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CALCULATION OF RELATIVE TOLERANCES IN THE NUMBER OF OFF-TYPES 2005

Document prepared by experts from Germany

Introduction

1. The number of off-types allowed in a specific sample size is calculated on the basis of a population standard. The population standard can be fixed in a general way on the basis of technical experience of the crop including knowledge of the breeding methods and the levels of genetic homogeneity associated with those methods. Such population standards are called "Fixed population standards".

2. Another possibility is to define a population standard on the basis of existing varieties. Because it is calculated in relation to other varieties, such population standards are called "Relative population standards". On the basis of specific acceptance probabilities relative tolerance limits can be calculated for a specific sample size. A relative population standard should be calculated for the assessment of uniformity in cross-pollinated varieties if the number of comparable varieties is sufficiently high to give a representative mean number of off-types.

3. TGP/10.2 par. 5.b explains in which cases the off-type procedure may be appropriate for the assessment of uniformity in cross-pollinated varieties:

> "If, especially in qualitative characteristics, the great majority of individuals of a variety have the same expression, plants with a clearly different expression can be detected as off-types (e.g. root color in fodder beet). In such cases the off-type procedure is appropriate. The recommended limit for the number of off-types should then be based on the number of off-types in comparable varieties."

4. In document TG/1/2 the following recommendation was given for the assessment of uniformity of cross-pollinated varieties including synthetic varieties:

> "Visually assessed characteristics have to be handled in the same way as those are measured. The number of plants visually different from those of the variety should not significantly (5% probability of error) exceed the number found in comparable varieties already known."

5. There is not yet a recommended procedure for the calculation of relative tolerances for off-types in document TG/1/3 and the related TGP documents. The TWC agreed at its 21st meeting that the subject of relative tolerances for off-types should be incorporated in a section within TGP/10.3.2.

6. The present document will elaborate a practical example where off-types can be observed in cross-pollinated varieties and where a relative population standard should be applied. An approach for the calculation of relative tolerance limits will be proposed.

Example for the observation of off-types in cross-pollinated varieties

7. In Fodder Radish, Root color is expressed qualitatively with the four states white, red, violet and blackish brown (TG/178/3). The varieties have a clearly dominant state of expression and are described with one note. Only a small number of plants with a different expression can be observed and these are considered as off-types. The off-types are clearly visually detectable. The following recommendations are given in the Test Guidelines for the assessment of uniformity of this characteristic:

- Observation of 100 plants.
- The variability within the variety should not exceed the variability of comparable varieties already known.
- Interpretation of results should be made according to the rules for cross-pollinated varieties as stated in the General Introduction to the Test Guidelines.

8. The number of off-types in root color observed in the DUS test in Germany in 1996 to 2003 is shown in the table below. The number of reference varieties reflects the changes in the reference collection. The different composition of the reference collection results in a different mean number of off-types. The number of off-types can be influenced by a change of reference varieties or slightly by a change of standard samples.

9. The mean number of off-types observed in the reference varieties was taken as the tolerated population standard (= relative population standard). The tolerated number of off-types was calculated according to the procedure for fixed population standards in

self-pollinated varieties as presented in TGP/10.3.2 “Statistical methods: Off-Types”. The binomial distribution was applied with an acceptance probability of 95%.

Year	Number of reference varieties	Mean number of off-types in reference varieties (%)	Relative population standard	Allowed number of off-types in a sample size of 100
1996	36	1.31	1.31	3
1997	38	1.11	1.11	3
1998	44	0.95	0.95	3
1999	46	2.17	2.17	5
2000	43	0.98	0.98	3
2001	37	1.11	1.11	3
2002	47	1.66	1.66	4
2003	46	1.60	1.60	4

General recommendation for the calculation of relative tolerances in the off-types procedure

10. If relative tolerance limits are appropriate for the assessment of uniformity of cross-pollinated varieties (see Section TGP/10.2) the mean number of off-types observed in the reference varieties should be applied as population standard. The number of off-types allowed in a specific sample size should be calculated according to the binomial distribution with an acceptance probability of 95% (see Section TGP/10.3.2).

11. If the mean number of off-types in the reference collection changes considerably from year to year the use of a moving average over several years should be considered. A moving average might be appropriate if the mean number of off-types is influenced by sampling effects.

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