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**INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS**

GENEVA

**TECHNICAL COMMITTEE**

**Thirty-Fifth Session  
Geneva, March 22 to 24, 1999**

**MATTERS ARISING FROM THE 1998 SESSIONS OF THE TECHNICAL WORKING  
PARTIES TO BE DEALT WITH BY THE TECHNICAL COMMITTEE**

*Document prepared by the Office of the Union*

1. This document summarizes, in Annex I, matters arising from the 1998 sessions of the Technical Working Parties (hereinafter referred to as the "TWPs") which have to be dealt with by the Technical Committee (hereinafter referred to as the "Committee"). They comprise important subjects discussed or decisions taken by the TWPs, communicated to the Committee

- (a) for information and for a possible decision to be taken by the Committee,
- (b) for information,
- (c) for discussions planned by the Committee under separate agenda items.

The headings of the various items are listed on pages 1 and 2 of the Annex.

2. To shorten references to the various TWPs and the BMT in this document, use is made of the following codes that designate their documents:

TWA: Technical Working Party for Agricultural Crops;  
TWC: Technical Working Party on Automation and Computer Programs;  
TWF: Technical Working Party for Fruit Crops;  
TWO: Technical Working Party for Ornamental Plants and Forest Trees;  
TWV: Technical Working Party for Vegetables;  
BMT: Working Group on Biochemical and Molecular Techniques and DNA Profiling in Particular.

[Annex follows]

## ANNEX

**MATTERS ARISING FROM THE 1998 SESSIONS OF THE TECHNICAL  
WORKING PARTIES TO BE DEALT WITH BY THE COMMITTEE**

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I. MATTERS FOR INFORMATION AND FOR A POSSIBLE DECISION TO BE TAKEN BY THE COMMITTEE

Chairmanship

1. The TWF and TWO noted that the Committee had proposed to the Council, in view of the expiration of the chairmanship of Mr. Joël Guiard (France) with the closing of the ordinary session of the Council in October 1998, that it elect Mrs. Elise Buitendag (South Africa) as new chairman and Mr. Raimundo Lavignolle (Argentina) as new vice-chairman of the Committee. It further noted that the Council had elected Mrs. Buitendag as chairman of the Committee and Mr. M. Camlin (United Kingdom) as vice-chairman as Mr. Raimundo Lavignolle had taken up a post in the UPOV Office. The Council had also elected Mr. M. Camlin (United Kingdom) as chairman of the BMT and Ms. Françoise Blouet, France, as chairman of the TWA.

2. The Technical Working Parties noted that their chairmen's terms of office will expire with the ordinary session of the Council in 1999. As the last session of the Committee before that session of the Council will be held before the next sessions of the Technical Working Parties it was necessary to already make a proposal for a candidate for chairmanship for that session. The Technical Working Parties suggested to the Committee that it propose to the Council that it elect the following persons as chairmen:

TWF: Mr. Josef Harsanyi, Hungary

TWO: Ms. Elizabeth Scott, United Kingdom

TWV: Mrs. Julia Borys, Poland.

TWC: Mr. Wieslaw Pilarczyk, Poland (candidate proposed by the chairman of the TWC after consultation with members of the TWC)

(See documents TWF/29/14 Prov., paragraphs 33 and 64, TWO/31/19 Prov., paragraphs 50 and 96, and TWV/32/9, paragraph 68)

Revision of the General Introduction

3. The information on the Revision of the General Introduction to Test Guidelines, Harmonization of States of Expression and Their Notes (TG/1/2) is reproduced in documents TC/35/5 and TC/35/9 (Revision of TG/1/2) and in document TC/35/8 (Categories of Characteristics and Harmonization of States of Expression).

Application of COYD And COYU Analysis

4. The TWA, TWC, TWF and TWO noted that the Committee, while agreeing that several experts had still to gain experience with the application of COYD and COYU analysis for further species, had insisted that the document as reproduced in TC/33/7 had been adopted for use for cross-fertilized species and that no alternative strategy should remain and efforts

should rather be made to apply the document. Where there were too few varieties, the document would offer an alternative with the criterion of the long-term LSD. The Committee especially asked the Technical Working Party for Vegetables (TWV) to rediscuss the subject and study the application of the analysis to further vegetable species. The Committee also asked the TWC to consider means of explaining the method more understandably or making it more user-friendly. Moreover, if TWC experts were sent to sessions of other Technical Working Parties, the method would finally gain better acceptance by the various Technical Working Parties.

5. Survey on the Use of COY. The Chairman of the TWC referred to his summary made at the session of the Committee that had requested to know (a) whether there were valid reasons for not applying COYD (too few varieties, incomplete tables, large interactions, problems with setting an appropriate probability level), (b) what should be used instead of COYD and whether the two-out-of-three rule was still applicable in any situation, (c) whether there were similar valid reasons for not using COYU (e.g. too few degrees of freedom, incomplete tables of data, difficulties in setting probability levels, etc.), (d) what was recommended in these cases, whether it was suggested to look at non-forage species, e.g. onions or leeks, as an additional crop to assess the potential application of COYD/COYU, (f) whether COYD was applicable to data from cross-pollinating as well as self-pollinating species for both measured data and other recordings, (g) whether COYD could be used in countries where contemporary candidates were under test. The TWC had received from some of its experts short reports on recent developments in their countries. The experts from Denmark, Finland, France, Germany, Spain, the Netherlands and the United Kingdom reported that they would use COYD and COYU for grasses and, with the exception of the Netherlands, also for a few other cross-fertilized species. The experts from the Czech Republic, Hungary, Poland and the Ukraine reported either that they would only use COY occasionally or that they had only started using COY last year or that they planned to start using it soon. The expert from Japan reported that DUSTW had been tested and found good but had not yet been used as most tests lasted only for one year.

6. COYD for Measured Characteristics in Self-fertilized Varieties. The TWC noted the request from the Crop Working Parties to find a simple method for the treatment of measured characteristics in self-fertilized species or varieties. It noted document TWA/27/9 Rev. on COYD for measured characteristics in self-fertilized varieties, prepared by experts from Germany for the next session of the Technical Working Party for Agricultural Crops and highlighting some problems of establishing uniformity. In certain types of varieties it was easier to observe the off-types visually, in some others it was easier to apply COYD. The TWC agreed that all depended on the uniformity of the genotype. In the case of little variation, a visual assessment of off-types might be easier, in the case of more variation, it might be better to apply the COYD analysis. The COYD analysis gave a statistically firm approach for the handling of measured data irrespective of whether they resulted from cross-fertilized species or from self-fertilized species. The TWC therefore recommended the use of COYD where an expert looked for a method to handle measured data of self-fertilized species. However, it did not want to impose its use, if the crop expert preferred not to do so. The TWC agreed that nothing prevented the use of COYD for any measurements as long as the normal conditions for the application of the analysis of variance were fulfilled, e.g. these were measurements from more than one year, a certain number of plants, there existed some difficulties to observe distinction, there was a philosophy to wish to be able to distinguish the variety consistently in the following years, there was a normal distribution of the figures, there

was a constant variance, the observations were independent, the trial lay-out was randomized, there existed at least one replication.(See document TWC/16/14, paragraphs 44 to 47).

7. Rejection of COY by Most Technical Experts. Most experts in the TWF, TWO and TWV regretted that the Committee had not listened to the opinion of the crop experts and had insisted that the application of COYD and COYU for cross-fertilized varieties was obligatory. Some experts also insisted that decisions on uniformity and distinctness should be based not on the COYU and COYD result, but on the judgment of the testing expert. In most cases of ornamentals, fruits and vegetables, testing experts can examine distinctness and uniformity without the use of COY analysis. The expert from the UPOV Office explained that the result of COYU and COYD does not automatically lead to a decision, and that if the expert has a reasonable justification, he may still reject the result of the COYU and COYD analysis. Many experts insisted that the use of COYU and COYD analysis should be not obligatory, but optional. Many experts repeated their arguments that the COY analysis was unsuited for their species and that they would not use it. As their voices had not been heard or had been ignored in the past, they discussed at length how they could convince the Committee of their arguments and the impossibility of the application of the COY analysis to most fruit varieties, ornamental varieties and vegetable varieties.

8. Concern at Too Small Differences. Many experts expressed their concern that a method, which had originally been prepared and accepted to solve some difficulties in cross-fertilized grasses, had been extended step by step to all cross-fertilized agricultural species, then to all cross-fertilized species and was now recommended also for all cases of measurements. They had nothing against special requirements of experts for certain groups of species to solve their problems, but did not wish methods needed by a small group of experts or for a small group of species to be successively imposed on all experts for all species without any need and without them being heard. Several experts wondered whether they needed to have recourse to such refined methods as the COY, because varieties which would not be distinguished otherwise might indicate that experts had gone too far or were close to going too far in distinguishing varieties which should not be granted separate rights.

9. During the discussions in the TWO it was pointed out that there was a big difference in the testing of varieties of ornamental species compared with the testing of agricultural species. In agricultural species, the variety characteristics were observed and a description was made first and thereafter the distinction was made on the basis of description and further judgments on those characteristics in which the description showed some difference, if needed, and in cross-fertilized grass species on the basis of measurements and their statistical evaluation. In ornamental species the approach was the opposite. The expert would first observe the variety and take a decision on distinctness (and uniformity). This would be done visually and only in extreme cases would measurements be taken. These cases would be less than 1%. For one country it was reported that only one case had been noted in 25 years in which measurements were needed to take a decision on distinctness. In these few cases other simpler statistical methods such as the t-test or the LSD would be more than sufficient. In addition, the lay-out of the trials was not randomized, and there was no justification for randomization for only one case in 25 years.

(See documents TWC/16/14, paragraphs 17, 35 and 36, 67 to 70, TWF/29/14 Prov., paragraph 8, TWO/31/19 Prov. 7 to 11, and TWV/32/9 Prov., paragraphs 14 and 15). See also the heading: Distinctness and Genotype x Environment Interaction.



Development of Computer Programs for DUS Testing (responses on DUST9, DUSTW and other possible programs)

10. The TWA, TWC, TWF, TWO and TWV noted that the Committee had welcomed the new version of the DUSTX package and the prototype produced for Windows. The Committee recommended broader use of that freely available software which would ensure more harmonized evaluation of data. It was recalled that the prototype version of DUSTX or DUSTW (for Windows) was available from Ms. Sally Watson, Biometrics Division, DANI, Newforge Lane, Belfast, BT9 5PX, United Kingdom, and that in order to broadcast the free availability of the DUST Program, document TWC/15/17 reproduced the content of the manual for the DUSTW prototype with a simplified introduction. One expert in the TWV warned that the DUSTX program cannot be applied in countries where the testing institute is not equipped with corresponding computer facilities, and that the DUSTX program should be developed further. The expert from the UPOV Office explained that, while the use of COYU and COYD analyses for cross-fertilized species had become obligatory, the use of DUSTX program was only recommended.

11. The TWC received some updated information on corrections to DUST 9 and DUSTW as reproduced in Annex II of document TWC/16/14. It was expected that DUSTW would be completed by the end of 1998.

(See documents TWA/27/27, paragraph 19, TWC/16/14, paragraphs 65 and 66, TWF/29/14 Prov., paragraph 30, TWO/31/19 Prov., paragraph 47, and TWV/32/9 Prov., paragraph 32).

Testing of Seed-propagated Varieties of Ornamental Species

12. The TWO noted that the Committee had noted the discussions held in the TWO to investigate possible ways of cooperating with the Fleuroselect system. It had noted that the trial fields used for the comparative trials of new varieties undertaken by breeders of Fleuroselect had been considered to be in good shape, had a good reference collection and showed good variety knowledge, but the criteria were rather close to agronomic value. But in the end, the TWO had only been able to recommend to individual offices that they consider whether possibilities for cooperation existed at the national level, with Fleuroselect trials being used as a second trial and the testing period being shortened thanks to the information gained from them. The expert from ASSINSEL had insisted that it was very important to continue discussions with Fleuroselect. The Committee had agreed that it would welcome reports on the follow-up to cooperation at the national level.

13. The Committee had also noted the problems encountered when, in a species in which so far varieties had been propagated vegetatively, the first applications for seed-propagated varieties were received. The expert from ASSINSEL had pointed out that, according to the UPOV Convention, the uniformity of a variety had to be judged according to the manner of its propagation. If the national authorities applied the same criteria as for vegetatively propagated varieties, they would prevent any seed-propagated variety from obtaining protection. The Chairman of the Committee had concluded the discussions by stating that, in spite of the fact that document TC/34/8 contained many details on the special case of

*Pelargonium*, there were too many questions still open, for instance on the production method of the variety and on whether the variety was an F<sub>1</sub> hybrid or a population, how the parents were maintained, whether heterogeneity existed between plants or inside the plants, whether it was not possible to make the parents more uniform and so on. The TWO had therefore been asked to clarify these questions and report back to the Committee at its next session.

14. The expert from Germany reported again on the rejection of a seed propagated *Pelargonium* variety because of lack of uniformity. She asked the group which method from the General Introduction should be used; the methods for hybrids or those for cross-fertilized crops, as the variety was not a hybrid resulting from two inbred lines but from two populations with some inbreeding. The exact way the inbreeding took place was, however, not known to the experts. The TWO noted the decision of the Committee as a result of a similar case presented by the Technical Working Party for Vegetables (TWV) where the competent authority had to prove that the variety was really a hybrid. For that purpose, the parent lines might be necessary. If the applicant was not willing to submit the parent lines, the variety had to be treated as a normal cross-fertilized variety.

15. The expert from France reported of similar cases for *Tagetes* and *Impatiens* in France. In seed propagated varieties the parents in the hybrid were not so uniform. The question was whether a different approach than for pure inbred lines was acceptable, which was more adaptable to the way of propagation. At present it was rather difficult to test the parent lines in a similar way as, for example, in maize. It was important that experts exchanged more information on this subject.

16. In order to give the Committee more information in addition to TC/34/8 the Chairman will prepare a document in cooperation with the expert from Germany before the end of January 1999 clarifying the background and proposing possible procedures for testing (see document TC/35/7).

(See document TWO/31/19 Prov., paragraphs 51 to 55).

#### Judgement of Phytoplasma or Endophyte

17. The TWA, TWF and TWO noted that the Committee had discussed the effect of phytoplasma in varieties of *Euphorbia*. After having heard explanations on the details as reproduced in document TC/34/7, the Committee agreed quite rapidly that the inclusion of phytoplasma in a cell was an infection of the plant material which could be removed and, therefore, should not be considered part of the cell DNA. A candidate variety that differed from another variety only in the cause of introduction of the phytoplasma was therefore not considered a new variety and would therefore not qualify for separate plant variety protection. The Committee also noted that there might be many different varieties already given plant variety protection whose differences might be caused only by that phytoplasma. However, as long as that fact was not known, there were no consequences. Should it become clear the phytoplasma was the only difference, the protection of the variety would have to be withdrawn.

18. The expert from Germany in the TWO reported that, on the basis of the position of the Committee, they had requested information from their legal adviser. They could not find any legal justification not to grant protection although the difference was only caused by an

endophyte. Therefore, in the meantime, three varieties of that type had received plant variety protection in Germany.

19. In the ensuing discussions the experts in the TWO were split. Some followed the German interpretation, some the interpretation of the Committee, others were undecided. As arguments for or against the different positions, the following were mentioned:

20. The comparison with virus infection was wrong. A virus would weaken the plant. It would use the protein of the cell and control the protein synthesis and in many cases would finally destroy the plant. There was often not only one single pattern but several patterns. It would not cause uniform changes but plants would have different degrees of virus infection. The endophyte would produce hormones that finally would produce branches and create one single and uniform expression in all plants.

21. The endophyte was more comparable to a gene introduced into the cell by genetic engineering, although it was not in the nucleus but in the plasma.

22. After crossing, the endophyte would be found back in the seed. It was thus behaving as other genetic material of the cell and would be inherited by the off-spring. Only heat or chemical treatment of the seed might remove it. The endophyte might be compared to chimera varieties. In both cases the variety consisted of two genotypes, in the case of chimera of two different cells, in case of an endophyte of one genotype in the cell of another.

23. The criterion of easy removal was not correct. An endophyte could not be removed as easily as a virus. In the end also a gene introduced by genetic engineering could be removed from the cell. Also chimera could be separated easily in a cell culture.

24. In some countries endophytes had received protection separately from the variety (of ryegrass). In a chemical test the activity of the endophyte could be measured. In ryegrass it had little effect on the biochemical distance and ryegrass varieties with different endophytes had been protected.

25. The TWO agreed that all depended on the definition of variety. In the UPOV Convention a variety was defined in such a way that it could have one or several genotypes. Most experts in the drafting procedure of the text of the Convention might have had in mind cross-fertilized varieties, but others might have thought also of chimera. Therefore, at present, endophytes might also be a further example.

26. In order to supply the Committee with more information for its next session, the Chairman of the TWO will prepare together with the experts from Germany, Australia and from the Community Plant Variety Office (CPVO) a document which will compile more information and arguments (see document TC/35/6).

(See documents TWA/27/27, paragraph 13, TWF/29/14 Prov., paragraph 22, and TWO/31/19 Prov., paragraphs 34 to 43).

### Special Cases in New Species

27. The TWO noted that the Committee had taken note of the problems of finding varieties of common knowledge and of judging whether clonal material might no longer be new and of how much selection was necessary to enable plant material selected in the wild to be protected. While according to the 1978 Act of the UPOV Convention a variety could be protected even if it was a discovery, the 1991 Act, in the definition of the breeder, required that the variety be not only discovered but also developed. Several experts in the Committee had agreed that this question also included politically sensitive matter. The Committee therefore had to carefully study the technical and legal problems involved. All experts agreed that it was not possible to seek protection for material merely obtained from a gene bank unless a certain amount of selection work had been done. The intensity of this selection work would have to be judged differently depending on the species concerned.

28. The TWO also discussed the case of material selected in the wild and then vegetatively propagated. The variety was in most cases identical to the material collected. Should that be considered sufficient to grant variety protection? The experts considered two aspects: Was there sufficient selection work done and was the variety still new? Some experts took the position that there was no difference between the breeder making the selection directly in the wild and collecting several plants or doing the selection on his premises. With respect to the novelty it depended on the total variation in the species. If it could be assumed that the plant material selected was expected to have occurred only in that place and nowhere else it may still be considered new. If it could be expected to have occurred in several places, it may have been available to others and already been selected and marketed and was therefore no longer new. Material for vegetative propagation selected in a market would in all cases be no longer new even if sold only under the species name.

29. The TWO could not reach any conclusion. It agreed that that question was at present a very sensitive one. In the session there was also no fully supported opinion on what was considered to be sufficient breeding. Some experts also considered that a description of a species and its variation would be sufficient knowledge to block all varieties of the described range and a difference for a new variety had to be seen in an as yet undescribed range before protection could be granted.

(See document TWO/31/19 Prov., paragraphs 56 to 58).

### Status of the UPOV Test Guidelines

30. The TWA, TWF, TWO and TWV noted that the Committee had discussed the status of the UPOV Test Guidelines. It noted that the only binding obligations on UPOV member States were those contained in the text of the Convention itself. UPOV could moreover only make recommendations on that text or prepare guidelines for the interpretation of the legal obligations. The UPOV Test Guidelines were intended to give guidance for the interpretation of Articles 7, 8 and 9 of the 1991 Act of the Convention. Their purpose was to ensure that the Articles in question were applied in as harmonized a form as possible and that decisions were taken in a similar way leading to the same or similar results. How far the Guidelines were reflected in national practice or national law depended on the individual situation in each member State. In practice, the UPOV Test Guidelines were taken over in many member

States entirely without change (no deletion of characteristics, no addition). In other member States, all characteristics with an asterisk and a selection of those without an asterisk were taken over. As they were not exhaustive, further characteristics were added in yet others. In principle the UPOV Test Guidelines were broadly accepted and guaranteed on account of the broad participation in their preparation and continuous updating, which also proved their quality. The use of the UPOV Test Guidelines was independent of whether a given State had a system of official tests done by government testing authorities or a breeder testing system. Applicants and breeders also used them.

(See documents TWA/27/27, paragraphs 9 and 10, TWF/29/14 Prov., paragraphs 14 to 19, TWO/31/19 Prov., paragraphs 19 to 31, and TWV/32/9 Prov., paragraphs 20).

### Extended Testing at the Initiative of the Testing Office, Long or Short Table of Characteristics

31. The TWA, TWF, TWO and TWV noted that the Committee had difficulty in accepting that it would be left to the testing expert to decide whether further tests should be made without a special request from the applicant where the usual characteristics were not sufficient to establish distinctness. After a detailed discussion, the Chairman of the Committee had finally concluded by proposing that the Test Guidelines should be very well prepared so that the need to include new characteristics in the list might be avoided. That list of characteristics should then be kept for several years. If there were an obvious omission or a need to include further characteristics, the other offices should be informed of the inclusion, and it should be discussed in the Technical Working Party concerned. One should avoid searching for a difference for its own sake because, if one really looked for a difference, a small one would eventually be found. The whole question should be discussed further with breeders and other crop experts in the various Technical Working Parties. It was important to keep the spirit and the quality of the Test Guidelines in mind as, without that spirit and that quality, there was reason to wonder where unlimited deviation from the Test Guidelines would eventually lead.

32. Extended Testing on the Initiative of the Testing Office. Most experts agreed on the recommendation character of the UPOV Test Guidelines, saw, however, a conflict with the rejection, by the Committee, of extended testing at the initiative of national authorities. They required freedom to use additional characteristics at any time considered necessary. If a testing expert finds new, clearly distinct expressions in characteristics not included in the Table of Characteristics of the Test Guidelines, the testing expert cannot ignore those characteristics. However, three different types of additional characteristic were considered (i) characteristics existing before but so far not used (e.g. color of style), which would as a result reduce the scope of the already existing variety if protected and thus would not be recommended; (ii) characteristics not existing before which were detected or bred for the first time and whose use was considered completely justified; (iii) new characteristics from new methods (e.g. electrophoresis) the use of which should first be agreed upon by UPOV. National Offices should carefully study the effect of such addition on the already existing varieties with respect to the diminishing of the scope of protection of those varieties. They should also contact experts from their Technical Working Party from other member States who would test varieties of the same species to inform them of their intention and try to reach a consensus in order to keep harmonization in the testing between member States. If necessary, they might also discuss the matter with breeders. At a later stage such characteristics should be proposed for inclusion in the UPOV Test Guidelines. Several

experts considered it difficult to discuss the problem globally without clear and concrete cases. Others considered it difficult to mention a clear case as that would mean accusing a given country. The breeder present in the TWA session warned that the uniformity of existing varieties should be kept in mind while adding other characteristics and that an additional burden should not be placed retroactively on existing varieties.

33. Criteria and principles decided for the selection of characteristics for inclusion in the Test Guidelines. Several experts felt the need to repeat and note down the criteria and principles decided for the selection of characteristics for the inclusion in the Test Guidelines. Other considered that, with the wider opening of UPOV and with new developments, the time had come to reconsider the structure and the contents of the UPOV Test Guidelines. It was rather difficult to prepare Test Guidelines in the present way for world-wide application.

34. Long or Short Table of Characteristics. The TWA wondered whether it was still possible to agree on a longer list of characteristics to be useful world-wide. Many characteristics on a very long list might no longer contribute to distinction but only complicate the Test Guidelines. A shorter list used by all might be more applicable which then would be supplemented by further characteristics chosen according to agreed standardized principles. Others considered setting up an information system of all characteristics used for a given species, by the different member States, e.g. on Internet with a free exchange on a bulletin board or other means of exchange within UPOV to be better than a very long list of characteristics in the UPOV Test Guidelines. Others considered a long list covering all characteristics useful as it would facilitate the selection of characteristics appropriate in a given country.

35. The TWF and TWO also discussed the question whether, when establishing Test Guidelines, it would not be better to aim right from the beginning for a larger number of characteristics to be included in the Test Guidelines without an asterisk, with a reinforcement of the use of the asterisk for those characteristics which should be used by all member States. From the larger number of non-asterisk characteristics, each State could then select those characteristics considered necessary. The majority of the experts considered it easier to select characteristics from a larger list of agreed characteristics for its national use than to add additional characteristics to a rather short list of UPOV Test Guidelines characteristics. They therefore recommended not to delete or refuse inclusion in new Test Guidelines of any characteristic which might not be needed in one region of the world but might be useful in another. This was mainly addressed to those countries or regional groupings which had decided to use all characteristics in the UPOV Test Guidelines, also all non-asterisk characteristics and thus aimed at keeping the total number of non-asterisk characteristics as low as possible. If everybody added new characteristics to a short list, different countries might add the same characteristics with slightly different wording and, even worse, with different states of expression. The TWF therefore agreed to discontinue the practice of recent years of eliminating a large number of characteristics at the time of revision of Test Guidelines, mainly because some States had simply adopted the practice of using all characteristics of the UPOV Test Guidelines for testing irrespective of whether they carried an asterisk or not. That practice resulted in unnecessary costs with a large list of characteristics and the desire to reduce the non-asterisk characteristics. Costs should not be a criteria for the inclusion of non-asterisk characteristics in the UPOV Test Guidelines but only the normal technical criteria such as usefulness for DUS testing, reliability and repeatability. Costs might only be a criterion for the inclusion of characteristics in national test guidelines. There might

be also characteristics which were very important and useful in one region of the world but useless or impossible to be used in another, partly because of climatic conditions. Such characteristics should not be excluded from the UPOV Test Guidelines.

36. The experts finally agreed that more exchange of information was necessary among the experts and that the use of additional characteristics should be communicated to the other experts testing varieties of the same species in other countries. In order to find out how far the number of characteristics actually used in each member State differed from the adopted UPOV Test Guidelines, how many and which of the characteristics from the non-asterisk characteristics had been selected and which additional characteristics had been used, the TWO agreed to select the species rose and carnation and to ask all member States to submit to the Office of UPOV their list of characteristics actually used for the testing, including characteristics needed only once or twice in special cases. The TWA agreed to continue discussions on this subject during its next session on the basis of a document raising all these points and proposing guidance on how to prepare future Test Guidelines to be prepared by experts from Germany.

37. The Role of Test Guidelines is to Ensure Harmonized Descriptions. The TWO insisted on the fact that the main aim of the Test Guidelines was to ensure a harmonized description. They were helpful for the establishing of distinctness, but they were only one step in that direction and alone would never be enough to establish distinctness. In this respect they were especially concerned that some States used the Test Guidelines directly for the establishing of distinctness in applying the rule that a difference of one state of expression in a qualitative characteristic was sufficient for distinctness and a difference of two states in the case of quantitative characteristics. This was considered by the TWO as completely unacceptable. With very few exceptions, such as ploidy and a few other characteristics, the majority of the characteristics (about 95% of all characteristics or more) were no truly qualitative characteristics but only quantitative characteristics expressed in a qualitative way. Even color or shape characteristics were mostly quantitative characteristics although they often gave the impression of true qualitative characteristics. The application of the rule of one state difference in the description for distinctness was therefore a very dangerous rule. The rule of using the variety description based on the Test Guidelines especially for quantitative characteristics and applying a rule of two states of expression difference for distinctness throughout the characteristics and throughout the species was also unacceptable. The Notes in the Test Guidelines were only given in order to harmonize variety descriptions; they said nothing on distinctness.

(See documents TWA/27/27, paragraphs 9,10, 22 to 25, TWF/29/14 Prov., paragraphs 14 to 19, TWO/31/19 Prov., paragraphs 19 to 31, and TWV/32/9 Prov., paragraphs 20, 36 and 37).

#### Fixing a Difference Below the Level of Significance and Application of Supporting Evidence

38. The TWC noted that the TWA had come to the conclusion that electrophoretic characteristics should not be sufficient to establish distinctness. They should only have a supporting function and only be used in addition to another difference in a morphological characteristic. The question of how large that difference and that different requirement had to be was left open, however. Some experts in the Subgroup were of the opinion that it might be possible to consider using electrophoretic characteristics in combination with other

characteristics, and requiring clear differences in at least two or more characteristics. Others imagined them being used in the case of differences in morphological characteristics below the significance level. Some experts, however, wondered how to determine the difference in a morphological characteristic below its significance level. Another possibility could be a difference in a characteristic not used so far, like yield, but that raised the question of distance and the means of checking uniformity or stability of yield. In general, it should only be used if the crop expert was convinced that the candidate variety was a different variety, in which case the characteristic would only support what had been observed in other traditional characteristics, but at a level that alone might not have been sufficient to establish distinctness.

39. The TWC considered that first the question of the appropriate method and sample size would have to be solved before the question of a difference, which was supported by evidence through electrophoresis, could be handled. In addition, that question was not a statistical but a political one. It was, for example, not possible to combine statistical evidence from COY results below the required level with evidence from electrophoresis characteristics. For a statistical comparison the weight of each characteristic had to be known as well as whether they were independent or correlated.

(See document TWC/16/14, paragraphs 15 and 16).

#### Prescreening of Varieties

40. The TWA, TWF, TWO and TWV noted that the Committee had rediscussed the question of prescreening and noted the different views of the various Working Parties. In order to make progress in the discussions, the Committee agreed that some concrete cases would have to be selected and the whole problem further investigated on the basis of them. It proposed to ask all Technical Working Parties to rediscuss the question of prescreening and to cite examples that would support their positions. For the TWA, the species *Poa* and potato were mentioned as possible examples and, for the TWO, roses. For roses there was already a good deal of additional information that would be helpful. In addition, it would underline the importance of ornamental varieties and the international trade in them. For the TWF, the species peach was mentioned. The Committee also agreed that, in addition to developing models for the prescreening of varieties, it was very important to have an intensive exchange of information between the testing stations and the offices of member States. Only if they knew what varieties were protected or tested in other member States would they be able to check a complete collection of varieties to find all similar varieties which should be compared with a candidate variety.

41. The TWA heard a report on prescreening in *Poa pratensis* and *Solanum tuberosum*. In the discussions the experts repeated all the arguments in favor and against the use of characteristics not included in the UPOV Test Guidelines and the need to reach a balance of the different risks involved. Some experts repeated that it was too risky to accept a difference in the electrophoresis band without having checked the uniformity as the difference could be caused by an off-type only and one would in this case wrongly not plant the variety in question for comparison in the field. It was also necessary to fix the minimum difference and to do that it was important to know the genetic control of the bands used. There had to be a possibility of limiting the risk of taking a wrong decision. In the past, a regional reference



collection had not involved a big risk but nowadays, especially in the ornamental species, a world reference collection was needed which required some screening to keep the number of varieties planted reasonable.

42. The TWA accepted the idea of prescreening and agreed that UPOV had to search for a good system to select all similar varieties to be grown. Several experts in the TWA proposed selecting characteristics less affected by the environment, for example, the characteristics resulting from protein electrophoresis. Others insisted that the electrophoresis method was not robust enough to be used alone. Therefore it should only be applied together with other characteristics. Some experts were of the opinion that even for electrophoresis all information should be collected in the same testing station or trial field in order to be applicable. Some experts in the TWA considered that, in addition to traditional (morphological) characteristics for prescreening, other methods could be also envisaged as for example image analysis or even DNA methods. In the prescreening, a larger difference had to be required to avoid eliminating a very similar variety. The comparison was therefore different from that of testing DUS where a small difference might be enough. It was necessary to clearly define the whole screening process and lay down the rules in the description of the testing for the species concerned, e.g. in the Test Guidelines or in an annex to them. However, before being able to do so, it was necessary in looking at particular cases to establish certain basic principles for prescreening irrespective of which methods were used. Only thereafter should it be decided where the rules were to be reproduced in the Test Guidelines. In order to make progress during its next session, the TWA asked the expert from the Netherlands to prepare a draft for a protocol for the prescreening of *Poa pratensis* varieties and the experts from France for maize varieties.

43. In connection with the discussions on prescreening, the TWA noted that prescreening was mainly a question for the system of government growing tests and to a lesser extent for the system of testing by the applicant or breeder where the possibility of six months' opposition after publication of the description before the final granting would allow correction by third parties of oversights during the testing. For the description, breeders were recommended to use as many characteristics as possible as that would increase their possibility of defining their rights. In the event of opposition, it might be possible that additional tests were required, if need be, with additional varieties.

44. The TWO stated that it was worried about the intentions behind the whole question of prescreening. It was not at all convinced that it would lead to useful results. Why should characteristics other than the grouping characteristics or at least characteristics included in the Test Guidelines be used at all for prescreening? The characteristics of the Test Guidelines would be sufficient for prescreening and thus there was no need to search for other characteristics. In addition, for many ornamental species with vegetatively propagated varieties, the variety collection had to be grown anyhow and therefore little saving could be expected and the interest in prescreening was reduced. For other species, more studies would be necessary. However, also for prescreening, new characteristics from electrophoresis or DNA profiling should not be used unless there was a strong correlation with existing morphological or at least phenotypical characteristics. For ornamental varieties, a picture of the most typical organs of the variety, next to the grouping characteristics, would be the most useful tool.

45. The TWC noted document TWC/16/13 on most similar variety: comparisons based on morphology, pedigree and molecular methods, prepared by experts from the United Kingdom. The document studies the construction of similar variety sets based on morphological data and molecular methods. Data sets from maize have been studied in detail together with pedigree information where available. The DNA analysis methods have shown a measure of internal agreement when compared to the variety selected as the most similar by morphology. However, it should also be noted that for certain target varieties very consistent *but different* conclusions can be drawn. Overall, the DNA methods appear to give better correlations between each other when identifying a most similar variety, and also correlate better with pedigree data, than does morphology.

46. The TWC noted a report on a study on the use of AFLP markers for DUS testing in perennial ryegrass made by experts from Belgium, France, the Netherlands and the United Kingdom and presented by the expert from France. In that study the usefulness of AFLP markers for DUS testing in perennial diploid ryegrass (*Lolium perenne* L.) was investigated from a set of 11 cultivars assayed for DNA polymorphism using two primer combinations. The results suggested that AFLP markers were discriminant enough to distinguish between the closest cultivars although a large redundancy was observed.

47. The BMT noted several reports on the use of DNA profiling for prescreening as a possible tool in DUS testing. The results showed that the molecular distance was poorly correlated with the morphological distance, while similarity by pedigree showed higher consistency with that by molecular distance than that by morphological distance. Several testing experts insisted that the results meant that the molecular distance was no useful tool for prescreening, since the aim of prescreening was to identify the varieties which were similar in morphological characteristics. Moreover, some experts questioned the basic idea that morphological distance could be substituted by molecular distance in absence of any systematic linkage between these distances. However, some molecular scientist explained that the result totally depended on the species and the choice of the markers. The results with azalea showed high correlation between molecular distance and morphological distance. The choice of markers relating to morphological characteristics may make effective pre-screening by molecular distance possible.

48. The BMT agreed that the size of the reference collection was getting larger and larger, testing authorities needed more efficient methods, such as molecular techniques, in order to search for reference varieties effectively and to minimize the number of the reference varieties grown in tests for DUS. The BMT stressed that tools for prescreening needed to be reliable as the discarded varieties would never be compared with the candidate variety. The experts therefore suggested that, if molecular methods were not absolutely reliable, the results of the molecular techniques could not be used alone, but only together with morphological characteristics.

49. The BMT concluded that further studies were needed and that discussion had to continue on the choice of molecular markers linked to morphological characteristics and on the use of molecular markers combined with morphological characteristics for prescreening. As the BMT had asked for the specification of one or two species on which research could be concentrated in future, the TWF selected peach and citrus for that purpose. The expert from France will prepare a document on peach for that purpose by the end of this year, and the expert from Australia will prepare a document on citrus. The TWO stated that roses might be

a suitable species for such studies. Several experts recalled the position of the Technical Working Parties, which should not be lost of site, that only those DNA markers could be used for DUS testing which showed a strong correlation to morphological expressions.

(See documents BMT/5/17 Prov., paragraphs 62 to 66, TWA/27/27, paragraphs 33 to 40, TWF/29/14 Prov., paragraphs 11 to 13, 31 and 37, TWO/31/19 Prov., paragraphs 15 to 18, and TWV32/9 Prov., paragraph 19).

#### Use of Electrophoresis in Cross-fertilized Varieties

50. The TWA noted document TWA/27/11 reporting on the meeting of the TWA Subgroup on Electrophoresis held in Geneva on April 3, 1998. In that meeting ASSINSEL had reported that it could not accept electrophoretic characteristics in parallel with traditional phenotypic analysis as a last resort. It had agreed that electrophoretic characteristics were very useful, but not for the study of distinctness of synthetic forage varieties. The experts had then discussed criteria for the acceptance of distinguishing characteristics, which should be the same as for any other characteristic. The experts had referred to the creation of a special category of characteristic in the annex to the Test Guidelines for Wheat, Barley and Maize, since the majority of the UPOV member States was of the view that it was not possible to establish distinctness solely on the basis of a difference found in a characteristic derived by using electrophoresis. The experts had discussed the additional problem of dealing with frequencies for distinctness where there could not exist uniformity but only stability in those frequencies. The advantages of additional characteristics had been discussed and the disadvantages of reducing the minimum distance and opening wide the door to plagiarism. The remaining problems with the methods were mentioned, their sensitivity leading to different results when slight changes occur. The problems of interpretation of the results were highlighted and the statistical questions of an optimal sample size which may be prohibitively high.

51. The Subgroup of the TWA had finally stated that too many questions still remained open. It had also noted that the introduction of electrophoretic characteristics raised many additional questions which still had to be solved. Therefore, other Technical Working Parties should also study the use of electrophoresis in cross-fertilized varieties. Particularly the Technical Working Party for Vegetables (TWV) and Technical Working Party for Ornamental Plants and Forest Trees (TWO) (for seed propagated varieties) should give their opinions and the Technical Working Party on Automation and Computer Programs (TWC) should answer the questions on sample size, the optimum method for the establishing of distinctness and whether and how greater minimum distances could be prefixed to discourage plagiarism. Moreover, the effect of its possible use in the certification and national listing system should be considered, and also whether VCU results could be used in combination with electrophoretic characteristics to establish distinctness. However, no system would be acceptable which would not enable the checking of uniformity and stability in the characteristics finally used to establish distinctness. The main conclusion was that electrophoretic characteristics should not have an independent function for cross-fertilized varieties in DUS testing; a difference in an electrophoretic characteristic alone should not be sufficient to establish distinctness. It should only have a supportive function if the crop expert was convinced by other morphological or physiological characteristics that the variety was different. The Subgroup had reminded experts that, in all studies, it should be kept in mind that the advantage achieved from the method should be weighed against the effect it might

have on the varieties, on the breeder and on the whole plant variety rights (PVR) system. If it would create more problems than it solved, it should not be accepted and discussions should not be pursued further.

52. The TWA agreed that document TWA/27/11 summarized well the present state of development and thinking. It only required to change a few parts which may lead to wrong conclusions, mainly paragraphs 12, 17 and 21. Paragraph 12 referred to a problem variety and should not be understood as describing the situation in general. The variation within varieties reported in paragraph 17 was mentioned by breeders but could not be confirmed by other experts. Normally varieties showed lower variation within varieties than between varieties. The problems of interpretation were not shared by all experts and reference was made to a successful ring test several years ago. Other experts insisted, however, that, in addition to a good genetic knowledge of the bands, the most important factor was a very clear definition of the method and its strict application, as small things such as change of temperature or replacement of a reagent could completely change the results.

53. ASSINSEL reported in the TWA that it had discussed the possible use of characteristics derived by electrophoresis for DUS testing during its last Congress and had highlighted the following three points:

(a) The burden for the breeder of maintaining the allele frequencies of his variety uniform and stable;

(b) The facilitation of plagiarism and the weakening of the plant variety rights (PVR) system, as it was very easy to select a "new variety" out of an existing one.

(c) At its Congress, ASSINSEL had not only requested the exclusion of such characteristics from the UPOV Test Guidelines or their Annexes, but had also firmly requested UPOV not to accept them for DUS and to officially exclude them from DUS tests in ryegrass. The position had not been addressed for other cross-fertilized species.

54. Some experts in the TWA questioned why UPOV agreed on precise statistical methods and recommendations, going into very small details, to reach harmonized results between member States if the harmonized results were then jeopardized by using other evidence obtained from electrophoresis or other methods. Before using electrophoresis as additional evidence, a certain minimum distance in the normal characteristics should be fixed as to support an expert's conviction. How could stability of the electrophoretic differences be checked? Some other experts explained that the additional evidence could not only be used to support an expert's conviction of the existence of a distinct variety but also confirm the rejection of a variety for lack of distinctness. "Evidence" in this context was not a clear difference in one characteristic but the total difference between varieties, the sum of all differences. If that was not sufficient even though the expert was convinced that here were two varieties, additional evidence could be used to support his conviction.

55. The recommendation to use electrophoretic characteristics only in a supporting function if the crop expert was convinced that the candidate variety was a different variety, raised the question in the TWA why it was needed at all if the expert was already convinced of the minimum level needed for him to use those characteristics. Was there a second lower level of minimum distance which could be sufficient if supported by electrophoretic evidence? In the

case of statistical calculations requiring 1% significance, was 5% enough if supported by other evidence?

56. The expert from France in the TWA explained that in all member States there were small differences; she could therefore only speak for France. In France, the technical expert who had done the test would not take a decision alone; he had to convince a group of other experts of the distinctness of the variety. In this process not only results of tests on the basis of UPOV Test Guidelines were taken into account. They formed the basis, but if exceptionally they were not enough, the Committee could request further evidence.

57. The TWA finally agreed that more information was necessary, especially on the granting procedure and procedure before the courts in case of objections, on the position of the technical expert in the whole process, on the part the Test Guidelines play and the part of other evidence and other methods. The expert from the Netherlands offered to prepare a paper for the next session. The TWA saw the need for several further questions to be explored in further papers. The expert from France offered to find out the place of electrophoresis in the testing, the legal aspects and the interpretation of the results.

58. The TWV supported the conclusion of the TWA and its Subgroup. Some experts stated that the need for electrophoresis in vegetables has not yet arisen. Breeders have not pressed the plant variety protection offices to introduce electrophoresis.

(See documents TWA/27/27, paragraphs 41 to 52, and TWV/32/9 Prov., paragraphs 40 to 42).

#### New Alleles in Cereals

59. The TWA noted document TWA/27/23 introduced by the expert from the United Kingdom and document TWA/27/19 introduced by the expert from Germany. Both documents dealt with the problem of new alleles in barley which could only be identified by one of the two methods mentioned in the Draft Test Guidelines for Barley. In that document (TG/19/10), UPOV had agreed to recommend polyacrylamid gel electrophoresis in the presence of sodium dodecyl sulfate (SDS PAGE) for the analysis of hordeins. At the same time it had agreed, however, that if only C-(Hor-1) and B-(Hor-2) hordeins were of interest, then the standard reference acid PAGE method of ISTA could be used. Several new allele expressions had been proposed for B- and C-hordeins which could only be detected with the SDS PAGE method. The question was whether under those circumstances UPOV had to decide on the use of one single method only, the SDS PAGE method, to avoid being blocked or hampered by a second method which apparently was less able to detect allele expressions, or whether UPOV should only accept those allele expressions which both methods were able to detect.

60. In the discussion in the TWA, several laboratory experts considered it a good safeguard to be able to check a newly found allele expression with a second method to avoid accepting artifacts. On the other hand the mandatory combination of the two methods would almost freeze the *status quo* and hamper development as each method would distinguish alleles which the other method could not distinguish and which would accordingly be precluded from use. The two methods would also not find exactly the same polymorphism and it could be argued by some experts that they were really observing two different characteristics which

were rather closely linked but different. One expert compared them to the characteristics of growth habit of a variety observed in single-spaced plants and in drilled rows. Both were the growth habit of the same variety but the expressions were different. Both might be able to be used for distinction. Therefore it might be considered to really have five characteristics (Hor-1 SDS PAGE; Hor-1 Acid PAGE; Hor-2 SDS PAGE; Hor-2 Acid PAGE and Hor-3 SDS PAGE).

61. Several experts in the TWA warned, however, that such an approach would lower the minimum distance. One would also lose the possibility of confirming the existence of an allele by another method. The biggest problem would be that the use of a second method would create new characteristics which were almost identical with existing characteristics. The TWA therefore finally decided to keep document TG/19/10 unchanged, to study the whole problem and the consequences of any proposed solution further, to gain further knowledge and at present to accept for B-hordein and C-hordein only those new allele expressions which could be identified by both methods mentioned in the above documents.

(See document TWA/27/27, paragraphs 53 to 56).

#### Distinctness and Uniformity Testing in Oil Seed Rape

62. The experts in the TWA noted document TWA/27/15. The document discussed how male sterile lines should be tested and whether it was possible to distinguish different versions of a line. It explained the different ways of creating lines using cytoplasmic (CMS) or nuclear (PgS) sterility. The TWA also noted document TWA/27/10 on distinctness testing in oil seed rape with different male sterility systems, introduced by experts from Germany. The document lists the different male sterility systems (CMS Polima, CMS Ogura, MSL (Male Sterility NPZ-Lembke), Seedlink™ (PGS-System)) and the obvious genetic differences between them. It states that distinctness based on test cross with known restorers was not recommended as it (and also the granted protection) would be dependent on the existence of another variety, the pollinator with specific restoration ability. The TWA noted that in the testing of CMS varieties it was necessary to require the submission of the maintainer line (B) and to request that A was distinct, uniform and stable and that B was very similar to A and uniform and stable so as to enable reproduction. B would not automatically be protected but only on special application by the applicant/breeder. In the case of nuclear sterility 50% male sterile plants and 50% male fertile plants exists, the male fertile being destroyed by a herbicide to which only the fertile plants are susceptible. The question arose what parts should be protectable, either : (i) A pure, (ii) the mixture or (iii) B pure. The protection of A pure would create technical problems as after destruction of the fertile plants one would not have an even plant density. This would create an undesirable lack of uniformity in the plot. The question was whether one could protect the mixture with two components or only the components alone. The testing of the mixture with two genotypes could be possible but did not seem advisable as an assessment of uniformity and distinctness was difficult. To test the mixture one would have to test the components in the same way as in maize.

63. The TWA therefore considered that what therefore remained was to protect pure B (the original parent made partly sterile). This could be the wisest solution as one would work with pure material, which would not be a GMO variety in the case of PGS system. The breeder present reported that in reply to a questionnaire circulated within ASSINSEL breeders had

stated that they wanted protection of the mixture. ASSINSEL had started further discussion on that subject and had created a subgroup. Several experts stated that it was not possible to protect something which could not really be tested. One could not force the breeder to ask for protection of B only, but could refuse protection of the mixture. Others mentioned that the B line was not maintained alone, but only in a mixture. Some countries had therefore considered whether they could protect the mixture. As applications were already pending in the first and second year of test, a common understanding in UPOV was desirable to avoid States from going different ways.

64. With respect to the question whether different types of male sterile (m.s.) lines could be protected, the TWA noted that in oil seed rape so far in addition to the differences in the m.s. mechanism, differences in other characteristics had so far been found, especially in the size of petals. They could therefore be distinguished just like any other line or variety without having recourse to the m.s. mechanism. The breeder present reported that in ASSINSEL about half of the breeders had expressed themselves in favor and half against the use of restorer lines to establish distinctness. ASSINSEL would continue its discussions and also discussing the use of molecular markers in this context. Some experts in the TWA stated that if the use of restorer lines was accepted for distinctness, one would have to grow and group the varieties in the field according to their different systems of production. Others, however, considered that UPOV had so far restricted its tests to phenotypical expressions. If restorer lines were used for distinctness, this would no longer be the case.

65. When evaluating the hybrid against the rules laid down in document TG/1/2, the TWA had to agree that in a three-way hybrid segregation was permitted, provided the restorer was sufficiently stable and always the same segregation was obtained. For single crosses, however, segregation was not permitted. Therefore the single cross would not meet the uniformity standards. For this reason, some experts proposed to only protect A and RR and rr. It would, however, be difficult to refuse protection for the single cross hybrid, but approve it for national listing. Some experts therefore wondered whether the hybrid really was a single cross and not an  $F_2$ , a narrowed population, however, not in equilibrium. The UPOV Convention required the uniformity to be judged according to the method of propagation. The question was posed whether that case justified a deviation from TG/1/2 with a different interpretation of the Convention, as the hybrid was stable. The reason why the breeder would not make his restorer line completely uniform was that uniformity increased the glucosinolate content of the hybrid. Several experts warned that such precedents might open the door to other unwanted exceptions.

66. The TWA agreed that if there were no morphological (or other phenotypical) differences between lines with differing male sterility mechanisms, the lines should not be separately protected. The differing methods might, however, be patentable. The whole question needed further study. The most important aspect was to keep each other informed of developments and of decisions taken. Before a common decision could be reached it would be wise to collect as much information as possible and avoid taking a decision too early. It should always be kept in mind that in a court case the technical expert would be called upon to justify his technical approach to applying the basic legal rules.

(See document TWA/27/27, paragraphs 62 to 76).

Naming of Alleles in the Test Guidelines for Soya Bean

67. The expert from Germany in the TWA proposed to change the naming of the band to numbers in the electrophoretic characteristics for Soya Bean and to consider what to do with the present naming (e.g. characteristics 25 and 27 where the expression would have the same name as the locus) if new alleles appeared in future for those characteristics. Moreover, there would be no possibility of adding new alleles and the states would not take into account the distance of migration. The TWA agreed not to change the names of the bands, as the nomenclature used was that approved by the Soybean Genetic Committee apart from the addition of the small letter "a". Because several points could be not clarified and solved to the complete satisfaction of all experts but in order not to delay the otherwise already adopted document, the TWA agreed to insert a footnote on the first page of the Annex stating that the Annex had only been preliminarily accepted and might be amended when more information became available.

(See document TWA/27/27, paragraphs 78 to 81).

Question, in the Technical Questionnaire, on the Status of the Variety under the Legislation on the Protection of the Environment and on Human and Animal Health

68. All Technical Working Parties noted that the Committee confirmed, as already mentioned in the report on the last session of the Committee, that all Test Guidelines would in future contain a question in the Technical Questionnaire requiring information on the status of the variety under the legislation on the protection of the environment and on human and animal health. Some experts in the TWV asked questions on the heading "Breeding method" in the Technical Questionnaire. Following the request of the TWV, the expert from the Community Plant Variety Office explained the heading of the corresponding question in the Technical Questionnaire of the CPVO. Based on the Technical Questionnaire of the CPVO, the TWV decided to replace the heading by "Authorization for release" and to place the question as an independent section after "4. Information on origin, maintenance and reproduction of the variety." The TWV decided to consult the Committee and to send the proposal of the TWV to the chairmen of the other Technical Working Parties. The TWO noted that the Committee reconfirmed, as already mentioned in the report on the last session of the Committee, that all Test Guidelines would in future contain a question in the Technical Questionnaire requiring the information referring to the status of the variety under the legislation on the protection of the environment and on human and animal health. It noted that the Technical Working Party for Fruit Crops (TWF) and Technical Working Party for Vegetables (TWV) had agreed to recommend a separation of the request for information on release from that on the origin. It agreed that the information be separated, but did not decide on how, in the same way as the TWF (see also paragraph 61, last subparagraph).

(See documents TWF/29/14 Prov., paragraph 21, TWO/31/19 Prov., paragraph 33, and TWV/32/9 Prov., paragraphs 22 to 23).



Duration of Testing, Replacement of Second Year by Second Location

69. The expert from Spain asked the TWV whether tests in two different locations/environments in the same growing season can satisfy the minimum requirement for testing distinctness and uniformity. The expert from the UPOV Office answered that the phrase "The minimum duration of tests should normally be two similar growing periods," meant that the tests should be conducted in the corresponding growing periods of two different years. The expert from the Netherlands insisted that the words "two similar growing periods" could be interpreted as two tests in different locations/environments in the same growing period or as one test in the spring and another in the fall. He also emphasized that, because the objective of repeating DUS tests was to check whether distinctness was influenced by the environment, two tests in different years at one place could be substituted by tests in the same year in different environments and planting times. The Chairman also emphasized that two tests in different environment in the same growing season should be allowed for certain species, especially for species which can be grown under controlled conditions. The testing expert should have discretion to choose to conduct the tests in two different environments of one growing season.

70. The expert from the UPOV Office questioned the interpretation proposed. An expert from Poland made a comment from the viewpoint of a statistician that year interaction and environmental interaction should be treated differently in statistical analysis, such as COYU.

71. The expert from Spain in the TWV suggested that if the tests in two different environments of one growing period were permitted, it should be clearly shown in the Test Guidelines. Another expert from the UPOV Office expressed concerns that such a change in Test Guidelines would not only give member States a certain flexibility, but would act as a recommendation to member States to conduct tests differently from the current practice. The TWV agreed to ask the Committee and the other Technical Working Parties for advice.

(See document TWV/32/9 Prov., paragraphs 46 to 48).

Bulk Samples

72. In connection with the report on the discussions in the Subgroup on Lavender, the TWO discussed the problem of bulk samples for the testing of characteristics in the content of certain oils or fragrances. In many cases, as for example for lavender, the examination was done in special institutes at rather high cost and thus only one single test on the basis of a bulk sample was made. How was it possible to assess uniformity on the basis of a single sample? Several experts reported that in most cases distinctness was not only seen in those characteristics but also in others. Should distinctness depend only on a difference in such a characteristic, of course, several samples would be necessary to ensure that both varieties were uniform in that characteristic.

(See document TWO/31/19 Prov., paragraph 85).

## II. MATTERS FOR INFORMATION

### Improvement of Document TWC/11/16 on the Testing of Uniformity of Self-fertilized and Vegetatively Propagated Species

73. The TWA, TWC, TWF, TWO and TWV noted that the Committee finally approved document TC/34/5, which would replace the former document TWC/11/16 for the testing of uniformity of self-fertilized and vegetatively propagated species, subject to a few changes and corrections. The TWA also noted the existence of an earlier document, TWC/14/4, which would provide additional explanations on the use of the former document TWC/11/16 that would themselves be applicable in the same way to document TC/34/5. The TWC considered that document TC/34/5 on uniformity for self-fertilized varieties adopted by the Committee did not at present call for further discussions, despite some criticism by one expert of the difficulties encountered by crop experts in finding the right population standard and decision rule for different sample sizes.

(See documents TWA/27/27, paragraph 7, TWC/16/14, paragraphs 11 and 49, TWF/29/14 Prov., paragraph 9, TWO/31/19 Prov., paragraph 12, and TWV/32/9 Prov., paragraph 16).

### Definition of Off-type, Admixture

74. The TWA, TWF, TWO and TWV noted that the Committee had approved the following definition of off-type:

“Any plant is to be considered an off-type if it can be clearly distinguished from the variety in the expression of any characteristic of the whole plant or of part of the plant, used in the testing of distinctness, taking into consideration the particular species.”

75. With the adoption of this definition, the Committee wanted to make it clear that the same criteria would apply to the definition of off-types as to the testing of distinctness. With respect to the definition of admixtures, the Committee followed the proposal of the TWA which tried to avoid the term admixture and therefore the need for further definition, and agreed to the following sentence:

“Plants that are very different from those of the variety could be disregarded as long as their number does not interfere with the test.”

76. In choosing the phrase “could be disregarded,” the Committee stressed that it would depend on the judgment of the crop expert whether they were disregarded or not. That would mean in practice that in horticultural crops with a low number of plants just one single plant would interfere with the test and could not be disregarded.

77. The TWO approved the definition of off-type but regretted that it was expressed in a way which would be interpreted differently, especially the part “of the whole plant or of part of the plant.” It was meant from the TWO’s point of view to state that a difference seen on an

organ on one part of the plant without being seen on all of those organs would make the plant an off-type. It could, however, also be interpreted to mean characteristics of the whole plant like "habit" compared to characteristics of part of the plant like "leaf." The TWO tried to improve the wording and discussed different new drafts but could not finally agree on a definite version and therefore asked only to inform the Committee on its discussions. The last proposal which found support from a large part of the TWO but also opposition by some members read: "Any plant is to be considered an off-type if it can be clearly distinguished from the variety in the expression of any characteristic used in the testing of distinctness, whether expressed on all organs to which its expression refers, or even only on one or several organs of that plant, taking into consideration the particular species."

#### UPOV-ROM Plant Variety Database

78. The TWA, TWC, TWF, TWO and TWV noted updated information supplied by the Office of UPOV on the UPOV-ROM Plant Variety Database. In 1997 (and in 1998), six issues of UPOV-ROM had been issued at two-month intervals. The software used by the French firm was the same as that developed for the WIPO ROMARIN CD-ROM. As new improvements in the latter's software had been made, the UPOV-ROM would also contain several improvements in the near future, the main one being the possibility of using it in networks. The UPOV-ROM already contained the 1997 OECD List of Cultivars eligible for certification and, although at present available only in pdf format (as of January 1, 1999 included in the database itself), the list of varieties protected through the European Union Community Plant Variety Office (CPVO). Discussions were also under way to include the varieties contained in the European Union Catalogue. The UPOV-ROM has also been offered to subscribers since the beginning of the year at an annual subscription price of CHF 750 plus postage. The TWC had requested that, as of the next issue of the UPOV-ROM, States should state, which had provisionally not been done for each record, whether it was a new record (1), a modified record (2) or an unchanged record (3). The expert from Denmark inquired whether the Office of UPOV could not ask JOUVE to include such a program in its control program, as for some States it would be very difficult to follow that request.

79. At the request of the Office of UPOV, the TWC discussed various details of the production disc. Several experts replied that the main use was in the end to replace the copying of information from the national gazettes. The checking of the variety denominations was the main use. Some countries needed to incorporate the data into their own national databases. For that purpose some experts would, however, need the finalization of the UPOV Code for genera and species and a more frequent (monthly) production. Without these two requirements the information could only be used as a counter check on whether data had been correctly copied from the individual gazettes. Furthermore the possibility was needed to use UPOV-ROM in the national network and more user-friendly routines to extract data. Also mentioned were the time between the supply of data and the distribution of UPOV-ROM which should also be reduced. As further subjects for consideration it was suggested to include variety descriptions and to consider offering the information on Internet.

80. The TWO discussed possibilities on how the UPOV-ROM could be improved and what information could be added. From the purely technical point of view it would be ideal if the UPOV-ROM would also contain as complete information as possible on the characteristics of the varieties, meaning the full test report. In several countries that would, however, create

legal problems and might also undermine payment for the purchase of test reports. A second possibility would be to include the full variety description. The description would not contain any secret or confidential element and would not pose any legal problems. Some States, however, provided variety descriptions only against payment of a certain fee. Some States also required a certain interest to be proven. The next lower level would be the description with the characteristics contained in the Technical Questionnaire, or at a still lower level with the characteristics used for grouping varieties. During the testing and before the Offices had their own results, the information provided by the applicant could be included with the reservation that it was information submitted by the applicant and not yet verified by the Office. Here some experts foresaw difficulties in including information not verified by the Office, while others envisaged legal difficulties as the information from the applicant had to be kept confidential. All experts agreed, however, that it would be useful to have some information already before the granting of rights to be able to know whether plant variety protection had been applied for a given variety in another State; from the breeder's reference or the variety denomination alone that was not possible. The inclusion of a picture was also considered helpful although the problems were not underestimated.

81. In order to get a clearer picture, the Office of UPOV would distribute a circular to all Working Parties inquiring about their wishes and need for inclusion of technical information in the UPOV-ROM and the practical feasibilities and possible legal problems, workload and costs with respect to the inclusion of the full test report, full description, Technical Questionnaire characteristics, grouping characteristics or even less information as only groups of varieties (e.g. winter, spring varieties, climbing, bush types, annual, perennial, fruit, ornamental, rootstock, etc.).

82. The TWO also noted the use of the UPOV-ROM for the checking of variety denominations considered very useful by the majority of experts. One expert, however, demanded more frequent updating by member States as for some States there was still a need to consult the national gazettes which contained more recent information. States should supply the information to UPOV at the same time as they published it in their gazettes. The updating should be done in parallel to ensure that the UPOV-ROM contained updated information. There were several technical problems to be solved which would best be discussed and solutions to overcome them found if a few experts responsible for the actual checking of denominations could meet and find solutions. The Office of UPOV in Geneva could be a possible meeting place.

(See documents TWA/27/27, paragraphs 14 and 15, TWC/16/14, paragraphs 19 to 22, TWF/29/14 Prov., paragraphs 23 and 24, TWO/31/19 Prov., paragraphs 75 to 79, and TWV/32/9 Prov., paragraph 26).

#### UPOV Documents in Electronic Form

83. The TWA, TWF, TWO and TWV confirmed its interest in obtaining more documents in electronic form. It noted that the UPOV Test Guidelines might soon be available in electronic form, namely on a CD-ROM. It also noted that the Office of UPOV planned to set aside an open and a restricted area on its homepage for the reproduction of certain documents.

(See documents TWA/27/27, paragraph 17, TWF/29/14 Prov., paragraph 26, TWO/31/19 Prov., paragraph 45, and TWV/32/9 Prove., paragraph 28).

#### Telecommunications, Exchangeable Software and Contacts

84. The TWA, TWF, TWO and TWV noted that the Committee had welcomed document TWC/15/9 which contained information on the electronic mail addresses of participants in UPOV Technical Working Parties, while information on database management systems in use in the UPOV member States was to be found in document TWC/15/8 and information on exchangeable software in document TWC/15/10. They supported the proposal by the TWC that more States should supply such information to the expert from the United Kingdom. The TWA further noted with appreciation that the above information was also available on the Internet and would be regularly updated by experts from the United Kingdom (<http://www.bioss.sari.ac.uk/links/upov/upov/upov.html>).

85. The expert from the United Kingdom in the TWC introduced document TWC/16/7 on database management systems in use in UPOV member States and document TWC/16/9 on exchangeable software. The TWC regretted that only a small number of member States had supplied information. More countries were invited to supply information and to check the information they had given in the past. Changes and new information should also be sent by e-mail to Mr. Ian Nevison (United Kingdom) (e-mail: [ian@bioss.sari.ac.uk](mailto:ian@bioss.sari.ac.uk)). The information would also be available on Internet (<http://www.bioss.sari.ac.uk/links/upov/>).

86. The expert from the United Kingdom in the TWC introduced document TWC/16/8 on electronic mail addresses of UPOV technical experts. The document was noted with appreciation. He invited more countries to supply information and to check the information they had given in the past and report all changes by e-mail to Mr. Ian Nevison.

87. The TWC and TWF noted that an electronic bulletin board for participants in Technical Working Groups will be established by the expert from the United Kingdom in order to facilitate discussion and information exchange on varieties.

(See documents TWA/27/27, paragraph 20, TWC/16/14, paragraphs 34, 61 and 62, TWF/29/14 Prov., paragraphs 31 and 34, TWO/31/19 Prov., paragraph 48, and TWV/32/9 Prov., paragraphs 33 and 34).

#### List of Statistical Documents

88. The contents of documents TWC/15/2 and TWC/15/3 prepared for the last session by experts from France containing a list of documents produced by the Technical Working Party on Automation and Computer Programs and a top index to those documents is now available on Internet and will be updated by experts from the United Kingdom (see paragraph 61 above). The TWC appreciated the updating of those lists and especially the topic index which made it easier to find a particular document on a given subject. It proposed, however, to continue for some years with the updating of printed documents. The Office of UPOV would download the information about four to five weeks before the next session and distribute it to the TWC experts.

89. The TWC agreed to prepare a list of statistical documents of broader interest and/or containing recommendations from the TWC to the other Technical Working Parties which would still be valid or prepare a summary of information which might be contained in different documents. An attempt would also be made to indicate in the reports of the sessions which documents prepared for a given session had a longer lasting interest.

(See document TWC/16/14, paragraphs 63 and 64).

#### Developments in the World Wide Web

90. The TWC noted document TWC/16/6 on the UPOV TWC WWW information pages, prepared by experts from the United Kingdom. As discussed at the UPOV TWC meeting in Budapest in June 1997 some WWW pages had been created which brought together information about the work of the TWC. The main aim of the pages was to provide a readily-accessible reference source for information about the work of the TWC in particular, but of other groups also, if they wished to participate. Information that was held in the pages included: (a) e-mail addresses of participants at all UPOV Technical Working Parties; (b) a list of UPOV TWC participants and their addresses; (c) basic information about TWC meetings; (d) an indexed list of all past TWC working papers; (e) descriptions of the procedures COYD/COYU; (f) details of UPOV database systems; (g) details of statistical software available from UPOV TWC participants. The pages were accessible at: <http://www.bioss.sari.ac.uk/links/upov/>. In the meantime the Office of UPOV had opened an official Website which could be accessed at: <http://www.upov.int>. UPOV would also provide for links from its Website to those pages. The expert from the United States reported that information on plant patents and especially on images of the US plant patents of the last 20 years were available at <http://www.patents.ibm.com/ibm.html> which was a private Website. He wondered whether UPOV could make available UPOV documents on the Internet, if needed with password protection. The Office of UPOV reported that plans were under way to produce UPOV documents on the Internet, either under a password or free, but it was mainly a question of workload when that would happen.

91. The TWC noted document TWC/16/5 on the e-mail bulletin board for varieties and seeds technical matters, prepared by experts from the United Kingdom. The document explains that an electronic bulletin board for the discussion of technical matters concerned with plant varieties and seeds would serve as a form of on-line special interest discussion group. Newcomers could join the group by registering as members.

92. The TWC and TWV welcomed the proposal to set up a bulletin board. It stressed that the good practice guidelines for contributors as laid down in document TWC/16/5 should be strictly followed. It was expected that the bulletin board would start in about one month. It would be announced to those experts who are on the e-mail list in document TWC/16/8. Experts who wish to participate should register their participation. The registration is free of charge.

(See documents TWC/16/14, paragraphs 67 to 70, and TWV/32/9 Prov., paragraph 34).

### List of Species in Which Practical Technical Knowledge Has Been Acquired

93. The TWA, TWF, TWO and TWV noted that the Committee welcomed document TC/34/4, which contained an updated version of the list of species in which practical technical knowledge had been acquired. It asked all member States to provide the Office of UPOV with any new information for the updating of that document.

(See documents TWA/27/27, paragraph 21, TWF/29/14 Prov., paragraph 32, TWO/31/19 Prov., paragraph 49, and TWV/32/9 Prov., paragraph 35).

### Uniformity Criteria in Measured Characteristics of Different Categories of Varieties

94. The TWA noted document TWA/27/9 Rev. on Uniformity Criteria in Measured Characteristics of Different Types of Varieties, introduced by experts from Germany. The document presented results that suggested that, depending on the species and the nature of the characteristic concerned, it may be necessary to determine uniformity, using criteria which are not met by the recommendations in document TG/1/2. Such conditions may arise in crops or types of varieties considered to be self-pollinating and for characteristics with a high genetic variation between varieties or a high environmental variation within varieties. As present, in rape seed for example, the characteristic plant height provides good differentiation between varieties in the collection. But using plant-by-plant measurements or visual observation does not make it possible to reliably identify off-types and to check uniformity for the characteristic.

95. Several experts in the TWA disagreed with the results presented in the above document as they considered them to be affected by the differing definitions of variety and especially by the use of parent lines which were not inbred lines with uniform, identical plants. Therefore without the removal of off-types before the taking of measurements the diagrams were difficult to interpret and it was not possible to draw conclusions from the study. Therefore more information and more details were necessary, for example the identification of the varieties in the diagrams to be able to verify whether they had been considered to fulfill the uniformity requirements or not, which variety type they were (e.g. whether they were real inbred lines or only parental lines which consisted of narrowed populations), etc. The expert from Germany would prepare a new document before the end of the year.

(See document TWA/27/27, paragraphs 57 to 61).

### Overlapping of Alleles in the Draft Test Guidelines for Sunflower

96. In the Subgroup on Sunflower meeting and partly in the main session of the TWA, a large part of the discussions with respect to electrophoresis centered on the problem of the overlapping in Pgm 4 of another gene of which the genetic control was not known and which therefore was not intended to be used for DUS testing but which could confuse experts reading the electrophoretogram. It was finally called Pgm 3. The second major problem was the previously proposed use of Acp 1 which needed good migration to enable detection of the small difference and which was visible in the hybrid only as a smear. As the difference was

obviously too small and the reliability of the interpretation of the electrophoretogram could not be guaranteed it was deleted. The third major question was the proposed use of Mdh where the same problem of overlapping with a faint band as for Pgm 3 existed and in total three loci were overlapping in the same band. As a result, differences were visible only as differences of intensity of the band. While some experts were confident to be able to separate the three loci, others were afraid that that was not always possible. As a difference was only visible as small difference in the intensity of the band, it was difficult to detect off-types and therefore to check uniformity. It was therefore decided to delete Mdh but to continue studying it and especially to make a new blind ring test to find out whether the laboratory experts would always come to the same results and the same interpretation of the results.

(See document TWA/27/27, paragraph 83).

### Image Analysis

97. The TWC noted document TWC/16/10 on VISOR—a plant variety image database system—prepared by experts from the United Kingdom and a few further pages distributed during the session. The document reports on the progress in the development of a database system for storing and viewing photographic records of plant varieties. The VISOR system is the product of a collaborative project involving Biomathematics & Statistics Scotland (BioSS) and the Scottish Agricultural Science Agency (SASA). The main purpose of the system is to support investigations into methods for variety identification using digital image analysis. VISOR uses worldwide web browsers to view images. VISOR can operate on a stand-alone PC or on a networked server and can be accessed across the Internet. A JAVA/JAVASCRIPT-enabled browser is required for access, preferably Netscape 4 or Internet Explorer 4. At BioSS/SASA the image database system has been used to hold three years of photographic data on carrot varieties. The aim is to see whether, given a photograph of a variety from a new season, the same variety from an earlier season can be found in the database. Preliminary results from three seasons of data on sliced roots of carrots have been encouraging. Work will continue on developing these approaches.

98. The TWC noted document TWC/16/11 on digital images in plant variety testing prepared by experts from the Netherlands and a further few pages supplementing that document. The document explains that digital images can be used in variety testing for measuring characteristics described in the UPOV Test Guidelines automatically by the computer (image analysis), with image analysis characteristics being measured accurately and fast. Besides, it offers possibilities to measure characteristics quantitatively which could previously only be scored visually. The characteristics obtained with image analysis can easily be analyzed with the powerful statistical tools for DUS testing to assess distinctness and uniformity. Furthermore, it may also be possible to let the computer automatically generate part of the variety description in a fast, accurate and efficient way using the information automatically retrieved from a set of images. Another use of digital pictures is a visual comparison of varieties, e.g. for comparing a candidate variety with the reference collection. This can be done by searching through the image database by manual browsing of images: a screen of thumbnail images is presented to the user, and the user can scroll through the list of images. A step further is to find similar varieties automatically by computer.



99. The expert from France in the TWC reported on a study on automatic assessment of seed purity by artificial vision undertaken by postgraduate and Ph.D. students at GEVES, Angers, France. It was aimed at differentiating seeds of foreign species in a given seed lot. In the study 103 characteristics were measured covering size, shape, grey level distribution and texture and the three-colored channel red, green and blue. Several approaches had been studied: (a) linear approaches as K-nearest neighbors, linear discriminant analysis and fuzzy C-means clustering algorithm or (b) non-linear approaches as multi-layer perceptron network, hybrid neural network or propalistic neural network. The last mentioned method had been considered the most interesting one. Image analysis had been considered a good tool for automatic seed identification and it was planned to continue the study to develop a complete vision system for on-line discrimination and to cover more species. The same system could also be applied to flowers or leaves.

100. The experts in the TWC referred also to work done on the same subject some years ago in Denmark and in the United Kingdom and for grain check systems in Sweden.

101. The TWO noted paragraphs 7 to 10 of document TWO/30/12 on the use of image analysis in the DUS testing of ornamental plants, and that the progress planned had not been achieved. Therefore, the meeting foreseen for November of this year had to be cancelled. But work will go on; it is now planned to incorporate discussions on the results in the next session of the Working party itself. The subgroup comprised at present experts from Germany, France, the Netherlands, the United Kingdom, but other States are also invited to join. Monday morning of the next session will be devoted exclusively to image analysis.

(See documents TWC/16/14, paragraphs 23 to 28, and TWO/31/19 Prov., paragraph 5).

#### Distinctness and Genotype x Environment Interaction

102. The TWC noted document TWC/16/3 on distinctness and genotype x environment interaction, prepared by experts from Germany. The document refers to document TWC/14/7 which introduces the combined over years distinctness (COYD) criterion. According to this criterion, two varieties are distinct when their difference exceeds the least significant difference (LSD), which uses the variety x year interaction mean square as an error term. This criterion had been adopted to replace the earlier UPOV distinctness criterion (the "2 x 1% criterion"), which required the varieties 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 2 x 1% criterion uses the plot error mean square as an error term. The document argued that the COYD criterion treats genotype x year and genotype x location interaction differently. Specifically, genotype x year interactions are considered as random, while genotype x location interaction is implicitly taken as fixed. That does not seem to be consistent. By contrast, the 2 x 1% criterion regards both interaction components as fixed. It is argued that regarding interaction effects as fixed is appropriate for assessing distinctness. Therefore, the document suggests that TWC critically evaluate the COYD criterion relative to the 2 x 1% criterion.

103. The TWC agreed with the finding but not with the conclusions. According to UPOV a variety needs to be distinct in at least one location. Therefore most member States use only one testing location and grant protection if the variety is distinct in that place. That means,

however, that it is possible that the variety is not distinct in another place which, however, is irrelevant for the granting of rights. It is on the other hand necessary that distinctness be consistent and repeatable in the following year. Therefore not just any difference is acceptable, but only those that are expected to be found in the next year. The Offices were able to choose locations but cannot choose years. The TWC was therefore satisfied with the present procedure of COY.

104. The TWC noted document TWC/16/4, containing some remarks on the combined over years distinctness criterion, prepared by experts from Germany. The document states that the combined over years distinctness (COYD) criterion is based on a mixed model, which implies that the variance-covariance structure has the so-called Compound Symmetry (CS) form. The LSD computed for COYD produces a valid test only when the CS assumption is met. To measure the departure from the CS assumption the document suggested and computed for *Lolium perenne* a data set of the *Bundessortenamt*. The results indicate appreciable departure from CS. They show that under departure from CS, an increased sampling variation is to be expected among variety x year mean squares for different groups of years. This may partly explain observations reported in past TWC documents. The document concluded that the validity of the LSD procedure suggested for COYD may be hampered by departure from the CS assumption. The document encouraged the TWC to search for powerful and simple alternatives to COYD for data that violate the CS assumption. The document concludes that no satisfactory alternative to the paired t-test can be suggested at this stage, and it is unclear whether a simple and powerful alternative under departure from CS is forthcoming.

105. The TWC made it clear that 20 degrees of freedom were not considered to be a fixed margin between the COYD method and the long-term LSD. In the beginning it was stated "about 20," but the word "about" had been lost. Twenty degrees of freedom was a very conservative approach to be on the safe side. All depended on the quality of the data with long-term results. Three years of incomplete data might be used instead of long-term results but more studies were necessary before firm recommendations could be made. The expert from Germany offered to prepare another paper for the next session. The TWC agreed to make it clearer to the experts applying COYD that it was important to obtain consistent results. The experts should stick to one method and not change it if in one year the total number was higher or lower than the level of about 20 degrees of freedom. The number of varieties grown should also not be artificially increased to reach the level of 20 degrees of freedom. A few degrees less would not affect the precision of COYD, especially as it was only intended to support the opinion of the expert. In some publications a level of 12 degrees of freedom was considered the critical level for the application of certain methods. It was important to bring this information to the attention of the crop experts to change their obviously wrong impression that 20 degrees of freedom is a fixed borderline. The revised document TG/1/2 should also be clear in that respect.

(See document TWC/16/14, paragraphs 37 to 43).

#### Incomplete Plot Design, Reduction of Reference Collection

106. The TWC noted document TWC/16/12 on the efficiency of different designs in spring rape seed prepared by experts from Denmark. The document recalls that, in the DUS testing, spring rape is one of the major crops in Denmark, which means that there are many reference

varieties grown each year. At the same time some difficulties have been encountered in the establishment of distinctness of new candidates. An investigation was therefore started in order to examine whether the designs could be improved in order to lower the critical differences necessary to distinguish new candidates from established varieties.

107. The TWC noted a report of the expert from Poland on some optimum problems in planning DUS trials. Because of the rapid increase in the number of varieties in the testing it was questionable whether the basic assumptions of the analysis of variance were still fulfilled. It was studied how to optimize the costs of trials and how to reduce the costs. Compared were the number of years, the number of replicates and the number of characteristics and their optimum relationship. The study concluded that the number of replicates was too small, the number of measurements too high and the number of years too small. If possible, more than two years should be used.

108. The TWC noted document TWC/16/2 on the possibility of application of incomplete blocks in DUS trials, prepared by experts from Poland. The document recalls that the necessity of proving distinctness from all known varieties creates the necessity of comparing a growing number of varieties within the same trial. For example, in DUS trials on maize conducted in 1996 at the experimental station Slupia Wielka in Poland, 212 varieties were compared. As a rule, the randomized complete block design was used in such experiments. In view of such a high number of varieties one could doubt whether the basic assumptions of analysis of variance were fulfilled. In particular, the assumption concerning uniformity of plots within complete blocks (replicates) could not be fulfilled. The document therefore studied the possibility of application of incomplete blocks in DUS trials.

109. The TWC agreed that incomplete block design could allow some gains in the testing costs by reducing the number of plants observed without losing precision (e.g. 40 instead of 60 plants). Care should, however, be taken with varieties with large border/neighbor effects like rape seed as the method could only compensate different soil conditions but not side effects. The incomplete block design was a good tool to show the precision with increased number of plants. The TWC noted, however, that it might not be possible to realize a gain as the varieties had also to be tested for uniformity and for those tests more plants were needed. Only if a large number of varieties (over 200) was tested, was it possible to work with fewer plants. Therefore the testing should be continued with complete plots and incomplete plots should be used only if problems arose. For the next session the expert from Denmark offered to prepare a paper on the follow-up to COYD with incomplete plots.

(See document TWC/16/14, paragraphs 53 to 60).

#### Standardization of E-mail Attachments Intended as a Basis for TWC Documents

110. The TWC and TWV noted the difficulties encountered by the Office of UPOV in the opening of attachments to e-mails, in giving them some sense or a reasonable shape to be used as a basis for a UPOV document. Despite a number of conversion programs available and powerful hardware, the opening or saving of electronic documents caused numerous computer breakdowns. Some documents could not be even saved at all despite the help of computer experts. In other documents drawings were overlapping, or depending on the conversion program used, either only the drawing was there but not the text or the text was there and only

a square, indicating that there might be something else. In one case all the automatic numbering of headings and paragraphs of a document were completely different to the original version sent. Having noted the problems encountered, the TWC agreed to a few recommendations for the submission of e-mail attachments. As far as possible the following should be observed:

1. The software or the program used should always be specified when sending an electronic document.
2. A hard copy should always be sent to enable a comparison with the sometimes incomplete electronic version. If time was short, a hard copy should be sent by telefax.
3. The size of each single attachment should not be too large. .
4. Images should not be saved as pictures but as drawings in order to save capacity.
5. Certain still to be recommended software programs should be used if available (e.g. the text of documents should be converted to Word 2.0 or rich text format (rtf)).

(See documents TWC/16/14, paragraph 71 and TWV/32/9 Prov., paragraph 73).

New Methods, Techniques and Equipment in the Examination of Varieties, Including the Progress Report on the Work of the BMT

111. The TWA, TWC, TWF, TWO and TWV noted that the Committee had noted with approval the report from the Chairman of the BMT which had held its fifth session at Cambridge from March 11 to 13, 1997, as reported in document BMT/4/21 and that the next session was scheduled to take place in Beltsville, United States of America, from September 28 to 30, 1998. The TWF and TWO noted the results of that session as summarized in document C/32/10 Add.

112. The TWO noted document BMT/5/6 studying the application of DNA profiling method to find out the variation between and inside rose varieties. It agreed on the request of the BMT that rose might be the most suitable ornamental species for studies of DNA profiling. As a second species it mentioned chrysanthemum.

113. Most of the experts stressed, however, that they saw no need at all for such studies. In the ornamental species sufficient characteristics were available for the testing of DUS. The TWO reconfirmed its position that such methods should only be accepted if there was a strong correlation between existing morphological characteristics and any of the bands observed. In the ornamental species these methods were not needed and were not wanted. TWO expressed its serious concern that it did not want to face in future a situation in which it was put under pressure to use such methods just because governments had spent a lot of money on research which the TWO considered superfluous. It did not want the methods developed by the laboratories to be imposed on them in the end, as had happened in the past in similar cases for some crops using other methods like electrophoresis. In ornamental species, differences in

varieties should be visually observable, in order to verify if the varieties were not too close to each other to justify a separate variety.

(See documents TWA/27/27, paragraph 29, TWF/29/14 Prov., paragraphs 35 to 37, TWO/31/19 Prov., paragraphs 73 and 75, and TWV/32/9 Prov., paragraph 38).

114. Before opening the fifth session, the Chairman of the BMT gave an overview of the previous four BMT sessions. He observed that considerable information on different molecular techniques and statistical methods had been provided in the sessions. The DNA profiling methods presented in the BMT sessions quickly shifted from RFLP and RAPD to more advanced techniques with higher polymorphism and reproducibility, such as AFLP and microsatellite. He also referred to the usefulness of document BMT/3/2, introducing definitions and nomenclature for DNA profiling methods.

115. The BMT had provided a forum for an exchange of views and information between molecular biology researchers, statisticians and UPOV experts. It had discussed the use of molecular techniques in the context of the UPOV Convention. It had noted the risks involved in the use of DNA profiling data without sound knowledge of the genetic background. It had noted the need to identify precise statistical methods and the error risks involved. The BMT had agreed that several technical problems had to be solved before any introduction of DNA profiling for DUS testing. In particular, the uniformity and stability of varieties for molecular markers was still open question. Variability within and between varieties for molecular markers needed to be studied intensively. In addition, the standardization of reproducible molecular techniques would be indispensable for the introduction of these techniques. It had also discussed the use of DNA profiling for prescreening and in disputes on essential derivation. It had introduced a new notion "genetic distance" for the UPOV framework. The concept of genetic similarity or conformity had demonstrated the potential use of molecular techniques for the judging of essential derivation. The BMT had agreed that the criteria of distinctness and of essential derivation should be kept separate.

116. Finally, the Chairman referred to the main aim of the work of the BMT and the conclusion reached at the third session as reproduced in document BMT/3/18, paragraph 36, 38 and 39.

"36. Final Conclusions: The BMT agreed that the new techniques for DNA-profiling were a powerful tool to provide detailed information on the relationship between varieties. They supplied considerable background on a variety and were also very useful for the identification of existing varieties. They would be very useful for the estimation of essential derivation together with other sources of data (e.g. breeding history). The BMT was, however, not in a position to recommend its use for distinctness purposes. [...]. It therefore finally proposed that the Committee not recommend the use of DNA-profiling for DUS purposes before all these open points had been clarified or before harmonized protocols had been established for the use of DNA-profiling (if its use was ever accepted for DUS testing)."

"38. The BMT favored the approach of ASSINSEL which was to keep the judgment of essential derivation as far as possible separate from the DUS testing and that the criteria of essential derivation had to be judged species by species. At

present information on DNA-profiling should only be complementary information which may help the expert in the testing but which would not be used for distinctness testing.”

“39. The BMT agreed that UPOV should not feel under pressure to accept the new methods just for fear of being regarded as old-fashioned. It had the task of defending the efficacy of the plant variety protection system and of defending it against the introduction of unsuitable tools which might affect its functioning. [...]”

(See document BMT/5/17 Prov., paragraphs 3 to 8).

#### Presentation of Biochemical and Molecular Techniques: New Techniques, Advantages and Limits of Different Techniques

117. There were several short presentations which are reproduced in more detail in paragraphs 10 to 15 in document BMT/5/17 Prov. and in the documents BMT/5/2, BMT/5/8, BMT/5/9 and BMT/5/11. The discussions on these representations can be summarized as follows:

#### Reproducibility

118. The BMT noted that the reproducibility of AFLP markers could be significantly improved if the markers and the appropriate DNA preparation procedures were carefully chosen. The studies also showed high consistency in the results of STMS markers conducted in different institutes by the standardized DNA preparation procedure.

#### Stability on Molecular Markers

119. The results of estimated mutation rate on SSR alleles in soybeans indicated that in some cases there might be high mutation rates of molecular markers. In principle, if information obtained with molecular markers was used for DUS testing, that information should satisfy not only distinctness, but also uniformity and stability criteria. Through further empirical studies on variability in molecular markers over the generations, the criteria of stability applied to molecular markers for DUS testing needed to be studied. New molecular characteristics, if unstable, might force breeders or maintainers of the protected varieties to carry out additional selection work to keep the characteristics stable. Therefore, breeders insisted that stability criteria for molecular markers should be carefully discussed so that they did not create an extra burden.

#### Access to Molecular Techniques

120. The expert from ASSINSEL in the BMT referred to the importance of access to molecular techniques. He warned that many molecular techniques were proprietary and not freely accessible. If the use of a certain kind of molecular technique was recommended, the

technique should be freely available (if necessary, against payment) to plant variety protection offices worldwide. In addition, if a national office permitted the use of a particular molecular technique for DUS testing, the information of such molecular technique and the resulting data should be publicly available and accessible to other countries. The BMT reaffirmed the necessity to take into accounts access to molecular techniques as well as their costs.

#### Databases of DNA Profiles of Varieties

121. The BMT noted the future need for the construction and standardization of databases of DNA profiles of varieties. In the light of the likely future use of DNA profiling, the construction of standardized databases should start as soon as possible in order to utilize the burgeoning data efficiently. However, prior to such construction, the molecular methods to be used for the future must be identified; the robustness of reference markers and their stability over generations should be considered. For example, one expert questioned how large a population of existing varieties had to be for deriving robust reference markers. UPOV had to recommend a set of techniques to collect data for such a database especially as so many data were already available.

122. The BMT also discussed difficulties in freely accessing such databases. If molecular markers were used for DUS testing, the free access to databases of those molecular markers would be necessary. However, the confidentiality of certain variety information should also be taken into account.

#### Development of Microsatellite Markers

123. The BMT heard of several projects to develop new microsatellite markers. The problems of microsatellites, however, was that microsatellite markers were still developed only for major species and their development was very costly. In this connection, the use of genes known in one species to derive microsatellite markers for other closely related species seemed to be a useful method to develop markers for minor species.

#### Use of Molecular Techniques for DUS Testing

124. The Chairman of the BMT summarized the discussions on the research reports as follows. More and more information had become available on different methods giving good results. The question was what to do with all that information. The BMT had to think of ways how that information could be used in the testing of varieties, especially in the light of the speed with which molecular markers provided variety identification. It was necessary to make concrete recommendations to avoid repeating the errors made in the past with respect to the use of electrophoretic characteristics. There were, however, still many unsolved problems, such as the lack of repeatability, where some progress had been made, but not enough. The next problem was the testing of uniformity and stability. Some results were available but they were far from sufficient. The future research had to concentrate in this area. In addition, the introduction of molecular characteristics might reduce the minimum distance between protected varieties. At present, it was still dangerous to use molecular markers to establish distinctness.

125. Following a question on the present position of the plant variety protection office of the United States on molecular characteristics in DUS testing, the experts from the United States of America answered that the Office had not yet received any application for a new variety which had been distinct from another varieties only in molecular characteristics. There had always been differences in some other characteristics and thus rights had been granted on the basis of morphological characteristics complemented by molecular characteristics.

(See document BMT/5/17 Prov., paragraphs 17 to 24).

#### Assessment of Variability Within Varieties and Between Varieties, Uniformity

126. The BMT noted several reports which are reproduced in detail in paragraphs 25 to 27 of BMT/5/17 Prov. and in document BMT/5/4 and BMT/5/6. The BMT noted that, in the case of roses, the uniformity level was very high as had been expected, but for sexually reproduced species, further studies had still to be made. Results were highly dependent on the choice of molecular method. The BMT discussed the detection of phenotypic mutations by molecular methods. Because molecular markers could not cover all genetic information, some phenotypic mutations, especially those caused by a change in a single gene, might not be detected by molecular markers. Several molecular researchers suggested that the causes of mutations and the preparation procedures might influence whether a phenotypic mutation could be detected or not. The BMT discussed the correlation between the uniformity of phenotypic and biochemical and molecular characteristics. Some experts reported cases in which a variety with high uniformity in isozyme analysis did not show uniformity in phenotypic characteristics observed in the field. The BMT finally discussed how to assess uniformity in molecular markers, for example, how many samples were necessary and how much variability within a variety should be allowed. The Chairman reminded the participants of the following four options concerning the acceptable level of uniformity for characteristics obtained with molecular markers in paragraph 34 of document BMT/3/18:

#### Uniformity

“..... There are a number of ways of approaching this problem [of the uniformity requirement]:

“(i) it could be decided that this lack of uniformity precludes the use of such profiling techniques;

“(ii) it could be accepted that the level of non-uniformity exhibited by currently registered cultivars (which would need to be determined systematically and empirically) represented a baseline which candidates in the future would not be allowed to exceed;

“(iii) it could be suggested that from a certain date, all future candidates would have to be uniform in the particular profiling character;



“(iv) it could be accepted that the repeatability (i.e., stability) of the differences between cultivars is more important than the insistence on plant to plant uniformity. Thus if the variability within a cultivar, as estimated whether by single plant analysis or by a bulk analysis, is maintained from generation to generation (is stable) then this could be accepted as evidence of sufficient uniformity within that cultivar. This proposition would be recognizing that the examination of uniformity is at least partly to ensure that the distinguishing features of a cultivar are maintained during multiplication and commercialization. Hence it is stability rather than uniformity *per se* which is essential.”

127. One expert in the BMT suggested that the minimum level of uniformity required for the use of molecular markers should be derived from variability within existing reference varieties, which was the same method as that used for electrophoretic characteristics.

128. The BMT reaffirmed that the greatest remaining shortcoming was the checking and control of uniformity in characteristics obtained with molecular markers. It agreed that the four options mentioned above would have to be discussed in the next session together with research results on more and different species.

(See document BMT/5/17 Prov., paragraphs 28 to 32).

#### Choice of Genetic Estimator, Molecular Markers and Diversity in Sample Varieties

129. The BMT noted several reports which are reproduced in more detail in paragraphs 34 to 36 of document BMT/5/17 Prov. and in documents BMT/5/5, BMT/5/7 and BMT/5/16. The discussions can be summarized as follows:

130. The BMT noted that, although different methods of estimating genetic distance showed different figures, the results from different methods were often strongly correlated. On the other hand, however, the BMT noted that the choice of the method of estimating molecular distance, the weighting of markers, the choice of molecular markers, and the diversity of the sample population used for establishing markers system should depend on the objectives for which the molecular distance is to be used. Which markers should be chosen for molecular marker set, frequently observed markers or rarely observed markers? Which markers should be weighted for the estimation of molecular distance? Which sample populations of varieties should be chosen for establishing the marker system, diverse populations or highly similar populations? The answer should depend on whether the proposed use was for essential derivation or for distinctness. For essential derivation, variety samples with smaller variability should be used for the establishment of marker systems, using frequently observed markers, chosen and weighted for estimation of genetic distance.

131. In the discussion of the choice of molecular markers, several experts suggested that the markers related to morphological information should be given the highest importance. The choice of markers relating to morphological characteristics would be very important for the purposes of prescreening. One molecular scientist reported from his practical point of view that he had chosen molecular markers by discarding markers highly correlated to other markers.

### Precision of Molecular Distance

132. The BMT also noted further studies were needed to develop a more precise system for the estimation of molecular distance. The high standard deviation observed in the molecular distance estimations indicated the difficulty of using this method to judge essential derivation. The effects of sample size and number of markers on the accuracy of the molecular distance estimate should also be studied.

### Comments From the Chairman of the TWC

133. The Chairman of the TWC reported that several studies on statistical methods for DNA profiling data were in progress in the TWC and that the discussions in the TWC on optimum precision would also be able to contribute to the discussions of the BMT. He also reported that an electronic bulletin board for participants in Technical Working Parties as well as in the BMT had been established by experts from the United Kingdom. He warned against the risk of using two dimensional graphs for the data of principal components analysis (PCA). He reminded the participants that, although that type of graph showed the relationship of different varieties clearly and graphically, it represented only a part (for example, 40%) of variability. He also suggested that the combination of diverse data, for example AFLP and microsatellite data, should be explored in view of its precision. Finally, he requested that good firm data sets including not only molecular data, but also morphological and pedigree data were needed for assessing the advantages and disadvantages of different statistical methods.

134. Following his request, the BMT discussed the establishment of complete data set of molecular markers, pedigree and morphological characteristics in cooperation with member States and breeders in order to ask the TWC to assess different statistical methods. The expert from ASSINSEL stated that they were pleased to cooperate in the project under the condition that the objective of the project and the necessary data were clearly defined. Finally, experts from the United Kingdom proposed to establish a data set by using data available in their institute, but asked that other experts should supply data on different species: e.g., ryegrass, mutants in ornamental crops and oilseed rape, as the problems involved in the three examples mentioned would be completely different.

(See document BMT/5/17 Prov., paragraphs 33 to 40).

### Definition of Variety

135. The Chairman of the BMT reported on the discussion on the definition of "variety" held by a BMT which met on February 12, 1998. Part of the overheads used are reproduced as Annex III to document BMT/5/17 Prov. He briefly explained the four options discussed in that BMT meeting. The first and second options were strict interpretations of Article 1, while the third and fourth options were its wide interpretation, allowing the use of molecular characteristics. The first option was that establishment of distinctness was only based on phenotypic characteristics and that no molecular characteristics were admitted except if they were strictly linked with phenotypic characteristics. The second option was that information obtained using a molecular tool could not be used alone for a conclusion on clear distinctness,

but only as a complementary help to confirm a clear phenotypic difference (especially for use in otherwise not easily observable phenotypic differences). In the third option, DNA polymorphism would be considered as a result of the expression of genotype or combination of genotype and molecular characteristics would be used for establishing distinctness. The difficulty was that it would be difficult to define a clear difference and to judge uniformity and stability. In the fourth option, every difference in molecular markers could be used as a basis for establishing distinctness. The Chairman also briefly explained the advantages and disadvantages of each option. He reported that most participants in that BMT meeting had favored the second option.

136. The Office of UPOV introduced paragraph 20 of document CAJ/38/7 Prov., the conclusion of the Chairman of the Administrative and Legal Committee (CAJ) on the discussions on "Characteristics Used in Distinctness Test" in the CAJ in its spring session of this year, which reads as follows:

"20 (a) One should not reject the use of molecular tools out of hand in the examination of distinctness.

"(b) It was not possible, at the present stage at least, to allow information obtained using a molecular tool to serve alone as the basis for a conclusion on the clear distinctness of two varieties.

"(c) The use of molecular tools could only be contemplated if there was a guarantee that the minimum distances between varieties would not be made smaller.

"(d) The risk of "mini systems of protection" evolving from different examination practices, mentioned at the previous session of the Committee, could not be ruled out, but everything should be done to avoid them.

"To that end, it was particularly appropriate that the BMT on Biochemical and Molecular Techniques, and DNA Profiling in Particular, should continue its work."

137. In addition, the Office of UPOV asked that a cautious approach be adopted in view of the rather similar wording and especially the use of the wording "the expression of the characteristics resulting from a given genotype or combination of genotype" in the definition of variety and for essential derivation.

138. Most participants in the BMT basically supported the conclusion of the CAJ and favored the second of the four options that information obtained using a molecular tool could not be used alone for a conclusion on clear distinctness, but only as a complement to phenotypic differences, thus confirming the opinion of the crop expert.

139. The expert from ASSINSEL in the BMT, recalling the discussion in the Diplomatic Conference in this respect, stated that, in his opinion, the difference between these two concepts had been clear despite the same wording finally used in the Convention. The basic concepts were that the "variety" was defined by phenotypic expressions and that essential

derivation was assessed by conformity of genotypes. He also emphasized that essential derivation was part of the scope of the breeders' right.

140. The BMT discussed the application of the second option by using the case of disease resistance. One expert asked how to deal with a potato variety which was known to have a disease resistance gene, but whose disease resistance could not be observed. Several experts insisted that the genetic evidence alone was not enough to establish distinctness for the variety, therefore such a variety without sufficient differences in phenotypic characteristics should not be protected. Another expert quoted the case of a variety which was known to have a disease resistance gene, and whose disease resistance could be observed in some cases, but not in others. Some experts felt that in this case because of its lack of uniformity the characteristic of disease resistance could not be used for distinctness.

141. Several experts in the BMT emphasized that the purpose of plant variety protection was not only to grant a right for breeders of new variety, but also to protect the rights of breeders of existing protected varieties. The BMT reaffirmed that the introduction of new techniques should not lead to a reduction of minimum distance and to the erosion of existing plant breeders' rights.

142. The BMT also reaffirmed that many technical questions, such as uniformity and stability in the use of molecular tools for DUS testing were still open and needed to be solved before any recommendation on the use of those tools could be made.

143. The expert from the Community Plant Variety Office in the BMT explained the position of his office on this subject. At present, the CPVO did not accept a difference based on molecular techniques for DUS purposes. Therefore, the CPVO favored at present the first option discussed in the BMT. However, in the future, the CPVO might have to shift to the second option. The expert from the CPVO believed that, before the introduction of molecular techniques, the cases where molecular characteristics could be used for the establishment of distinctness should be clearly defined and that detailed technical guidelines, including protocols for molecular methods and the assessment of uniformity and stability, should be described in the Test Guidelines.

(See document BMT/5/17 Prov., paragraphs 41 to 48).

#### Position of the Breeders vis-à-vis DNA Profiling

144. The Secretary-General of ASSINSEL introduced document BMT/5/14, "ASSINSEL Position on Characteristics for DUS Testing," adopted by the General Assembly of ASSINSEL on May 30, 1997. In that document, ASSINSEL proposed the classification of characteristics used for DUS testing in the following three groups: (1) UPOV characteristics (Test Guidelines); (2) Additional "phenotypic" characteristics, such as yield, sugar content, disease resistance, combining capacity and herbicide resistance; (3) Additional non-phenotypic convincing evidence. The third characteristics should be used with the agreement of applicants, if all other characteristics failed to establish sufficient distinctness, despite some evidence and if a test procedure has been agreed upon between the competent authority and the applicants. He stated that the proposal made by ASSINSEL was almost the same as the second option discussed in the BMT and the CAJ. He repeated that the problem of the

introduction of new characteristics for DUS testing should be solved without placing new obligations on the holders of an already protected variety. He added that the group of breeders of ryegrass had opposed the use of “additional non-phenotypic convincing evidence” for ryegrass varieties and that a special working group was organized to discuss which species should be excluded from the application of “additional non-phenotypic convincing evidence.”

145. One expert in the BMT insisted that electrophoretic characteristics should be dealt with in the same way as disease resistance and should be treated differently from information obtained with molecular markers. The Office of UPOV explained that the electrophoretic characteristics had already been included in the Annex to several Test Guidelines. Another expert stated that there should be a clear border line between morphological characteristics and biochemical/molecular characteristics, including electrophoretic characteristics, when considering whether they could be used as independent characteristics or complementary information. In this context, the word “non-phenotypic” was liable to lead to misunderstanding.

146. One expert in the BMT pointed to the difficulty of applying new biochemical and molecular techniques to varieties of cross-fertilized species with relatively low stability. In such varieties, the breeders and maintainers may not be able to maintain the population with the same molecular characteristics generation after generation and submit the same samples in response to a request from the national office.

147. Several experts in the BMT made comments on “additional phenotypic characteristics.” They pointed out that characteristics, such as yield, disease resistance and sugar content, were dependent on the environment and therefore less reliable for distinctness testing. In addition, these were often observed on bulk samples and thus the checking of uniformity was difficult if not impossible. Further, the other experts warned against the risk of these characteristics being used as cosmetic characteristics.

148. Biochemical scientists asked for the position of ASSINSEL on the rapid introduction of molecular techniques for variety identification. The expert from ASSINSEL answered that the requirement of variety identification was completely different from that of plant variety protection. Variety identification techniques could be used for seed quality and for certification, but could not directly be used for plant variety protection. One big point of difference was the concept of minimum distance.

(See document BMT/5/17 Prov., paragraphs 49 to 53).

#### The Use of DNA-Profiling Methods by Expert Witnesses in Disputes on Essential Derivation

149. The Secretary-General of ASSINSEL introduced document BMT/5/13 on the “Assessment of Essential Derivation Using Molecular Markers: A Tomato Pilot Study,” prepared by ASSINSEL and document BMT/5/15 on the “Assessment of Essential Derivation” prepared by ASSINSEL. The expert from ASSINSEL repeated that, while the decision on DUS was taken by the competent national PVR authorities, the decision on the essential derivation was taken by arbitrators or courts and not by the PVR offices. However, he said that did not mean that the PVR offices did not need to do anything. Courts needed the guidance of technical experts and would probably approach PVR offices for advice. Because

the definition of essential derivation was not defined in detail in the 1991 Act, UPOV and the PVR office should establish a clear and detailed definition of the provision for its application. In particular, he stressed that the meaning of “predominantly derived from the initial variety” should be clarified by establishing threshold levels.

150. The expert from ASSINSEL further explained some problems in essential derivation. The “spirit” of the provisions of essential derivation was clear for breeders. The most important point to judge essential derivation would be “the intention of the second breeder.” It was, however, impossible for the PVR office to prove “the intention.” Instead, the PVR office could establish technical tools to be utilized for assessment of genetic conformity.

151. The Chairman of the BMT stated that, in the Diplomatic Conference, UPOV had been requested to establish guidelines on essential derivation. The discussion on essential derivation in the BMT could be considered as a part of the activities of UPOV to establish such guidelines. However, defining the interpretation of the words on essential derivation was not the task of UPOV. The BMT should focus on technical aspects, for example, identifying the methods and tools to assess essential derivation and providing technical information on how to use molecular markers to assess genetic conformity.

152. The BMT agreed that its task was to discuss the technical tools for assessment of essential derivation, for example, molecular techniques, statistical methods and their accuracy. In addition, the BMT noted that the further studies, especially by extending to the other species, were required for further discussion on essential derivation.

153. The BMT discussed the establishment of threshold levels. Some experts insisted that, because the molecular distance was different depending on species concerned as well as on the molecular techniques and molecular distance estimators used, the threshold level of molecular distance for judgment of essential derivation had to be determined case by case. Some breeders insisted that the threshold level would be indispensable for the application of the concept of essential derivation in practice despite the difficulties of its establishment. However, the BMT agreed that the threshold level for the judgment of essential derivation was not to be determined by UPOV, but by breeders.

(See document BMT/5/17 Prov., paragraphs 54 to 59).

#### Future Program, Date and Place of the Next Session of the BMT

154. The BMT discussed whether it should continue as a separate working group. The BMT was the only forum where testing experts, molecular scientists, statistician and breeders were able to exchange their views and opinions on the use of molecular techniques for DUS testing as well as essential derivation and prescreening. Continuation of these discussions was needed for further progress. It had to continue its discussion on statistical improvements and the precision of methods and especially on the question of uniformity and stability. It also needed to consider how to introduce molecular markers in “option two” and how to use them for prescreening. In addition, the conclusions of the CAJ requested the BMT to continue its work. Therefore, the BMT proposed to have further sessions as a separate working group.

155. One expert in the BMT suggested that more focused discussion was necessary in order to make real progress and to elaborate methods for practical use in DUS testing. He proposed that the BMT concentrate on a few species, such as oilseed, and discuss its methods and protocol for application. That could be done in his view in a smaller ad-hoc group concentrating on a few species. The Working Party decided not to follow the proposal of a small ad-hoc group, because of the difficulty of choosing a limited list of species and the necessity for a broad information exchange. On the other hand, the BMT decided to ask each Technical Working Party to choose one or two priority species to be taken up in the BMT.

156. The experts from the Community Plant Variety Office offered to host the sixth session. The Working Party accepted that offer and agreed to hold its sixth session in Angers, France, towards the end of February or beginning of March 2000 about two to three weeks before the Committee. During the session, the BMT planned to discuss the following items: (i) Short presentation of biochemical and molecular techniques: new techniques, advantages and limits of different techniques; (ii) Assessment of variability within varieties and between varieties, in particular, uniformity and stability in molecular markers; (iii) Construction and standardization of databases of DNA profiles of varieties; (iv) Statistical methods; (v) Confidence intervals and improvement of precision of distance estimates; (vi) Graphic representation of genetic distances; (vii) Comparison of genetic distances with phenotypic distances; (viii) Combination of information from diverse data types (AFLP, SSR, morphological data, etc.); (ix) Possibilities and consequences of the introduction of DNA-profiling methods for DUS testing; (x) Position of the breeders vis-à-vis DNA profiling; (xi) The use of DNA-profiling as a possible tool for prescreening in DUS testing; (xii) The use of DNA profiling methods by expert witnesses in disputes on essential derivation.

(See document BMT/5/17 Prov., paragraphs 67 to 70).

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