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DATA RECORDING AND INTERPRETATION

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In connection with the methods used for testing distinctness, homogeneity and stability, the Technical Committee expressed the following preliminary thoughts. It is intended that they will be included in the General Introduction to Guidelines (document TG/1/1) when next revised. They will be sent to the professional organizations in the field of plant breeding and the seed trade for comments before being rediscussed during the thirteenth session of the Technical Committee.

I.   TESTING OF DISTINCTNESS

A.   General

1.   The varieties with which a new variety has to be compared are the varieties of common knowledge as defined in the Convention. A first basis of comparison is normally those varieties maintained in the reference collection of the examining State.

2.   For a better definition of the state of a characteristic in the Test Guidelines, example varieties are given whenever possible.

B.   True Qualitative Characteristics

3.   In the case of true qualitative characteristics (in the sense of discrete, discontinuous characteristics), two varieties have to be considered distinct if they show expressions which fall into two different states of the respective characteristics.

C.   True Quantitative Characteristics

4.   In the case of true quantitative characteristics--that is, measurable characteristics on a one-dimensional scale--two varieties have to be considered distinct if they are distinct at one testing place at least, provided that the difference between them is clear and consistent. In order to obtain comparable results in the various member States, the number of observations has to be fixed. It is desirable to make a direct comparison between two such varieties. A difference occurring in two consecutive, or in two out of three, growing seasons with one percent significance, based for instance on the application of the Least Significant Difference, is considered a clear difference.

D.   Characteristics Observed Visually

5.   Visual characteristics are characteristics that are or can be made visible. Differences in taste, smell, feeling, etc., can be dealt with in the same way as visible characteristics.

6.   A quantitative characteristic which is normally observed visually but is capable of being measured should be measured, in cases of doubt, if it is the only distinguishing characteristic in relation to another variety.   When interpreting visual assessments, two varieties are to be considered distinct if they are distinct at one testing place at least, provided that the difference between them is clear and consistent.   In order to obtain comparable results in the various member States, the number of observations has to be fixed.   It is desirable to make a direct comparison between two such varieties.   When statistical methods are used, the properties of the scale are taken into account and the same confidence levels are borne in mind as for true quantitative characteristics.

7.   Quantitative characteristics recorded by visual assessment could be measured given time and adequate facilities.   In many cases (e.g. hairiness, glaucosity, curvature, etc.) this would involve quite sophisticated techniques but, in theory, it is possible.

8.   Instead of counting the exact number of hairs or measuring the thickness of the wax layer, the varieties are classified on the basis of eye observations.   A trained observer can make rapid and reliable classifications.   It is indispensable to define the characteristic in question (e.g., either density of hairs or length of hairs).

9.   When a fixed scale is used throughout the trials and years, the environmental influence on the varieties is reflected in the figures.   Statistical operations on these figures must be preceded by a test on the properties of the scale;   e.g., do the observations show normal (Gaussian) distributions and, if not, why not?

10.   Visual characteristics are often recorded on a scale that does not satisfy the assumptions of the usual parametric statistics.   Even the simple operation of calculating a mean value is not allowed if the notes are taken on a ranking scale not having equal intervals throughout the scale.   In this situation, generally only non-parametric statistical procedures are applicable.   In such cases it is advisable to use a scale established on the basis of example varieties representative of the different levels of the characteristic.   One and the same variety should then always receive the same Note and thus facilitate the interpretation of data.

11.   Whatever the scale, direct pairwise comparisons are recommended because these have 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 the observer is convinced that it could be measured if the facilities were available. The simplest criterion for establishing distinctness is of course to require consistent differences (differences with the same sign) in pairwise comparisons, provided that they can be expected to recur in following trials.

E.   Combination of Characteristics

12.   When having to decide whether two varieties are distinct from one another, cases may arise where two varieties differ in two or more separately assessed characteristics, each below the agreed level of significance.

13.   In these cases the combination of characteristics might be a way to establish distinctness.   In practice this possibility has already been used when examining the relation between two characteristics as a new characteristic (e.g., length/width ratio).

14.   It is often seen that the relation between two characteristics is stable and may show significance when the separate characteristics do not.   There are, however, some statistical traps with ratios.   It should be checked that the assumptions of the statistical method used are really satisfied.

15.   If two characteristics are combined to form one new characteristic and the difference reaches at least the agreed level of significance (1% in at least two years), it is acceptable to use this finding as a basis for establishing distinctness.

16. Another possibility might be to establish distinctness on the basis of a multivariate analysis, e.g., by combining the data of two or more characteristics by Hotellings T^2 or a discriminant function analysis. Care should be taken to avoid the introduction of an artificial combination resulting from the analysis of a limited set of data without having enough experience of its repeatability. The question has also still to be studied whether, in such cases, a minimum level of confidence for each individual characteristic should be required which could be lower than normal.

17. For the time being, no solution can be proposed for the case where two or several characteristics could not be combined. But it might be considered whether in such cases a sufficient number of characteristics might reveal a difference which has to be taken into consideration.

II. TESTING OF HOMOGENEITY

A.   General

18. According to Article 6(1)(c) of the Convention, a new variety must be sufficiently homogeneous, having regard to the particular features of its sexual reproduction or vegetative propagation. To be considered homogeneous, the variation shown by a variety must be as limited as possible, depending on the reproductive system of the variety. Possible off-types due to occasional mixture, mutation or other causes require a certain tolerance. Unless stated otherwise in the relevant Test Guidelines, these tolerances should not exceed those set down below.

B.   Vegetatively Propagated Varieties and Truly Self-Pollinated Varieties

19. For vegetatively propagated varieties and truly self-pollinated varieties the following table indicates the maximum acceptable number of off-types in samples of various sizes.

Maximum Acceptable Number of Off-Types in Samples of Various Sizes*

N	Maximum Number	N	Maximum Number
2 - 9	0	460 - 529	8
10 - 89	1	530 - 599	9
90 - 149	2	600 - 669	10
150 - 209	3	670 - 739	11
210 - 269	4	740 - 809	12
270 - 329	5	810 - 879	13
330 - 389	6	880 - 949	14
390 - 459	7	950 - 1020	15

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* Still under discussion.

C.   Mainly Self-Pollinated Varieties

20.   Mainly self-pollinated varieties are varieties which are not fully self-pollinated but which are treated as such for testing. For these, a higher tolerance is required and the maximum numbers of off-types allowed in the table for vegetatively propagated varieties and for truly self-pollinated varieties are doubled. The Technical Working Parties are requested to list, within their competence, those crops where this higher tolerance should be applied.

D.   Cross-Pollinated Varieties including Synthetic Varieties

21.   Cross-pollinated 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.

22.   For measured characteristics the standard deviation or variance should be used as the criterion for comparison. A variety is considered not to be homogeneous in the measured characteristic concerned if--with reference to the Fisher test--its variance exceeds [1.5] times the average of the variances of the varieties used for comparison.

23.   Visually assessed characteristics have to be handled in the same way as those which are measured, namely, by comparing them with comparable varieties already known. The number of off-types should not significantly [95% confidence level] exceed those of comparable varieties already known.

E.   Hybrid Varieties

24.   Single cross varieties have to be treated as mainly self-pollinated varieties, but a tolerance has also to be allowed for inbred plants (sibs). It is not possible to fix a percentage as the decisions differ according to the species and the breeding method. However, the percentage of sibs should not be so high as to interfere with the trials. The Technical Working Parties should fix the maximum percentage tolerated in the Test Guidelines concerned.

25.   For double cross or three-way cross varieties, a segregation of certain characteristics is acceptable if it is in agreement with the formula of the variety. If the heredity of a characteristic is known, clear-cut segregating characteristics have to be treated as qualitative characteristics. If the described characteristic is not a clear-cut characteristic, it has to be handled as in the case of normal cross-pollinated varieties; that is to say, the homogeneity has to be compared with that of comparable varieties already known. For the tolerance of sibs, the same considerations apply as in the case of a single cross variety.

III.   TESTING OF STABILITY

26.   According to Article 6(1)(d) of the Convention, a new variety must be stable in its essential characteristics, that is to say, it must remain true to its description after repeated reproduction or propagation or, where the breeder has defined a particular cycle of reproduction or multiplication, at the end of each cycle.

27.   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 homogeneity.

28.   Nevertheless, during the testing for distinctness and homogeneity careful attention has to be paid to stability. If no facts are discovered which might indicate that the variety is unstable, it can be assumed that the variety is stable.

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