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POPULATION STANDARDS IN HYBRIDS OF OUTBREEDING SPECIES

Document prepared by experts from the United Kingdom

POPULATION STANDARDS IN HYBRIDS OF OUTBREEDING SPECIES

1. This paper concerns an issue that has been brought to our attention by the UK Vegetable DUS testing centre.

2. In TWV 31, N.P.A. van Marrewijk of the Netherlands gave a paper expressing concern about the application of fixed population standards for off-types to hybrids of out-breeding species. In e-mail communication (in Appendix), he clarified his concerns. These related to document TG/1/2 (Revised General Introduction to the Guidelines for the Conduct of Tests for Distinctness, Homogeneity and Stability of New Varieties of Plants, dated 1979), which stated that single-cross hybrids are to be treated as "mainly self-pollinated". A higher tolerance is required for this class of varieties than for vegetatively propagated and truly self-pollinated varieties.

3. Mr. van Marrewijk believes that relative standards should be used for hybrids of outbreeding species. So rather than using a fixed population standards, the standards set should be based on hybrids of similar genetic make-up.

4. The General Introduction is currently being updated. The current working document TC/36/8 modifies the guidance for using off-types as the basis for assessing uniformity and now recommends the use of relative tolerance limits for hybrids of cross-pollinated parents (section 7.6.2, paragraph 140). This would seem to resolve the issue.

5. I would be interested in the view of the TWC in this matter.

Adrian Roberts
Biomathematics and Statistics Scotland
16 June 2000

APPENDIX

E-mail to N.P.A. van Marrewijk, dated 16 May 2000

Dear Dr van Marrewijk,

I act as statistical consultant to the Scottish Agricultural Services Agency. In this role, I work with Niall Green especially on statistical issues for Vegetable DUS testing.

I have recently read a discussion paper for TWV 31 entitled "Population standards in hybrids of outbreeding species" prepared by you. Since it is relevant to the testing of homogeneity for vegetable crops in the UK, I would like to clarify the points of concern.

I was not clear from the paper whether your concerns related to the blanket application of a single population standard to all hybrid types for a crop, or if they relate to the techniques and assumptions underlying the tables produced in TWC/11/16. I am attending TWC 18 in Kiev in June, and I could bring any issue of relevance to the TWC that arises from this. Have you produced any further papers on this issue?

Many regards
Adrian Roberts

E-mail from N.P.A. van Marrewijk, dated 16 May 2000

Dear Mr Roberts,

The reason for preparing the TWV31 paper was that quite a lot of parent lines of vegetable hybrids cannot be bred as homozygous parent lines because of the inbreeding depression occurring in these species. Although mostly single cross hybrids, they do not fully fit to the rules of paragraph 33 of TG/1/2 (to be treated as mainly self-pollinated species - par. 29 -; especially the fixed number (and/or percentages) of off-types proposed those days by the UPOV counselor attending the TWV do not fit). The remark relating to the allowance of inbred plants is less relevant in the present testing work than the genetic heterogeneity of the parent lines and consequently of the hybrids.

For such single cross hybrids even 'vegetatively fixed' motherlines are used (e.g. leek, cauliflower). These parents tend to be heterogeneous in many genes. Nevertheless these hybrids are much more homogeneous than the population varieties within the same species.

The background of my paper was that each individual line (and consequently the hybrids produced from it) has (have) to be considered against its (their) own genetic composition. A fixed standard for such F1-hybrids would lead to a lot of rejections. A relative standard (like for outbreeding crops) would take into account that genetic heterogeneity of the parent lines. The rules of paragraph 33 may fit for species with relatively low inbreeding depression, like maize. Most of the vegetable hybrids should be treated as 'other categories of hybrids' as mentioned in paragraph 34, although many are 'F1-hybrids' or nearly 'F1-hybrids'.

In case of Brassica hybrids mostly 'sporophytic self-incompatibilty' is used as the mechanism for hybridisation, resulting in single and double cross hybrids. In case of 'cytoplasmic male sterility' (carrot, onion, some Brassicas) in fact a threeway cross is made, but from a genetic

point of view the couple of A and B line tend to become an isogenic pair, except for the cytoplasmic factor and the restorer gene(s). I hope this clarification is clear to you.

Kind regards,
Nico van Marrewijk, CVN

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