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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/11

“EXAMINING STABILITY”

Document prepared by an expert from the European Community

to be considered by the

*Technical Working Party for Vegetables
at its forty-fourth session, to be held in Veliko Tarnovo, Bulgaria, from July 5 to 9, 2010*

*Technical Working Party on Automation and Computer Programs
at its twenty-eighth session, to be held in Angers, France, from June 29 to July 2, 2010*

*Technical Working Party for Agricultural Crops
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*Technical Working Party for Ornamental Plants and Forest Trees
at its forty-third session, to be held in Cuernavaca, Morelos State, Mexico,
from September 20 to 24, 2010*

*Technical Working Party for Fruit Crops
at its forty-first session, to be held in Cuernavaca, Morelos State, Mexico,
from September 27 to October, 2010*

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1. INTRODUCTION

The General Introduction (document TG/1/3) explains the following with regard to Stability:

“7.1 Requirements of the UPOV Convention

Article 6 (1)(d) of the 1961/1972 and 1978 Acts of the UPOV Convention require that a 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.” Similarly, Article 9 of the 1991 Act of the UPOV Convention requires that a variety “shall be deemed to be stable if its relevant characteristics remain unchanged after repeated propagation or, in the case of a particular cycle of propagation, at the end of each such cycle.”

“7.2 Relevant / Essential Characteristics

The relevant or essential characteristics include at least all characteristics used for the examination of DUS or included in the variety description established at the date of grant of protection of that variety. Therefore, all obvious characteristics may be considered, irrespective of whether they appear in the Test Guidelines or not.”

Thus it is clear that in the context of the UPOV Convention, references to Stability and its examination refer to the stability **of the variety itself**, after repeated propagation. It is important to be precise about this because in some crop sectors the word “stability” is used with other, slightly different meanings, most usually in the context of individual plants within a variety which are exhibiting significant variations in some part of their structure during a single propagation cycle which could be a result of a spontaneous mutation. Within the context of the UPOV Convention this would be treated as a uniformity problem, and the stability of the variety would not be examined further.

2. EXAMINATION OF STABILITY

2.1 Nature of stability and its connection with uniformity

2.1.1 The General Introduction explains the following with regard to the examination of Stability:

“7.3.1.1 In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable. Furthermore, if the variety is not stable, material produced will not conform to the characteristics of the variety, and where the breeder is unable to provide material conforming to the characteristics of the variety, the breeder’s right may be cancelled.

“7.3.1.2 Where appropriate, or in cases of doubt, stability may be tested, either by growing a further generation, or by testing a new seed or plant stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied. Further guidance on the examination of stability is considered in document TGP/11, “Examining Stability.” “

2.1.2 Plants grown from two or more generations of the candidate variety should be so alike that they could not be declared distinct from each other for any relevant characteristic. The ability of the variety to remain true to type over successive generations, and therefore stable, depends on the genetic constitution of the variety and the maintenance breeding effort made by the applicant to ensure that the variety remains uniform from one cycle to the next. Thus stability can be considered to be uniformity over time.

2.2 Practical aspects to consider for the examination of stability

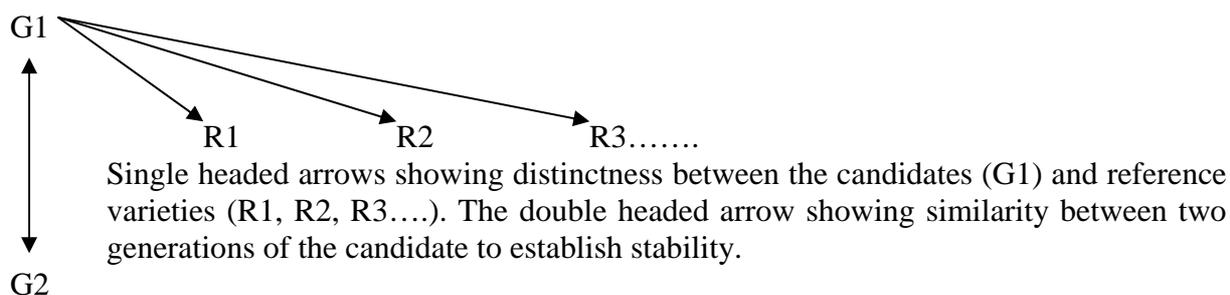
2.2.1 If the number of off-types in a variety is already clearly outside the permitted tolerances during a single test, the variety will be judged not uniform (as outlined in TGP/10/1 “Examining Uniformity”). In this case no statement on stability will be made.

2.2.2 For cases which are not clear-cut, or when the examination authorities wishes to ascertain as a matter of routine, whether the stability criterion has been met by a candidate variety, the authority should decide whether to actively test for stability. The testing of stability should be conducted either: (i) by testing a new seed or plant stock or (ii) based on the same sample (but after the propagation cycle). In the case (i) above, the examination authority should request the applicant to provide the sample of plant material to be tested for stability, this sample itself having been obtained from the subsequent cycle of reproduction or propagation of the initial sample used to determine distinctness and uniformity. In case (ii) above the propagation cycle can be undertaken by the examination authority as long as it can ensure the safety and reliability of the propagation procedure.

2.3 Examples of examining for stability

2.3.1 The three following scenarios can be envisaged for seed propagated crops, depending on the time when the examination authority decides to carry out the stability test in relation to the distinctness and uniformity test

2.3.2 *Testing stability at the same time as distinctness and uniformity (e.g. Phaseolus vulgaris in Australia):* Two generations of seeds of the candidate variety are requested from the applicant at the same time and sown along with the other reference varieties in the DUS trial. Ideally, the seeds are from two successive generations, designated as G1 and G2. For trialing purposes, G1 or the first generation of the candidate variety is compared against the reference varieties (R1, R2, R3....) to examine its distinctness and uniformity. For testing stability, G2 or the second generation of the candidate is compared against the first generation G1 to establish that there is no difference between them in their relevant characteristics. If the states of expression for the relevant characteristics are the same in the two generations then they are considered to be stable. For measured characteristics the candidate variety is considered stable if there is no statistical difference between the two generations. So the test of stability is basically a test for similarity between both generations. The following diagram illustrates the situation:

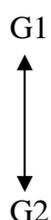


2.3.3 *Testing stability in a separate trial (e.g. Zea mays parent lines in France):* Sometimes it is not possible to plant the second generation of seed at the time of sowing the trial for distinctness and uniformity. Consequently, seed from the original sample of the candidate variety needs to be sown with the subsequent generation of seed of the candidate variety in a later separate trial.

(a) When the technical examination is carried out as a two-year DUS test by the examination authority (GEVES), a part of the submitted seed sample is sown in a specific trial to produce selfings. In the second year the seeds harvested on six selfings are sown in ear-rows besides a two rows plot sown with seeds of the submitted sample. All the characteristics are checked on the ear-rows in comparison with the plot. The candidate parent line variety is declared stable if at least 5 ear-row's plants are similar to those in the plot (1 different ear-row is accepted to take into account the risk of mistake done by the authority when producing selfings).

(b) When the technical examination is carried out partly using the applicant's results (one year of testing for distinctness and uniformity carried out by the applicant) the applicant is asked to provide to the examination authority (GEVES) seeds of the candidate variety in the year "n-1" (the year in which the applicant carries out half of the test for distinctness and uniformity) and 6 non-threshed ears of the candidate variety are sent to the examination authority in year "n". The ears are threshed by the examination authority and sown in ear-rows close by a plot sown with seeds of the submitted seed sample. All the characteristics are checked on the ear-rows in comparison with the plot. The candidate parent line variety is declared stable if at least 5 ear-row's plants are similar to those in the plot (1 different ear-row is accepted to take into account the risk of mistake done by the authority when producing selfings).

The examination authority should already have a fixed idea of what constitutes a representative plant of the candidate variety by the time it conducts testing on the sample to be used for stability. In this respect, a draft variety description may have already been drawn up in time for the stability test, thus avoiding the need to use reference varieties and having to determine the expression of the relevant characteristics. Since the second trial does not include the reference varieties, the only objective is to look at the similarity of the two generations in their relevant characteristics. The following diagram illustrates the situation:



The double headed arrow showing similarity between two generations of the candidate to establish stability.

2.3.4 *Testing stability in hybrids*: Hybrids are produced by crossing two or more parental lines; they cannot breed true because of their heterozygous genetic make-up. Therefore, two generations of hybrids cannot be produced from two successive generations of seeds. All hybrids have a definitive cycle of propagation from their parental lines and according to the different acts of the UPOV conventions (see Article 6 of the 1978 Act of the UPOV Convention and Article 9 of the 1991 Act) they should be stable at the end of each cycle of propagation. For example, a single cross hybrid (F1) developed in the first year (Year 1) should be compared against the same single cross hybrid (F1) produced in the second year from the same parental lines (P1 and P2). This can be demonstrated by the following diagram:



The double headed arrow showing similarity between the F1 hybrids produced in two different years to establish stability. For double and triple cross hybrids, F1 from two different reproduction cycles (which may take more than one year) should be compared in a similar way.

Where appropriate, or in cases of doubt, the stability of the hybrid may, in addition to an examination of the hybrid variety itself, also be assessed by examination of the uniformity and stability of its parent lines (see also 2.3.2 above).

2.4 Conclusion

2.4.1 The stability criterion can be concluded on by an assumption based on the uniformity of the variety, or in case of doubt, by testing it directly through the re-propagation of the candidate variety or via one of its subsequent generations.

2.4.2 Once the relevant authority is satisfied that the candidate variety fulfils the stability criterion subsequent to the finalising of the DUS test, then on technical grounds it can be awarded plant breeders' rights.

2.4.3 If the plant material does not conform to the characteristics of the candidate variety after repeated reproduction of propagation then it has to be considered that the variety is not stable and the breeders' rights shall not be granted.

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