties are grouped together."

2.2.1.3 Function 1 above identifies the role of grouping characteristics in selecting varieties for the growing trial.

2.2.2 Criteria

2.2.2.1 The General Introduction sets out the criteria (document TG/1/3, section 4.8 Functional Categorization of Characteristics) for the selection of grouping characteristics as follows:

> "1. (a) Qualitative characteristics or
>
> (b) Quantitative or pseudo-qualitative characteristics which provide useful discrimination between the varieties of common knowledge from documented states of expression recorded at different locations.
>
> […]"

2.2.2.2 The states of expression of the grouping characteristics for the candidate varieties need to be known before the (first) growing trial in order to be able to use that information in selecting varieties for the growing trial. For that reason, information is requested in the Technical Questionnaire (TQ). Document TGP/7, "Development of Test Guidelines" (Guidance Notes 13.4) states that:

> "(a) Grouping characteristics selected from the Table of Characteristics should, in general, receive an asterisk in the Table of Characteristics and be included in the Technical Questionnaire.
>
> (b) TQ characteristics selected from the Table of Characteristics should, in general, receive an asterisk in the Table of Characteristics and be used as grouping characteristics. TQ characteristics are not restricted to those characteristics used as grouping characteristics;
>
> (c) Asterisked characteristics are not restricted to those characteristics selected as grouping or TQ characteristics."

2.2.2.3 Where UPOV has developed Test Guidelines, these will provide useful grouping characteristics. However, grouping characteristics are provided in the Test Guidelines for two reasons, as specified in section 2.2.1.2. Therefore, the use of each grouping characteristic for excluding varieties from the growing trial, as opposed to its use for organizing the growing trial so that similar varieties are grouped together (see section 3.5.1), should be considered carefully.

2.2.2.4 In the absence of UPOV Test Guidelines, the criteria set out in 2.2.2.1 should be used for identifying suitable characteristics which may be used for selecting varieties for the growing trial.

2.2.3 Use of grouping characteristics

Once an appropriate set of grouping characteristics has been selected it is possible to identify those varieties in the variety collection which can be excluded from the growing trial. The following theoretical examples are presented for illustration purposes:

2.2.3.1 Example: Single growing cycle

Candidate variety A

Species: *Impatiens walleriana* Hook. f.
UPOV Test Guidelines: TG/102/4

Grouping characteristics:

(a) Leaf: variegation (QL);
(b) Flower: type (QL);
(c) Flower: number of colors (eye zone excluded) (QL);

(d) Flower: main color (PQ) with the following groups:
Gr. 1: white
Gr. 2: yellow
Gr. 3: pink
Gr. 4: blue pink
Gr. 5: orange
Gr. 6: red
Gr. 7: purple
Gr. 8: violet

Information for candidate variety A provided in the Technical Questionnaire

		Candidate variety A	Varieties in the variety collection	
	Characteristics	note	note	Exclusion from the growing trial
(7)	**Leaf: variegation**			
QL	absent		1[ ]	YES
	present	9[X]	9[ ]	NO
(15)	**Flower: type**			
QL	single	1[X]	1[ ]	NO
	double		2[ ]	YES
(17)	**Flower: number of colors (eye zone excluded)**			
QL	one	1[X]	1[ ]	NO
	two		2[ ]	YES
	more than two		3[ ]	YES
(18)	**Flower: main color**			
PQ	white		1[ ]	YES
	yellow		2[ ]	YES
	pink	3[X]	3[ ]	NO
	blue pink		4[ ]	NO
	orange		5[ ]	YES
	red		6[ ]	YES
	purple		7[ ]	YES
	violet		8[ ]	YES

2.2.3.1.1 This example assumes that varieties with expression “pink (3)” and “blue pink (4)” can be clearly distinguished from varieties in all the other color groups, but assumes that further comparison is needed between varieties within those groups because there is a continuous variation from “pink (3)” to “blue pink (4)”. Therefore, varieties in both color groups are included in the growing trial (see also section 3.5).

2.2.3.1.2 In cases where there is, in general, a single growing cycle, it is important to ensure that reliable grouping characteristics are used. This should avoid the candidate variety being included in a wrong group and, therefore, avoid the need to undertake a second growing cycle in which the candidate is grown in a trial with varieties which should have been included in the first growing cycle.

2.2.3.2 Example: Two growing cycles

2.2.3.2.1 In cases where there is more than one growing cycle, it may be possible after the first growing cycle to go further in the elimination of varieties from the growing trial. This may be possible using information for the candidate variety and varieties in the variety collection obtained from the first growing trial. This is particularly relevant in the case of grouping characteristics which are more influenced by the environment.

2.2.3.2.2 The following theoretical example is presented for illustration for the use of grouping characteristic in the case of two growing cycles:

Candidate variety B

Species: *Vicia faba* L. var. *major* Harz..
UPOV Test Guidelines: TG/206/1

Grouping characteristics

(a) Plant: growth type (QL);
(b) Wing: melanin spot (QL);
(c) Dry seed: color of testa (immediately after harvest) (PQ) with the following groups:
Gr. 1: beige
Gr. 2: green
Gr. 3: red
Gr. 4: violet
Gr. 5: black

Information for candidate variety B provided in the Technical Questionnaire:

		Candidate variety B	Varieties in the variety collection	
	Characteristics	note	note	Exclusion from the growing trial
5.1 (2)	**Plant: growth type**			
	determinate		1[ ]	YES
	indeterminate	9[X]	2[ ]	NO
5.3 (16)	**Wing: melanin spot**			
	absent	1[X]	1[ ]	NO
	present		9[ ]	YES
5.6 (32)	**Dry seed: color of testa (immediately after harvest)**			
	beige		1[ ]	YES
	green		2[ ]	YES
	red	3[X]	3[ ]	NO
	violet		4[ ]	NO
	black		5[ ]	YES

2.2.3.2.3 This example assumes that varieties with characteristic Dry seed: color of testa “red (3)” and “violet (4)”, can be clearly distinguished from varieties in all the other color groups but that further comparison is needed between varieties within those groups. Therefore, it is necessary to include varieties of both color groups in the growing trial (see also section 3.5.1).

2.2.3.2.4 In this example, it may be possible to exclude from the second growing cycle varieties with Dry seed: color of testa, “violet (4)”, which have been included in the first growing trial because the characteristic was observed in the candidate variety B and the varieties in the collection in the same growing trial, thus making it possible to have more precision during the observation.

2.2.3.2.5 It may also be possible to use further characteristics for grouping in the second growing cycle, because the grouping will be based on observation obtained from the same growing trial.

2.3 Multivariate analysis/Phenotypic distance

2.3.1 Introduction

2.3.1.1 Multivariate analysis is an approach whereby varieties are the subject of an overall comparison, in contrast to a characteristic by characteristic approach.

2.3.1.2 One example is the use of "phenotypic distance" which takes input data (e.g. descriptions) and derives a measure of similarity/difference between varieties under comparison.

2.3.1.3 When using phenotypic distance for the selection of varieties for the growing trial, the objective is to calculate the pair-wise distances between the varieties of common knowledge and the candidate variety, by using descriptive and/or other information. These distances can then be related to a threshold to decide on whether a direct comparison in a growing trial is necessary or not.

2.3.2 Methods

2.3.2.1 GAIA

2.3.2.1.1 The GAIA method, developed by experts from France, calculates a phenotypic distance between two varieties, which is a sum of distances for individual characteristics. For each genus or species, this system is calibrated to determine: (a) the weighting given to differences in each characteristic; and (b) the threshold, called "Distinctness plus" threshold, for the phenotypic distance used to eliminate varieties from the growing trial. The experience of crop experts is necessary to calibrate different parameters.

(a) Defining weightings

2.3.2.1.2 The weighting is a measure of the "reliability" of a difference in a given characteristic. This reliability depends on different factors, such as the:

- precision of the observation
- degree of the influence of the environment in the expression of the characteristic (the larger the influence the lower the weighting)
- discrimination power of the characteristic
- genetic regulation of the characteristic
- size of the difference (the larger the difference, the higher the weighting)

2.3.2.1.3 Example characteristic "Shape of ear":

Shape of ear:
note 1 = conical
note 2 = conic-cylindrical
note 3 = cylindrical

Comparison between difference in notes and weighting		
	Difference in notes	Weighting (defined by crop experts)
conical (1) vs. conical (1)	0	0
conical (1) vs. conic-cylindrical (2)	1	2
conical (1) vs. cylindrical (3)	2	6
conic-cylindrical (2) vs. conic-cylindrical (2)	0	0
conic-cylindrical (2) vs. cylindrical (3)	1	2
cylindrical (3) vs. cylindrical (3)	0	0

Thus, when the crop experts compare a variety 'i' with conical ear (note 1) to a variety 'j' with cylindrical ear (note 3), they define a weighting of 6. Those weightings are summarized in the form of a weighting matrix:

Weighting matrix 'i'				
		Variety 'i'		
Variety 'j'		**1**	**2**	**3**
	1	0	2	6
	2		0	2
	3			0

2.3.2.1.4 Example characteristic "Length of husks". Weighting matrix defined by the crop experts:

1 = very short
2 = very short to short
3 = short
4 = short to medium
5 = medium
6 = medium to long
7 = long
8 = long to very long
9 = very long

		Variety 'i'								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Variety 'j'	**1**	0	0	0	2	2	2	2	2	2
	2		0	0	0	2	2	2	2	2
	3			0	0	0	2	2	2	2
	4				0	0	0	2	2	2
	5					0	0	0	2	2
	6						0	0	0	2
	7							0	0	0
	8								0	0
	9									0

The weighting of a difference between a variety 'i' with very short husks (note 1) and a variety 'j' with short husks (note 3) is 0. Experts considered that a minimum difference of 3 notes is necessary in order to define a non-zero weighting between two varieties. Furthermore, even if the difference in notes is greater than 3, it is decided to maintain the weighting of 2.

(b) Defining the "Distinctness plus" threshold

2.3.2.1.5 The "Distinctness Plus" threshold, is determined by the crop expert at a level which is higher than the difference needed to establish distinctness, thereby ensuring that all pairs of varieties, having a distance equal or greater than the Distinctness Plus threshold, would be distinct in the growing trial. The determination of the Distinctness Plus threshold is based on experience gained with the varieties in the variety collection.

2.3.2.1.6 In the following illustration the estimated Distinctness Plus threshold is (D^+)= 10.

(c) Calculating the distance between a variety pair

2.3.2.1.7 The distance between a given pair of varieties (varieties A and B in this illustration) is calculated as the addition of the weightings for the characteristics used. In the following example the characteristics considered are: ear shape; husk length; type of grain; number of rows of grain; and ear diameter.

Matrix for 5 characteristics for varieties A and B						
	Ear shape	Husk length	Type of grain	Number of rows of grain	Ear diameter	
Notes for variety A	1	1	4	6	5	
Notes for variety B	3	3	4	4	6	
Difference observed	2	2	0	2	1	
Weighting according to the crop expert	*6*	*0*	*0*	*2*	*0*	$D_{A-B} = 8$

(d) Decisions

2.3.2.1.8 In the illustration above the distance between varieties A and B (D_{A-B} = 8) is smaller than the distinctness plus threshold (D^+), thus varieties A and B would be included in the same growing trial.

2.3.2.1.9 The GAIA method can be used for the selection of varieties for the growing trial as follows:

(i) Selecting varieties for the (first) growing trial: using information provided in the TQ by the applicant and the information already held on varieties in the variety collection to exclude from the growing trial those varieties for which the phenotypic distance with the candidate variety is greater than Distinctness Plus threshold.

(ii) Selecting varieties for subsequent growing trials: using the information of the first growing cycle, to eliminate from subsequent growing cycles all pairs of varieties reaching or surpassing the Distinctness Plus threshold.

2.3.2.1.10 The GAIA software has been developed to automate these comparisons. Details of the GAIA method are provided in TGP/8, "Use of Statistical Procedures in Distinctness, Uniformity and Stability Testing".

2.3.2.2 Other

2.4 Photographs

2.4.1 Document TGP/7 states that the Test Guidelines may require that a representative color photograph of the variety should accompany the information provided in the Technical Questionnaire. In these cases, it is recommended that guidance be provided by the authority to enhance the usefulness of the photograph (e.g. to include a metric scale in the picture, to define what parts of the plant should be included; light conditions, background color, etc).

2.4.2 Photographs can provide additional useful information to that already provided by the characteristics described in the Technical Questionnaire under section 5 “Characteristics of the variety to be indicated”. In particular photographs may provide information on characteristics not included in the TQ. This may, for example, concern shapes and plant structures, which are not easy for applicants to describe by means of notes in the Table of Characteristics and, therefore, might not be included as characteristics in section 5 of the TQ. In addition the information provided in photographs on characteristics included in the TQ may be more discriminatory than that provided in section 5 of the TQ and may allow more varieties to be eliminated from the growing trial.

SECTION 3: GROWING TRIAL ORGANIZATION

3.1 Number of independent growing cycles

3.1.1 A key consideration with regard to growing trials is to determine the appropriate number of growing cycles. In that respect, document TGP/7, Annex I: TG Template, section 4.1.2, states:

> "4.1.2 Consistent Differences
>
> The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles."

3.1.2 The Test Guidelines, where available, specify the recommended number of growing cycles. When making the recommendation, the experts drafting the Test Guidelines take into account factors such as the number of varieties to be compared in the growing trial, the influence of the environment on the expression of the characteristics, and the degree of variation within varieties taking into account the type of variety e.g. whether it is vegetatively propagated, self-pollinated, cross-pollinated or a hybrid variety.

3.2 The notion of independent growing cycles

3.2.1 As indicated in section 3.1, where there is a need of more than one growing cycle, the growing cycles should be "independent".

3.2.2 When varieties are grown over successive years and the layout of the plants in the trial is randomized (at least partly), the independence of the growing cycles is usually satisfied.

3.2.3 For some perennial crops, e.g. fruit trees, the same plants are examined over successive years. In such cases, the independence of growing cycles is also satisfied.

3.2.4 In the case of plants grown in greenhouses, provided the time between two sowings is not "too short" and the layout of the plants in the trial is randomized (at least partly), two growing cycles can overlap and still be considered as independent.

3.2.5 It may be possible to obtain two independent growing cycles in one location during the same year. The use of more than one location in order to obtain independent growing cycles in a given year would require that the variety-by location interaction is as large as the variety-by cycle (year) interaction in any characteristic used for distinctness. In general, this assessment is based on the experience of experts with regard to the variation of the expression of the characteristics in the locations concerned.

3.3 Use of multiple locations in the examination of distinctness

Document TGP/7 "Development of Test Guidelines" (see Annex I, TG Template, section 3.2) clarifies that "Tests are normally conducted at one place". In cases where more than one place is used, the factors below should be taken into account:

3.3.1 Purpose

It may be considered appropriate to conduct tests at more than one place for the following purposes:

3.3.1.1 Minimizing the overall testing period

More than one location may be used as a means of achieving more than one independent growing cycle in, for example, the same year, as set out in section 3.2. This can, therefore, reduce the overall length of the testing period and facilitate a quicker decision.

3.3.1.2 Reserve trial

Authorities may designate a primary location, but organize an additional reserve trial in a separate location. In general, only the data from the primary location would be used, but in cases where that location failed, the reserve trial would be available to prevent the loss of one year's results.

3.3.1.3 Different agro-climatic conditions

Varieties of a different geographical origin may require different agro-climatic growing conditions. Varieties are distributed to the most appropriate location or, if the choice of the appropriate location is not obvious from the information known at the time of the receipt of the samples, to more than one location.

3.3.2 Use of information from multiple locations

3.3.2.1 Where more than one location is used, it is necessary to establish decision rules to cover, for example, whether two varieties need to be distinct in only one location or in all locations.

3.3.2.2 It is also necessary to define the way in which the information obtained in the centers would be used; e.g. whether it will be averaged over centers or whether each center would be considered individually.

[The TC-EDC proposed that the TWC should prepare further guidance].

3.4 Type of plot for observation

The Test Guidelines specify the type/s of plot for the growing trial (e.g. spaced plants, row plot, drilled plot, etc.) in order to examine distinctness as well as uniformity and

stability. Guidance on trial design is provided in document TGP/8 "Use of statistical procedures in DUS testing".

3.5 Similar varieties

3.5.1 Grouping characteristics

3.5.1.1 As noted in section 2.2.1.2, grouping characteristics are:

> " […]
>
> "2. Characteristics in which the documented states of expression, even where recorded at different locations, can be used, either individually or in combination with other such characteristics, to organize the growing trial so that similar varieties are grouped together."

3.5.1.2 In section 2.2.3 "Use of grouping characteristics", it was explained how varieties could be excluded from the growing trial on the basis of grouping characteristics. However, grouping characteristics can also be used to organize the growing trial for varieties included in the trial. This is explained below with reference to the examples provided in section 2.2.3.

3.5.1.3 Example: *Impatiens walleriana* Hook. f.

On the basis of characteristic "Flower: main color", the varieties in the growing trial are grouped and candidate variety A is placed in the PINK GROUP:

PINK GROUP: Flower: main color: pink (3)

BLUE PINK GROUP: Flower: main color: blue pink (4)

BLUE PINK GROUP is also included because there is no clear cut-off between states pink (3) and blue pink (4).

3.5.1.4 Example: *Vicia faba* L. var. *major* Harz. f.

On the basis of characteristic "Dry seed: color of testa,", the varieties included in the first growing trial are grouped and candidate variety B is placed in the RED GROUP:

RED GROUP: Dry seed: color of testa: red (3)

VIOLET GROUP: Dry seed: color of testa: violet (4)

VIOLET GROUP is also included because there is no clear cut-off between states red (3) and violet (4).

3.5.1.5 It may also be possible to use further characteristics for identifying the most similar varieties in the second growing cycle, because the information will be based on observations from the same growing trial.

3.5.2 Phenotypic distance

3.5.2.1 Phenotypic distance can be used to organize the growing trial so that similar varieties are grouped together (see section 2.3).

3.5.3 Photographs

3.5.3.1 Photographs, provided by the applicant in the Technical Questionnaire (see section 2.4), can provide useful information to arrange varieties in the growing trial by helping to identify the most similar varieties.

SECTION 4: OBSERVATION OF CHARACTERISICS

4.1 Methods of observation

4.1.1 The expression of characteristics can be observed visually (V) or by measurement (M). Both types of observation can be made on single, individual plants (S) or on groups of plants/plots as a whole (G).

4.1.2 The four possibilities and the symbols used in the Test Guidelines to indicate the recommended method of observation for the assessment of distinctness, are as follows:

MG: single record for a group of plants or parts of plants based on measurement(s)
MS: records for a number of single, individual plants or parts of plants obtained by measurement
VG: single record for a group of plants or parts of plants based on visual observation(s)
VS: records for a number of single, individual plants or parts of plants obtained by visual observation.

4.1.3 Measurement (M)

Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, etc.

4.1.4 Visual observation (V)

Visual observation (V) is an observation made on the basis of the expert's judgement. Visual observation also includes observations where the expert uses reference points (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. color charts).

4.1.5 Single record of a group of plants or parts of plants (G)

4.1.5.1 Single record of a group of plants or parts of plants (G) indicates that a single record (value or data) is retained as the basis for the assessment of distinctness. The single record may be obtained directly from an overall observation of the whole plot. However, it may be necessary to make several visual observations of the plot (see example 1), or several measurements (see example 2), in order to establish the single record.

Example 1

Several observations: Hairiness of lower side of leaf in barley (self-pollinated): leaves of several plants are observed;

Example 2

Several measurements: Plant: time of inflorescence emergence in meadow fescue, tall fescue (cross-pollinated); where at each observation date the average plot is expressed as: (1) boot swollen, (2) tip of inflorescence, (3) ¼ of inflorescence emerged, (4) ½ of inflorescence emerged. The date of inflorescence emergence is the date at which the average plot has reached stage 2, which, if necessary, can be obtained by interpolation.

4.1.5.2 In cases where several observations of the plot are to be made, the Test Guidelines provide an indication of the number of plants to be observed (e.g. all observations should be made on {x} plants or parts taken from each of {x} plants).

4.1.5.3 In most cases, G provides a single record per variety, in which case it is not possible or necessary to apply statistical methods. In some cases of G, e.g. where there are several repetitions or plots, or more than one growing trial, more than one record per variety may be obtained, in which case statistical methods can be applied

4.1.6 Records for a number of single, individual plants or parts of plants (S)

Records for a number of single, individual plants or parts of plants (S) obtained by visual observation or measurements are retained for the assessment of distinctness (see example 3).

Example 3

Plant height in grasses (cross-pollinated): each plant is measured and the value of each plant is then used for the assessment of distinctness.

4.1.7 Test Guidelines provide an indication of how many individual plants should be observed in the case of VS/MS (e.g. all observations should be made on {x} plants or parts taken from each of {x} plants).

4.1.8 The choice of the method of observation and, in particular, the determination of the appropriate number of observations, depends on whether the data will be used for the assessment of distinctness, for the assessment of uniformity, or for both (see section 4.3). The assessment of uniformity implies that it is necessary to observe single plants. For distinctness, the "typical" expression of the varieties is recorded, which may, after observation of the plot, be possible with only one record. Normally the same data can be used for distinctness and for the variety description. The elements determining the most appropriate method of observation are discussed in section 4.2.

4.1.9 The method of observation determines the type of data and thus the choice of methods for the assessment of distinctness. If it is intended to apply a specific statistical method the experts need to consider the data structure required. Further information is provided in TGP/8 section 3 and see 5.3.2.2.1 of this document.

4.2 Selection of the method of observation

The choice of the method for the assessment of distinctness should take into account the following aspects:

4.2.1 Visual observation vs. measurement

4.2.1.1 The choice of visual observation (V) or measurement (M) will be influenced by:

(a) Type of expression of the characteristic:

Qualitative (QL) characteristics: In general, a single record for a group of plants is obtained by means of a visual observation (VG);

Quantitative (QN) characteristics: Quantitative characteristics can be measured or visually observed. The General Introduction explains that:

> "5.4.1 In cases where there is very little variation within varieties, the determination of distinctness is usually on the basis of a visual assessment, rather than by statistical methods."
>
> […]
>
> "5.5.2.2.1 Quantitative characteristics are not necessarily assessed by measuring or counting and can be assessed visually. Where there is doubt regarding the use of a normally visually assessed quantitative characteristic as the distinguishing characteristic in relation to another variety, it should be measured, if that is possible with reasonable effort."

Pseudo-qualitative characteristics: Pseudoqualitative characteristics are, in general, observed visually.

(b) Variability between and within varieties:

For the assessment of distinctness, visual observations require sufficient variation between, and a low level of variation within varieties, since they may be less precise (based on the expert's judgement). Measurements provide a higher level of information and more precise data (a calibrated observation).The features of propagation determine the level of genotypic variation within varieties. Vegetatively propagated, truly self-pollinated and mainly self-pollinated varieties normally have relatively little variation within varieties. Within cross-pollinated and synthetic varieties, variation is normally greater than for self-pollinated and vegetatively propagated varieties, especially in quantitative and some pseudo-qualitative characteristics.

(c) Number of varieties in the collection [and in the growing trial]: more precision may be necessary in order to distinguish a larger number of varieties. Measurements provide more precise data.

(d) Resources (equipment, staff): visual assessment is usually less time-consuming than measurements. Measurements for some characteristics may be partly automated (e.g. imaging). Different characteristics may be assessed simultaneously (e.g. thousand seed weight + kernel length; length + width of petals).

(e) Relation between workload and precision required.

4.2.1.2 If visual observation fulfills the requirements for the DUS assessment it is preferable because visual observations are, in general, quicker and cheaper.

4.2.2 Single observation of a group of plants (G) or observation on individual plants (S)

4.2.2.1 If there is relatively little variation within varieties (excluding off-types) compared to the variation between varieties, the expression of characteristics can be recorded by a single observation of a group of plants in order to provide sufficient data for assessment of

distinctness as well as for the variety description. These conditions are fulfilled in most characteristics in self-pollinated and vegetatively propagated varieties and for most qualitative and pseudo-qualitative characteristics in cross-pollinated varieties.

4.2.2.2 If considerable genotypic and/or environmental variation occurs within varieties, it is necessary to observe individual plants in order to determine the mean expression as well as the variation within a variety. Distinctness is then assessed by comparing variety means calculated on the basis of the individual plant data, taking into account the random variation inherent in the variety means. This is the normal situation for quantitative characteristics in cross-pollinated varieties.

4.2.3 Summary

The following table summarizes the normal method of observation (see section 4), although there may be exceptions:

	Type of characteristic		
Method of propagation	QL	PQ	QN
Vegetatively propagated	VG	VG	VG/MG/MS
Self-pollinated	VG	VG	VG/MG/MS
Cross-pollinated	VG/(VS*)	VG/(VS*)	VS/VG/MS/MG
Hybrids	VG/(VS*)	VG/(VS*)	**

* records of individual plants only necessary if segregation is to be recorded
** to be considered according to the type of hybrid (see section 4.3.3).

4.3 Examples

4.3.1 Examples for characteristics recorded by visual observation

4.3.1.1 Qualitative characteristics

In qualitative characteristics the states of expressions are self-explanatory and independently meaningful. Notes are provided for each of the states.

Examples:

Barley (self-pollinated)

	Stage [1)] Stade [1)] Stadium [1)] Estado [1)]	English	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
2.	**25-29** **VS**	**Lowest leaves: hairiness of leaf sheaths**		
		absent	Marylin, Alexis	1
		present	Pastoral, Ceres	9

⇨ Distinctness – using single record based on visual observation of a number of individual plants (VG)

⇨ Uniformity - off-types, fixed population standard based on visual observation of individual plants

Field bean (cross-pollinated)

	Stage [1)] Stade [1)] Stadium [1)] Estado [1)]	English	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
12. **(+)**	**71-81** **VG**	**Plant: growth type**		
		determinate	Tista	1
		indeterminate	Condor	2

⇨ Distinctness – using single record based on visual observation of the plot (VG)

⇨ Uniformity - off-types, relative population standard based on visual observation of individual plants

4.3.1.2 Quantitative characteristics

Quantitative characteristics can be recorded by observation of a group of plants (mainly for self-pollinated and vegetatively propagated varieties) or by observations of single plants (mainly for cross-pollinated varieties).

Examples:

Wheat (self-pollinated)

	Stage [1)] Stade [1)] Stadium[1)] Estado [1)]	English	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
7. **(*)**	**60-69** **VG**	**Ear:** **glaucosity**		
		absent or very weak	Soissons, Adonis	1
		weak	Garant, Ventura	3
		medium	Contra, Paros	5
		strong	Niklas, Combi	7
		very strong	Boxer, Wim	9

⇨ Distinctness – using single record based on visual observation of the plot (excluding off-types) (VG), or by direct comparison with similar varieties

⇨ Uniformity - off-types, fixed population standard based on visual observation of individual plants

Ryegrass (cross-pollinated)

Char No.	Method of Examination	English	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
2. **(a)** **(p)** **(+)**	**A** **B**	**Plant: vegetative growth habit in autum**		
QN	**(a)**	erect		1
		semi erect	Trani (Lp), Matador (Lm)	3
		medium	Talbot (Lp)	5
		semi prostrate	Barclay (Lp), Wilo (Lm)	7
		prostrate		9

⇨ Distinctness - variety means calculated from records of visually observed individual plants (VS)
⇨ Uniformity - relative uniformity based on variances, using records of visually observed individual plants.

It is important to note that when statistical methods (e.g. calculation of arithmetic mean of individual plant growth habits) are to be applied, the data should meet all the assumptions for the method concerned. For further details see document TGP/8, section 4 Validation of data and data assumptions.

4.3.1.3 Pseudo-qualitative characteristics

Pseudo-qualitative characteristics are recorded like qualitative characteristics. Distinctness is assessed from a single record based on visual observation (VG) and the off-type procedure is applied for uniformity.

Radish (cross-pollinated)

	English	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
19. (*) (+)	**Radish: shape**		
	transverse elliptic	Fakir, Rond rose à très grand bout blanc	1
	circular	Cerise, Tinto	2
	elliptic		3
	obovate		4
	broad rectangular	Delongpont, De Pontoïse, Pernot	5
	rectangular	Clipo, Fluo, Salto	6
	narrow rectangular	Albion, Apolo	7
	narrow obtriangular		8
	iciclical	Blanche transparente	9

⇨ Distinctness –using single record based on visual observation of individual plants (VG), or by direct comparison with similar varieties

⇨ Uniformity - off-types, relative population standard based on visual observation of individual plants.

4.3.2 Examples for characteristics recorded by measurements

4.3.2.1 The table below provides an example for recording measurements in self-pollinated varieties (barley) with very little within-variety variation (single record: MG) and in cross pollinated varieties (rye) with substantial plant-to-plant variation (records of individual plants: MS).

4.3.2.2 In the case of barley, distinctness for the characteristic "Plant: length" is usually based on a single record for each variety. The replicated measurements within a plot determine the mean plot value and the replications are not considered for further evaluations. If appropriate, the replications can be used to calculate a least significant difference (LSD) for distinctness. Uniformity in this example is assessed on the basis of off-types, which are observed visually.

4.3.2.3 The data obtained from individual plant measurements in rye are used for the assessment of distinctness and uniformity.

	Single record per variety (MG)	Records of individual plants (MS)
Example	Barley, document TG/19/10, Characteristic 12: Plant: length (stem, ear and awns)	Rye, document TG/58/6, Characteristics 10 + 11: Leaf next to flag leaf: length of blade Leaf next to flag leaf: width of blade
Recording of data	Replicated measurements in the plots and calculation of the plot mean value in order to determine a representative value for the plot (1-5 measurements in the plot depending on the variability within the plot) Measurement of all plot replications of the test and calculation of the overall mean value in order to determine a representative value for the variety under the specific year x location conditions Counting of off-types	60 plants per variety are recorded according to the Test Guidelines. The leaf next to flag leaf is collected from 60 plants (20 neighboring plants from each of 3 replicates). The plants at the beginning and the end of a row should be excluded. Measurement of leaf length and width (mm) (e.g. using a ruler on the desk).
Distinctness assessment	on the basis of direct comparison or one record per variety (single measurements are not used for further evaluations)	on the basis of 60 single plant records per variety; same data for D & U (mean, SD)
Uniformity assessment	on the basis of off-types	
Description	mean value of variety transformed into note	mean value of variety transformed into note

SECTION 5: ASSESSING DISTINCTNESS IN THE GROWING TRIAL

5.1 Introduction

The assessment of distinctness depends on the type of expression of the characteristic and the method of observation, both of which determine the type of data obtained.

5.2 Assessing distinctness on Qualitative (QL) characteristics

The General Introduction provides guidance on whether a difference between two varieties can be considered to be clear in the case of qualitative characteristics (see document TG/1/3).

> 5.3.3.2.1 Qualitative characteristics: "In qualitative characteristics, the difference between two varieties may be considered clear if one or more characteristics have expressions that fall into two different states in the Test Guidelines. Varieties should not be considered distinct for a qualitative characteristic if they have the same state of expression."

5.3 Quantitative (QN) characteristics

5.3.1 Introduction

The General Introduction explains that:

> "5.3.3.2.2 Quantitative characteristics: Quantitative characteristics are considered for distinctness according to the method of observation and the features of propagation of the variety concerned. […]"

5.3.2 Visual observation (VG-VS)

5.3.2.1 Direct comparison

The General Introduction explains that:

> "5.5.2.2.2 A direct comparison between two similar varieties is always recommended, since direct pairwise comparisons are the most reliable. In each comparison, a difference between two varieties is acceptable as soon as it can be assessed visually and could be measured, although such measurement might be impractical or require unreasonable effort."

5.3.2.2 Use of statistics

5.3.2.2.1 The General Introduction explains that:

> "5.5.2.2.3 The simplest case for establishing distinctness is when clear differences between varieties, in pair-wise comparisons, are of the same sign, provided these differences can be expected to recur in subsequent trials (e.g. variety A is consistently and sufficiently greater than B) and there are a sufficient number of comparisons.

However, in most cases, establishing confidence that varieties are clearly distinguishable, is more complex. This is explained further in document TGP/9, "Examining Distinctness"

5.3.2.2.2 It is possible to use statistical procedures with data obtained from VG and VS. In this case, it is particularly relevant to check if the data obtained meets the assumptions required for the statistical procedure to be applied. Further information is provided in document TGP/8, in particular in section 3 "Types of characteristics and their scale level" and in section 4 "Validation of data and data assumptions".

5.3.3 Measurements (MG-MS)

Different types of data can be obtained from measurements. From the statistical point of view, a characteristic is only considered at the level of the recorded data, either for DUS analysis or for description of the characteristic (see document TGP/8.3 "Types of characteristics and their scale levels"). The following are statistical methods which can be used to analyze distinctness on the basis of data obtained from measurements.

5.3.3.1 The Combined Over-Years Distinctness Criterion (COYD)

5.3.3.1.1 To assess distinctness for varieties on the basis of a quantitative characteristic it is possible to calculate a minimum distance between varieties such that, when the distance calculated between a pair of varieties is greater than this minimum distance, they may be considered as "distinct" in respect of that characteristic. Amongst the possible ways of establishing minimum distances is the method known as the Combined-Over-Years Distinctness (COYD).

5.3.3.1.2 The COYD method involves:

– for each characteristic, taking the variety means from the two or three years of trials for candidates and established varieties and producing over-year means for the varieties;

– calculating a least significant difference (LSD), based on variety-by-years variation, for comparing variety means;

– if the over-years mean difference between two varieties is greater than or equal to the LSD then the varieties are said to be distinct in respect of that characteristic.

5.3.3.1.3 The main advantages of the COYD method are:

– it combines information from several seasons into a single criterion (the "COYD criterion") in a simple and straightforward way;

– it ensures that judgements about distinctness will be reproducible in other seasons; in other words, the same genetic material should give similar results, within reasonable limits, from season to season;

– the risks of making a wrong judgement about distinctness are constant for all characteristics.

5.3.3.1.4 Details on the use of as the Combined-Over-Years Distinctness (COYD) are provided in document TGP/8 "Use of Statistical Procedures in Distinctness, Uniformity and Stability Testing".

5.3.3.2 The 2x1% criterion

5.3.3.2.1 For two varieties to be distinct using the 2x1% criterion, the varieties need to be significantly different in the same direction at the 1% level in at least two out of three years in one or more measured characteristics. The tests in each year are based on Student's two-tailed t-test of the variety means with standard errors estimated using the plot residual mean square.

5.3.3.2.2 With respect to the 2x1% criterion, compared to COYD, it is important to note that:

– Information is lost because the criterion is based on the accumulated decisions arising from the results of t-tests made in each of the test years. Thus, a difference which is not quite significant at the 1% level contributes no more to the separation of a variety pair than a zero difference or a difference in the opposite direction. For example, three differences in the same direction, one of which is significant at the 1% level and the others at the 5% level would not be regarded as distinct.

– Variety measurements on some characteristics are less consistent over years than on others. However, beyond requiring differences to be in the same direction in order to count towards distinctness, the 2x1% criterion takes no account of consistency in the size of the differences from year to year.

5.3.4 Distinctness on the basis of Notes / States

5.3.4.1 Difference of two notes

The General Introduction states that:

> "5.4.3 For quantitative characteristics, a difference of two Notes often represents a clear difference, but that is not an absolute standard for assessment of distinctness. Depending on factors, such as the testing place, the year, environmental variation or range of expression in the variety collection, a clear difference may be more or less than two Notes. Guidance is provided in document TGP/9, "Examining Distinctness."

The guidance mentioned in the General Introduction is as follows:

5.3.4.2 Location / Year

5.3.4.2.1 Document TGP/7/1 "Development of Test Guidelines" (see Annex III: GN 28) explains that example varieties are important to adjust the description of the characteristicsfor year and location effects, as far as possible. However, it states that "Nevertheless, because of the possibility of particular interactions between the variety genotype and location

(e.g. influence of photoperiod), it should not be assumed that descriptions developed in different countries or locations using the same set of example varieties will be the same […]." Thus, in cases where descriptions of varieties have been produced in different locations or different years it is not appropriate to assume that a difference of two notes between varieties, for a quantitative characteristic, demonstrates that the varieties are necessarily distinct. The difference in notes required to establish distinctness on the basis of descriptions produced in different locations or years will need to be evaluated on a case-by case basis.

5.3.4.2.1 In cases where the descriptions of varieties are produced in the same location and year, i.e. in the same growing trial, the environmental variation within the trial, together with the possibility of making suitable adjustments for such variation, will need to be considered in relation to whether two notes represents a satisfactory basis for distinctness. Furthermore, where two varieties are situated side-by side in the trial, it may be possible to establish distinctness even where the two varieties are attributed the same note (see also section 5.3.2.1).

5.3.4.3 Range of scale

Document TGP/7/1 "Development of Test Guidelines" (see Annex III: GN 20) explains that, in the case of quantitative characteristics, it is necessary to determine the appropriate range to describe the characteristic. In general, a standard "1-9" scale is used, but a "limited" range (notes 1-5) and a "condensed" range (notes 1-3) have also been accepted. Thus, when deciding on the number of notes required to establish distinctness, the range of the scale will need to be taken into account.

5.4 Assessing distinctness on Pseudo-qualitative (PQ) characteristics

5.4.1 Introduction

The General Introduction provides guidance on whether a difference between two varieties can be considered to be clear in the case of pseudo-qualitative (PQ) characteristics:

> 5.3.3.2.3 Pseudo-qualitative characteristics: "A different state in the Test Guidelines may not be sufficient to establish distinctness (see also section 5.5.2.3). However, in certain circumstances, varieties described by the same state of expression may be clearly distinguishable."

5.4.2 Visual Observation (V)

A direct comparison between similar varieties is an appropriate means of assessing distinctness in pseudo-qualitative characteristics.

5.4.3 Measurements (M)

In general, measurements are not used for pseudo-qualitative characteristics.

5.4.4 Distinctness on the bases of Notes/States

5.4.4.1 In the same way as for quantitative characteristics, the number of notes which may establish distinctness is influenced by factors such as location, year and environmental

variation within the trial. Also, as with quantitative characteristics, the range of the scale (number of notes) also varies. However, an important additional factor with pseudo-qualitative characteristics is that, whilst a part of the range is continuous, there is not an even distribution across the scale and it varies in more than one dimension (e.g. shape: ovate (1), elliptic (2), circular (3), obovate (4)). This means that it is difficult to define a general rule on the number of notes to establish distinctness within a characteristic.

5.4.4.2 The following examples illustrate why deciding on the number of notes required to establish distinctness needs particular care:

Example 1:

Type of mottling: only diffuse (1); diffuse and in patches (2); diffuse, in patches and linear bands (3); diffuse and in linear bands (4).

Example 2:

Shape: broad elliptic (1), medium elliptic (2), narrow elliptic (3), ovate (4)

Example 3:

Color: green (1), yellow green (2), green yellow (3), yellow (4), orange (5), red (6)

In the case of Examples 1 and 2, it is not appropriate to say that the "difference" between varieties with states 1 and 2 is less than between varieties with states 1 and 4, although they are respectively 1 and 3 notes "different". In some cases, for example, the difference between notes 2 and 3 may be greater than between notes 1 and 4. However, Example 3 demonstrates that, for some pseudo-qualitative characteristics, it might be possible to follow a similar approach to that used for quantitative characteristics in some parts of the range e.g. varieties with states 2 and 3 (1 note difference) have less difference than those with states 1 and 4 (3 notes difference).

5.5 Parent formula of hybrid varieties

5.5.1 Introduction

5.5.1.1 In some Test Guidelines, e.g. Maize (document TG/2), Rape seed (document TG/36) and Sunflower (document TG/81), an optional method for selecting varieties for the growing trial is described, based on the parent lines and the formula of the hybrid.

5.5.1.2 The use of the parental formula requires that the difference between parent lines is sufficient to ensure that the hybrid obtained from those parents is distinct. The method is based on the following steps:

(i) description of parent lines according to the Test Guidelines;

(ii) checking the originality of those parent lines in comparison with the variety collection, based on the table of characteristics in the Test Guidelines, in order to identify similar parent lines;

(iii) checking the originality of the hybrid formula in relation to the hybrids in the variety collection, taking into account the most similar parent lines; and

(iv) assessment of distinctness at the hybrid level for varieties with a similar formula.

5.5.2 Requirements of the method

The application of the method requires:

(i) a declaration of the formula and submission of plant material of the parent lines of hybrid varieties;

(ii) inclusion in the variety collection of the parent lines used as parents in the hybrid varieties of the variety collection (for guidance on the constitution of a variety collection see document TGP/4 section 1) and a list of the formulae of the hybrid varieties;

(iii) application of the method to all varieties in the variety collection. This condition is important to obtain the full benefit; and

(iv) a rigorous approach to assess the originality of any new parent line in order to be confident on the distinctness of the hybrid variety based on that parent line.

5.5.3 Assessing the originality of a new parent line

5.5.3.1 The originality of a parental line is assessed using the characteristics included in the relevant Test Guidelines.

5.5.3.2 The difference between parent lines must be sufficient to be sure that hybrids produced using different parent lines will be distinct. For example:

Characteristic 1: a characteristic having two states of expression (absent/present), which are determined by two alleles of a single gene, with one dominant allele (+) for the expression “present” and one recessive allele (-) for the expression “absent”.

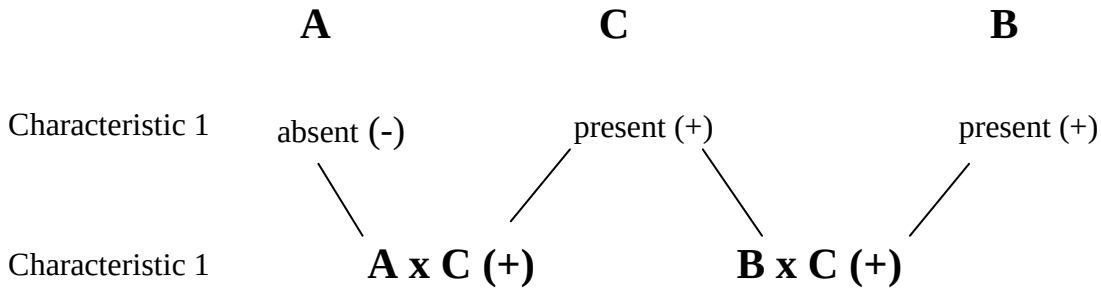
Three parent lines:

A: with the recessive allele (-) with expression “absent”
B: with the dominant allele (+) with expression “present”
C: with the dominant allele (+) with expression “present”

Crossing the above-mentioned parent lines to obtain the following F1 hybrids:

(A x C): having expression “present” for Characteristic 1
(B x C): having expression “present” for Characteristic 1

The following diagram shows the ways the two different crossings result in the same expression of Characteristic 1 (i.e. “present” in both hybrids), although parent line A(-) and parent line B(+) have different expressions.



5.5.3.3 Although the parent lines A and B are clearly different for characteristic 1, the two hybrid varieties A x C and B x C have the same expression. Thus, a difference between A and B for Characteristic 1 is not sufficient.

5.5.3.4 With a more complex genetic control involving several genes, not precisely described, the interaction between the different alleles of each gene and between genes might also lead to similar expression at the level of the hybrid varieties. In such cases, a larger difference is appropriate to establish distinctness between two parent lines.

5.5.3.5 Determining the difference required is mainly based on a good knowledge of the species, of the characteristics and, when available, on their genetic control.

5.5.4 Verification of the formula

5.5.4.1 The aim of verifying the formula is to check if the candidate hybrid variety has been produced by crossing the parent lines declared and submitted by the applicant.

5.5.4.2 Different characteristics can be used to perform this check when the genetic pattern of each parent can be identified in the hybrid. Generally, characteristics based on polymorphism of enzymes or of some storage proteins can be used.

5.5.4.3 If no suitable characteristics are available, the only possibility is to cross the parent lines using the plant material submitted by the applicant and to compare the hybrid variety seedlots (the sample submitted by the applicant and the sample harvested after the cross).

5.5.5 Uniformity and stability of parent lines

5.5.5.1 The uniformity and stability of the parent lines should be assessed according to the appropriate recommendations for the variety concerned. The uniformity and stability of the parent lines are important for the stability of the hybrid. Another requirement for the stability of the hybrid is the use of the same formula for each cycle of the hybrid seed production.

5.5.5.2 A check of the uniformity on the hybrid should also be done, even if distinctness of the hybrid has been established on the basis of the parent lines.

5.5.6 Description of the hybrid

5.5.6.1 A description of the hybrid variety should be established, even where the distinctness of the hybrid has been established on the basis of the parent formula.

5.6 Summary of the use of statistical methods

5.6.1 The following table summarizes possible statistical methods in relation to the type of observation. For further details, see TGP/8 section 3 "Types of Characteristics and their Scale Levels".

Method of observation	Use of statistical methods	
VG / MG	Statistical methods can be used if more than one record per variety is obtained (e.g. years, plots, repetition	**IMPORTANT**: check data assumptions for the statistical method.
VS	Statistical methods can be applied, e.g. Chi square	
MS	Statistical methods can be applied, e.g. COY; 2x1%.	

5.6.2 For further details on the types of characteristics, the data obtained and the methods for the assessment of distinctness, see document TGP/8 section 3 "Types of Characteristics and their Scale Levels".

SECTION 6: SUPPLEMENTARY PROCEDURES

6.1 Introduction

The General Introduction explains that:

> 5.3.1.2 In addition, certain supplementary procedures may be developed to avoid the need for a systematic individual comparison. For example, the publication of variety descriptions, inviting comment from interested parties, or cooperation between members of the Union, in the form of an exchange of technical information, could be considered as supplementary procedures. However, such an approach would only be possible where the supplementary procedures, in conjunction with the other procedures, provide an effective examination of distinctness overall. Such procedures may also be appropriate for consideration of varieties of common knowledge, for which living plant material is known to exist (see section 5.2.2) but where, for practical reasons, material is not readily accessible for examination. Any such procedures are set out in document TGP/9, "Examining Distinctness."

6.2 Publication of variety descriptions

The General Introduction notes that the publication of variety descriptions inviting comment from interested parties may be considered as a supplementary procedure to avoid the need for a systematic individual comparison (see document TG/1/3, section 5.3.1.2). An example of the use of such a procedure can be found in document TGP/6 Section 2.2, which explains the procedure used in Australia.

6.3 Cooperation between members of the Union

The General Introduction states that cooperation between members of the Union in the form of exchange of technical information could also be used as a supplementary procedure (see document TG/1/3, section 5.3.1.2).

6.4 Use of randomized "blind" testing

6.3.1 After, or during, the examination, some doubts may exist over the distinctness of a variety on the basis of the trials. In such cases, the following situations are possible:

(a) with no differences observed, the application is rejected;

(b) with no conclusive difference observed and a claim from the applicant, the examining authority may decide to arrange additional tests.

6.3.2 In the case of visually observed characteristics one possible arrangement for the additional test is "blind" testing.

6.3.3 The aim of "blind" testing is to assess distinctness between a pair of varieties avoiding any pre-judgement in the observation by making the samples in the trial anonymous (the expert is "blind" in respect to the identity of the variety in each plot). This kind of test plays a clarifying role when the differences between the candidate and (a) similar variety(ies) are not clearly definable. In such a case, another test during or after the examination of distinctness may provide evidence for a definitive decision by the authority.

6.3.4 The following are some examples of "blind" testing:

Randomized variety plots: duplicates of the same variety receive individual codes and are randomly distributed in the trial.

Plots containing a mixture of varieties: plots with a mixture of material from the varieties under examination are included in the trial. [This can be useful for seed propagated varieties].

Parts of plants of varieties: randomized parts of plants from the varieties under examination (e.g. leaves or fruit).

6.3.5 Applicants may be part of the "blind" testing process. They may also be invited to visit the "blind" test and be requested to try to identify the plots of their variety.

6.3.6 At the end of the "blind" testing. a variety may be declared as distinct:

(a) if the expert and the breeder always identify the variety; and

(b) the difference can be considered as a clear difference for that characteristic.

6.3.7 In all cases, it is the authority which decides on distinctness.

6.4 The advice of plant experts

There may be cases where the assistance of a recognized plant expert or group of plant experts with extensive knowledge of varieties of common knowledge in a given genus, species or type of variety may be appropriate. In these cases, it is recommended that clear rules on the tasks and responsibilities of the plant expert or group of plant experts involved, as well as on the management of the information submitted for the purposes of examination, be established in order to maintain the transparency of the system.

[End of document]