

**Report of a
Working Group
on Sunflower**

**Held in
Novi Sad
Yugoslavia
20-23 July 1984**

**UNDP/IBPGR EUROPEAN
COOPERATIVE PROGRAMME
FOR CONSERVATION AND
EXCHANGE OF CROP
GENETIC RESOURCES**



International Board for Plant Genetic Resources



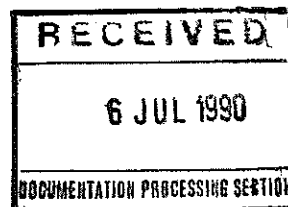
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EUROPEAN COOPERATIVE PROGRAMME FOR THE CONSERVATION
AND EXCHANGE OF CROP GENETIC RESOURCES

Sunflower Working Group

REPORT
of a Working Group held at the Institute
of Field and Vegetable Crops, Novi Sad,
Yugoslavia, 20-23 July 1984



UNDP-IBPGR

The International Board for Plant Genetic Resources (IBPGR) is an autonomous international scientific organization under the aegis of the Consultative Group on International Agricultural Research (CGIAR). The IBPGR, which was established by the CGIAR in 1974, is composed of its Chairman and 16 members; its Executive Secretariat is provided by the Food and Agriculture Organization of the United Nations. The basic function of the IBPGR is to promote and coordinate an international network of genetic resources centres to further the collection, conservation, documentation, evaluation and use of plant germplasm and thereby contribute to raising the standard of living and welfare of people throughout the world. The Consultative Group mobilizes financial support from its members to meet the budgetary requirements of the Board.

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INTRODUCTION

The European Cooperative Programme for the Conservation and Exchange of Crop Genetic Resources (ECP/GR) is organized on the basis of crop working groups. Accordingly, a Sunflower Working Group was convened 20-23 July 1984 at the invitation of the Institute of Field and Vegetable Crops (IFVC), Novi Sad, Yugoslavia. A list of participants is shown in Appendix I.

The participants were welcomed to the Institute by its Director, Prof. T. Vrebalov. Members had an opportunity to visit experimental fields of the Institute.

Objectives of the Working Group meeting were outlined by Mr. P.M. Perret of the ECP/GR Secretariat. The meeting elected Dr. D. Skoric as Chairman of the Working Group. The Agenda as approved is shown in Appendix II.

REPORT

1. A descriptor list following standard IBPGR format had been prepared by Dr. Skoric for consideration by the Working Group. Additionally, a descriptor list from the Research Centre for Agrobotany (RCA), Hungary, was submitted for discussion and another descriptor list was received by the Working Group from the Sunflower Crop Advisory Committee of the U.S. National Plant Germplasm System (NPGS). In the course of lengthy discussions the relative usefulness of descriptors and descriptor states was examined and accordingly a final agreement was reached for a draft list.

2. It was learned that the V.I. Vavilov All Union Scientific Research Institute of Plant Industry (VIR), USSR, is preparing its own descriptor list. The Working Group recommended that the draft descriptor list be submitted to VIR, in consideration of their important scientific activities as they relate to sunflower and their substantial sunflower germplasm collection. It is hoped that mutual agreement on the choice of descriptors can be reached.

3. It was also recommended that the draft be further distributed amongst sunflower scientists in order to obtain a worldwide consensus on descriptors.

4. Although at this stage the sunflower descriptor list is in draft form, it was agreed that it be included in the report as an Appendix so as to facilitate rapid implementation in data bases. (See paragraph 7). The draft descriptor list is shown in Appendix III.

5. Members of the Working Group briefly presented information on the representation of landraces/old cultivars and wild species of sunflower held by institutes in their respective countries. With a few exceptions, the number of accessions in collections of cultivated species was felt to adequately represent the genetic diversity existing in cultivated sunflower in Europe; however there is a need to include in these collections wild species from North and Central America. It is understood material is fully available from the US National Plant Germplasm System. The Working Group noted that a substantial amount of characterization/evaluation work remains to be done for the wild species presently in European collections, and that additional work on landraces/old cultivars is necessary, although these latter were generally considered to have been more extensively characterized/evaluated.

6. The Working Group stated that the size of breeders collections in some cases is extensive but it was pointed out that the material held does not represent the genotypes from original populations although genes of potential interest may be present in these collections. The Working Group recommended that for future germplasm documentation and exchange a more clear distinction be made between original samples and other lines.

7. The necessity for central data base(s) to store and distribute information on sunflower germplasm held in European collections was recognized by the Working Group. The representative of the Cereal Research Institute (CRI), Szeged, Hungary, informed the members of his Institute's willingness to undertake the responsibilities of a data base and subsequently the Working Group recommended that CRI be designated as European data base for cultivated sunflower. In view of their extensive activities in the area of wild species, it was also recommended that IFVC, Yugoslavia be designated as the data base for wild species.

8. The Working Group discussed at length the immediate need for registration of information in the data base. It was recognized that accessions often do not maintain their genetic integrity when multiplied/regenerated under varying ecogeographical conditions, and the importance was stressed of including in the basic passport data certain descriptors such as date of last regeneration or multiplication (1.8); Accession size (1.9); number of times accession regenerated (1.10) etc.

9. Members noted that the type of maintenance technique used during multiplication/regeneration can have an influence on the genetic constitution of the sample. It concluded that a useful descriptor to provide an indication of possible changes of genetic constitution was the number of plants grown during the last regeneration. It recommended therefore that this additional descriptor (1.11) be included in the descriptor list.

10. Consequently, it selected 20 basic passport descriptors from the draft descriptor list and recommended that these constitute the first set of information to be collated by the data bases. These 20 descriptors are marked (with an asterisk) in Appendix III.

11. In order to facilitate the registration of data by data bases and to maintain standards of accuracy, it was strongly recommended that the entire descriptor list format (including descriptor's number, abbreviations, etc.) be strictly followed.

12. After considering various means of transferring data, the Working Group agreed that at this stage the use of magnetic tape was the most compatible method. It agreed to accept a set of minimum guidelines provided by IBPGR (shown in Appendix IV) to be applied when recording information on magnetic tapes. It was agreed that other computerized forms or those manually prepared will be accepted by data bases, when use of magnetic tape is not possible.

13. The Working Group recommended that members should initiate and be responsible for transfer of passport data from their respective countries to the data bases. ECP/GR country coordinators will be requested by the ECP/GR Secretariat to fully support Working Group members in this task, or to initiate action in countries which had no sunflower specialist at this meeting.

14. The Working Group agreed that it will be the responsibility of the data bases, after collation of the data, to identify obvious duplicates between collections and produce a draft preliminary catalogue of European sunflower collections in the form of a print out which will be circulated for verification and comment to the countries involved.

15. It was recommended that following registration of basic passport data, all data on descriptors included in sections CHARACTERIZATION AND PRELIMINARY EVALUATION of the finalized version of the descriptor list should be sent by institutes holding collections to the nominated data bases, and it was hoped that these would continue to assume responsibilities for this subsequent step.

16. The Working Group reviewed various means of promoting the collection and registration of complete characterization data. Due to the considerable number of accessions not yet characterized or evaluated, it recommended, firstly, that a limited number of accessions be selected, taking into consideration the uniqueness of their origin, potential variability, etc. and, secondly, that the characterization and evaluation work should be shared amongst institutes. The Working Group recognized that the selection of accessions can be undertaken only following publication of the preliminary European catalogue.

17. It was recommended that a meeting be convened in the form of a seminar after completion of the draft preliminary catalogue and verification of it by the countries concerned to discuss the rationalization of collections, the promotion of characterization/ evaluation work (see paragraph 16), the responsibilities of active collections^{1/} in maintaining and distributing the material and the registration of full data in the data bases (see paragraph 15).

^{1/} Active collections are intended for medium-term storage, regeneration, multiplication, characterization, documentation and exchange.

18. The following tentative timetable for implementation of data base work and descriptor list publication, was recommended by the Working Group:

- | | |
|--|---------------|
| - ECP/GR Secretariat to publish Working Group Report | Sept.
1984 |
| - Draft descriptor list to be circulated by IBPGR | Sept.
1984 |
| - Return of comments on circulated draft descriptor list to Working Group Chairman | Dec.
1984 |
| - Requested basic passport data to data bases | Jan.
1985 |
| - Publication by IBPGR of descriptor list | May
1985 |
| - Draft preliminary catalogue in form of print-out by data bases to countries | May
1985 |
| - Countries to verify and comment on draft preliminary catalogues | Aug.
1985 |
| - Seminar for rationalization of collections, etc. | Nov.
1985 |
| - Registration of full data in data bases ^{1/} | - |

19. In general the Working Group noted that the European genetic variability was well represented in existing collections. It was pointed out that old landraces of confectionary type in Portugal, Spain and Turkey have limited representation in collections and may be under threat of genetic erosion. In Spain and Turkey the respective responsible institutions are undertaking measures to collect these landraces; ECP/GR Secretariat was requested to contact Portugal to obtain more information on the status of collections there. It was also learned that Morocco may face a similar situation. Local populations from Australia, China and Latin America are very variable and a unique source of germplasm. It was stressed that these populations have not been adequately collected. The Working Group submitted this information to IBPGR for consideration.

20. It was stated that with the exception of H. annuus all wild species are poorly represented in world collections. It was agreed that further collecting is imperative and that, additionally, attention should be drawn to the need to collect interspecific hybrids due to their high

^{1/} The Working Group felt that the assignment of target dates at this time is impracticable for registration of full data.

variability. The Working Group noted with interest a series of proposed collecting missions 1985-88 in the USA by the Sunflower Crop Advisory Committee (NPGS) of the USA. Prospects of enhancing collaboration between European and U.S. scientists were presented by the Chairman of the Committee mentioned above. It was consequently agreed that European scientists should participate in the missions. It was noted that the IBPGR was prepared to assist in this matter, if requested. Specific areas in the USA were considered for collection of wild species, particularly mountainous areas and the border region between USA and Mexico. Portions of Canada and Latin America are also areas where collecting is necessary.

21. The Working Group recognized the need to follow phytosanitary regulations and expressed its strong concern about the possible spread of pathogens when germplasm is exchanged. It recommended that a phytopathologist/entomologist should participate in collecting missions in order to immediately identify samples which are potentially dangerous. In some cases a first preliminary trip at flowering time to observe symptoms on individual plants to be collected may prove useful. The Working Group further recommended that effective measures be taken to stop the spread of pests and pathogens. Among those noted were fumigations, chemical treatments, radiation, maintenance in quarantine for at least one generation, germination of seeds in petri-dishes before transplanting and X-ray analysis.

22. The Working Group recognized the need for training on genetic resources topics (maintenance of germplasm, documentation, characterization and evaluation etc.) in nearly every country. Training on an individual basis was felt to be more effective and worthwhile than group training. It was noted that the ECP/GR is entitled, following the terms of its project document, to support such trainees. The Working Group recommended that the institutes concerned should contact the ECP/GR Secretariat to propose candidates for training and the institute where this should be carried out (preferably in Europe).

23. The Working Group recommended that a trainee from each of the two data bases, CRI, Hungary, and IFVC, Yugoslavia, be sent to one key documentation centre. It was informed of an IBPGR:ECP/GR Workshop on Exchange of Information to be held in Radzikow, Poland, 23-25 October 1984 and recommended that documentation officers of the respective data bases attend this Workshop.

24. It was recommended that a European base collection^{1/} be designated. The proposal from Bulgaria and Czechoslovakia to hold this base collection, respectively in the Institute of Plant Introduction and Genetic Resources "K Malkov", Sadovo, Bulgaria and the Research Institute of Plant Production, Ruzyně, Czechoslovakia was noted with interest. It was further agreed that designation of such a base collection be made after publication of the preliminary European catalogue.

1/ Base collections are intended for long term seed storage usually at -10°C to -20°C and not for exchange of material unless such material is not available elsewhere.

25. The Working Group considered various aspects of maintenance of wild species. It was informed of various methods used for germination of seed and regeneration of plants, e.g. cold treatments. It observed that known current maintenance procedures do not always allow for adequate conservation of collected wild species. Therefore the Working Group recommended that the data base for wild species, IFVC, Yugoslavia, also be designated as a documentation centre for maintenance of wild species and as such will act as a reference centre for distribution of information. It was further recommended that this reference centre will share this information and collaborate with other institutes/networks throughout the world, e.g. the wild species subsection of NPGR. Additionally, it was recommended that European institutes send photocopies of their papers on procedures followed for maintenance in addition to references which address the topic.

26. The necessity of sharing the workload between institutes for multiplication/regeneration of wild species was discussed. The 5th FAO consultation on the European Cooperative Network on Sunflower will be held at the IFVC in Yugoslavia 24-27 July 1984. As IFVC is also liaison centre of the FAO sub-network on sunflower wild species, the Working Group was informed that this matter will be further discussed at the FAO meeting and that mutually beneficial agreement will be reached.

The Working Group recorded its appreciation of the excellent arrangements and facilities provided by the Institute of Field and Vegetable Crops for all aspects of this meeting.

APPENDIX I

LIST OF PARTICIPANTS

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AGENDA

1. Welcome by Prof. T. Vrebalov, Director, Institute of Field and Vegetable Crops
2. Statement of Objectives of the meeting
3. Election of a Chairman, and adoption of Agenda
4. Formulation of a work plan for the ECP/GR on Sunflower Genetic Resources for the period of Phase II: 1984-86 and Phase III 1986-89 under the following headings:
 - 4.1 The adoption of a standard international list of descriptors for Sunflower
 - 4.2 Identification and documentation of contents of European collections
 - 4.2.1 Listing of base and active collections
 - 4.2.2 Definition of minimum passport data necessary to identify accessions
 - 4.2.3 Recommendations on procedures to be followed for rapid transfer of minimum passport data to data base
 - 4.2.4 Production of a European Sunflower inventory based on minimum passport data
 - 4.2.5 The determination of replications of identical material in different collections and production of a revised list of unique accessions
 - 4.2.6 Establishment at responsible institute of full data base (registration of all available passport, characterization and evaluation data) for a revised list of unique accessions
 - 4.2.7 Recommendations on responsibilities for the data base
 - 4.3 Promotion of the collection and registration of complete characterization data
 - 4.4 Proposals for rationalization of collections between institutes/countries
 - 4.5 Urgent collecting requirements

- 4.5.1 Urgent field "rescue" operations, identified by Working Group members
- 4.5.2 Proposals on when and by whom these operations will be carried out
- 4.6 Phytosanitary matters
- 5. Identification of training needs and recommendations on implementation
 - 5.1 Individual training
 - 5.2 Group training - seminars and discussion/workshops
- 6. Other business
- 7. Writing of report and recording decisions taken and recommendations made under items 3-6 above
- 8. Consideration of report and approval by Working Group

DRAFT DESCRIPTORS LIST

PREFACE

[Readers are advised that the following is a draft descriptor list and is published here in accordance with paragraph 4 of the Report (p. 1)].

The IBPGR encourages the collection of data on the first four categories of this list: 1. Accession; 2. Collection; 3. and 4. Characterization and preliminary evaluation. The IBPGR endorses the information in categories 1-4 as the minimum that ideally should be available for any one accession. Other descriptors are given in categories 5 onwards that will enable the simple encoding of further characterization and evaluation data and which can serve as examples for the creation of additional descriptors in the IBPGR form by any user.

Although the suggested coding should not be regarded as the definitive scheme, this format has the full backing of the IBPGR and is promoted worldwide. The descriptor list given here provides an international format and thereby produces a universally understood language for all plant genetic resource data. The adoption of this scheme for all data encoding, or at least the production of a transformation method to convert other schemes to the IBPGR format, will produce a rapid, reliable and efficient means for information storage, retrieval and communication. This will greatly assist the utilization of germplasm throughout the international plant genetic resources network. It is recommended, therefore, that information should be produced by closely following the descriptor list with regard to: ordering and numbering descriptors; using the descriptors specified; and using the descriptor states recommended.

Any suggestions for modifications will be welcomed by the IBPGR Secretariat, Rome.

DESCRIPTOR LIST FOR SUNFLOWER

The IBPGR now uses the following definitions in genetic resources documentation.

- i) passport data (accession identifiers and information recorded by collectors);
- ii) characterization (consists of recording those characters which are highly heritable, can be easily seen by the eye and are expressed in all environments);
- iii) preliminary evaluation (consists of recording a limited number of additional traits thought desirable by a consensus of users of the particular crop).

Characterization and preliminary evaluation will be the responsibility of the curators, while further characterization and evaluation should be carried out by the plant breeder. The data from further evaluation should be fed back to the curator who will maintain a data file.

The following internationally accepted norms for the scoring or coding of descriptor states should be followed as indicated below:

- a) measurements are made in metric units;
- b) many descriptors which are continuously variable are recorded on a 1-9 scale. The authors of this list have sometimes described only a selection of the states, e.g. 3, 5 and 7 for such descriptors. Where this has occurred the full range of codes is available for use by extension of the codes given or by interpolation between them - e.g. in 8. (Pest and disease susceptibility) 1 = extremely low susceptibility and 8 = high to extremely high susceptibility;
- c) presence/absence of characters are scored as + (present) and 0 (absent);
- d) for descriptors which are not generally uniform throughout the accession (e.g. mixed collection, genetic segregation) mean and standard deviation could be reported where the descriptor is continuous or mean and 'x' where the descriptor is discontinuous;
- e) when the descriptor is inapplicable, '0' is used as the descriptor value, e.g. if an accession does not form flowers, a 0 would be scored for the following descriptor.

Flower colour

- 1 White
- 2 Yellow
- 3 Red
- 4 Purple

- f) blanks are used for information not yet available;
- g) standard colour charts e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, Munsell Color Charts for Plant Tissues are strongly recommended for all ungraded colour characters (the precise chart used should be specified in the NOTES descriptor, II).

PASSPORT

1. ACCESSION DATA

*1.1 ACCESSION NUMBER

This number serves as a unique identifier for accessions and is assigned by the curator when an accession is entered into his collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number is still not available for re-use. Letters should occur before the number to identify the genebank or national system (e.g. MG indicates an accession comes from the genebank at Bari, Italy; PI indicates an accession within the USA system)

*1.2 DONOR NAME

Name of institution or individual responsible for donating the germplasm

*1.3 DONOR IDENTIFICATION NUMBER

Number assigned to accession by the donor

*1.4 OTHER NUMBERS ASSOCIATED WITH THE ACCESSION
(other numbers can be added as 1.4.3, etc.)

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not collection number, see 2.1.)

1.4.1 Other number 1

1.4.2 Other number 2

*1.5 SCIENTIFIC NAME

1.5.1 Genus

1.5.2 Species

1.5.3 Subspecies

1.5.4 Botanical variety

1.5.5 Cultivar groups 1/

1/ From early domestication, three directions of dispersal have been traced for the crop (Mackie 1943) and constitute the original varietal stocks that have been clustered by Baudet (1977) into three divisions named "cultivar groups" (cv.gr.). The latter being predominantly anthropomorphic divisions, other groups could be recognized within the species.

*1.6 PEDIGREE/CULTIVAR NAME

Nomenclature and designations assigned to breeder's material

*1.7 ACQUISITION DATE

The month and year in which the accession entered the collection, expressed numerically, e.g. June = 06, 1981 = 81

1.7.1 Month

1.7.2 Year

*1.8 DATE OF LAST REGENERATION OR MULTIPLICATION

The month and year expressed numerically, e.g. October = 10, 1978 = 78

1.8.1 Month

1.8.2 Year

*1.9 ACCESSION SIZE

Approximate number of seeds of accession in collection.

*1.10 NUMBER OF TIMES ACCESSION REGENERATED

Number of regenerations or multiplications since original collection

*1.11 NUMBER OF PLANTS GROWN DURING LAST REGENERATION

2. COLLECTION DATA

*2.1 COLLECTOR'S NUMBER

Original number assigned by collector of the sample normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections and should always accompany sub-samples wherever they are sent

*2.2 COLLECTING INSTITUTE

Institute or person collecting/sponsoring the original sample

*2.3 DATE OF COLLECTION OF ORIGINAL SAMPLE

Expressed numerically, e.g. March = 03, 1980 = 80.

2.3.1 Month

2.3.2 Year

*2.4 COUNTRY OF COLLECTION OR COUNTRY WHERE CULTIVAR/VARIETY BRED

Use the three letter abbreviations supported by the Statistical Office of the United Nations. Copies of these abbreviations are available from the IBPGR Secretariat and have been published in the FAO/IBPGR Plant Genetic Resources Newsletter number 49

2.5 PROVINCE/STATE

Name of the administrative subdivision of the country in which the sample was collected

2.6 LOCATION OF COLLECTION SITE

Number of kilometres and direction from nearest town, village or map grid reference (e.g. TIMBUKTU7S means 7 km south of Timbuktu)

2.7 LATITUDE OF COLLECTION SITE

Degrees and minutes followed by N (north) or S (south), e.g. 1030S

2.8 LONGITUDE OF COLLECTION SITE

Degrees and minutes followed by E (east) or W (west), e.g. 7625 W

2.9 ALTITUDE OF COLLECTION SITE

Elevation above sea level in metres

*2.10 COLLECTION SOURCE

- 1 Wild
- 2 Farm land
- 3 Farm store
- 4 Backyard
- 5 Village market
- 6 Commercial market
- 7 Institute
- 8 Other (specify in the NOTES descriptor, 11)

*2.11 STATUS OF SAMPLE

- 1 Wild
- 2 Weedy
- 3 Breeder's line
- 4 Primitive cultivar (landrace)
- 5 Inbred line
- 6 Hybrid
- 7 Synthetic
- 8 Ornamental
- 9 Other (specify in NOTES descriptor, 11)

2.12 LOCAL/VERNACULAR NAME

Name given by farmer to cultivar/landrace/weed

*2.13 NUMBER OF PLANTS SAMPLED

Approximate number of plants collected in the field to produce this accession

2.14 PHOTOGRAPH

Was a photograph taken of the accession or environment at collection?

- 0 No
- + Yes

2.14.1 Photograph number

If photo has been taken provide any identification number/system in the NOTES descriptor, 11

2.15 HERBARIUM SPECIMEN

Was a herbarium specimen collected?

- 0 No
- * + Yes

*2.16 TYPE OF MATERIAL

- 1 Pure line
- 2 Segregating
- 3 Open pollinated variety
- 4 Hybrid
- 5 Wild species
- 6 Other (specify in the NOTES descriptor, 11)

2.17 GROWTH HABIT

- 1 Determinate bush
- 2 Indeterminate semiclimber
- 3 Indeterminate climber
- 4 Other (specify in the NOTES descriptor, 11)

2.18 IF UNDER CULTIVATION: CROP

- 1 Monoculture
- 2 Mixed cropping (specify companion crop in the NOTES descriptor, 11)
- 3 Relay cropping
- 4 Backyard crop

2.19 TOPOGRAPHY

- 1 Swamp
- 2 Flood plain
- 3 Plain level
- 4 Undulating
- 5 Hilly
- 6 Mountainous
- 7 Other (specify in the NOTES descriptor, 11)

*2.20 PESTS AND DISEASES OF COLLECTION SAMPLE

Specify, using item numbers of pests and diseases (Section 8) and severity of infection on 1-9 scale. '0' indicates that sample has no pests or diseases

2.21 OTHER NOTES FROM COLLECTOR

Collectors should record ecological/climatic information. For cultivated crops, cultivation practices such as irrigation, season of sowing, etc., should be recorded

CHARACTERIZATION AND PRELIMINARY EVALUATION DATA

3. SITE DATA

3.1 COUNTRY OF CHARACTERIZATION AND PRELIMINARY EVALUATION

3.2 SITE (RESEARCH INSTITUTE)

3.3 NAME OF PERSON IN CHARGE OF CHARACTERIZATION

3.4 SOWING DATE

3.4.1 Day

3.4.2 Month

3.4.3 Year

3.5 HARVEST DATE

3.5.1 Day

3.5.2 Month

3.5.3 Year

3.6 CULTIVATION METHOD

Record row spacing and other management practices

4. PLANT DATA

4.1 VEGETATIVE

4.1.1 Leaf size

- 1 Extremely small
- 3 Small
- 5 Medium
- 7 Large
- 9 Extremely large

4.1.2 Leaf habit of petiole

- 1 Erect
- 3 Erect to semi-erect
- 5 Semi-erect
- 7 Semi-erect to horizontal
- 9 Horizontal

4.1.3 Plant height (at full flowering)

- 1 Dwarf (less than 40 cm)
- 2 Extremely small (40.1 - 80.0 cm)
- 3 Small (80.1 - 120.0 cm)
- 4 Small to medium (120.1 - 160.0 cm)
- 5 Medium (160.1 - 200.0 cm)
- 6 Medium to tall (200.1 - 240 cm)
- 7 Tall (240.1 - 280.0 cm)
- 8 Tall to extremely tall (280.1 - 320.0 cm)
- 9 Extremely tall (more than 320.0 cm)

4.2 INFLORESCENCE AND FRUIT

4.2.1 Time of 50% flowering

Measured in number of days before or after 50% flowering time of a reference standard local variety (the name of which should be recorded in NOTES descriptor, 11).

It is more accurate to use sums of effective temperatures to measure this descriptor; therefore when possible this method should be used (to be recorded in NOTES descriptor, 11)

4.2.2 Flowering uniformity

- 1 Extremely uniform
- 5 Medium
- 9 Extremely variable

4.2.3 Time of maturity

Measured in number of days of the reference standard local variety used in 4.2.1 (the name of which should be recorded in NOTES descriptor, 11)

It is more accurate to use sums of effective temperatures to measure this descriptor; therefore when possible this method should be used (to be recorded in NOTES descriptor, 11)

4.2.4 Uniformity of maturity

- 1 Extremely uniform
- 5 Medium
- 9 Extremely variable

4.2.5 Percentage of seed setting under bag

4.2.6 Head angle (at maturity)

- 1 0°
- 2 45°
- 3 90°
- 4 135°
- 5 180°
- 6 225°

(See Figure 1)^{1/}

4.2.7 Head size

- 3 Small
- 5 Medium
- 7 Large

4.2.8 Head shape (grain side)

- 1 Concave
- 2 Flat
- 3 Convex
- 4 Misshapen

(See Figure 2)^{1/}

4.2.9 Branching

- 0 Absent
- + Present

^{1/} Figures are not shown in this draft descriptor list; they will be included in the finalized descriptor list when published by IBPGR

4.2.10 Type of branching

- 1 Basal branching
- 2 Top branching
- 3 Fully branched with central head
- 4 Fully branched without central head

(See Figure 3)^{1/}

4.3 SEED

4.3.1 Seed colour

- 1 White
- 2 Grey
- 3 Brown
- 4 Black
- 5 Anthocyanin

4.3.2 Seed stripes

- 0 Absent
+ Present

4.3.3 Colour of seed stripes

- 1 White
- 2 Grey
- 3 Violet grey

4.3.4 Weight of 1000 seeds

4.3.5 Pericarp thickness

- | | |
|-------------------|---------------------|
| 1 Extremely thin | (less than 0.30 mm) |
| 2 Thin | (0.31 - 0.50 mm) |
| 3 Medium | (0.51 - 0.70 mm) |
| 4 Thick | (0.71 - 0.90 mm) |
| 5 Extremely thick | (more than 0.90 mm) |

4.3.6 Kernel percentage

4.3.7 Protein percentage

Method of measurement should be recorded in NOTES descriptor, 11

4.3.8 Oil percentage

Method of measurement should be recorded in NOTES descriptor, 11

^{1/} Figures are not shown in this draft descriptor list; they will be included in the finalized descriptor list when published by IBPGR

FURTHER CHARACTERIZATION AND EVALUATION

5. SITE DATA

5.1 COUNTRY OF FURTHER CHARACTERIZATION AND EVALUATION

5.2 SITE (RESEARCH INSTITUTE)

5.3 NAME OF PERSON IN CHARGE OF EVALUATION

5.4 SOWING DATE

5.4.1 Day

5.4.2 Month

5.4.3 Year

5.5 HARVEST DATE

5.5.1 Day

5.5.2 Month

5.5.3 Year

6. PLANT DATA

6.1 VEGETATIVE

6.1.1 Root type

- 1 Tap
- 2 Rhizome
- 3 Tuber

6.1.2 Anthocyanin coloration of hypocotyl

- 1 Extremely weak
- 3 Weak
- 5 Medium
- 7 Strong
- 9 Extremely strong

- 6.1.3 Leaf shape
- 1 Oblong
 - 2 Lanceolate
 - 3 Triangular
 - 4 Cordate
 - 5 Rounded
- (See Figure 4)^{1/}
- 6.1.4 Number of leaves
- 6.1.5 Leaf colour
- 1 Light green
 - 2 Medium green
 - 3 Dark green
 - 4 Other (specify in the NOTES descriptor, 11)
- 6.1.6 Anthocyanin coloration of leaf (on margin of young leaves)
- 0 Absent
 - + Present
- 6.1.7 Leaf glossiness
- 0 Absent
 - + Present
- 6.1.8 Leaf blistering
- 1 Extremely weak
 - 3 Weak
 - 5 Medium
 - 7 Strong
 - 9 Extremely strong
- 6.1.9 Keeness of indentation of leaf
- 3 Fine
 - 5 Medium
 - 7 Coarse
- 6.1.10 Regularity of indentation of leaf
- 1 Regular
 - 2 Irregular

^{1/} Figures are not shown in this draft descriptor list; they will be included in the finalized descriptor list when published by IBPGR

6.1.11 Shape of cross section of leaf

- 1 Concave
- 2 Flat
- 3 Convex

(See Figure 5)^{1/}

6.1.12 Leaf wings

- 0 Absent
- + Present

6.1.13 Angle of lateral veins of leaf

- 1 Acute
- 2 Right angle or nearly right angle
- 3 Obtuse

(See Figure 6)^{1/}

6.1.14 Height of the tip of the leaf blade compared to insertion of petiole (at 2/3 height)

- 1 Extremely low
- 3 Low
- 5 Medium
- 7 High
- 9 Extremely high

(See Figure 7)^{1/}

6.1.15 Petiole

- 1 Extremely short
- 5 Medium
- 9 Extremely long

6.1.16 Hairiness at top of stem

- 1 Extremely low
- 3 Low
- 5 Medium
- 7 High
- 9 Extremely high

(See Figure 8)^{1/}

^{1/} Figures are not shown in this draft descriptor list; they will be included in the finalized descriptor list when published by IBPGR

6.1.17 Length of internodes of stem (in central third, at flowering)

- 3 Short
- 5 Medium
- 7 Long

6.1.18 Percent stalk breakage

Record stage of growth in NOTES descriptor, 11

6.1.19 Percent root lodging

Record stage of growth in NOTES descriptor, 11

6.2 INFLORESCENCE AND FRUIT

6.2.1 Bud form before flowering

- 1 Open
- 2 Closed

6.2.2 Bract length on bud

Taken at inflorescence stage and measured in cm.

6.2.3 Bract pubescence

- 1 Glabrous
- 5 Sparse
- 9 Dense

6.2.4 Number of ray flowers

- 1 Extremely few
- 3 Few
- 5 Medium
- 7 Many
- 9 Chrysanthemum

6.2.5 Shape of ray flower

- 1 Elongated
- 2 Ovoid
- 3 Rounded

6.2.6 Colour of ray flower

- 1 Ivory
- 2 Pale yellow
- 3 Yellow
- 4 Orange
- 5 Purple
- 6 Red
- 7 Multicolour

6.2.7 Colour of disk flower

- 1 Yellow
- 2 Red
- 3 Purple

6.2.8 Anthocyanin coloration of stigma

- 1 Extremely weak
- 3 Weak
- 5 Medium
- 7 Strong
- 9 Extremely strong

6.2.9 Pollen quantity

- 3 Poor
- 5 Medium
- 7 Good

6.2.10 Pollen viability (percentage)

6.2.11 Pollen colour

- 1 White
- 2 Pale yellow
- 3 Yellow
- 4 Orange

6.2.12 Pappi

- 0 Absent
- + Present

6.2.13 Pappi colour

- 1 Green
- 2 Red (rust)

6.2.14 Natural position of first flowering lateral head as compared to central head (at end of flowering)

- 1 Below
- 2 Above

6.2.15 Photoperiod response

- 1 Neutral
- 2 Short day
- 3 Long day
- 4 Ambiphoto-periodic

6.3 SEEDS

6.3.1 Length of seed

- 3 Small
- 5 Medium
- 7 Large

6.3.2 Shape of seed

- 1 Elongate
- 2 Ovoid elongate
- 3 Ovoid wide
- 4 Rounded

(See Figure 9)^{1/}

6.3.3 Thickness of seed

- 3 Thin
- 5 Medium
- 7 Thick

(See Figure 10)^{1/}

6.3.4 Cross-section of seed

- 1 Flat
- 2 Ovoid
- 3 Round

6.3.5 Mottling of seed

- 0 Absent
- + Present

^{1/} Figures are not shown in this draft descriptor list; they will be included in the finalized descriptor list when published by IBPGR

6.3.6 Position of stripes

- 1 Marginal
- 2 Lateral
- 3 Both marginal and lateral

(See Figure 11)^{1/}

6.3.7 Seed yield

Yield in grams/head

6.3.8 Volume weight of seeds

Measured kg/hl

6.3.9 Composition of fatty acid

6.3.9.1 Palmitic (16.0)	<u> </u>	%
6.3.9.2 Stearic (18.0)	<u> </u>	%
6.3.9.3 Oleic (18.1)	<u> </u>	%
6.3.9.4 Linoleic (18.2)	<u> </u>	%

6.3.10 Percent chlorogenic acid

7. STRESS SUSCEPTIBILITY

Scored on a scale of 1-9 where:

- 3 Low susceptibility
- 5 Medium susceptibility
- 7 High susceptibility

7.1 LOW TEMPERATURE (SEEDLING STAGE)

7.2 HIGH TEMPERATURE (+35°)

7.3 DROUGHT

7.4 HIGH SOIL MOISTURE

7.5 SALINITY

7.6 SOIL ACTIVITY (pH)

7.7 HERBICIDE REACTION

7.7.1 2,4-D

7.7.2 Other (specify in NOTES descriptor, 11)

^{1/} Figures are not shown in this draft descriptor list; they will be included in the finalized descriptor list when published by IBPGR

8. PEST AND DISEASE SUSCEPTIBILITY

Scored on a scale 1-9, with pest or disease specified where:

- 3 Low susceptibility
- 5 Medium susceptibility
- 7 High susceptibility

8.1 PESTS

- 8.1.1 Homeosoma nebullela (European Sunflower Moth)
- 8.1.2 Homeosoma electellum (N. American Head Moth)
- 8.1.3 Contarinia schulzi
- 8.1.4 Zygogramma exclamationis
- 8.1.5 Bothynus gibbosus
- 8.1.6 Masonaphis masoni
- 8.1.7 Empoasca abrupta
- 8.1.8 Cylindrocopturus adpersus
- 8.1.9 Aphididae Homoptera
- 8.1.10 Tanymecus dilaticollis
- 8.1.11 etc.

8.2 FUNGI

- 8.2.1 Plasmopara helianthi
Specify race if known in NOTES descriptor, 11
- 8.2.2 Puccinia helianthi
Specify race if known in NOTES descriptor, 11

- 8.2.3 Sclerotinia sclerotiorum
 - 8.2.3.1 Root
 - 8.2.3.2 Leaf and stem
 - 8.2.3.3 Head
- 8.2.4 Sclerotinia minor
- 8.2.5 Botrytis cinerea
- 8.2.6 Septoria helianthi
- 8.2.7 Alternaria tenuis
- 8.2.8 Alternaria zinnii
- 8.2.9 Alternaria helianthi
- 8.2.10 Phoma oleracea var. helianthi-tuberosi
- 8.2.11 Phomopsis (Diaporthe spp.)
- 8.2.12 Albugo (Cystopus tragopogonis)
- 8.2.13 Erysiphe cichoracearum
- 8.2.14 Verticillium spp.
- 8.2.15 Verticillium albo-atrum
- 8.2.16 Macrophomina phaseoli
- 8.2.17 Sclerotium rolfsii
- 8.2.18 Fusarium sp.
- 8.2.19 Rhizopus spp.
- 8.3 BACTERIA
 - 8.3.1 Erwinia carotovora
 - 8.3.2 Other
- 8.4 VIRUS AND MYCOPLASM
- 8.5 OTHER
 - 8.5.1 Orobanche Cumana
Specify race if known in NOTES descriptor, 11)
 - 8.5.2 Other

9. ALLOENZYME COMPOSITION

This may prove to be a useful tool for identifying duplicate accessions

10. CYTOLOGICAL CHARACTERS AND IDENTIFIED GENES

10.1 MALE STERILITY TYPE

- 1 Genetic
- 9 Cytoplasmic

10.2 CYTOPLASM TYPE

- 1 CMS 1
- 2 CMS 2
- 3 CMS 3
- 4 CMS 4
- 5 - CMS 5

(continuing for each cytoplasm type identified)

10.3 CHROMOSOME NUMBER

10.4 RESTORER FERTILITY GENES

Record identified genes

10.5 OTHER

11. NOTES

Give additional information where descriptor state is noted as 'Other' as, for example, in descriptors, 2.10, 6.1.5, etc. Also include here any further relevant information

ORGANIZATION OF MAGNETIC TAPE

The magnetic tapes to be exchanged between Germplasm Documentation Centres should be accompanied by a statement giving information on the following technical points:

1. Number of tracks
2. Density of recording
3. Code used
4. Labels
5. Block and record forms
6. Structure of record

The first two items are hardware dependent. Others are software dependent and therefore subject to agreement between the centres.

In order to simplify programmes for reading/writing the tapes, it is recommended that senders of data should:

- a. use ASCII code
- b. not use labels
- c. not 'block' records, i.e. one block should contain one record
- d. use records of fixed length, and put all the data to be transferred on 'one accession - one record' basis
- e. provide an accompanying statement giving details of the layout of descriptors in a record, i.e. descriptor name, length, type and other relevant information in the sequence they appear in the record. This descriptor can either be attached to tape on a sheet of paper or written on tape as a text file. In the latter case the text file should precede the data file.

It will be of great help to the receiver of the tape if the listing of the first few records is attached to the tape.