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UPOV

TWA/XIV/14
ORIGINAL: English
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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL WORKING PARTY FOR AGRICULTURAL CROPS

Fourteenth Session
Hanover, Federal Republic of Germany, June 5 to 7, 1985

REPORT

adopted by the Technical Working Party for Agricultural Crops

Opening of the Session

1. The fourteenth session of the Technical Working Party for Agricultural Crops (hereinafter referred to as "the Working Party") was held in Hanover, Federal Republic of Germany, from June 5 to 7, 1985. The list of participants is given in the Annex to this report. Meetings of Subgroups on several species were held at the same place on June 4, 1985.

2. Dr. Böringer, President of the Bundessortenamt welcomed the participants to his office in Hanover. The session was opened by Mr. J. Guiard, Chairman of the Working Party. The Chairman expressed the sincere condolences of the Working Party at the recent tragic death of Dr. J. Le Roux (South Africa).

Adoption of the Agenda

3. The Working Party unanimously adopted the agenda of the fourteenth session as reproduced in document TWA/XIV/1, after having agreed to discuss under item 19 the possibility of creating a system of circulating technical information and to discuss under item 15 document TWA/XIV/6 and document TC/XX/12 Prov., paragraph 55 concerning resistance genes in cereal varieties.

Adoption of the Report on the Thirteenth Session

4. The Working Party unanimously adopted the report on its thirteenth session as reproduced in document TWA/XIII/11 Prov., after having agreed on the following changes:

(i) to separate the first sentence of paragraph 26 from the rest of the paragraph and to add thereafter a new paragraph reading: "During the discussions a comparison was made between the nature of the characteristics used for resistance (vertical) of a variety with respect to a range of races of a parasite and for example the electrophoresis of gliadines. The French expert underlined that in the first case the measuring tool was represented by living beings which were open to evolution contrary to the laboratory method required for the electrophoresis."

(ii) to replace "TWA/XII/9" by "TWA/XIII/9" in paragraph 27;

(iii) to replace "seven" by "six" in the first sentence of paragraph 28 and to delete "Sweden", and in the second sentence of the same paragraph to add "from" after "30 ears,"

(iv) to replace "true experts" by "specialists" in the second sentence of paragraph 35.

Report on the Twentieth Session of the Technical Committee

5. The Chairman gave a report on the last session of the Technical Committee, restricting himself to subjects important to the Working Party. The full report on the session is reproduced in document TC/XX/12 Prov.

6. Dr. M.-H. Thiele-Wittig gave a brief report on the third session of the Technical Working Party on Automation and Computer Programs. The full report on that session is reproduced in document TWC/III/13 Prov.

Test Guidelines for Cotton

7. The Working Party noted that no comments had been received from the professional organizations on the draft Test Guidelines for Cotton (document TC/88/1(proj.)). During the session, it made the following changes to that document:

(i) the word "basic" before "seed" was deleted from paragraph 1 of the Technical Notes;

(ii) changes made in the Table of Characteristics:

Characteristic

3	to receive the state "very short" with the example variety "GSA-75" and the state "very tall" with the example variety "Acala SJ-2"
4	to have the example variety "Cocker 210" replaced by "Coker 310"
7	to have the word "pinnate" replaced by "lanceolate"
9	to receive an additional example variety "Blanco 3363" to Note 3
14	to receive example varieties "GSA-71, Stripper 31-A" for Note 1

19 to have the "(+)" deleted and to have the states "very weak" and "very high" added with the example varieties "Promese, Deltapine 41" for Note "9"

20 to have the example variety "NC Nair" deleted;

8. During the discussion, some experts expressed their opinion that the present draft Test Guidelines for Cotton were not complete, due to a lack of example varieties which are an important component of Test Guidelines and also due to a lack of participation by specialists in the Working Party. The Working Party agreed, however, that it should be sent to the Technical Committee for adoption, mentioning these shortcomings.

Test Guidelines for Groundnut

9. The Working Party noted that no comments had been received from the professional organizations on the draft Test Guidelines for Groundnut (document TC/93/1(proj)). During the session, it made the following changes to that document:

(i) changes made to the Technical Notes:

Paragraph

2 to have the word "basic" before "seed" deleted

5 to have the second half of the first sentence starting with "but it is preferable ..." deleted;

(ii) changes made in the Table of Characteristics:

Characteristic

2 to receive a plus "(+)"

14 to have the plus "(+)" deleted

(iii) "Commercial Grouping" as listed in Annex 1 was included as item 5.6 of the Technical Questionnaire.

10. Since the Table of Characteristics of the draft Test Guidelines was provided with few example varieties, the Working Party decided to request the experts from Israel to make up a whole list of example varieties to be sent to the Office of UPOV before the end of August. The draft Test Guidelines would then be sent to the Technical Committee.

Test Guidelines for Rice

11. The Working Party noted that no comments had been received from the professional organizations on the draft Test Guidelines for Rice (document TG/16/2(proj.)). During the session, it made the following changes to that document:

(i) changes made to the Technical Notes:

Paragraph

1 to have the word "basic" before "seed" deleted

4(iii) to have the word "plant" replaced by "stem"

10 to have the word "pod" replaced by "lemma"

(ii) changes made in the Table of Characteristics:

Characteristic

4 to read "Penultimate leaf: anthocyanin coloration of auricles"

20 to receive the Notes "1 to 5" in place of "1 to 9"

27 to have the word "front" replaced by "lateral"

(iii) some of the Japanese example varieties were corrected.

Test Guidelines for Red Clover

12. The Working Party noted document TWA/XIV/5 which contained comments on the draft Test Guidelines for Red Clover and made the following changes to that document (document TG/5/2 (proj.)):

(i) changes made in the Table of Characteristics:

Characteristics

1 to receive an asterisk

2, 4 to have the example variety "Reko" replaced by "Kora"

5 to have the example variety "Reko" replaced by "Krano"

6 to receive the additional states "absent or very few" with the example variety "Merviot", and "very high" with the example variety "Norsman," and to receive the example variety "Sabtoron" for the state "high"

(ii) In the Explanations and Methods in the drawings for characteristic 6, the drawings on the states of expression were deleted;

(iii) In the Technical Questionnaire, in paragraph 5.2, the example variety "Reko" was replaced by "Kora."

Test Guidelines for White Clover

13. The Working Party noted and accepted the draft Test Guidelines for White Clover (document TG/38/4(proj.)) without making any changes.

14. During the examination of the Test Guidelines for White Clover, the expert from the United Kingdom raised a question in respect of homogeneity in a characteristic of frequency as used in Characteristic 3 reading "Leaf: frequency

of plants with white marks". The Working Party noted this outstanding question and will bring it to the attention of the Technical Committee for further study.

Electrophoresis Test on Wheat

15. Mr. Guiard (France) introduced document TWA/XIV/10, prepared by the expert from the United Kingdom, which contained the results of the UPOV Collaborative Study on Electrophoresis in Wheat, and an additional document prepared by the expert from France which contained additional comments on the results of the above study. The last mentioned document is reproduced in Annex II to this report and the general procedure of the study is reproduced in Annex III to this report.

16. During the discussion, some experts pointed out that the repeatability of results of some varieties is very low when using both the electrophoresis and morphological methods, which might be caused by segregations or by the actual differing methods themselves. Without a replication it was difficult to separate these sources of variability. The lack of correlation between morphological characteristics and the results of the electrophoresis tests seemed to be clear and did not need to be proved again.

17. The Working Party agreed to continue its study on electrophoresis, with regard to the following points, before reaching a final conclusion:

(i) member States would use the second grain stored to repeat the electrophoresis tests;

(ii) the present situation of the study on the electrophoresis test would be summarized in a comparative table of the different electrophoretic methods used with accompanying details on each method;

(iii) the results of the second year of test would be awaited.

Hybrid Varieties in Wheat

18. M. Guiard introduced a document prepared by the experts from France and distributed during the session. It was amended during the session and is now reproduced in Annex IV to this report.

19. During the discussion, it became clear that to reach high hybridity in Hybrid Wheat would be difficult and the occurrence of a certain percentage of off-types was the result of the use of the actually available products for sterilization and especially of the interaction of these products with the climatic conditions at the place of production. The discussion was thereafter concentrated on the size of the additional tolerance needed for the testing of homogeneity. The Working Party agreed, however, not to take a final decision on this question at present and to collect further information from the Federal Republic of Germany, France and the United Kingdom for the next session.

Triticale

20. Mr. Guiard introduced document TWA/XIV/2, which contained the list of characteristics by which Triticale could be distinguished from rye, soft wheat and hard wheat and two additional documents prepared by the experts from

France and distributed during the session. They were provided with some additional information, which are now reproduced in Annexes V and VI to this report. There were some additional explanations given concerning the problem of the nature of Triticale and it was summarized that the main problems for Triticale were the matter of its nomenclature and distinctness. With regards to nomenclature, it was decided to bring this question to the attention of ISTA (International Seed Testing Association). As far as distinctness was concerned, Triticale varieties were in the nature of self-pollinated plants but the selfing rate was not quite as high as that of wheat. The Working Party finally agreed that the Federal Republic of Germany and France should prepare draft Test Guidelines for Triticale before the end of the year.

Reproducibility of Characteristics

21. Mr. Guiard introduced an additional document prepared by the experts from France, and distributed during the session, which contained information on the characteristics used for the testing of Wheat in the member States. The paper is reproduced in Annex VII to this report.

22. It was pointed out that a large number of additional characteristics were used in France, Spain and the United Kingdom besides the UPOV characteristics. The Working Party regretted this situation and agreed to seek a possible solution.

23. It came to the general conclusion that it would be necessary to revise the UPOV Test Guidelines for Wheat in the near future. For that purpose it was suggested that a start be made with the reexamination of both the characteristics in the UPOV Test Guidelines for Wheat and the additional characteristics used in the individual member States. This reexamination should be supplemented by information on the testing procedure for Wheat in the different member States. The expert from France would prepare a questionnaire to be sent to member States before the end of September. The reply should be submitted by the end of the year.

24. The Working Party noted that, in the case of cereals, example varieties in the UPOV Test Guidelines could not always be kept available long enough for testing because varieties changed very fast. It was therefore agreed to check which example varieties indicated in the UPOV Test Guidelines for Wheat were no longer available.

Additional Matters Resulting from the Twentieth Session of the Technical Committee

25. Testing of Distinctness. The Working Party noted that the question whether off-types could be sufficiently distinguished to be protected separately from their original varieties was mainly a problem for ornamental plants and especially for flower colors. However it was agreed that, generally, the distance required to discriminate between an off-type and a variety should be the same as that which discriminated between two varieties.

26. Testing of Homogeneity. The Working Party was informed that the Technical Working Party on Automation and Computer Programs had prepared a new method for testing homogeneity which applied log. transformations of all varieties in order to eliminate errors arising from non-uniform selection of Reference Varieties. The expert from the Netherlands announced that he would prepare another method which would apply only to those reference varieties which were scattered near the variety mean. He would propose this method first during

the next session of the Technical Working Party on Automation and Computer Programs.

27. Homogeneity of Hilum Color in Broad Beans and Field Beans. There was no discussion on this subject during the present session. The expert from the Netherlands would make some suggestions for a solution before the end of the year.

28. Procedure for the Establishing of Test Guidelines. The Working Party agreed to the procedure for establishing or revising Test Guidelines as laid down in paragraphs 22, 34 and 36 of document TC/XX/12 Prov.

29. Harmonization of Lists of Characteristics Established by Different Bodies. The Working Party noted that efforts to harmonize lists of characteristics for testing established by different bodies had been carried out successfully for Vine, but not very satisfactorily for other species. It confirmed, however, that such efforts must be continued, although there were great difficulties involved. It came to a general agreement that as a first step it was possible to establish "a minimum list of common characteristics." Another possibility was to invite experts from other bodies to sessions of the Working Party as observers.

Information on Resistance Genes in Cereal Varieties.

30. Mrs. Rasmussen (Denmark, Chairman of the Subgroup on Diseases) introduced document TWA/XIV/6 Rev., which contained comments from member States on the proposal to collect information on resistant genes in cereals and the list of resistance genes in cereal varieties, and document TWA/XIV/3, which contained the recommendations on the use of resistance genes in cereals made by the European and Mediterranean Plant Protection Organization (EPPO). The updated list is reproduced in Annex VIII to this report.

31. The proposal to distribute information on resistance genes in cereals was generally accepted. The Working Party agreed to compose a list of resistance genes for Powdery Mildew in Spring Barley Varieties as a working paper--not yet a final document--which would be updated each year. The Working Party also studied the possibility of establishing some kind of Guidelines for the testing of diseases without, however, making a definite proposal.

32. The Working Party agreed to report to the Technical Committee that resistance should be defined by the resistance genes in the variety (physio form of diseases) rather than by the pathogen because plants are more easily controlled and the goal of this work was to describe varieties and not to describe the pathogen, which would merely be a tool in the test as, for example, other tools, such as the electrophoresis method.

The Variety Concept in Rape

33. The expert from the Federal Republic of Germany introduced document TWA/XIV/12 which explained possible types of varieties in rape seed. Mr. Guiard introduced an additional document on the pure lines of rape, which has been translated into English and is reproduced in Annex IX to this report, and reported on comments made by member States on the revision of the Test Guidelines for Rape.

34. The Working Party came to a general agreement not to start the revision of the Test Guidelines for Rape at once, but in the near future. The revision should be based on the experience gained from the new types of varieties such as synthetic varieties and varieties with two components. It was also pointed out that the breeding method should be taken into consideration when preparing the revision. The Working Party agreed as a first step to collect further information on the concept of Rape variety as well as detailed information on test procedures in different countries. For this purpose, the expert from the Federal Republic of Germany would prepare the questionnaire by the end of September.

Test Guidelines for Turnip and Turnip Rape

35. Mr. Guiard reported on the results of the meeting of the Subgroup held on June 4 to discuss Test Guidelines for Turnip and Turnip Rape on the basis of documents TWA/XIV/7 and TWA/XIV/7 Rev. The Working Party decided to keep a minimum number of characteristics with an asterisk and abandoned the proposal by the Subgroup to include additional asterisks separately for Turnip and Turnip Rape, since there was no clear-cut border between the two. Finally, the Working Party agreed on the following changes to document TWA/XIV/7 Rev.

(i) Changes made to the Technical Notes:

Technical Note

1	to delete the third sentence and to replace the fourth sentence by the first sentence of paragraph 2 of the Technical Notes in document TWA/XIV/7
4	to replace the minimum number of plants "50" by "40"
5	to receive the following grouping characteristics: 3, 10, 28, 37
7	to have the last part of the last sentence but one replaced by: "... except when the characteristic is not appropriate."
10	to receive the minimum sample of "40" typical organs or plant parts

(ii) Changes made in the Table of Characteristics:

Characteristic

1	to have the example variety for Note 1 replaced by "Rex," to be observed at stage "00" and to include the full text of the method, to be supplied by the expert from the Federal Republic of Germany
2	to be deleted
19	to receive explanations reading: "The observation of the speed of formation is made through an assessment of the comparative development of the root on several occasions during the growing period. It may be necessary to dig up the plant for these observations."
32	to read: "Root: curvature of main axis" with the states "absent, present"

35 to have the word "bud" added

36 to be split into two characteristics, one for "autumn sown trials" and another for "spring sown trials"

40 to be recorded at stages 79 to 80

47 to have the word "early" deleted

48 to apply to "autumn sown trials"

(iii) Changes made in the Technical Questionnaire:

Under paragraph 5, the characteristic 36 to be included between 5.3 and 5.4.

Test Guidelines for Lucerne

36. The Working Party noted the proposals for a revision of the Test Guidelines for Lucerne (document TWA/XIV/8). After a preliminary discussion, the Working Party agreed that the experts from France would rewrite the draft Test Guidelines for the next session of the Working Party. All members of the Working Party were invited to send in their comments and suggestions for example varieties to Mr. Guiard (France) before the end of the year.

Comparison of the UPOV Test Guidelines for Potato and the Descriptor List for Potato prepared by IBPGR

37. Mr. Duyvendak (Netherlands) explained the differences between the UPOV working papers on Test Guidelines for Potato (documents TWA/XIV/4 and TWA/XIV/4 Rev.) and the Descriptor List for Potato prepared by the IBPGR. It was mentioned that the IBPGR Descriptor List had a larger number and generally a wider range of characteristics than the UPOV Test Guidelines and that the differences between the equivalent characteristics were so large that even a linear characteristic, such as plant height, did not correspond in the two systems. This situation was caused by the fact that the IBPGR Descriptors were made for all varieties, including wild and primitive varieties, whilst the UPOV Test Guidelines applied only to cultivated varieties. The Working Party considered that to hold a meeting between the UPOV Working Party and IBPGR would be difficult due to the different aims of the lists of characteristics of UPOV and IBPGR.

Test Guidelines for Potato

38. The Working Party noted the working paper on Test Guidelines for Potato (document TWA/XIV/4 Rev.) and made the following changes and remarks on that document:

(i) Paragraph 9 of the Technical Notes should be deleted.

(ii) Characteristic 17 of the Table of Characteristics should receive the Notes "3, 5, 7"

(iii) As far as characteristic 63 is concerned, the experts from the Netherlands and the Federal Republic of Germany would investigate the wording

of the states. The experts from the Netherlands would further examine paragraph 3 of the Technical Notes.

Test Guidelines for Common Vetch

39. The Working Party noted document TWA/XIV/9. In the Technical Notes, it replaced the sentence on the seed to be supplied by "The minimum quantity of seed to be supplied by the applicant in one or several samples should be 1 kg." The members of the Working Party were requested to submit comments to the Office of the Union and to the expert from Spain. The expert from Spain was asked to prepare a new document for the next session of the Working Party. If necessary, a Subgroup Meeting would be held.

Reference Collections for the Testing of Homogeneity in Grasses

40. Mr. Duyvendak (Netherlands) offered to prepare an additional proposal for a mathematical procedure which could be another solution to the problem of selecting control varieties. This proposal would be introduced and discussed firstly at the next session of the Technical Working Party on Automation and Computer Programs.

Items for the Technical Working Party on Automation and Computer Programs.

41. The Working Party had no special items to prepare to the Technical Working Party on Automation and Computer Programs.

Minimum Distance

42. The Working Party noted the results of the twentieth session of the Technical Committee. Since there had been no changes in the situation concerning this subject, the Working Party held no discussions.

Standard Test Guidelines

43. Mr. Guiard explained document TWO/XVIII/3 which contained the proposal for standard Test Guidelines prepared by experts from the Netherlands and translated by the Office of the Union. It was regarded as a common lay out for all plants. After examination of this proposal, the Working Party agreed not to take a final decision, but to accept the lay out of the Technical Working Party for Ornamental Plants and Forest Trees as an improvement with the following remarks which should be reported to the Technical Committee:

(i) The content of the Legend should be placed on the bottom of the first page of the Table of Characteristics in the three UPOV languages;

(ii) The explanation of an asterisk in section VII should be deleted as it was already covered by the Legend,

(iii) The repetition of the heading "Table of Characteristics" should be avoided;

(iv) The numbering of the paragraphs in each section should begin with "1".

List of Reference Books and Documents

44. Mr. Guiard introduced document TWA/XIV/11 which contained additional information for the draft list of reference books and documents. Some experts mentioned that, for the convenience of users, it might be necessary to change the lay out of the list, for instance by using a new page for each new heading. All experts were requested to send any further information to the Office of the Union for general distribution before the end of September.

Status of Test Guidelines

45. The Working Party agreed that the draft Test Guidelines for Cotton, for Groundnut, for Rice (revision), for Red Clover (revision) and for White Clover (revision) should be sent to the Editorial Committee and the Technical Committee for final adoption.

46. The Working Party agreed that the draft Test Guidelines for Potato (revision) should be sent to the professional organizations for comment as soon as the outstanding questions had been settled.

47. The Working Party agreed that the draft Test Guidelines for Turnip and Turnip Rape (revision) should be sent to the Technical Working Party for Vegetables. If that Working Party agreed to the changes made, the document could also be sent to the professional organizations for comments.

48. The Working Party agreed that the draft Test Guidelines for Lucerne (revision) and for Common Vetch (revision) would require further discussion during the next session of the Working Party.

Future Program, Date and Place of Next Session

49. At the invitation of the experts from Ireland, the Working Party agreed to hold its fifteenth session in Dublin, Ireland, from June 4 to 6, 1986, with possible Subgroup meetings on June 3, 1986, at the same place. The meeting would close on June 6 at 1 p.m. For its sixteenth session, the Working Party had already received an invitation from the expert from South Africa to hold that session in South Africa. It is planned to discuss the following items at the fifteenth session of the Working Party:

(i) Final Discussion on Draft Test Guidelines for:

- Potato (revision)
- Turnip (revision)

(ii) Discussion on Working Papers on Test Guidelines for:

- Lucerne (revision) (TG/6/1, TWA/XIV/8 & FR to prepare a new working paper)
- Common Vetch (TG/32/3, TWA/XIV/9 & ES to prepare a new working paper)
- Triticale (DE & FR to prepare a working paper)

(iii) Electrophoresis Test on Wheat (TWA/XIV/10, TWA/XIV/14 Prov., Annex II and III, UK to prepare an updated report and member States to furnish further information and details on the test)

(iv) Testing Procedure for Wheat characteristics (FR to prepare a questionnaire to be answered by the member States)

(v) Hybrid Varieties in Wheat (TWA/XIV/14 Prov., Annex IV & FR to prepare a paper on the results from DE, FR, UK)

(vi) List of Resistance Genes in Wheat (TWA/XIV/14 Prov., Annex VIII & updated information to be sent to UPOV)

(vii) Methods for the testing of Distinctness, Homogeneity and Stability of varieties of Rape (DE to prepare a questionnaire to be answered by the member States)

(viii) Homogeneity of Hilum Color in Broad Bean and Field Bean (NL to prepare a paper)

(ix) Additional Matters Resulting from the Twenty-first Session of the Technical Committee

(x) Standard Test Guidelines (TWO/XVIII/3 & decisions of the Technical Committee)

(xi) List of Reference Books and Documents (updated version according to information received by UPOV)

(xii) Concept of Distinctness and Homogeneity with Respect to Discontinuous Characteristics of Not Truly Self-pollinated Varieties (NL to prepare a paper)

Any Other Business

50. During the session, the majority of experts expressed their opinion that the technical people should have a method of exchanging technical information at a rather early stage, for example, proposals for new testing methods, information on resistance genes, etc. on a private basis within the UPOV member States. The Technical Committee was asked to decide whether the Newsletter of UPOV might be that forum or whether the information was too technical and another means should be sought, for example to activate the present small circulation system using a distribution list, or to publish a new bulletin with a small circulation.

Visits

51. In the late afternoon of the first day of the session, the Working Party made a short visit to the station of the Bundessortenamt at Rethmar (cereal trials) and in the afternoon of the second day it visited the Station at Schornhorst (grass trials).

52. This report has been adopted by correspondence.

[9 Annexes follow]

ANNEX I

LIST OF PARTICIPANTS AT THE FOURTEENTH SESSION OF THE TECHNICAL WORKING PARTY FOR AGRICULTURAL CROPS HANOVER, FEDERAL REPUBLIC OF GERMANY, JUNE 5 TO 7, 1985

I. MEMBER STATES

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[Annex II follows]

TWA/XIV/14
ANNEX II
UPOV COLLABORATIVE STUDY ON ELECTROPHORESIS

1. GENERAL

1.1 The exercise will be prepared by the UK who will submit a Report to the UPOV Technical Working Party on completion.

1.2 Material will be distributed for sowing in autumn 1983.

1.3 Participating countries/centres will comprise:-

Belgium	(Sweden)
France	The Netherlands
Germany	United Kingdom (3 centres)
Spain	

Addresses of participating organisations, with names of contact persons, are listed in Appendix 1.

2. THE AIM OF THE EXERCISE

2.1 To assess the Distinctness and Uniformity of 6 varieties of winter wheat by

(a) conventional morphological examination using ear-rows and a limited number of characteristics.

(b) electrophoresis of the grain storage proteins.

2.2 To compare the results obtained by these 2 methods to assist in estimating the possible value of electrophoresis as an aid in DUS testing.

3. PROCEDURE

3.1 30 numbered ears of each of 6 varieties of winter wheat labelled A-F will be despatched to participating centres by 15 Sept 1983.

3.2 ELECTROPHORESIS

From each ear detach 2 sound grains; carry out electrophoresis on one of them and retain the other.

3.2.1. The method used should be that for which your laboratory is best organised. A description of the method or a reference which describes it should be included with your results.

3.2.2. The band patterns obtained should be marked with the number of the ear and each pattern should be recorded as 'normal' or 'variant' on the VARIETY RECORD FORM (Appendix 3). Please indicate with the notes on your method (a) the scale used to record each band. A 5-state system commonly used is:-

absent
trace
weak
medium
strong

and (b) the criteria you have employed to decide what constitutes a 'variant'. NOTE: In addition to the occurrence of individual 'variants', a variety may be uniform for band pattern or may consist of 2 or more electrophoretic components.

3.2.3. The stained gels should be photographed. Send one copy with your results and retain another for your records.

3.3. MORPHOLOGICAL EXAMINATION

3.3.1 Examine the 30 ears carefully for relevant characteristics among those listed in Appendix 2. Note any which appear to differ from the bulk and record these on the VARIETY RECORD FORM, Appendix 3.

3.3.2. Thresh the ears into packets numbered 1-30 and sow in the field as ear rows numbered 1-30:

No of grains per row	: at least 20
Distance between rows	: c. 200 mm
Distance between grains in the row	: c. 50 mm

3.3.3. Cultural treatment of the ear-rows should be dictated by local practice to ensure good establishment and growth, protection from pest and bird damage and fungal diseases and avoidance of lodging.

3.3.4. Observe the ear-rows at least twice per week throughout the growing-season and until ripe.

Record rows differing from the majority (Variant ear-rows or 'VERs') in the characteristics listed in Appendix 2.

NOTE: VERs may be 'fully variant' where the whole row differs uniformly from the majority in one or more characteristic or 'mixed' (segregating) where some plants are 'normal' and others 'variant'. Record your observations on the VARIETY RECORD FORM, Appendix 3.

4. SENDING THE RESULTS

Send the completed Variety Record Forms, together with the notes/reference on your electrophoresis method and photographs of the gels to Mr A J Eade, NIAB, Cambridge, to arrive not later than 1 November 1984.

UPOV Collaborative Study on Electrophoresis

Appendix

MORPHOLOGICAL etc CHARACTERS

Serial No.	Characteristic	Characteristic No in UPOV Technical Guideline for Wheat; document TG/3/8 of 1981
1	Ear-presence of awns	17
2	Grain-colour	30
3	Straw-wall thickness	13
4	Lower glume : internal surface-extent of hairs	26
5	Date of ear-emergence	5
6	Flagleaf - attitude of leaf blade	3
7	Flagleaf - glaucosity of leaf blade	7
8	Flagleaf - glaucosity of leaf sheath	6
9	Culm - glaucosity of neck	9
10	Ear - glaucosity	8
11	Ear - shape	15
12	Ear - density	16
13	Ear - awns/scurs; presence and distribution	17,18
14	Plant height	12

[Annex III follows]

ADDITIONAL COMMENTS ON THE FIRST RESULTS OF UPOV COLLABORATIVE ON ELECTROPHORESIS IN WHEAT

(see doc TWA XIV/10)

In addition with comments made by M. EADE, the following remarks could be pointed out :

1 - This work is very useful for the electrophoresis point of view, but also for the question of minimum distances with morphological characteristics :

- on one hand, an analysis of results between all participants shows that the threshold to declare off-types for a given characteristic seems to be different.
  As an example, in variety D, for the characteristics 10 and 14 not all countries give the same conclusions, even for the plants 3, 12, 17, 18, 19 and 30 rather frequently declared off types.
- on the other hand, results lead to ask the question on the limit between fluctuation and variation. This remark enforces the necessity of studying progenies in second year to check the validity of the 1st year observations.

2 - About electrophoresis, it is too early to give general conclusions, and the new test in 1985 will be useful to point out the main questions on this (or these) method (s).

Nevertheless, we can notice that :

- The different methods of electrophoresis illustrated in this test give in terms of uniformity good results for varieties B and E considered sufficiently uniform with the morphological characteristics.
  In the case of variety B, there is a question for the IEF method, but only for one lab and not for the other using the same method.

- For the variety A and C, there is a very good concordance between the majority of labs in the identification of the two biotypes. So it is not mainly a question of method, but more to know if it is worthwhile to consider electrophoresis of gliadins as an important characteristic and consequently to require uniformity.

- For the variety D, morphological characteristics seem to be more discriminant than the SGE or PAGE methods, but IEF method might be a good tool as soon as the problem of minimum distances will be solved.

- For the variety F, we can observe that electrophoresis methods, especially SDS - PAGE and IEF have a very good reproductibility at least as good as for the characteristics 14 and without the fluctuation due to seed quality or environmental conditions.

  To complete the comparison, it would be worthwhile to present with 1985 results a comparative table on electrophoresis methods, particularly on differences taken in account and interpreting rules.

[Annex IV follows]

HYBRID VARIETIES IN WHEAT

Synthesis of informations received according to the annex II of C.U. 1007.08.1 :

		CH	D	DK	F	IRL	J	S	SA	UK	NL
(i)	Breeding work	just at the beginning	yes, first on cytoplasmic meristem basis, now on gametocide basis	no	yes, essentially on gametocide basis	no	yes, foundamental research	no	no	yes on gametocide basis mainly with existing commercially available varieties	no
(ii)	Varieties already developped	no, but first varieties in VCU tests	no, but 2 winter varieties in 1st year tests	no	no Only one variety in 3rd year in large VCU plots and 8 varieties under tests	no	no	no	no	6 applications in 84/85	no
(iii)	DUS method	-	no special method in 1st year. In 2nd year, 120 ear-rows of each component will be studied	-	each hybrid and its components are tested for DUS : a little plot for the hybrid and ear-rows for the components. A control is undertaken to check the cross	-	no, for the time being but male sterility and restoring ability might be checked in the testing method	-	-	No special DUS methods. ear-rows are used for F 1 varieties	-
(iv)	Specificity in relation to conventional varieties	-	no specifity for D and S. For uniformity, judgement more lenient with in addition a tolerance for male sterility. Tolerance will be fixed in the light of experience	-	no, specifity for D and S. Uniformity judgement more lenient due to a tolerance for female plants. In relation to our experience with actual hybrid varieties, a tolerance for off-types whatever the origin, might be fixed at 10 % (about 2000 plants are observed in total)	-	no	-	-	F_1 varieties are compared with parents Special allowance is made for female parent. Parents must also satisfy registration criteria	-
(v)	Problems as regards variety protection	-	nothing special	-	in some case, the identification of the female type among hybrid plants	-	distinctness of isogenic lines with only a difference for sterility or restoring ability	-	-	no special problem encountered in first year	-
	Observations	-	Gametic sterility and toxicity of gametocide are under discussion	-	the main questions now are about the importance of the expected improvement with hybrid varieties and more directly in relation to DUS studies, the feasibility of seeds	-	-	-	-	Gametic sterility and toxicity of gametocide are under discussion	-

[Annex V follows]

TRITICALE

Informations received according to the annexe II of C.U. 1007.08.1 :

	CH	D	DK	E	F	J	S	UK	IRL
(i) Breeding work	yes	yes, mainly on hexaploïd level, but also on tetraploïd level.	no	yes	yes mainly on hexaploid level bred on the scheme Triticale 8 X x Triticale 6 X or Triticale 8 X x Wheat 6 X.	no	yes	yes	yes
(ii) Variety already developped	1 variety LASKO	3 varieties granted PBR 2 in 3rd year of test, 3 in 2nd year and 19 in 1st year.	no	8 varieties already included in the national list.	5 varieties on the national list, 6 varieties in 1st year of test	no	4 varieties VCU tests and 3 in DUS tests	1 variety already marketed, 27 applications, in the last three years 6 varieties granted PBR.	in planning
(iii) DUS method	DUS testing made by an other country	Now, the same as for wheat, more appropriate that the one for rye The list of characteristics is given.	-	the same as for wheat	the same as for wheat. The list of characteristics is not exactly the same.	-	the same as for wheat with a judgment in plot and in ears-rows.	DUS in Germany	-
(iv) Specificity in relation to neighboring species	-	fixed homogeneity tolereances and as Triticale is not a strictly selfpollinating, they apply twice the tolerance as for wheat.	-	no comment	fixed homogeneity tolerance and as Triticale is not a strictly selfpollinating they apply twice the tolerance as for wheat.	-	some difficulties due to the lack of guidelines with example varieties.	-	-
(v) Problems as regards plant protection	-	no special problems to distinguish Triticale varieties from wheat or rye.	-	Triticale is not on PBR list in Spain	no special problem to distinguish Triticale varieties from wheat or rye;	-	less than expected	see the comments on TWA XIV/2.	-

[Annex VI follows]

TWA/XIV/14
ANNEX VI

TRITICALE

Comments on the document TWA/XIV/2 prepared by the experts from France :

DK : As they have no experience in DUS test in Triticale, no comment.

HUNG : In reference to the works of some authors, they propose to include Triticale into the Triticum genus as Triticum Triticosecale Wittmack.

About the rules of seed production, hungarian experiences show that cross-pollinisation could reach 20 or 30 %, especially for dwarf and semi-dwarf strains.
They agree with all others points of TWA XIV/2.

NL : The main remark is about the nomenclature : all required conditions to create a new genus are not fullfilled, and particularly clearcut differences between the new genus and the others already existing.
They propose to place each particular group in the taxon with which it is more akin.
At present, the only available group (hexaploïd "self-fertilised" group) could be placed in Triticum aestivum as wheat-like triticale varieties.

S : The nomenclature should be cleared by some authorities, e.g. ISTA Nomenclature Commitee.
They notice that Triticale is mainly self-fertili ed, but there is also a propensity to cross-fertilise.
Some remarks on the total range of the characteristics.

S.A. : No comment . They agree with the document.

U.K. : About the nomenclature, they note that ISTA Committee is to consider the stabilisation of the generic name X Triticosecale Wittmack.
They propose that the genus Triticale should be divided in two groups :

- one to be treated as mainly self-fertilised like wheat
- the other mainly out-pollinated like rye.

They agree that such a proposal would not be without problems and if accepted, it would lead to differential rules for seed production.

They provide comments on the characteristics used to distinguish the four crops, in addition, they give informations like drawings and description of electrophoresis methods.

E : They give comments on the range of some characteristics given to recognize Triticale from Wheat and Rye (in general they propose to increase the ranges given by France for soft and hard wheat and Triticale).

[Annex VII follows]

TWA/XIV/14
ANNEX VII

SYNTHESIS OF THE ANSWERS TO THE ANNEX I OF CU 1007-08-1 :

Additional informations following the survey on the use of UPOV characteristics for wheat.

CH : Strict application of the UPOV guidelines TG/3/8.

No additional information in relation to the questionnaire on the reproductibility of characteristics of wheat.

D : The actual situation is the same as described in TWA/XII/3 rev.

The only characteristic with an asterisk not used is characteristic 26, because more variation within a variety than between varieties.

DK : They follow rather strictly the list of characteristics of TG/3/8

Six additional characteristics have been mentionned in TWA/XII/3 rev.

Some glume-characteristics are not useful due to lack of uniformity and consequently not discriminant.

E : They sent new answers to the questionnaire with some modifications which show that they have now much experience on characteristics as glucosity, anthocyanin coloration, ...

Generally, they give a better appreciation on the characteristics for which they change their judgment.

They keep about 35 additional characteristics.

F : No additional information. About 30 additional characteristics.

IRL : They sent new answers to the questionnaire.

The main modifications are on the judgment of homogeneity and stability (questions 1 c, 1 d). For the question 2 b, they also change their judgment on the discriminating capacity of some characteristics.
For the question 3, it appears that many characteristics formerly not always used, are now used for all varieties with homogeneity and stability requirements.

NZ : They propose some changes in the answers for six characteristics. These changes show that they consider environmental conditions more important and glume-characteristics (23 and 26) with a lack of uniformity.

S : No change. They follow the guidelines TG/3/8.

Some difficulties with the uniformity for the characteristics 5 and 22.

UK : No change. They confirm the use of the guidelines TG/3/8 plus 51 additional characteristics mentionned in TWA/XII/3 Rev. Annex II.

[Annex VIII follows]

LIST OF POWDERY MILDEW (Erysiphe graminis) RESISTANCE SOURCES AND GENES IN SPRING BARLEY VARIETIES

VARIETY	COUNTRY OF	DENMARK		UNITED KINGDOM		GERMANY	SWEDEN
DENOMINATION	ORIGIN	SOURCE(S)	GENE(S)	FACTOR(S)	GENE(S)	SOURCE(S)	GENE(S)
Akka	SE						Ml-k + Ml-a9
Akta	DK	Ly	Ml-a7				
Albert	SE	MC, We	Ml-a9, Ml-g				
Alva	SE	La	Ml-(La)				Ml-v
Annika	SE	Ru, We	Ml-a13, Ml-g				
Apex	NL			9	Ml-o	Ml-o, We	
Aramir	NL	Ar, We	Ml-a12, Ml-g	2,5	Ml-g+Ml-(CP), Ml-a12	Ar, We	
Ark Royal	GB			6	Ml-k+Ml-a7		
Atem	NL			4,9	Ml-v, Ml-o		
Athos	F	Ar, We	Ml-a12, Ml-g	2,5	Ml-g+Ml-(CP), Ml-a12		
Aura	D					Sp, We	
Bacchus	GB			3	Ml-a6		
Beate	D					non-uniform	
Beauly	GB			(4), 5	(Ml-v), Ml-a12		
Benedicte	SE	MC	Ml-a9				
Bente	SE	Ly	Ml-a7				
Berolina	D					non-uniform	
Bingo	DK	La, Ru	Ml-(La), Ml-a13				
Birka	SE	MC	Ml-k + Ml-a9			MC	Ml-k + Ml-a9
Caja	DK	Al, La	Ml-a, Ml-(La)				
Camarque	GDR			Rx	unknown		
Camelot	GB			8	Ml-a9		
Cameo	GB			?8	?Ml-a9		
Candice	GB			2,4	Ml-g+Ml-(CP),Ml-v	La, We	
Canova	D	Ly, We	Ml-k+Ml-a7, Ml-g			Ly, We	
Carina	D	Sp, We	Ml-a6+Ml-a4, Ml-g			SP, We	
Carnival	GB			3	Ml-a6		
Caroline	D					MC + ?	
Celt	GB			7	Ml-a		
Cerise	GB	La, We	Ml-(La), Ml-g+Ml-(CP	2,4	Ml-g+Ml-(CP), Ml-v	La, We	
Claret	GB	La, Ly	Ml-(La), Ml-k+Ml-a7	4,6	Ml-v,Ml-k+Ml-a7		
Claudia	D	La, We	Ml-(La), Ml-g			La, We	

over -

LIST OF POWDERY MILDEW (Erysiphe graminis) RESISTANCE SOURCES AND GENES IN SPRING BARLEY VARIETIES

VARIETY	COUNTRY OF	DENMARK		UNITED KINGDOM		GERMANY	SWEDEN
DENOMINATION	ORIGIN	SOURCE(S)	GENE(S)	FACTOR(S)	GENE(S)	SOURCE(S)	GENE(S)
Corgi	GB			2	Ml-g + Ml-(CP)		
Coronet	GB			? 6	? Ml-k + Ml-a7		
Cromarty	GB			5	Ml-a12		
Croydon	SE			8	Ml-a9		
Cytris	F			8	Ml-a9		
Deacon	GB			5	Ml-a12		
Delta	GB			2,7	Ml-g+Ml-(CP), Ml-a		
Donau	GB			6	Ml-k + Ml-a7		
Doublet	GB			4,6	Ml-v, Ml-k + Ml-a7		
Duchess	GB			R			
Efron	NL			2,8	ML-g+ML-(CP), Ml-a9		
Egmont	GB	Ar, La	Ml-a12, Ml-(La)	4,5	Ml-v, Ml-a12		
Escort	GB			4,6	Ml-v, Ml-k + Ml-a7		
Europa	D	Ar, We	Ml-a12, Ml-g			Ar, We	
Flare	GB			2,4	Ml-g+Ml-(CP), Ml-v		
Flute	GB			7	Ml-a		
Frida	SE						Ml-a12
Georgie	GB	La, We	Ml-(La), Ml-g	2,4	Ml-g+Ml-(CP), Ml-v		
Gimpel	D					non-uniform	
Golden Promise	GB			0	-		
Goldmarker	GB			3,4	Ml-a6, Ml-v		
Goldspear	GB			3,4	Ml-a, Ml-v		
Golf	GB	La, We	Ml-(La), Ml-g+Ml-(CP)	2,4	Ml-g+Ml-(CP), Ml-v	La, We	
Gorm	DK	La	Ml-(La)				
Grit	GDR	Ar	Ml-a12			Ar	
Gula	DK	Ar, We	Ml-a12, Ml-g				
Gunhild	DK	Al, We	Ml-a, Ml-g			Al, We	
Gunnar	SE	Tu	?				Ml-a13 +

over

LIST OF POWDERY MILDEW (Erysiphe graminis) RESISTANCE SOURCES AND GENES IN SPRING BARLEY VARIETIES

VARIETY DENOMINATION	COUNTRY OF ORIGIN	DENMARK		UNITED KINGDOM		GERMANY	SWEDEN
		SOURCE(S)	GENE(S)	FACTOR(S)	GENE(S)	SOURCE(S)	GENE(S)
Harrier	GB			R			
Harry	SE	MC, We	M1-a9, M1-g			MC, We	M1-a9, M1-g
Havila	NL	La, We	M1-(La), M1-g				
Helena	D					Ar, We	
Heriot	GB			0	-		
Hora	D					Ar	
Ida	SE	MC, We	M1-k + M1-a9, M1-g				M1-k + M1-a9, M1-g
Inga	DK	Ar, La	M1-a12, M1-(La)	4,5	M1-v, M1-a12		
Irania	D					Ar	
Jarl	DK	La	M1-(La)				
Javelin	F			2,5	M1-g+M1-(CP),M1-a12		
Jenny	SE	Ru	M1-a13				M1-a13, M1(Ru2)
Jonna	DK	La, Ly	M1-(La), M1-a4+M1-a7				
Jupiter	GB	La, Sp	M1-(La), M1-a6+M1-a14	3,4	M1-a6, M1-v		
Kajsa	SE						M1-k + M1-a9
Kara	SE						M1-k + M1-a9 + ?
Keti	DK	Ru	M1-a13				
Klaxon	GB	La, Ly	M1-(La),M1- k+M1-a7	4,6	M1-v, M1-k+M1-a7		
Koral	CSSR					La, Ru	
Koru	GB	La, We	M1-(La),M1-g+M1-(CP)	2,4	M1-g+M1-(CP),M1-v		
Kustaa	SE						M1-9
Kym	GB			2,4,8	M1-g+M1-(CP),M1-v, M1-a9	non-uniform	
Lami	DK	La	M1-(La)				
Laser	GB			3,4	M1-a6, M1-v		
Leith	GB			2,8	M1-g+M1-(CP),M1-a9		
Lina	SE	La, Mu	M1-(La),M1-a7+M1-(Mu)				M1-a7, M1(Mu)
Lofa	DK	La	M1-(La)	4	M1-v		
Luna	D					Ar	
Louisa	F			? 2,5	?M1-g+M1-(CP),M1-a12		

over -

LIST OF POWDERY MILDEW (Erysiphe graminis) RESISTANCE SOURCES AND GENES IN SPRING BARLEY VARIETIES

VARIETY DENOMINATION	COUNTRY OF ORIGIN	DENMARK		UNITED KINGDOM		GERMANY	SWEDEN
		SOURCE(S)	GENE(S)	FACTOR(S)	GENE(S)	SOURCE(S)	GENE(S)
Magnum	GB	La, Ru	M1-(La), M1-a13	R			
Mandolin	NL	La, LG, We	M1-(La),M1-a7+ M1-(LG), M1-g				
Marlies	SE					non-uniform	
Matelot	GB			7	M1-a		
Mazurka	GB			2,6	M1-g+M1-(CP),M1-k+M1-a7		
Merchant	GB			Rx	unknown		
Midas	GB			3	M1-a6		
Mikkel	DK	La, LG	M1-(La),M1-a7+M1-(LG)				
Mona	SE	MC	M1-k + M1-a9				M1-k + M1-a9
Mosane	B			2	M1-g+M1-(CP)		
Multum	D					We + ?	
Nairn	GB			2,5	M1-g+M1-(CP),M1-a12		
Natasha	F			5	M1-a12		
Nery	DK	La	M1-(La)				
Nordal	DK	Ly	M1-k + M1-a7				
Nudinka	D					Ar	
Odin	DK	LG	M1-a7 + M1-(LG)				
Pamina	SE	MC, We	M1-a9, M1-g				
Patrik	SE						M1-a12
Patty	F			2,5	M1-g+M1-(CP),M1-a12		
Piccolo	NL			2,5	M1-g+M1-(CP),M1-a12		
Porter	GB			6b	M1-a7		
Printa	NL			2,5	M1-g+M1-(CP),M1-a12		
Prisca	SE	MC	M1-a9				M1-k + M1-a9
Proctor	GB	0	-	0	-		
Regatta	GB			Rx	unknown		
Regent	GB			2,4,5	M1-g+M1-(CP),M1-v,M1-a12		
Roland	SE	MC	M1-a9	8	M1-a9	MC	M1-a9
Romi	DK	Ru	M1-a13				

over -

LIST OF POWDERY MILDEW (Erysiphe graminis) RESISTANCE SOURCES AND GENES IN SPRING BARLEY VARIETIES

VARIETY DENOMINATION	COUNTRY OF ORIGIN	DENMARK		UNITED KINGDOM		GERMANY	SWEDEN
		SOURCE(S)	GENE(S)	FACTOR(S)	GENE(S)	SOURCE(S)	GENE(S)
Salka	DK	La	Ml-(La)				
Severa	D					Ar, We	
Sewa	D	Ri	Ml-a3				
Simba	SE	La	Ml-(La)				Ml-v
Simon	SE			8	Ml-a9		
Steina	D					Ar, We	
Sundance	GB			2,4	Ml-g+Ml-(CP),Ml-v		
Sune	DK	La	Ml-(La)				
Susan	DK	Ar, La	Ml-a12, Ml-(La)				
Taarn	SE	Ru	Ml-a13				Ml-a13
Tasman	GB			6c	Ml-a7, Ml-(Ab)		
Tellus	SE	We	Ml-g				Ml-g
Themis	F			2,5	Ml-g+Ml-(CP),Ml-a12		
Torkel	SE	MC	Ml-k + Ml-a9				Ml-k + Ml-a9
Triumph (Trumph)	GDR	Ly, Ab	Ml-a7, Ml-(Ab)	6c	Ml-a7 , Ml-(Ab)	non-uniform	
Troja	SE						Ml-a9
Tron	DK	Ar	Ml-a12				
Tweed	GB			2,8	Ml-g+Ml-(CP),Ml-a9		
Tyra	DK	Al	Ml-a	7	Ml-a		
Uffe	DK	La	Ml-(La)				
Ultra	D					Ar, We	
Vega	DK	La	Ml-(La)				
Verity	GB	La	Ml-(La)				
Villa	D					We	
Vista	GB			4,7	Ml-v, Ml-a		
Warden	GB			3,4	Ml-a6, Ml-v		
Welam	SE	MC	Ml-a9			MC	Ml-a9

ANNEX

EXPLANATIONS TO POWDERY MILDEW (Erysiphe graminis) RESISTANCE GENES IN BARLEY

RESISTANCE	SOURCE(S)	GENE(S)	FACTOR(S)
None	0	-	0
Abessinian	Ab	Ml-(Ab)	6c
Algerian	Al	Ml-a	7
Arabische	Ar	Ml-a12	5
H. Laevigatum	La	Ml-v or Ml-(La)	4
H. Spontaneum	Sp	Ml-a6, Ml-a14	3
Long Glumes	LG	Ml-a7, Ml-(LG)	?
Lyallpur	Ly	Ml-k, Ml-a7	6
"	"	Ml-a7	6b
Monte Christo	MC	Ml-k, Ml-a9	8
Multan	Mu	Ml-a7, Ml-(Mu)	?
Ricardo	Ri	Ml-a3	?
Rupee	Ru	Ml-a13	?
Turkish	Tu	?	?
Weihenstephan	We	Ml-g, Ml-(CP)	2
-	-	Ml-0	9

Definition of other symbols used in List:

Rx = Specific resistance factors unidentified.

R = Resistant to all isolates used in tests.

[Annex IX follows]

TWA/XIV/14

ANNEX IX

[Original: French]

NOTE ON THE PURE LINES OF RAPE (B. NAPUS)

(drafted by M. Renard, INRA Station, Le Rheu, 35000 Rennes, France)

I. PLANT BIOLOGY AND HETEROSIS

Rather opposing views have led to the adoption of differing breeding methods for rape. The choice of method used for rape has in fact to be based on two main criteria:

- its system of reproduction,
- whether or not there exists a depressive effect within the generations produced by self-fertilization and hybrid vigor in the crosses between lines.

1.1 The system of reproduction of rape

Two marker features have been used to study the plant biology of rape:

- the color of the flower (orange/yellow)
- and more recently, the erucic acid content of the seed.

Rape may be considered an intermediary species. Nevertheless, the preponderence of self-fertilization permits rape to be classified with the autogamous species. Indeed, according to many writers, at least two-thirds of the reproduction occurs naturally by self-fertilization (Rumker and Leidner, 1913; Sylven, 1920; Olsson, 1952; Rives, 1957; Olsson and Person, 1958; Andersson and Olsson, 1961; Schuster, 1969; Röbbelen, 1975; Huhn and Rakow, 1979; Dudloff and Schweiger, 1984). In view of its plant biology, it would therefore seem difficult to treat rape as an allogamous species. The rate of cross fertilization can only be increased by the breeding of self-incompatible genotypes or, possibly, sterile male genotypes (gene or cytoplasm male sterility).

1.2 Heterosis and inbreeding in rape

Numerous studies have shown both the superiority of hybrids over line and variety populations and a significant inbreeding effect in the initial self-fertilized generations (Wagner 1954; Shelkondenko, 1968; Schuster and Michael, 1976; Campbell and Kondra, 1978; Lefort-Buson and Dattee, 1982 and 1985; Sernyk, 1983; Olivieri, 1983).

However, rational exploitation of hybrid vigor by producing F1 hybrid seed depends above all on developing a system of male sterility or of self-incompatibility.

II. ARGUMENTS IN FAVOR OF LINE BREEDING

There presently exists no operational system for controlling cross fertilization and the natural rate of cross fertilization in the breeding material is too low for heterosis to be well exploited.

According to studies carried out at INRA-Le Rheu (Lefort-Buson, 1983), the genetic expression is of the same type in both lines and hybrids: comparable distribution of characteristics, similar genetic variability, preponderence of additivity effects. Thus, in theory, heterosis could be maintained in the long term.

Various studies have shown that it is possible to discover lines that exceed the yield of the initial populations or crossings (Rive, 1957; Schuster and Michael, 1976).

Lines bred by genealogical selection are stable in all agronomic characteristics.

Selection in respect of all agronomic characteristics is greatly facilitated by working on homozygotic material.

The homogeneity of pure lines may result in shorter flowering (improved insect control) and greater homogeneity at harvesting (less shattering).

CONCLUSION

This breeding concept has proved efficient in respect of new varieties, particularly for winter rape:

The increase in yield over a period of 25 years is estimated at between 35 and 40%.

French lines have occupied and still occupy a most respectable place at international level: at least 80% of winter rape throughout the EEC (France 98%, Britain 90%, Netherlands 85%, FRG 50%), 85% in Switzerland and 70% in Poland.

The problems of resistance to phoma, of the elimination of erucic acid and of reducing the glucosinolate content of lines with good agronomic characteristics have all been rapidly solved.

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[End of Annex IX and of document]