EUROPEAN COOPERATIVE PROGRAMME FOR CROP GENETIC RESOURCES NETWORKS (ECP/GR)

Report of a working group on *Brassica*

ECP/GR

Second meeting, 13-15 November 1994, Lisbon, Portugal

T. Gass, M. Gustafsson, D. Astley and E.A. Frison, *compilers*

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The European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) is a collaborative programme among most European countries aimed at ensuring the long-term conservation and facilitating the increased utilization of plant genetic resources in Europe. The Programme, which is entirely financed by the participating countries and is coordinated by IPGRI, operates through crop-specific working groups in which curators and breeders work together to analyze the needs and set priorities for the crop concerned. Working group members and other scientists from participating countries carry out an agreed workplan with their own resources as inputs in kind to the Programme. The Programme is overseen by the Technical Consultative Committee (TCC) composed of National Coordinators nominated by the participating countries.

The International Plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization operating under the aegis of the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of plant genetic resources for the benefit of present and future generations. IPGRI works in partnership with other organizations, undertaking research, training, and the provision of scientific and technical advice and information.

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Contents

1. Introduction

The Technical Consultative Committee of ECP/GR, meeting in Szeged in October 1989, unanimously called for the formation of a *Brassica* working group and a first meeting was held in May 1991 in Prague. The second meeting of the ECP/GR *Brassica* Working Group was held in Lisbon, Portugal from 12 to 15 November 1994, just before the ISHS Symposium on Brassicas/Ninth Crucifer Genetics Workshop. It was also held simultaneously with the first meeting of the newly established IPGRI network on Rocket Genetic Resources.

The meeting was attended by participants from 12 countries. Their names and addresses are given in Appendix I. Dr L. Shashilova, N.I. Vavilov Institute of Plant Industry, St Petersburg, Russia and Dr P. Perrino, Germplasm Institute, Bari, Italy were unable to attend the meeting. Dr U. Menini, FAO, Rome, Dr J. Cherfas, Henry Doubleday Research Association, Coventry, UK and Dr J. Mc Ferson, USDA, Geneva, USA who were invited as observers also sent their apologies.

The meeting was opened by Dr T. Gass, the ECP/GR coordinator, who welcomed the participants on behalf of IPGRI. Prof. A. Monteiro then welcomed the members of the Working Group and expressed his satisfaction with the choice of Portugal as the site of the second meeting, and its coincidence with the ISHS meetings. He transmitted apologies for Dr L. Gusmão, the National Coordinator, who would only be able to attend the last session of the meeting. Dr E. Frison provided some background information on IPGRI and Phase V of the ECP/GR Programme.

The Chairman of the Working Group, Prof. M. Gustafsson, welcomed the members and expressed his sincere thanks to Prof. Monteiro and his Organizing Committee who made it possible for the Working Group meeting to be held in conjunction with the important ISHS Symposium. On behalf of the group, he thanked IPGRI, and particularly Drs E. Frison and T. Gass who initiated and organized this second meeting. The Chairman also stressed that in the framework of Phase V, it would be a challenge for the Working Group to extend and improve its activities. He welcomed the new and old members of the group and expressed the hope that during the three days of the meeting, fruitful discussions would take place which would result in the formulation of an adequate workplan for future activities.

Dr S. Padulosi introduced the newly created Rocket Genetic Resources Network and expressed his satisfaction that this network could meet in conjunction with the ECP/GR *Brassica* Working Group.

2. European *Brassica* databases

I. Boukema gave an overview of the objectives and the establishment of the Bras-EDB. She explained its structure and described the difficulties encountered in transforming the received data to a common format. At the present time the database includes 11 958 accessions from 16 collections in 15 countries, including 57% *B. oleracea*, 17% *B. napus* and 15% *B. rapa*. Activities are ongoing to trace nomenclatural duplicates using software developed at IPK, Gatersleben. It was emphasized that the identification of duplicates needs to be confirmed by observation of the material in the field.

The group acknowledged the important progress made in this area and thanked CGN for the accomplished work.

I. Boukema described the system used to group taxons. She emphasized that the nomenclature given by the donating genebank was not discarded but kept in a separate field in the database. The group agreed that the purpose of the database was to be useful and that consequently the approach to grouping taxons needed to be pragmatic. The group supported the concept of grouping the various nomenclatures given by the donating genebanks into a standard list of names used by the database. The list was reviewed by the members of the group who agreed to refer to this list in their internal communications.

Some data from Belgium, Spain, Portugal, the Slovak Republic and several countries of former Yugoslavia are still missing from the database. IPGRI agreed to assist CGN in obtaining the missing data from countries not represented at the meeting through contacts with the respective National Coordinators.

In order to improve the information contained in the database, the group agreed:

- to translate the information to english before sending it to CGN;
- to check the updated database and determine which information from their own institute can still be improved or completed, in particular regarding the common names;
- to send, where this was still lacking, an estimation for the availability of the material.

In particular:

- J. Silva Dias and E. Rosa agreed to send all the data from the collected material not yet documented in the Bras-EDB before the end of 1995;
- Y. Hervé agreed to send the missing data from the French collection before April 1995;
- J. Baert agreed to work on the documentation of the Belgian collection and send the data to CGN by July 1995;
- C. Gómez-Campo agreed to coordinate the transfer of the missing data from CRF, Madrid and if necessary from MBG, Galicia and SIA, Zaragoza before the end of 1994;
- I. Bartkowiak agreed to document IHAR's accessions other than *B. napus* and to send the data to CGN by December 1995;
- V. Kučera agreed to revise the data from the Czech Republic to update the Bras-EDB in view of the recent changes in the Czech agricultural research system by the end of 1995.

At the previous meeting in Prague, Czechoslovakia in 1991, it was agreed that an attempt would be made to establish a minimum list of descriptors in order to promote assessment of these characters and thereby provide users with easy access to the *Brassica* genepool. Consequently lists were produced for oilseed, forage, vegetable and wild *Brassica*.

The group agreed to use these minimum descriptors for all accessions. It was agreed that the descriptors list for *Brassica* and *Raphanus* produced by IPGRI will be used for further characterization and evaluation.

D. Astley and I. Boukema presented the concept of a Core Collection of cultivated *B. oleracea* which they developed for a screening project funded by the EC. They invited the group to give opinions on the approach adopted and to collaborate in further developing a *Brassica* core collection.

The group stressed that the existence of a core collection can in no way justify reduced inputs for conservation of all the available diversity. Core collections are established with the particular purpose to sample the genepool and facilitate access to the entire collection.

The Group acknowledged the usefulness of the work undertaken while noting that availability of sufficient high-quality seed had been one of the selection criteria. This was a pragmatic approach to meet the specific needs of the research project and is not ideal for the development of a Core Collection.

It was agreed that a group consisting of D. Astley, I. Boukema, G. Synnevåg, M. Gustafsson and a representative from IPK, Gatersleben would collaborate in further developing *Brassica* Core Collections which will contribute to more efficient access to the complete collections.

C. Gómez-Campo presented the status of the Wild *Brassica* Database. The group recommended that these data should be included in the Bras-EDB. C. Gómez-Campo agreed to send the data to CGN before September 1995. It was agreed that ETSIA, Madrid would maintain the original Wild *Brassica* Database and update it as documentation of the Wild Collection held in this institute.

Regarding the Bras-EDB it was agreed that updating would be done as needed (approximately every 3 years). *Raphanus* sp. and *Sinapis* sp. should not, as a priority, be included. The group agreed that every member of the group would advertise the availability of the Bras-EDB. It was also agreed that the database would not be enlarged to include data from the USA, Canada and China, but that CGN would simply obtain copies of the databases from these countries for information and reference.

It was recommended that genebanks would send information to CGN on the type of evaluation data which are available for each collection. The evaluation data, however, would not be included in the Bras-EDB.

The European *Brassica* database

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Introduction

The European Database for *Brassica* (Bras-EDB) was developed by the CGN, following a decision at the ECP/GR *Brassica* meeting, 21-23 May 1991 in Prague and Olomouc, former Czechoslovakia (IBPGR 1993). The database focuses on passport data of cultivated taxa from the genus *Brassica* maintained in germplasm collections in European research institutes and genebanks. In the future it might be expanded to include non-European data or data on wild species.

The objective of the Bras-EDB is to support rationalization of genetic resources activities in *Brassica*; its purposes are to:

- make an inventory of the European *Brassica* germplasm holding;
- trace duplicate accessions;
- trace gaps in the European *Brassica* germplasm holding;
- coordinate activities such as collecting missions and seed regeneration/seed increase programmes.

Establishment and content of the Bras-EDB were reported in the Plant Genetic Resources Newsletter (Hintum and Boukema 1993). This is an updated version of that report. A data-dictionary with description of the fields in the Bras-EDB (CGN 1994) is available on request. The database is also freely available in any format for serious users.

The system

Hardware

The Bras-EDB is implemented on a Micro VAX 3800, which is part of the large VAX cluster used by CPRO-DLO. This cluster is connected to the wide area network of the Dutch Ministry of Agriculture (AGRONET). Via this network, communication with other national and international computer networks is feasible.

Software

The Bras-EDB is an application of the database management system ORACLE version 6. The Bras-EDB consists at the moment of seven tables comprising 38 data elements. Six out of seven are decode tables, i.e. tables explaining the meaning of codes used in the only user table. This user table contains the actual passport data. The decode tables decode:

- address codes of the sources of the data, the donor institutions and origin institutions of the material;
- country codes of the origin country of the material; the standard three-letter IPGRI coding system is used;
- usage codes: nine categories of usage are distinguished, i.e. no apparent use, root vegetable, leafy vegetable, stem vegetable, inflorescence vegetable, oilseed, forage, multipurpose and other;
- origin type codes: the usual eight origin types are distinguished, i.e. wild habitat, ruderal, farm field, farm store or threshing place, backyard, local

market, commercial market or seed trade and institute, university, genebank or breeding company;
- population type codes: five population types are distinguished, i.e. wild, weedy, landrace, cultivar and research material;
- sample category: four categories are distinguished, i.e. most original sample, sample not within genebank responsibility, probable duplicate sample and sample with insufficient passport data.

Passport information includes the identity, classification, origin and background of the material. The table storing this information comprises 28 fields. These include a unique Bras-EDB number, fields for the name(s) of the accession, the holding genebank and its number for the accession, taxonomical nomenclature, fields for information describing the origin and ancestry of the accession, and a field indicating whether the sample is expected to be a duplicate, and if so, of which other Bras-EDB number. The table also includes a field for additional information of any kind, allowing for storage and retrieval of information not fitting in one of the other fields.

Transformation of the data

The data were received, after correspondence with European genebanks holding *Brassica* collections, in ASCII or dBASE files. After being loaded in temporary tables in the database they were transformed to fit the Bras-EDB passport table. This effort included:

- transformation of the taxonomical classification to the Bras-EDB system, e.g. the taxon now called *B. oleracea botrytis italica* was received from the data sources as: *B. botrytis italica, B. oleracea italica, B. oleracea* var. *italica, B. oleracea botrytis, B. oleracea botrytis cymosa, B. oleracea botrytis italica* and *B. oleracea* convar. *botrytis* var. *italica,* sometimes with author names (the original names are also retained);
- transformation of all codes, as far as necessary and possible, to the Bras-EDB coding system; the address codes cause particular difficulties in this respect;
- change of the format of the data, e.g. cultivar names were sometimes received in upper case, but in the Bras-EDB only the first letter should be a capital.

These transformed data could then be loaded in the main Bras-EDB table. Once there, the data were completed as far as possible with, e.g. the usage or population type. After transformation of the data and inclusion in the Bras-EDB, the complete database was sent to the donor of the information.

Content of the Bras-EDB

Currently (November 1994) the database contains 11 958 accessions from 16 collections in 15 countries; it holds a wide variety of *Brassica* crops, e.g. vegetables, oil and fodder crops. *Brassica oleracea* is the most numerous species (57%), followed by *B. napus* (17%) and *B. rapa* (15%). Most accessions of which the population type is known are cultivars (70%, corresponding to 40% of the total), but landraces and some wild species also are included. The major taxonomical groups per collection are given in Table 1, the number of accessions per population type are listed in Table 2.

Table 1. Number of accessions in the Bras-EDB per country and major taxonomical group

Country	*Brassica* species							Wild species	Other and unknown	Total
	carinata	*juncea*	*napus*	*nigra*	*oleracea*	*rapa*	× *Brassicora.*			
Bulgaria	—	37	271	24	153	75	—	—	8	568
Czech Republic	1	37	502	8	231	68	—	—	29	876
France	—	—	80	—	514	32	—	—	—	626
Germany: Braunschweig	115	93	260	95	390	195	—	1	1	1150
Germany: Gatersleben	37	75	117	38	652	295	1	36	181	1432
Greece	—	—	—	—	125	—	—	43	1	169
Hungary	—	—	—	—	95	4	—	—	—	99
Italy	—	6	13	2	242	166	—	9	71	509
The Netherlands	108	21	84	24	529	338	11	2	12	1129
Nordic Countries	—	—	94	1	167	83	—	—	—	345
Poland	—	—	301	—	101	7	—	—	—	409
Russia	21	—	—	—	1083	112	—	—	—	1216
Spain	—	—	27	—	153	—	—	—	38	218
Swiss	—	—	5	—	99	18	—	—	—	122
Turkey	—	—	15	65	135	21	—	—	2	238
United Kingdom	8	45	299	1	2121	359	—	5	14	2852
Total	290	314	2068	258	6790	1773	12	96	357	11958

Table 2. Number of accessions in the Bras-EDB per population type

Population type	No. of accessions
Wild	128
Weedy	18
Landrace	1512
Cultivar	4804
Research material	368
Unknown	5128

Duplicates

The identification of duplicates will help genebanks to set priorities for regeneration. Duplicates are traced by matching names or parts of names with a similar sound. This allows identification of duplicates despite typing, transliteration, translation or other errors. Examples of identified duplicates are given in Table 3, showing respectively a situation where a name was translated and the order of words was changed, a situation where transliteration from cyrillic apparently caused some problems, and finally some examples of the number of occurrences of some of the variety names.

Table 3. Examples of the identification of duplicates

Crop	Duplicates with similar names
Kohlrabi	'Blauwe Spek' 'Speck Blauer' 'Blauer Speck'
White cabbage	'Har'kovskaja Zimniaja' 'Khar'kovskaya Zimnyaya' 'Charkovskaja Zimnjaja'
Brussels sprouts[1]	'Wilhelmsburger'
Savoy cabbage[2]	'Vertus'
White cabbage[3]	'September'

[1] 6 samples in 5 collections.
[2] 9 samples in 8 collections.
[3] 6 samples in 3 collections.

Future activities

The next step in the development of the Bras-EDB will be to identify gaps in the European holdings. These gaps will be related to other, non-European *Brassica* collections, such as the USDA collection. Inclusion of other than passport data is also considered.

It is hoped that the Bras-EDB will become the central information source used for the coordination of all activities regarding *Brassica*.

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Taxonomic grouping to be used in the European database

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The following table includes the taxonomic grouping currently used for the European *Brassica* database and the number of accessions for each category. The grouping will be reviewed as appropriate during meetings of the ECP/GR *Brassica* Working Group.

Genus	Species	Subspecies	Common name	Number
Brassica	*barrelieri*			2
Brassica	*bourgeaui*			1
Brassica	*carinata*		ethiopian mustard	8
Brassica	*carinata*			282
Brassica	*cretica*	*cretica*		39
Brassica	*cretica*			7
Brassica	*elongata*	*elongata*		2
Brassica	*elongata*	*integrifolia*		3
Brassica	*fruticulosa*			4
Brassica	*incana*			3
Brassica	*inisma*			1
Brassica	*juncea*	*crispifolia*	mustard	1
Brassica	*juncea*	*crispifolia*		8
Brassica	*juncea*	*folisa*		1
Brassica	*juncea*	*integrifolia*		7
Brassica	*juncea*	*napiformis*		2
Brassica	*juncea*		brown mustard	3
Brassica	*juncea*		chinese mustard	3
Brassica	*juncea*		indian mustard	39
Brassica	*juncea*		large rooted mustard	1
Brassica	*juncea*		mustard	5
Brassica	*juncea*		mustard cabbage	3
Brassica	*juncea*		vegetable mustard	4
Brassica	*juncea*			237
Brassica	*macrocarpa*			8
Brassica	*montana*			3
Brassica	*napus*	*napobrassica*	rutabaga	55
Brassica	*napus*	*napobrassica*	swede	184
Brassica	*napus*	*napobrassica*	swede turnip	4
Brassica	*napus*	*napobrassica*		92

Genus	Species	Subspecies	Common name	Number
Brassica	*napus*	*napus*	fodder rape	32
Brassica	*napus*	*napus*	rape	7
Brassica	*napus*	*napus*		270
Brassica	*napus*	*napus annua*	rape	3
Brassica	*napus*	*napus annua*		112
Brassica	*napus*	*napus biennis*	fodder kale	1
Brassica	*napus*	*napus biennis*	fodder rape	3
Brassica	*napus*	*napus biennis*	hakuran kale	1
Brassica	*napus*	*napus biennis*	kale	2
Brassica	*napus*	*napus biennis*	rape	291
Brassica	*napus*	*napus biennis*	rape kale	39
Brassica	*napus*	*napus biennis*	rape kale (red)	1
Brassica	*napus*	*napus biennis*	winter forage rape	25
Brassica	*napus*	*napus biennis*		582
Brassica	*napus*	*napus pabularia*		4
Brassica	*napus*	*oleifera*	oilseed rape	38
Brassica	*napus*	*oleifera*	rape	1
Brassica	*napus*	*oleifera*		77
Brassica	*napus*	*oleifera annua*	spring oilseed rape	10
Brassica	*napus*	*oleifera annua*		3
Brassica	*napus*	*oleifera biennis*	winter oilseed rape	37
Brassica	*napus*	*oleifera biennis*		18
Brassica	*napus*		couve nabica	25
Brassica	*napus*		× *B. pekinensis* (Lour.) Rupr.	2
Brassica	*napus*			149
Brassica	*nigra*	*abyssinica*	black mustard	24
Brassica	*nigra*		black mustard	1
Brassica	*nigra*			233
Brassica	*oleracea*	*acephala*	black kale	1
Brassica	*oleracea*	*acephala*	fodder black kale	2
Brassica	*oleracea*	*acephala*	fodder kale	458
Brassica	*oleracea*	*acephala*	hyb ornamental kale	8
Brassica	*oleracea*	*acephala*	hybrid kale /borecole	1
Brassica	*oleracea*	*acephala*	kale	38
Brassica	*oleracea*	*acephala*	ornamental kale	4
Brassica	*oleracea*	*acephala*	portuguese kale	57
Brassica	*oleracea*	*acephala*	rape kale	1
Brassica	*oleracea*	*acephala*	thousand head cabbage	1
Brassica	*oleracea*	*acephala*	vegetable kale	2
Brassica	*oleracea*	*acephala*	white flowered kale	2
Brassica	*oleracea*	*acephala*	winter kale	2
Brassica	*oleracea*	*acephala*		65

Genus	Species	Subspecies	Common name	Number
Brassica	*oleracea*	*acephala costata*		4
Brassica	*oleracea*	*acephala medullosa*	marrow stem kale	12
Brassica	*oleracea*	*acephala medullosa*		14
Brassica	*oleracea*	*acephala palmifolia*	kale	1
Brassica	*oleracea*	*acephala palmifolia*		3
Brassica	*oleracea*	*acephala ramosa*		10
Brassica	*oleracea*	*acephala sabellica*	borecole	101
Brassica	*oleracea*	*acephala sabellica*	borecole kale	22
Brassica	*oleracea*	*acephala sabellica*	curly kale	1
Brassica	*oleracea*	*acephala sabellica*	hybrid kale/borecole	1
Brassica	*oleracea*	*acephala sabellica*	ornamental kale	3
Brassica	*oleracea*	*acephala sabellica*		25
Brassica	*oleracea*	*acephala viridis*	fodder cabbage	3
Brassica	*oleracea*	*acephala viridis*		31
Brassica	*oleracea*	*alboglabra*	chinese kale	36
Brassica	*oleracea*	*alboglabra*	hybrid chinese kale	2
Brassica	*oleracea*	*alboglabra*		13
Brassica	*oleracea*	*botrytis*		81
Brassica	*oleracea*	*botrytis botrytis*	autumn cauliflower	101
Brassica	*oleracea*	*botrytis botrytis*	cauliflower	632
Brassica	*oleracea*	*botrytis botrytis*	cauliflower group	4
Brassica	*oleracea*	*botrytis botrytis*	cauliflower	16
Brassica	*oleracea*	*botrytis botrytis*	green cauliflower	20
Brassica	*oleracea*	*botrytis botrytis*	hybrid cauliflower	19
Brassica	*oleracea*	*botrytis botrytis*	hybrid summer cauli	1
Brassica	*oleracea*	*botrytis botrytis*	hybrid winter cauli	1
Brassica	*oleracea*	*botrytis botrytis*	late summer cauli	1
Brassica	*oleracea*	*botrytis botrytis*	romanesco cauli	14
Brassica	*oleracea*	*botrytis botrytis*	summer cauliflower	118
Brassica	*oleracea*	*botrytis botrytis*	winter cauliflower	153
Brassica	*oleracea*	*botrytis botrytis*		113
Brassica	*oleracea*	*botrytis italica*	black broccoli	3
Brassica	*oleracea*	*botrytis italica*	broccoli	162
Brassica	*oleracea*	*botrytis italica*	broccoli group	5
Brassica	*oleracea*	*botrytis italica*	calabrese	44
Brassica	*oleracea*	*botrytis italica*	green head broccoli	4
Brassica	*oleracea*	*botrytis italica*	heading broccoli	1
Brassica	*oleracea*	*botrytis italica*	hybrid broccoli	5
Brassica	*oleracea*	*botrytis italica*	hybrid calabrese	8
Brassica	*oleracea*	*botrytis italica*	late broccoli	1
Brassica	*oleracea*	*botrytis italica*	portuguese broccoli	2
Brassica	*oleracea*	*botrytis italica*	purple head broccoli	30
Brassica	*oleracea*	*botrytis italica*	sprouting broccoli	80
Brassica	*oleracea*	*botrytis italica*		48

Genus	Species	Subspecies	Common name	Number
Brassica	*oleracea*	*capitata*	autumn cabbage	4
Brassica	*oleracea*	*capitata*	cabbage	620
Brassica	*oleracea*	*capitata*	cattle cabbage	15
Brassica	*oleracea*	*capitata*	coleslaw cabbage	1
Brassica	*oleracea*	*capitata*	early summer cab	2
Brassica	*oleracea*	*capitata*	fodder cabbage	4
Brassica	*oleracea*	*capitata*	hyb autumn cabbage	3
Brassica	*oleracea*	*capitata*	hyb early summer cab	1
Brassica	*oleracea*	*capitata*	hyb sum/aut cabbage	1
Brassica	*oleracea*	*capitata*	hyb summer cabbage	5
Brassica	*oleracea*	*capitata*	hyb winter cabbage	1
Brassica	*oleracea*	*capitata*	hybrid cabbage	36
Brassica	*oleracea*	*capitata*	hybrid storage cabb	1
Brassica	*oleracea*	*capitata*	jersey cabbage	1
Brassica	*oleracea*	*capitata*	loose head cabbage	1
Brassica	*oleracea*	*capitata*	ornamental cabbage	1
Brassica	*oleracea*	*capitata*	pickling cabbage	1
Brassica	*oleracea*	*capitata*	shetland cabbage	9
Brassica	*oleracea*	*capitata*	spring cabbage	57
Brassica	*oleracea*	*capitata*	summer cabbage	24
Brassica	*oleracea*	*capitata*	winter cabbage	14
Brassica	*oleracea*	*capitata*		118
Brassica	*oleracea*	*capitata alba*	autumn white cab	1
Brassica	*oleracea*	*capitata alba*	cabbage	2
Brassica	*oleracea*	*capitata alba*	e summer white cabb	2
Brassica	*oleracea*	*capitata alba*	fodder cabbage	1
Brassica	*oleracea*	*capitata alba*	hyb autumn cabbage	1
Brassica	*oleracea*	*capitata alba*	hyb summer white cab	8
Brassica	*oleracea*	*capitata alba*	hyb white cabbage	2
Brassica	*oleracea*	*capitata alba*	hyb winter white cab	1
Brassica	*oleracea*	*capitata alba*	hybrid cabbage	1
Brassica	*oleracea*	*capitata alba*	hybrid white cabbage	2
Brassica	*oleracea*	*capitata alba*	pointed headed cab	44
Brassica	*oleracea*	*capitata alba*	spring cabbage	1
Brassica	*oleracea*	*capitata alba*	spring white cabbage	39
Brassica	*oleracea*	*capitata alba*	summer white cab	42
Brassica	*oleracea*	*capitata alba*	white cabbage	959

Genus	Species	Subspecies	Common name	Number
Brassica	*oleracea*	*capitata alba*	white storage cabb	2
Brassica	*oleracea*	*capitata alba*	winter white cabbage	15
Brassica	*oleracea*	*capitata alba*		80
Brassica	*oleracea*	*capitata costata*		15
Brassica	*oleracea*	*capitata rubra*	cabbage	1
Brassica	*oleracea*	*capitata rubra*	hybrid red cabbage	3
Brassica	*oleracea*	*capitata rubra*	red cabbage	198
Brassica	*oleracea*	*capitata rubra*		2
Brassica	*oleracea*	*capitata sabauda*	hybrid savoy cabbage	7
Brassica	*oleracea*	*capitata sabauda*	savoy	13
Brassica	*oleracea*	*capitata sabauda*	savoy cabbage	257
Brassica	*oleracea*	*capitata sabauda*	winter cabbage	1
Brassica	*oleracea*	*capitata sabauda*	winter savoy cabbage	1
Brassica	*oleracea*	*capitata sabauda*		74
Brassica	*oleracea*	*gemmifera*	Brussels sprouts	433
Brassica	*oleracea*	*gemmifera*	hyb Brussels sprout	106
Brassica	*oleracea*	*gemmifera*		55
Brassica	*oleracea*	*gongylodes*	fodder kohlrabi	1
Brassica	*oleracea*	*gongylodes*	hybrid kohlrabi	1
Brassica	*oleracea*	*gongylodes*	kohlrabi	149
Brassica	*oleracea*	*gongylodes*	kohlrabi	25
Brassica	*oleracea*	*gongylodes*	purple kohlrabi	2
Brassica	*oleracea*	*gongylodes*	white kohlrabi	1
Brassica	*oleracea*	*gongylodes*		46
Brassica	*oleracea*	*gongylodes asiatica*		11
Brassica	*oleracea*	*oleracea*		6
Brassica	*oleracea*	*tronchuda*	sprouting tronchuda	6
Brassica	*oleracea*	*tronchuda*	tronchuda cabbage	30
Brassica	*oleracea*	*tronchuda*	tronchuda kale	6
Brassica	*oleracea*		cabbage	1
Brassica	*oleracea*		cabbage × cauli	5
Brassica	*oleracea*		cabbage × kale	1
Brassica	*oleracea*		kale × kohlrabi	1
Brassica	*oleracea*		kales/cabb/w cauli	1
Brassica	*oleracea*		ornamental kale	1
Brassica	*oleracea*		white flowered kale	3
Brassica	*oleracea*		wild cabbage	8
Brassica	*oleracea*		wild species	1
Brassica	*oleracea*			604

Genus	Species	Subspecies	Common name	Number
Brassica	*oleracea* × *rapa*			1
Brassica	*rapa*	*chinensis*	chinese cabbage	2
Brassica	*rapa*	*chinensis*	flat chinese cabbage	1
Brassica	*rapa*	*chinensis*	hyb japanese greens	1
Brassica	*rapa*	*chinensis*	hybrid pak choy	2
Brassica	*rapa*	*chinensis*	japanese greens	5
Brassica	*rapa*	*chinensis*	korean cabbage	1
Brassica	*rapa*	*chinensis*	pak choy	30
Brassica	*rapa*	*chinensis*	purple flowering pak choy	1
Brassica	*rapa*	*chinensis*	purple pak choy	1
Brassica	*rapa*	*chinensis*		43
Brassica	*rapa*	*chinensis atrovirens*	chinese cabbage	1
Brassica	*rapa*	*chinensis chinensis*		26
Brassica	*rapa*	*chinensis rosularis*		9
Brassica	*rapa*	*dichotoma*	spring turnip oils. rape	7
Brassica	*rapa*	*dichotoma*		22
Brassica	*rapa*	*japonica*	mizuna	2
Brassica	*rapa*	*japonica*		14
Brassica	*rapa*	*narinosa*		2
Brassica	*rapa*	*oleifera*	turnip oils. rape	2
Brassica	*rapa*	*oleifera*	winter turnip oils. rape	6
Brassica	*rapa*	*oleifera*		32
Brassica	*rapa*	*oleifera annua*	spring turnip oils. rape	57
Brassica	*rapa*	*oleifera annua*		21
Brassica	*rapa*	*oleifera biennis*	winter turnip oils. rape	95
Brassica	*rapa*	*oleifera biennis*		29
Brassica	*rapa*	*oleifera silvestris*	Ruvo-group	16
Brassica	*rapa*	*oleifera silvestris*		7
Brassica	*rapa*	*parachinensis*	choy sum	3
Brassica	*rapa*	*pekinensis*	chinese cabbage	73
Brassica	*rapa*	*pekinensis*	flow chinese cabbage	2
Brassica	*rapa*	*pekinensis*	hyb chinese cabbage	17
Brassica	*rapa*	*pekinensis*	× *B. oleracea* L.	1
Brassica	*rapa*	*pekinensis*		117
Brassica	*rapa*	*pekinensis cephalata*		9
Brassica	*rapa*	*pekinensis glabra*		71
Brassica	*rapa*	*pekinensis laxa*		43
Brassica	*rapa*	*perviridis*	japanese greens	2
Brassica	*rapa*	*perviridis*	komatsuna	2
Brassica	*rapa*	*perviridis*		4
Brassica	*rapa*	*rapa*	autumn turnip	2

Genus	Species	Subspecies	Common name	Number
Brassica	*rapa*	*rapa*	fodder turnip	199
Brassica	*rapa*	*rapa*	hybrid turnip	1
Brassica	*rapa*	*rapa*	late turnip	1
Brassica	*rapa*	*rapa*	stubble turnip	14
Brassica	*rapa*	*rapa*	turnip	191
Brassica	*rapa*	*rapa*	turnip + flw shoots	5
Brassica	*rapa*	*rapa*	turnip + turnip tops	2
Brassica	*rapa*	*rapa*	turnip broccoli	1
Brassica	*rapa*	*rapa*	turnip tops	13
Brassica	*rapa*	*rapa*	vegetable turnip	45
Brassica	*rapa*	*rapa*		176
Brassica	*rapa*	*ruvo*	brocc o cima di rapa	31
Brassica	*rapa*	*ruvo*	broccoletto	20
Brassica	*rapa*	*ruvo*	broccolette di rapa	10
Brassica	*rapa*	*ruvo*	cima di rapa	23
Brassica	*rapa*	*trilocularis*	yellow sarson	2
Brassica	*rapa*	*trilocularis*		13
Brassica	*rapa*		rapistrum	4
Brassica	*rapa*		turnip	2
Brassica	*rapa*			239
Brassica	*repanda*			1
Brassica	*rupestris*			7
Brassica	*sinapistrum*			1
Brassica	*souliei*			2
Brassica	*subspontanea*	*planifolia*		1
Brassica	*tournefortii*			2
Brassica	*villosa*			9
Brassica			interspecies hybrid	1
Brassica			kale	1
Brassica				354
× *Brassicoraphan*		*radicole*		5
× *Brassicoraphan*		*raparadish*		6
× *Brassicoraphan*				1

Minimum descriptor lists

The minimum descriptor lists agreed upon by the ECP/GR *Brassica* Working Group are based on the Descriptors for *Brassica* and *Raphanus* published by IPGRI in 1990[1]. The number in parentheses indicates the trait number in the IPGRI descriptors list and the fact that this trait is evaluated according to the criteria described in the IPGRI publication. (*) means that the trait is assessed in a different way or that the descriptor is not considered in the IPGRI list.

Vegetable *Brassica*

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Cabbage		
Plant diameter		**(4.2.4)**
Leaf blade blistering/crimping		**(4.2.21)**
Leaf colour		**(4.2.24)**
Head shape		**(4.2.35)**
Stem length under head		**(4.2.57)**
Kales		
Plant growth habit		**(4.2.2)**
Plant height		**(4.2.3)**
Stem width		**(4.2.55)**
Leaf colour		**(4.2.24)**
Leaf blade curling (*)	3 = weak 5 = medium 7 = strong	
Tronchuda		
Leaf colour		**(4.2.24)**
Petiole and/or midvein enlargement		**(4.2.27)**
Head shape		**(4.2.35)**
Head-forming leaf overlap at terminal region		**(4.2.36)**
Stem length under head		**(4.2.57)**
Cauliflower		
Petiole length		**(4.2.28)**
Curd size (flowering head size)		**(4.2.74)**
Curd shape (flowering head shape in longitudinal section)		**(4.2.75)**
Curd colour (flowering head colour surface)		**(4.2.78)**
Head cover from subtending leaves		**(4.2.81)**
Harvest time or season (*)		

1 IBPGR. 1990. Descriptors for *Brassica* and *Raphanus*. International Board for Plant Genetic Resources, Rome

Broccoli

Petiole length	**(4.2.28)**
Floral apex branching pattern	**(4.2.73)**
Flowering head solidity	**(4.2.77)**
Flowering head colour surface	**(4.2.78)**
Head colour from subtending leaves	**(4.2.81)**

Brussels sprouts

Plant height	**(4.2.3)**
leaf blade width	**(4.2.13)**
Leaf colour	**(4.2.24)**
Sprout colour	**(4.2.68)**
Sprout distance (number of buds per unit of stem)	**(4.2.64)**

Forage *Brassica*

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Fodder turnip rape

Leaf: number of lobes (*)	5: many 3: medium 1: few 0+: none with incisions of blade base 0: none	
Root shape		**(4.2.82)**
Root colour of skin at top		**(4.2.92)**
Root colour of skin below ground		**(4.2.92)**
Root colour of flesh (*)	1: white 2: yellow	
Plant senescence at autumn sowing (*)	1: leaves are dying early 2: medium 3: plant keeps green leaves	
Flowering earliness at spring sowing		**(4.3.2)**
Ploidy level (*)	1: diploid 2: tetraploid	

Forage rape

Leaf: number of lobes (*)	5: many 3: medium 1: few 0+: none with incisions of blade base 0: none	
Leaf colour		**(4.2.24)**
Leaf bloom		**(4.2.26)**
Stem length		**(4.2.54)**

Stem width		(4.2.55)
Stem internode length (*)	short medium long	
Days to flower		(4.3.2)
Petal colour		(4.3.17)
Erucic acid and glucosinolates in seeds (*)	00 0– –0	

Fodder radish

Juvenile development	(4.1.5)
Plant height	(4.2.3)
Plant diameter	(4.2.4)
Lodging	(4.2.9)
Leaf hairiness	(4.2.25)
Root diameter	(4.2.85)
Root exterior colour	(4.2.92)
Days to flowering	(4.3.2)
Petal colour	(4.3.17)

Oilseed *Brassica*

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Oilseed rape (*Brassica napus* L. var. *oleifera f. biennis* & *f. annua*)

Leaf margin undulation		(4.1.3)
Stem anthocyan content at flowering stage (*)	0: absent 3: low 7: high	
Leaf division on a fully developed leaf of rosette (*)	1: entire 2: sinuate 3: lyrate 7: numerous lobes	(4.2.18)
Flower petal colour		(4.3.17)
Degree of branching		(4.2.2)
Silique length		(4.4.2)
Seed coat colour		(4.4.12)
1000-seed weight (g) at 5-6% moisture content		(4.4.13)
Erucic acid content (*)	0: absent (0-2%) present (% of fatty acids)	
Glucosinolate content (*)	0: absent present (µM/g of seeds)	

Oil content (*)	1: low 3: intermediate 5: high 7: very high (> 39% in meal)

Wild *Brassica*

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Wild *Brassica oleracea*

Leaf surface (*)	1: glabrous 2: hispid hairs 3: sparsely villous 4: densely villous
Flower colour (*)	1: white or whitish 2: yellow
Pods (*)	1: normal 2: thickened
Silique (*)	1: short (< 3 cm) 2: medium (3-6 cm) 3: long (> 6 cm)

Core collection

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The development of a preliminary core collection for *Brassica oleracea* grew out of the involvement of the Centre for Genetic Resources the Netherlands (CGN) and the Genetic Resources Unit of Horticulture Research International (HRIGRU) in a European Union research project. The AIR3 project is titled: The location and exploitation of genes for pest and disease resistance in European genebank collections of horticultural brassicas. The initial project task for the two GRUs was to identify the accessions of *B. oleracea* in their collections that represent the range of crop type/form and ecogeographic location, for use in the screening programmes, i.e. a preliminary core collection.

Frankel (1984) introduced the concept of a core collection for genetic resources collections, the core representing the genetic diversity of a crop species and its relatives with a minimum of duplication. Brown (1989) clarified the terminology and expanded on the idea by providing genetic and pragmatic arguments supporting the concept. Recently he reviewed the evolution of the core collection concept (Brown 1995). A précis of Brown's main points follows:

1. The term 'reserve collection' covers all material in genetic resources collection(s) other than the core accessions. Considerations regarding restricted availability — for instance due to plant breeders' rights — should not determine an accession's imputation to the core or reserve collection.

2. The entries in a core collection are chosen primarily to be representative. The aim of maximizing genetic diversity implies that the core should minimize similarity between its entries. For example, the sampling would include single-spaced points along an ecological gradient (a spectrum) rather than be restricted to a few repeats from both extremes (maximum diversity).

3. The core should not be confused with a set of accessions used for a specific purpose, i.e. a differential set, such as the *Brassica* S-allele series or European Clubroot Differentials.

4. "Evidence from experimental population genetics points to the genetic diversity of a species not being randomly dispersed within and between populations, but being organized to varying degrees. This organization means that careful selection of samples for the core will contain more of the genetic diversity than a random sample."

5. Pragmatic considerations: a curator has to make decisions or set priorities in the maintenance and characterization of collections and in the provision to users. Decisions taken in the development and maintenance of a core collection would be an aid in determining overall policy for collections.

6. The size of the core should be sufficient to encompass the known variation of the genepool. Brown suggested an arbitrary target of 5-10% with decisions based on as much information as possible including provenance, characterization, taxonomy and evaluation.

7. The core should be dynamic with changes in size and content through positive action by the curator(s).

8. A new development of the core concept has arisen from applying the concept to a crop species as a whole rather than a specific germplasm collection as this was previously intended. This results in a synthetic core, assembled from the various cooperating collections or from fresh sampling of wild or crop populations. The synthetic core collection is of more assistance to germplasm use but may need to be managed as a new distinct unit and requires an international committee of experts to agree on its composition.

The EU *Brassica* Project

The project is a collaboration between HRI, CGN and the Instituto Superior de Agronomia (ISA), Lisbon. The objective is to screen the cultivated *B. oleracea* genepool for resistance to downy mildew (*Peronospora parasitica*), white blister (*Albugo candida*) and the cabbage aphid (*Brevicoryne brassicae*). The research teams developed their screen protocols, which in turn defined the number and quality of accessions required from the genetic resources collections.

The pathology protocols placed constraints on the selection of material for purely pragmatic reasons. There was a minimum requirement for years 1 and 2 of >1000 seeds of very high germination quality. In addition, the two fungal screen protocols required the cotyledons to be well developed and suitable for inoculation. The project coordination team decided that a collection of 250-300 accessions would be practical. CGN and HRIGRU selected material from their collections based on taxonomy, provenance, additional information and stock control data totalling 293. The stock data (seed number and percentage germination) were used in order to meet the germination and seedling quality requirements. These accessions were coded BOCC in the *Brassica* European Database (Bras-EDB) at CGN.

The Bras-EDB was used to identify material available in other genetic resources collections which was not represented in the core. Significant collections were received from IPK, Gatersleben, Germany and INRA, Le Rheu, France. The project team were keen to fill gaps for specific crops such as collards from the USA; or material from geographic locations, especially the east European Republics, Spain and Turkey. Efforts have been made to fill these gaps from other genebanks and national programmes. ISA agreed to provide additional accessions representative of Portuguese brassicas. A majority of the accessions received required regeneration prior to their addition to the core or use in the research project.

The preliminary core collection developed for this project is in a sense fixed in that no accessions will be removed, although some will be added, during the lifetime of the project. However, in the broader context we see the core as fluid (Fig. 1), to be updated as additional accessions representing different parts of the genepool are received, and where necessary regenerated.

We envisage practical problems in the maintenance of a core collection. The core is the 'window' on the reserve collection and so will be the starting point for most requests. The core accessions will require large-scale regeneration in order to meet this potential demand. It will be possible to share the load if national programmes are prepared to produce bulk seed of specific accessions. It will even be possible for accessions to remain within national collections providing quality storage is available. However, in order to meet requests for the core collection, it will be more efficient to store the core accessions in a minimum number of genebanks. CGN and HRIGRU are happy to accept this coordination role to develop and maintain a core collection for *B. oleracea*.

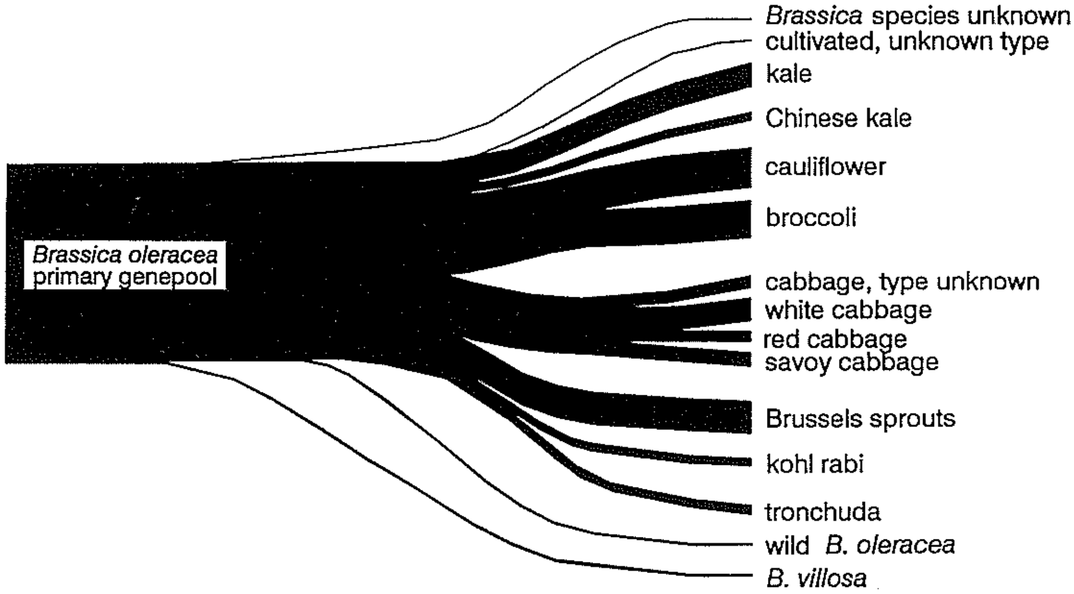

Fig. 1. First part of the diversity tree of the *Brassica oleracea* core collection (Hintum, in press)

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Wild (n=9) *Brassica* species database

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The Germplasm Conservation of Wild (n=9) Mediterranean Brassicas Project was developed under the sponsorship of the International Board on Plant Genetic Resources (IBPGR) from 1982 to 1988. The objective of this project was the collection, conservation, multiplication and germplasm characterization of wild species of the *Brassica oleracea* group.

The information compiled in each of these tasks was structured according to the descriptor list, which was designed specifically for this purpose. In this list, the following types of data are considered:

- passport data;
- multiplication data;
- characterization data.

Passport data include the geographic location and ecological aspects of the population, and information regarding the collected sample. The latter includes the field number assigned to the sample at the time of recollection, the accession number in the Germplasm Bank at ETSIA, Universidad Politécnica de Madrid (Spain), where the original sample is preserved, and the accession numbers of the banks where duplicated samples are found.

Multiplication data contain the conditions in which the multiplication of the different samples was carried out, as well as information on the material obtained after multiplication (weight and volume). This section of the descriptor list includes two accession numbers, the accession number of the original sample and that of the regenerated material, both of which are preserved in the Germplasm Bank at U.P.M. Accession numbers of the bank in which duplicates of the regenerated material are stored were also considered.

Characterization data are structured in Plant Data (comprised of information regarding seeds, plantlets and the vegetative stage of the adult plants), Flowering Data and Fructification Data.

All currently compiled information is administered by dBASE IV version 1.0 database management system, implemented on PC compatible computers with MS-DOS version 6.2 operating system.

The database consists of three files, BRAPASS.DBF, BRAMULT.DBF and BRACHAR.DBF, corresponding to the three sections of the descriptor list: passport data, multiplication data and characterization data. Each of the fields in these files directly corresponds to each of the descriptors utilized.

3. Genetic resources collections

The status of *ex situ* collections was presented for wild taxa by C. Gómez-Campo and N. Stavropoulos, and by representatives of national programmes. With regard to the wild collection maintained in Spain, the group recommended that its duplication should rapidly be completed. C. Gómez-Campo agreed to do this by March 1995.

Wild collections

Status (1994) of the wild *Brassica* collections in Spain

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Six IPGRI- (then IBPGR) funded missions between 1982 and 1988 have provided most of the material now stored in the Madrid UPM genebank for wild crucifers or duplicated in a number of other banks. Team members were M. Gustafsson, A. Zamanis, P. Perrino and the author, with other persons participating in specific areas. Some minor missions in the same period (Tohoku Univ., Fondena and P. Arús) also provided interesting material. Collections before 1982 include material obtained by E. Hernández-Bermejo, C. Gómez-Campo, M. Gustafsson, D. Ockendon and S. Snogerup. Table 1 summarizes the chronological input for the existing accessions.

Table 1. Accession chronology of wild (n=9) *Brassica* germplasm

Year	No. accessions	Source
1971-1981	21	Various
1982	25	Greece
1983	27	Crete (Greece), Turkey
1984	45	Sicily, southern Italy
1985	41	Italy, France, Spain
1986	19	Cyprus, Tunisia, Corsica, Sardinia
1988	44	Spain, France, Great Britain
1989-1994	17	Various
Total	239	

However, some 30 of these accessions can be considered redundant (either the same population recollected in separate years or in too close localities). This and other possible reasons will make totals closer to 200 or lower, in the following tables.

Table 2. Countries of collection of wild (n=9) *Brassica* germplasm

Country	Species	No. of accessions
Great Britain	*oleracea*	18
France	*oleracea, montana, insularis*	36
Spain	*oleracea, bourgaei, montana*	23
Italy	*montana, incana, villosa, rupestris, macrocarpa, insularis*	70
Tunisia	*insularis*	3
Greece	*cretica*	45
Turkey	*cretica*	7
Cyprus	*hilarionis*	2
Ukraine	*incana*	1
Total		205

Table 3. Populations collected for each taxon of wild (n=9) *Brassica* germplasm

Taxon	Number
B. alboglabra (received)	4
B. bourgaei (received)	2
B. cretica	17
B. cretica subsp. *aegea*	24
B. cretica subsp. *laconica*	11
B. hilarionis	2
B. incana	26
B. insularis	17
B. macrocarpa	3
B. montana	31
B. oleracea	47
B. rupestris	8
B. rupestris subsp. *hispida*	5
B. villosa	0
B. villosa subsp. *bivoniana*	6
B. villosa subsp. *drepanensis*	4
B. villosa subsp. *tinei*	2
Total	209

The difference in totals with Table 2 originates from the exclusion in Table 3 of four accessions of *B. alboglabra,* of Chinese origin. Duplication has been done automatically for most accessions collected between 1982 and 1986. *Brassica oleracea* collected in 1988 still needs to be duplicated in Sendai. Some samples collected in Spain are also pending.

Duplicated accessions of wild (n=9) *Brassica* germplasm include the following:
- 190 samples stored in the Madrid UPM seed bank (multiplication is still pending);
- 164 samples duplicated in at least a second bank (Sendai or Kew), and
- 112 of them also in a third bank.

Other banks holding accessions are in Sendai (Japan), Thessaloniki (Greece), Bari (Italy), Izmir (Turkey), Porquerolles (France) and Wakehurst, Kew (Great Britain).

Between 1983 and 1986, an IBPGR-financed program for multiplication permitted the acquisition of larger amounts of many originally small samples and making others available for distribution. At a lower rate, some multiplications were also performed afterwards.

For the multiplication program of wild (n=9) *Brassica* germplasm, multiplication of 81 accessions is estimated to be necessary (original sample volume < 25 ml). During the period 1983-87, 51 (63%) accessions were multiplied. Bulking up of 24 tiny base collections is required, and identification of 24 accessions is needed. It will be necessary to make distribution possible for 51 accessions.

Distribution at the species level was done some time ago (1966 for crucifers, 1976 for (n=9) *Brassica*) by means of the UPM catalogue, but IBPGR missions have opened the possibility for making much wider diversity available to researchers. In the 1990 catalogue (last issue), 17 seed samples were offered and an Appendix with 30 new collected accessions was included. The multiplication program will allow the inclusion of 27 more accessions in the near future. It is not easy to collect statistics on (n=9) *Brassica* seed requests dispatched, because they are often mixed with requests for other species or genera, but at least 10 sets have been sent to as many important teams working with *Brassica* in several countries, mostly for characterization (morphological or phytochemical), breeding for disease resistance and cytogenetic research.

Finally, regeneration has been given very low priority because seed preservation methods used seem to be highly effective. Crucifer seeds conserved for 25 years showed no significant decrease in germination rates. On the contrary, most of them showed significantly increased rates, probably because some initial dormancy is removed during conservation. Most (n=9) *Brassica* seeds have now been less than 12 years in storage. Under these circumstances regeneration has been only directed to some ancient samples kept in paper bags, usually combining this action with multiplication. We firmly believe that money invested in effective conservation would save many times as much in future regenerations. With wild species, the inconveniences of regeneration (intrinsic difficulties, unwanted selection, etc.) are not only economical.

The wild *Brassica* collection of the Greek Gene Bank

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The wild *Brassica* collection of the Greek Gene Bank (GGB) is limited to only one species, namely *Brassica cretica*. The collection was formed after the collecting expeditions of 1982 and 1983 which yielded seed samples from 43 populations. The expeditions were funded by FAO and IBPGR and were carried out by an international team of *Brassica* specialists (C. Gómez-Campo from Spain, M. Gustafsson from Sweden, A. Zamanis from Greece, and others).

The exploration was primarily targeted to southern Greece in general and particularly to the island of Kriti (15 populations), Peloponnisos (14 populations), Attiki and Evia (12 populations) and to a limited number of islands of the Aegean Sea (i.e. Kythira, 2 populations). The samples have been safely packaged by their collector (C. Gómez-Campo) in sealed glass tubes partially filled with colour-indexed silica gel. They are stored in the short- to medium-term storage room (Active Collection) under a temperature regime of 0-5°C. Recent viability testing has shown that the seeds maintain high viability.

The collected germplasm is safely duplicated at the *Brassica* collection of C. Gómez-Campo, at the Polytechnical University in Madrid. Technical and financial limitations have not allowed the regeneration and multiplication of this material until now. The germplasm is documented in our database as a *Brassica* file using the dBASE IV package.

Brassica cretica grows in rather inaccessible sites and is not considered to be particularly threatened. However, much of its existing variation in Greece has not been explored. New populations have been discovered in recent expeditions or occasional trips in Agion Oros (one near the monastery of Simonos Petra and another near the little monastery of Mylopotamos) and in Rodos island (on the walls of the acropolis of Lindos) (Fig. 1). The time, however, was not appropriate for seed collection. This shows that many new populations are certain to be found through expeditions to unexplored areas. For this reason the following action is needed:

1. A number of collecting expeditions to selected islands of the Ionian and the Aegean seas. If these expeditions are also aiming at the parallel collection of other wild *Brassica* species, certain complementary collections should be directed to a number of ecogeographically representative parts of the country, to roughly sample the existing variation of those species. Participation of experienced wild *Brassica* collectors from the ECP/GR *Brassica* Working Group or other institutions is considered a must.

2. Urgent regeneration and multiplication of the conserved germplasm, since the seed viability limit under the employed storage conditions in the GGB is nearing completion and any further delay puts the seeds in danger. Regeneration will also provide the opportunity for characterization and partial evaluation of the germplasm.

The above interventions are envisaged in the framework of the national genetic resources programme, approved by the parliament (Presid. Decree 80/1990) but still not enforced, and the respective EU programme that is long awaited by the genetic resources people of Europe.

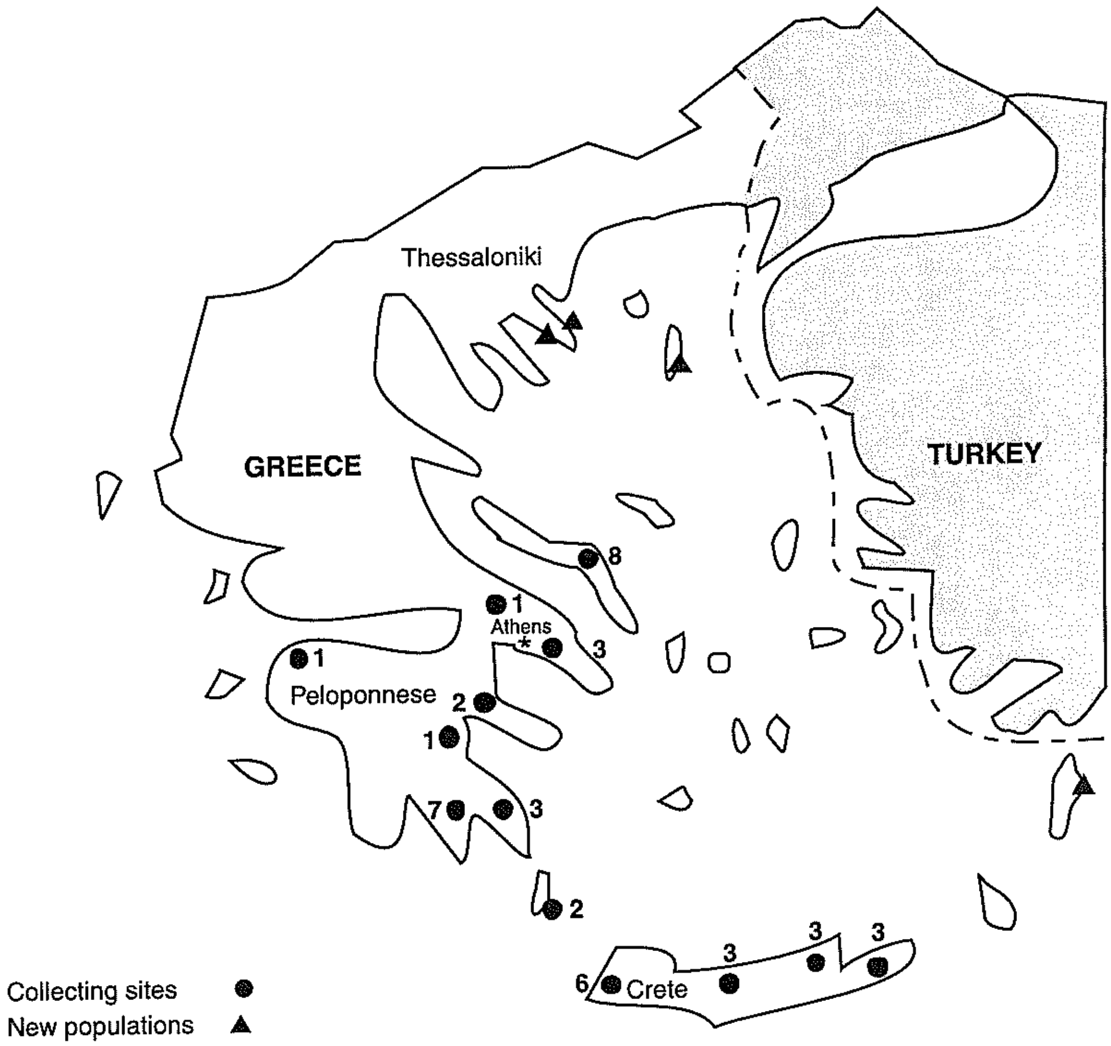

Fig. 1. Collecting sites and respective number of samples of *Brassica cretica*

National collections

With regard to the status of national collections:

- J. Silva Dias agreed to regenerate 20% of the collection held at ISA, Lisbon before the end of 1995. If more vernalization rooms and staff are made available a larger part of the collection will be regenerated. The collection at BPGV, Braga, will be regenerated as soon as facilities and staff are available. A duplicate of the material of which sufficient seed is available will be sent to HRI, Wellesbourne and to ISA, Lisbon as duplicates.
- Y. Hervé agreed to regenerate the remaining 75% of the collection held in INRA Rennes and proposed to send safety duplicates to HRI, Wellesbourne and to CGN, Wageningen. The group recommended that resources should be made available to fulfil this important objective.
- J. Baert informed the group that necessary equipment is now being installed for regeneration and conservation, although availability of staff remains a limiting factor. The group recommended that resources should be made available to meet these important requirements.
- C. Gómez-Campo agreed to contact INIA in view of the need for safety duplication of the collections held by CRF, Madrid, UPV, Valencia, MBG, Galicia and SIA Zaragoza.
- I. Bartkowiak agreed to send safety duplicates of IHAR's accessions not needing regeneration to CGN, Wageningen and HRI, Wellesbourne before the end of 1995.
- V. Kučera agreed to review the Czech collection and prioritize the conservation efforts according to type of accession and quality. He agreed to accomplish this for all the oilseed accessions in the Opawa Station and for 50% of the material in Olomouc by the end of 1996.

  The group appreciated the work done by the vegetable group in Olomouc and looks forward to constructive collaboration with the group now that they belong to the national genebank in RICP, Praha-Ruzyne.
- L. Frese agreed to produce safety duplicates for 60% of the FAL collection by the end of 1995. The group noted the uncertainty about the continuation of the CGN/FAL collaboration on brassicas and recommended that the work continue in any event in order to fulfil FAL's commitment within the ECP/GR *Brassica* Working Group.
- T. Gladis informed the group that IPK was continuing their regeneration programme and studies on the effectiveness of pollinating insects. The group recognized the thoroughness of the work undertaken in IPK on a wide range of crops and subjects. It recommended that resources should stay available at IPK to fulfil this institute's commitment within the ECP/GR *Brassica* Working Group.
- G. Synnevåg stated that NGB would continue the description work started on horticultural brassicas and proposed to begin with the agricultural brassicas using the minimum descriptor lists.
- D. Astley agreed to continue the regeneration activity (approximately 100/year) and prioritize safety duplication to CGN. He agreed to discuss safety duplication with the John Innes Centre and with SASA.
- I. Boukema agreed to revise the need for regeneration of the material in the CGN collection.
- N. Stavropoulos agreed to give higher priority to regeneration of the material held within the Greek Genebank. The group recommended that availability of facilities and staff to the Genebank be increased in order to ensure the institution's commitment within ECP/GR.

Status of the Belgian *Brassica* collection

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Apart from the Rijksstation voor Plantenveredeling, other breeding institutes hold collections. This is the case of SES Europe and PGS Gent, but these can not be considered as original collections.

The *Brassica* collection at the Rijksstation voor Plantenveredeling currently includes:

Brassica napus	69 accessions (including 5 old Belgian varieties)
Brassica rapa	87 accessions (including 60 of Belgian origin)
Raphanus sativus	22 accessions
Sinapis alba	23 accessions
Brassica oleracea botrytis	14 Belgian landraces

The duplicated material includes:

Brassica rapa	53 Belgian accessions at CGN, Wageningen
Brassica napus	3 Belgian accessions at CGN, Wageningen

Documentation of the collection is manual and not yet completed. The evaluation of the material has also not yet been completed. In regard to regeneration, 10 accessions of *B. rapa* have been regenerated in 1994.

A new walk-in freezer and seed packing machine were ordered. At the time of repacking the collection, the related data will be computerized.

Status of the Czech *Brassica* collection

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Introduction

Study, conservation and utilization of plant genetic resources have a long tradition in the Czech Republic. Several research and breeding stations were already working with plant genetic resources at the beginning of this century. They gathered and preserved a number of local landraces and conducted breeding work from that period. A wider choice of foreign cultivars, especially those of European origin, has been also maintained. Continuously, more than 30 institutions have been involved in germplasm conservation in the former Czechoslovakia and more than 43 000 accessions were maintained in collections in 1991.

The national information system on plant genetic resources (EVIGEZ) was developed in the Research Institute of Crop Production (RICP) Prague. RICP runs also a genebank that was completed in 1988 and provides long-term storage of all seed-propagated collections in the country.

After the division of former Czechoslovakia in 1992, collections were also divided according to the location of particular institutes. At that time institutions located in the Czech Republic held about 40 000 accessions including duplicates.

Since 1990 funds for agricultural research have been strongly reduced. The original number of 19 institutions dealing with plant genetic resources in the Czech Republic has decreased to 12. The Czech Ministry of Agriculture decided to make secure germplasm one of the priorities in agricultural research. As a result of this decision the National Programme on Plant Genetic Resources Conservation and Utilization was launched in 1994. This project provides necessary funds for all institutions dealing with plant genetic resources and covers all essential activities on germplasm study, maintenance and utilization. RICP Prague Gene Bank is in charge of coordination of this programme.

The main tasks of the National Programme include:

- collecting of local landraces and wild relatives;
- increasing collections aimed at covering a wide diversity of breeders' needs
- systematic documentation of collections;
- regular evaluations of collections;
- long-term preservation of germplasm and international collaboration;
- gathering of knowledge and resources for breeding and wider diversity of crops;
- creation of new collections (in crops where there is an interest on the part of breeders or growers).

Brassica collections

Many changes have occurred since the status of Czech *Brassica* collections was presented at the first meeting of the ECP/GR *Brassica* Working Group in 1991. Owing to the division of former Czechoslovakia the Slovak collection of Brassicaceae vegetables in the Research and Breeding Station in Kvetoslavov (more than 400 accessions) has been lost. But this collection containing mainly registered cultivars and breeding material had rather a local importance.

There are two main collections of *Brassica* genetic resources in the Czech Republic at present, namely the collection of predominantly vegetable crops in the former Research Institute for Vegetable Breeding and Growing (RIVGB) in Olomouc and the collection of oil crops in the Research Institute of Oilseed Crops in Opava. The RIVGB has been abolished and a group of research workers engaged in plant genetic resources (about 15 persons) has been associated with the Gene Bank at RICP, Prague-Ruzyne. Because of personnel changes and unreliable documentation, thorough revision of the collection had to be done recently. The result of the revision was a strong reduction of the former *Brassica* collection. Other collections mentioned in 1991, i.e. collection of *Brassica* fodder crops in the Research Institute of Fodder Plants in Troubsko near Brno and the collection of special breeding materials in RICP Prague Ruzyne, have not been established yet.

A review of the current status of the *Brassica* collections in the Czech Republic is shown in Table 1.

All accessions of *Brassica* collections are included in the passport part of the Czech central documentation system EVIGEZ. No description data are available yet. Not all samples are fully available because of limited amounts of seeds or low germination ability of seeds (see Table 1). These accessions should be regenerated preferentially. The accessions marked 'X' (Table 1) have been unviable due to previously unsuitable storage conditions.

Table 1. Documentation of collections of *Brassica* spp. in Czech Republic institutions

Species	Subspecies/ varieties	No. accessions with passport data	Status of accessions			Availability of accessions[1]			Storage in the GB, Prague[2]	
			Landraces/ primitive cvs.	Advanced cvs.	Breeders' material	Y	L, N	X	No.	%
Gene Bank, Olomouc										
B. oleracea L.	*alboglabra*	2	—	—	—	—	—	2	—	—
	botrytis	87	1	85	1	29	11	47	5	6
	capitata	127	8	114	5	51	42	32	18	14
	gemmifera	7	—	7	—	7	—	—	4	57
	gongylodes	12	—	12	—	12	—	—	7	58
	italica	1	—	1	—	1	—	—	1	100
	sabauda	18	—	17	1	8	2	8	4	22
	sabellica	8	—	8	—	3	5	—	—	—
B. rapa L.	*pekinensis*	12	10	2	—	11	—	1	—	—
	perviridis	2	—	—	—	—	—	2	—	—
	rapifera (=*rapa*)	1	—	1	—	1	—	—	1	100
B. carinata A. Braun		1	—	1	—	1	—	—	—	—
Research Institute of Oilseed Crops, Opava										
B. napus L.	*oleifera*									
	winter	432	—	317	115	421	—	—	73	17
	spring	129	1	119	9	94	35	—	18	14
	rapifera (=*napobrassica*)	1	—	1	—	1	—	—	—	—
B. rapa L. (=*campestris*)	*oleifera*									
	bieb	30	2	27	1	30	—	—	—	—
	praecox	22	—	18	3	22	—	—	—	—
B. nigra (L.) Koch		8	—	8	—	8	—	—	—	—
B. juncea (L.) Czern.		37	—	31	5	35	—	—	—	—
Total		937	22	769	140	735	95	92	131	14

[1] Y = fully available; L, N = limited availability; X = not available.
[2] Equals safe duplication of material.

Brassica genetic resources in France

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Introduction

In contrast to other European countries, France has no centre for genetic resources (genebank). The conservation of plant genetic resources is generally carried out by the plant breeding stations of the Institut National de Recherche Agronomique (INRA), by the Centre International de Recherche Agronomique pour le Développement (CIRAD) in the case of tropical species and by conservatories initiated at a regional level.

Brassica collecting and the management of genetic resources is carried out by the INRA Plant Breeding Station of Rennes in Le Rheu and the affiliated Vegetable Breeding Laboratory of Plougoulm in St Pol de Léon.

Past collecting missions have concentrated particularly on the species most important to French agriculture and those highly endangered (Table 1).

Table 1. Main *Brassica* crops in France in 1994

Crop	Acreage (ha)	Genetic status
Oilseed rape (*B. napus*)	600 000	90% pure lines
		10% "hybrid synthetics"
Kale	100 000 (?)	50% farmers' populations
		50% commercial varieties
Cauliflower	50 000	70% F_1 hybrids
		30% farmers' populations
Cabbage	8 000	90% F_1 hybrids
		10% commercial populations
Brussels sprouts	1 500	100% F_1 hybrids

Development of the collection since 1991

The largest part of the collection presently maintained and comprising 1100 accessions was established between 1981 and 1984, during a collecting operation partly financed by the CEE. Since the last meeting of the ECP/GR *Brassica* Working Group in 1991 in Prague, three activities have been carried out:

1. Additional collecting missions of kale and cabbage landraces in the regions that had not been completely covered previously; 67 new populations were consequently added to the collection (Table 2). The conservatory also received a radish collection from the Plant Breeding Station of Montfavet-Avignon following the discontinuation of the radish-breeding activities in that station.

2. The continuation of evaluation activities of the existing collection. This evaluation concerned only traits of interest to breeders such as the resistance to diseases

(*Plasmodiophora, Mycosphaerella, Peronospora*). Cauliflower accessions were also evaluated for male sterility.

3. Regeneration of the material collected between 1981 and 1984 was started. This activity was made possible by a financial contribution of the Bureau des Resources Génétiques. Owing to their high number, accessions were grouped according to practical criteria in order to simplify multiplication (see box). To this day only 225 cauliflower landraces have been regenerated (Table 3). This accounts for 25% of the French collection.

   Safety duplicates will be sent to the Dutch (CGN, Wageningen) and British (HRI, Wellesbourne) genebanks.

Table 2. Current status of the French *Brassica* collection

	Landraces	Commercial varieties	Total	Variation since 1991
Vegetable crops				
B. oleracea botrytis (cauliflower)	281	95	376	+ 2
B. oleracea capitata (cabbage)	63	73	136	+ 40
B. oleracea gemmifera (Brussels sprouts)	6	7	13	0
B. rapa (turnip)	—	36	36	0
Fodder crops				
B. oleracea acephala (kale)	370	17	387	+ 27
B. napus (fodder rape)	33	9	42	0
B. rapa and *B. napus rapifera* (swede-turnip)	79	8	87	– 13
Total	832	247	1077	+ 56

Table 3. Regeneration programme and distribution of cauliflower at Plougoulm Plant Breeding Laboratory, 1992-95

Year	No. populations regenerated	No. pollination units
1992-93	132	28 (2200 m^2)
1993-94	66	14 (1100 m^2)
1994-95	27	6 (500 m^2)
Total	225	48 (3800 m^2)
Quantity	**Distributed to**	**Collection type**
Four seed lots/population		
100 g	Plougoulm Laboratory	Main collection
50 g	Rennes Plant Breeding Station	Secondary collection
10 g	CGN, Wageningen	Safety duplication
10 g	HRI Wellesbourne	Safety duplication

Practical considerations regarding regeneration applied to the French *Brassica* collection

1. Regeneration necessity
   - Local varieties (landraces) collected between 1980 and 1984
   - Seed samples aged 1 to 3 years when collected (germination rates: 15 to 90%)

2. Regeneration constraints and problems
   - Mainly allogamous types (cauliflower, cabbage, kale) with isolation problems
   - 1100 accessions to regenerate
   - no real base for a core collection and necessity to preserve a large amount of genetic diversity
   - biennial plants

3. Bases for multiplication
   - Artificial isolation
     - plants under plastic greenhouses
     - pollination by bees (one small hive per pollination unit of 100 m^2)
     - pollination units separated by insect nets
   - Five populations by pollination unit
     - of same precocity at flowering
     - of same geographic origin (probability of genetic proximity)
   - 40 to 50 plants per population
     - 200 to 250 plants per pollination unit (100 m^2)

4. Bases for regrouping after regeneration (at harvest)
   - Same quantity of seeds collected per plant (10 g)
   - Mixture of seed from all plants per population (400 g)

5. Base of the new collection after regeneration
   - The populations are maintained separately but regrouped per pollination unit ('half genetic maintenance'):
     - each population present as female (seed pooled from 40-50 plants)
     - males are a mixture of 5 'close populations' (including the true population)
   - Each population is identified after regeneration by two items:
     - the identification of the original population
     - the group of males (pool of 5 populations) from the same 'population cell'

Status of the *Brassica* collections in Germany
Compiled by Lothar Frese and Thomas Gladis

The Gatersleben *Brassica* collection

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The genus *Brassica* contains 41 species; 11 of them are related to the *Brassica oleracea* group. Six species are of high economic value, five of which have a worldwide distribution. These are characterized by a complicated infraspecific structure, and they contain enormous variability. The Gatersleben genebank maintains an important collection containing about 1600 accessions from 25 species. New accessions from 1991 to 1994 are listed in Tables 1 and 2.

A key for the species and for all sufficiently known infraspecific taxa was provided by Gladis and Hammer (1990, 1992). The *B. oleracea* group has been treated by Gladis (1989). Taxonomy and infraspecific structure of this complex are extremely complicated and will be presented elsewhere.

Genebank material plays an important role in enlarging the genetic background of highly domesticated crop plants (Hammer 1993). The brassicas of the Gatersleben genebank may be a representative model for collecting, documentation and description, for maintenance *ex situ* and for storage of large and very diverse living plant collections. The collection is, in connection with cultivation experience accumulated here, the basis for reconditioning and potential enrichment of the range of our crop plants. For maintaining and managing populations of endangered wild relatives, primitive forms, introgressions, etc. *in situ* or on farm, respectively, more attention should be given to the experience and methods developed by farmers as well as by genebanks.

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Table 1. New *Brassica* accessions at the Gatersleben genebank between 1991 and 1994[1]

Year	Collection mission to	No. accessions	Taxa
1991		**5**	
	Italy	5	2 *B. oleracea* var. *capitata*
			3 *B. rapa*
1992		**18**	
	Cuba	1	1 *B. juncea*
	Italy	11	1 *B. oleracea* var. *gemmifera*
	Romania	1	1 *B. oleracea* var. *italica*
	Tunisia	5	2 *B. oleracea*
			6 *B. rapa*
			1 *Brassica* sp.
			1 *Brassica* sp.
			1 *B. oleracea* var. *capitata*
			3 *B. rapa* ssp. *rapa*
			1 *B. tournefortii*
1993		**29**	
	Albania, 2 missions	5	3 *B. oleracea* var. *capitata*
	Cuba	5	2 *B. oleracea* var. *viridis*
	Italy	6	1 *B. rapa*
	Romania	3	4 *Brassica* sp.
	Tunisia	10	5 *B. insularis*
			1 *B. oleracea* var. *selenisia*
			3 *Brassica* sp.
			2 *B. oleracea*
			7 *B. rapa* ssp. *rapa*
			1 *B. tournefortii*
1994		**19**	
	Albania	6	1 *B. nigra*
		1	1 *B. oleracea* var. *capitata*
	Central Asia	3	3 *B. oleracea*
	Italy	2	1 *B.* cf. *villosa*
	Mongolia	7	1 *B. rapa* ssp. *rapa*
	Romania		2 *B. rapa*
			1 *Brassica* sp.
			1 *B. napus*
			1 *B. oleracea*
			2 *B. napus*
			5 *B. oleracea* var. *capitata*

[1] Collecting missions 1991-1994 gave a total of 71 *Brassica* accessions.

Table 2. Other inputs from 1991 to 1994 (own collecting missions excluded)

Donor name	No. of accessions
B. barrelieri ssp. *barrelieri*	1
B. desnottesii	1
B. drepanensis	1
B. elongata	1
B. fruticulosa (div. ssp.)	6
B. gravinae	1
B. insularis	2
B. integrifolia	4
B. japonica	3
B. juncea	26
B. juncea var. *crispifolia*	4
B. juncea var. *rugosa*	2
B. macrocarpa	1
B. maurorum	4
B. napus	54
B. napus f. *annua*	1
B. nigra	2
B. oleracea	23
B. oleracea convar. *acephala*	3
B. oleracea var. *capitata*	1
B. oleracea var. *costata*	3
B. oleracea var. *gemmifera*	1
B. oleracea ssp. *oleracea*	3
B. oleracea ssp. *robertiana*	5
B. oleracea var. *sabellica*	1
B. pekinensis × *juncea*	1
B. rapa	33
B. rapa ssp. *chinensis*	13
B. rapa var. *narinosa*	1
B. rapa var. *nippo-oleifera*	1
B. rapa var. *parachinensis*	10
B. rapa ssp. *pekinensis*	20
B. rapa var. *perviridis*	1
B. rapa ssp. *rapa*	4
B. rapa var. *sylvestris*	3
B. rapa ssp. *trilocularis*	10
B. spinescens	2
B. taurica	1
B. tournefortii	5
Brassica sp.	22
Total	281
+ collecting missions	71
	352

The Dutch-German *Brassica* collection in Braunschweig

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Activities

Within the Dutch-German cooperation on plant genetic resources, carried out by the CGN/Wageningen and the Institute of Crop Science of the FAL/Braunschweig, a project on *Brassica* was started in November 1993. As I. Boukema (CGN) is already responsible for the horticultural *Brassica* spp., I. Jacks-Sterrenberg (FAL) focuses on the agricultural *Brassica* spp. (Tables 1, 2, 3 and 4). The main subjects of the work on agricultural species are:

1. Upgrading of the *Brassica* collection: this includes regeneration of material and minimal description during multiplication in the field as well as checking and completing the documenation. Another item is rationalization by comparison of the data within the Bras-EDB.

2. Work on the 'European Database for *Brassica*' (Bras-EDB)

3. Research and evaluation: to reveal the genetic diversity of the agricultural *Brassica* spp., research and evaluation is proposed.

Multiplication

Multiplication is expected to increase from 39 accessions in 1994 to 40 accessions per year in 1995 and 1996.

Table 1. *Brassica* collection FAL: species and continent of origin

Brassica species	Total	Continent of origin						
		Europe	Africa	North America	Central /South America	Australia	Asia	Un.[1]
carinata	115	0	112	0	0	0	2	1
juncea	93	37	3	5	0	0	20	28
napus	314	204	2	12	1	5	14	76
nigra	97	42	2	1	1	0	14	37
oleracea	393	259	3	7	1	1	69	53
rapa	200	93	0	8	3	0	43	53
Total	1212	635	122	33	6	6	162	248

[1] Un. = unknown.

Table 2. *Brassica* collection FAL: species and selection level

Brassica species	Total	Selection level					
		Wild	Weedy	Landrace	Cultivar	Research	Un.[1]
carinata	115	0	0	0	2	0	113
juncea	93	0	0	2	35	0	56
napus	314	7	0	2	241	15	49
nigra	98	1	0	0	17	0	79
oleracea	393	1	0	3	222	3	164
rapa	200	3	0	0	114	0	83
Total	1212	12	0	7	631	18	542

[1] Un. = unknown.

Characterization and documentation

1. **Passport data** total amount: 46
   > 50% filled: 18

2. **Descriptors** total amount: 124
   > 50% filled: 3 (informant, country of informant, TGW)

Important descriptors and amount of data available:

Dry matter yield [dt/ha]	32	Linolenic acid content [%]	80
Erucic acid content [%]	491	Lodging tendency	88
Early growth course [%]	112	Oil content [%]	75
Flower colour	78	Oil yield [dt/ha]	13
Flowering date start	187	Oleic acid content [%]	80
Flowering date end	166	Palmitic acid content [%]	80
Growth height [cm]	131	Thousand-grain weight (TGW) [g]	916
Linoleic acid content [%]	80	Winter susceptibility	28

Safety duplicates

None of the material is stored as a safety duplicate in another genebank.

Table 3. ***Brassica*** **collection FAL: species and utilization**

Brassica spp.	Total	Utilization					
		Oil/ fibre	Tube/ root	Vege-table	Fod-der	Wild	Un.[1]
carinata	115	115	0	0	0	0	0
juncea	93	93	0	0	0	0	0
napus	314	258	52	0	0	0	4
nigra	98	97	0	0	0	0	1
oleracea	392	0	11	377	4	1	0
rapa	200	94	1	104	0	0	1
Total	1212	658	64	481	4	1	6

[1] Un. = unknown.

Table 4. ***Brassica*** **collection FAL: status quo for multiplication (September 1994)**

Brassica spp.	Total	Not available [1]	Viability <80% [2]	Overlap 1/2	Regener-ation
carinata	115	6	0	0	6
juncea	93	0	4	0	4
napus	314	20	70	8	82
nigra	97	42	6	2	46
oleracea	393	182	61	2	246
rapa	200	58	15	0	73
Total	1212	313	156	12	457

Status of the *Brassica* germplasm collection of the Greek Gene Bank

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The Greek Gene Bank (GGB) maintains in its facilities 169 accessions of *Brassica*, of which 43 belong to the wild relative species *Brassica cretica* and the remaining 126 to the cultivated species *Brassica oleracea*. This germplasm has been collected in the years 1982 and 1983 through a number of specific collecting expeditions funded by IBPGR or as a side activity of multicrop expeditions targeted to certain priority species (forages and pulses, *Beta*, *Nicotiana*, cereals, etc.).

The germplasm is stored in the short- to medium-term storage room (Active Collection) under a temperature regime of 0-5°C and 20-30% air humidity. The water content of the seeds under these conditions is approximately 6%. Placement of the seed samples in our Base Collection (-21°C and sealed packaging) for long-term storage has been postponed for a certain period, with the expectation that in due time technical and financial support for proper characterization and multiplication of the small initial samples could be secured. Termination of international support in 1985 and priority and reassessment issues have not been helpful in that direction.

In the absence of isolation facilities and sufficient funding no progress has been made in that direction until now. However, all *B. cretica* samples have been safely packaged by their collector C. Gómez-Campo in sealed glass tubes partially filled with colour-indexed silica gel, and the *B. oleracea* ones are stored under reliable low humidity conditions, so fortunately the seeds still maintain high viability, as this year's tests have proven.

The germplasm is documented in our database as a *Brassica* file using the dBASE IV package.

All *B. cretica* germplasm and certain *B. oleracea* accessions are safety duplicated in the *Brassica* germplasm collection of C. Gómez-Campo, at the Polytechnical University in Madrid. Only limited germplasm has been distributed to requesting research organizations, mainly from certain *B. oleracea* accessions that had adequate seeds.

Recent expeditions have shown that there is a dramatic loss of *Brassica* landraces throughout the country (Fig. 1). Although 10 years ago germplasm grown in family gardens was considered secure, today it is being displaced rapidly by modern varieties. As the old generation of experienced farmers stops farming activity, there is a loss of knowledge and personal interest in these landraces, because most new farmers lack the knowledge to produce and maintain their own seed or they are reluctant to do so since marketed seed is readily available. Taking into account that previous collections covered only a small part of the country (mainly parts of Thrace, Macedonia, Kriti and Peloponnisos) there is a need for:

1. Urgent collecting expeditions to ecogeographically and agronomically representative parts of the country to rescue as much germplasm as possible, before it is irreversibly lost.

2. Urgent regeneration and multiplication of the conserved germplasm, since the seed viability limit under the storage conditions in the GGB is nearing its end and any further delay puts the seeds in danger. Regeneration will also provide the opportunity for characterization and partial evaluation of the germplasm.

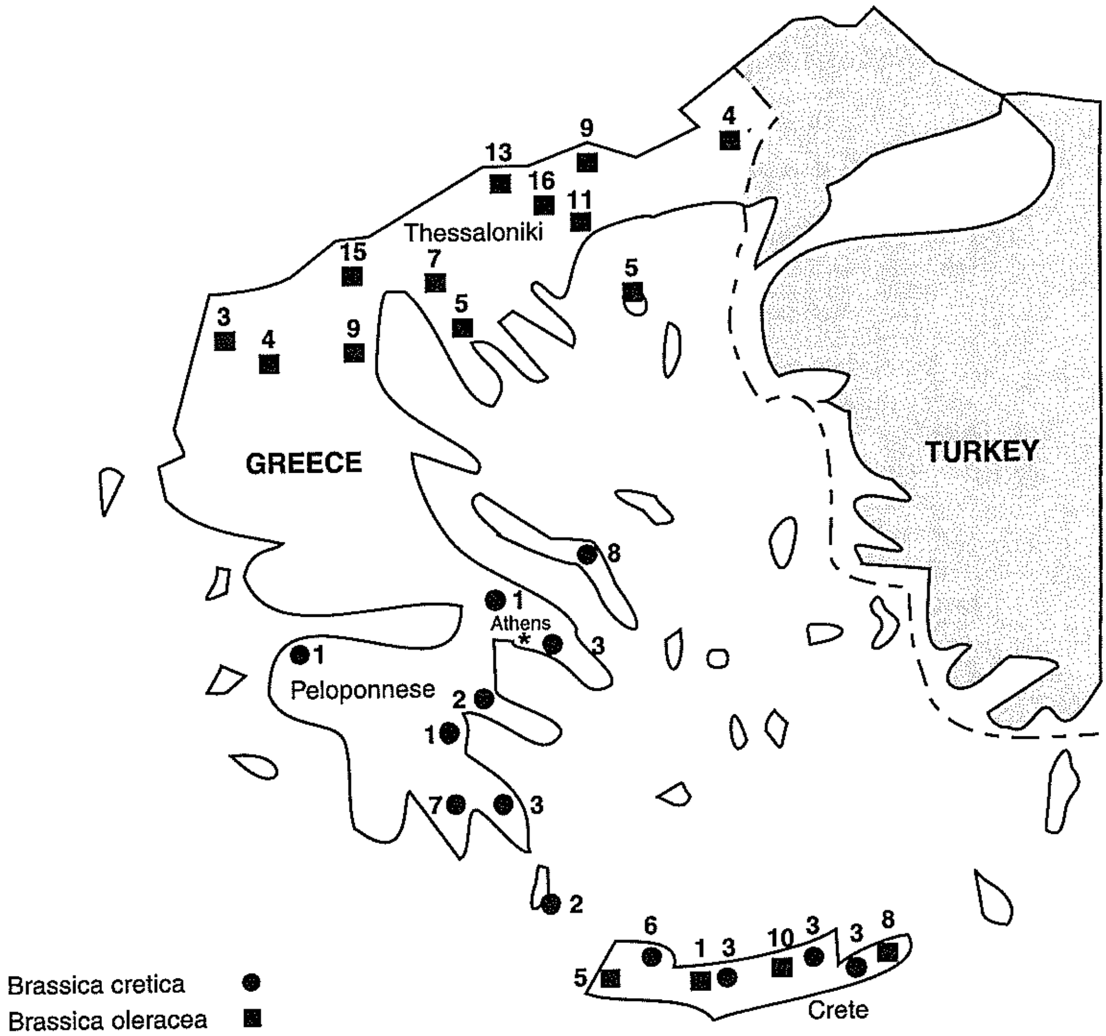

Fig. 1. Collecting sites and respective number of samples of *Brassica cretica* and *Brassica oleracea*

The above interventions are envisaged in the framework of the national genetic resources program, approved by the parliament (Presid. Decree 80/1990) but still not enforced, and the respective EU program that is long awaited by the genetic resources people of Europe.

The following summarizes the current state of the *Brassica* germplasm collection of the Greek Gene Bank:

Number of accessions	169
Brassica cretica	43
Brassica oleracea	126
Storage conditions	
Brassica cretica	Temp. 0-5°C; sealed glass tubes
Brassica oleracea	Temp. 0-5°C; air humidity 25-30%
Safety duplication	
Brassica cretica	all in Spain
Brassica oleracea	some in Spain
Documentation	As dBASE file
Regeneration and multiplication	None

Status of the Italian *Brassica* collections
Compiled by Thomas Gass

Status of the collection in CNR, Bari

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Since the last meeting of the *Brassica* Working Group, the collection has increased by about 100 accessions collected in Italy, mainly in the Basilicata region and Sardinia, and since 1993 also in Albania. The total number of *Brassica* accessions stored in Bari is, therefore, about 500. Duplicates of all the material collected were sent to IPK, Gatersleben for multiplication, first characterization and botanical identification. Since 1991 some old types of cultivated *Brassica* also have been collected. Some of these are very specific to certain agricultural areas where, apparently, no new introductions have been registered.

Recently the genebank in Bari has improved the conditions for regeneration activity with support from the Basilicata Regional administration. First contacts taken with the Puglia Regional Administration may also provide new facilities for vegetable germplasm, including *Brassica* ecotypes.

Status of the *Brassica* collection in Palermo

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Established in 1993 within the Botanical Garden of the University of Palermo, the Genebank is unique in Italy and is the most recent genebank in Europe. Its work focuses on the *ex situ* conservation of seeds originating from wild species of the Mediterranean region. The Genebank pays particular attention to the conservation of regional endemisms, including ancestral species of cultivated plants from different Brassicaceae genera (*Brassica, Sinapis*), Umbelliferae (*Apium, Daucus*), Compositae (*Lactuca, Aster, Calendula*), Leguminosae (*Lupinus, Medicago, Hedysarum, Lens, Trigonella, Lathyrus*) and Alliaceae (*Allium*).

Brassica accessions held at the Genebank of the Botanical Garden of Palermo are listed in Table 1.

Concerning the wild Brassicaceae in ancestors of cultivated species, the laboratory annexed to the Genebank works on the collection and *in situ* and *ex situ* conservation through strategies other than establishing protected areas and that take into account the protection of the populations from fire or other biological and human hazards.

Table 1. ***Brassica*** **accessions maintained in the genebank of the Botanical Garden of Palermo**

Species	Origin	Date	Accession number	No. of seeds
Brassica bivoniana Mazola et Raimondo	M.te Inici Castellammare (TP)	07/94	57	950
Brassica drepanensis (Caruel) Damanti	M.te San Giuliano Erice (TP)	07/94	56	1350
Brassica fruticulosa Cyr.	Cefalù (PA)	07/93	58	300
Brassica macrocarpa Guss.	Favignana (TP)	07/94	54	400
Brassica nigra (L.) Koch	Valderice (TP)	08/94	50	1000
Brassica rupestris Rafin.	Isulidda S. Vito Lo Capo (TP)	09/94	42	70
Brassica rupestris Rafin.	Rocca Busambra Ficuzza (PA)	07/94	64	100
Brassica souliei (Batt.) Batt.	Alimena (PA)	05/93	63	50

Current status of the IOF-CT cruciferae collection and related activities

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Following previous observations and studies on high genetic diversity of wild and cultivated Brassicaceae exploited as vegetables in Sicily, seed-collecting activities were started in the last years. The accessions belonging to different species (Table 1), collected mainly in Eastern Sicily, are now to be studied for supplementary description of traits. This year the work has started for *Brassica oleracea* var. *italica* utilizing some of the descriptors indicated in the 'EEC umbrella varieties programme for vegetables' edited by the Commission of the European Communities.

In the next few years we will carry out evaluation activities mainly for specific characters related to disease, salt and drought resistance.

In November 1994, the IOF-CT cruciferae collection includes about 200 accessions (more than 65% of which are local cultivars or wild species) as shown in Table 1. The seeds are dried to about 5% moisture and are stored in glass bottles at 5°C.

The aim of our work is to develop a correct description of the accessions and to use the collected seeds for regeneration.

Table 1. ***Brassica*** **accessions in the Istituto di Orticoltura e Fruticoltura collection**

Species	No. of accessions
Brassica oleracea acephala	4
Brassica alba	2
Brassica campestris var. *silvestre*	1
Brassica fructiculosa	4
Brassica nigra	3
Brassica oleracea var. *botrytis*	25
Brassica oleracea var. *capitata*	14
Brassica oleracea var. *gongylodes*	14
Brassica oleracea var. *italica*	69
Brassica rapa	18
Crambe maritima	1
Diplotaxis erucoides	2
Diplotaxis muralis	1
Diplotaxis tenuifolia	1
Eruca sativa	8
Hirschfeldia incana	2
Lepidium sativum	5
Raphanus sativum	10
Sinapis alba	1
Sinapis arvensis	3

Current status of the CGN cruciferae collection

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The collection

The CGN cruciferae collection consists of 1374 accessions (October 1994). An overview of the collection is given in Table 1.

The history and the attempt to reduce redundancy of the *B. oleracea* collection were described in the report of the ECP/GR *Brassica* Working Group Meeting in 1991. The total exercise of reduction of duplication resulted in 54 bulked accessions made from 273 original collected samples.

All information on the collection is available in any form, i.e. printed or in computer files. The passport data of the *Brassica* part of the collection (1129 accessions of which 529 *B. oleracea*) are included in the Bras-EDB.

Regeneration

All material included in the CGN collection has been regenerated and fulfils our standards regarding quality and quantity (germination >80%, >4500 seeds). Some material no longer fulfilling these standards and some material not yet included in the collection needs to be regenerated.

Storage

The seeds are dried until a seed moisture content of about 5% is reached. The seed samples are packed in laminated aluminum foil bags and stored at -20°C for long-term storage. User samples are stored at 4°C.

Safety duplication

All material included in the collection is duplicated at the Genetic Resources Unit of HRI, Wellesbourne, UK.

Characterization/evaluation

Parts of the collection have been characterized and/or evaluated for 74 different traits. This resulted in 14 077 observations.

Most of the *B. oleracea* accessions have been characterized according to CGN descriptor lists (partly derived from UPOV and partly from the IBPGR descriptor l ist).

Among the evaluation data are data about nematode, clubroot, *Phoma* and *Fusarium* resistance. Part of the material, mainly *B. carinata*, is screened for fatty acid composition. The evaluation data were supplied by institutions or private firms using our material.

Currently part of the *B. oleracea* material (87 accessions) is being tested for resistance to downy mildew, white rust and cabbage aphid in the EC AIR programme 'The location and exploitation of genes for pest and disease resistance in European genebank collections of horticultural brassicas'.

Utilization

Until now 2128 seed samples of the collection have been distributed for utilization; of these, 138 samples were used by CGN, 1232 by institutions or private companies in the Netherlands and 758 by institutions or private companies in other countries. These figures include only the CGN accession numbers. Material distributed under a receipt number (a preliminary number before accession) is not included here but will amount to about 1000 samples.

Research

The reduction of duplication of the *B. oleracea* collection has been verified using isozymic markers as will be reported during this meeting.

Table 1. Number of accessions (CGNnrs) per cultivar group

Scnr	Cultivar group	CGNnrs
0701	*Brassica oleracea* wild	3
0702	*Brassica oleracea* group borecole	43
0704	*Brassica oleracea* group marrow stem kale	6
0707	*Brassica oleracea* other or unspecified kales	6
0708	*Brassica oleracea* group chinese kale	17
0711	*Brassica oleracea* group white cabbage	127
0712	*Brassica oleracea* group pointed headed cabbage	24
0713	*Brassica oleracea* group red cabbage	26
0714	*Brassica oleracea* group savoy cabbage	42
0717	*Brassica oleracea* group Brussels sprouts	51
0718	*Brassica oleracea* group kohlrabi	9
0719	*Brassica oleracea* group cauliflower	174
0723	*Brassica oleracea* other or unspecified	2
0724	*Brassica* wild species (2n=18)	1
0726	*Brassica napus* group fodderrape	32
0727	*Brassica napus* group swede	7
0728	*Brassica napus* group winter (oilseed) rape	33
0729	*Brassica napus* group spring (oilseed) rape	5
0730	*Brassica napus* other or unspecified	7
0734	*Brassica rapa* group fodder turnip	167
0735	*Brassica rapa* group vegetable turnip	45

Scnr	Cultivar group	CGNnrs
0736	*Brassica rapa* group spring turnip (oilseed) rape	10
0737	*Brassica rapa* group winter turnip (oilseed) rape	17
0738	*Brassica rapa* group chinese cabbage	45
0739	*Brassica rapa* group pak choy	16
0740	*Brassica rapa* group mizuna	2
0741	*Brassica rapa* group komatsuna	2
0742	*Brassica rapa* group yellow sarson	2
0743	*Brassica rapa* group broccoletto	20
0748	*Brassica rapa* other or unspecified	12
0752	*Brassica juncea* group oilseed	17
0753	*Brassica juncea* group vegetable	4
0757	*Brassica carinata*	108
0761	*Brassica nigra* group black mustard	24
0764	*Brassica* unspecified	7
0766	*Brassica* other wild species	1
0770	*Sinapis alba* wild	7
0771	*Sinapis alba* group white mustard	44
0776	*Raphanus sativus* group radish	41
0777	*Raphanus sativus* group giant radish	70
0778	*Raphanus sativus* group fodder radish (oilseed)	43
0779	*Raphanus sativus* group mougri (caudatus)	2
0780	*Raphanus sativus* other or unspecified	28
0784	*Camelina sativa*	1
0786	*Eruca sativa*	7
0796	× Brassicoraphanus group radicole	5
0797	× Brassicoraphanus group raparadish	6
0798	Other cruciferae (excluding ornamentals)	2
0799	Cruciferae unspecified	4

Status of the national *Brassica* collections in the Nordic Countries

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Introduction

Since 1979, the conservation of plant genetic resources in the Nordic Countries (Denmark, Finland, Iceland, Norway and Sweden) has been organized by the Nordic Gene Bank (NGB). As a regional centre for plant genetic resources, NGB has been commissioned by the Nordic Council of Ministers to conserve and document the genetic variation in the Nordic material from all species of value to agriculture and horticulture. Wild relatives of cultivated species also fall within the mandate.

NGB is organized as a small central institute within a regional network of institutes and individuals engaged in the conservation and utilization of plant genetic resources. The network consists of members of several internordic working groups that NGB has established to cover the range of crops grown in the Nordic countries.

The national *Brassica* collections

The conservation work concerning *Brassica* is organized in the vegetable working group (horticultural *Brassica*) and in the working group for root crops, oil crops and pulses (agricultural *Brassica*). The members of the working groups are crop specialists who set priorities and standards for the work. They also act as NGB's representatives in their own countries and organize collections, documentation and regeneration.

Table 1 shows the *Brassica* collections in the Nordic Gene Bank (NGB), 1994. In total, 345 accessions are stored in NGB, 235 horticultural *Brassica* and 110 agricultural *Brassica*. The main part of the *Brassica* material preserved by the NGB are landraces originating from Nordic countries and Nordic-bred cultivars. Non-Nordic cultivars which have been grown extensively in a Nordic country are preserved if they are not preserved in any other genebank.

The highest number of accessions exist in swedes (41+12), cauliflower (36), white cabbage (77), turnip (32), spring and winter rape (50) and forage rape (44).

Material of old varieties and landraces is still collected and regenerated to the extent in which it is possible to obtain this material. During the last 15 years most of the *Brassica* material in the Nordic countries has been collected, but there is still a certain need for collection of horticultural *Brassica* in Sweden and Finland and for agricultural *Brassica* in Norway.

No serious efforts are made about conservation of wild *Brassica* material either *in situ* or *ex situ*. Two accessions of wild *Brassica* are stored in NGB.

Most of the material of horticultural *Brassica* is described, and the information is available in databases. Normally UPOV guidelines are used for the characterization of *Brassica napus*, *B. oleracea* and *B. rapa* landraces and cultivars. In addition, some production and quality characters are described. Some of the most important descriptors are to be used in a common vegetable catalogue, to be printed soon. There is still a need for characterization, mainly in agricultural *Brassica* where most of the material is still to be described (Table 1).

Of all *Brassica* accessions stored in NGB, 46% is also duplicated for safety reasons in NGB's permafrost store on Svalbard. In 1994, NGB has until now received nine requests for *Brassica* material from a total of 88 requests received.

Table 1. *Brassica* material in the Nordic Gene Bank (NGB), 1994[1]

	Total no. of accessions	Needs	
		Regeneration	Characterization
Horticultural (235 accessions)			
Brassica napus napobrassica	41	6	18
Brassica oleracea acephala gongylodes	1	0	1
Brassica oleracea acephala sabellica	11	2	2
Brassica oleracea botrytis botrytis	36	10	2
Brassica oleracea capitata alba	77	17	5
Brassica oleracea capitata conica	12	3	2
Brassica oleracea capitata rubra	11	3	1
Brassica oleracea capitata sabauda	1	0	1
Brassica oleracea oleracea gemmifera	11	3	1
Brassica pekinensis	2	1	1
Brassica rapa rapa	32	3	8
Agricultural (110 accessions)			
Brassica napus napobrassica	12	1	12
Brassica napus (spring and winter)	50	5	40
Brassica oleracea acephala medulossa	4	2	4
Brassica rapa oleifera (spring and winter)	44	5	44

[1] In addition, two accessions of wild *Brassica* material are stored in the NGB.

Status of the national *Brassica* collections in Poland

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The Polish Gene Bank currently maintains 343 *Brassica* accessions (Table 1). Of these, none have been safety duplicated in other genebanks. When the viability of the seed falls below 80%, the material is regenerated in the Plant Breeding Station at Borowo.

The germplasm maintained in the Brassica collection at the Polish Gene Bank is continuously used in the rape breeding programme of the Institute.

The structure of the database in which the Polish collection is documented is shown in Table 2.

Table 1. Brassica collection of the Polish Gene Bank (5-1-95)

Polish name	English name	Genus	Species	Subsp./ variety	No. of accessions
Brukiew	rutabaga	*Brassica*	*napus*	*napobrassica*	7
Rzepak	rape	*Brassica*	*napus*	*napus annua* + *napus biennis*	75
Jarmuz	kale	*Brassica*	*oleracea*	*acephala*	3
Kalafior	cauliflower	*Brassica*	*oleracea*	*botrytis*	108
Brokul	broccoli	*Brassica*	*oleracea*	*botrytis*	11
Kapusta	cabbage	*Brassica*	*oleracea*	*capitata*	82
Kapusta bruks.	Brussels	*Brassica*	*oleracea*	*gemmifera*	19
Kalarepa	kohlrabi	*Brassica*	*oleracea*	*gongylodes*	8
Kapussta wloska	savoy	*Brassica*	*oleracea*	*sabauda*	13
Kapusta	cabbage	*Brassica*	*oleracea*	*viridis*	3
Kapusta pek.	chinese	*Brassica*	*pekinensis*		7
Rzepa	turnip	*Brassica*	*rapa*		2
Rzepik	rapistrum	*Brassica*	*rapa*		5
Total					343

Table 2. Structure of the Polish *Brassica* database (RZEPA OB.dbf)

Number of records: 584
Date of last update: 10.02.93

Field	Field name	Type	Width	Dec.	
1	PL	Character	8		Accession number
2	NAZ	Character	25		Name
3	ROK	Numeric	4		Year of observation
4	PRZEZ	Numeric	3		Overwintering
5	KW POCZ	Date	8		Begining of flowering
6	KW KON	Date	8		End of flowering
7	DL KWIT	Numeric	2		Length of flowering
8	OK WEG	Numeric	3		Vegetation period
9	WYS ROS	Numeric	5	1	Height (cm)
10	WYLEG	Numeric	1		Lodging (scale 1-9)
11	MTN	Numeric	4	2	1000-grain weight (g)
12	ZAW TLUSZ	Numeric	4	1	Oil content (%)
13	PLON	Numeric	5	2	Yield (q/ha)
14	KWAS ERUK	Character	4		% of fatty acids
15	GLUCOZYN	Character	5		μmol/g of seeds
Total			90		

Status of the national *Brassica* collections in Portugal

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National collections

The Portuguese *Brassica* germplasm is kept at the following institutions (Table 1):

Banco Portugues de Germplasma Vegetal (BPGV), Braga
Instituto Superior de Agronomia (ISA), Lisbon
Horticulture Research International (HRI), Wellesbourne.

Germplasm collecting and door-to-door enquiries to growers were carried out in 1987 and 1988 with the object of surveying landraces and their folknames (originally only tronchudas and galega kales). Almost the whole country was covered and 378 farmers were interviewed. Recently, collecting has been done with David Astley and Eduardo Rosa inland in North Portugal (Trás-os-Montes).

Table 1. The Portuguese *Brassica* collections[1]

	ISA	BPGV	HRI
B. oleracea (tronchuda, acephala, capitata)	493	459	200
B. rapa	91	209	100
B. napus	42	—	43
Raphanus sativus	2	—	2
Total	628	668	345

[1] The collection in Oeiras has only 6 *B. olearacea* and 6 *B. napus,* while the collection in Numi (Braga) maintains a duplicate of recent expeditions by David Astley.

Part of the collection (393 accessions) was packed under vacuum in 1988. The rest is kept in paper bags. The quantity of seed of each accession varies between 1 and 380 g. The germination rate is not known. Only a few accessions are safety duplicated in other banks. Some duplicates are kept at Numi (Braga) and Wellesbourne (Table 2).

Almost no regeneration has been done since the material was collected. Eight accessions were regenerated in 1991 and currently 40 accessions are undergoing regeneration.

The collection is basically considered a working collection. Part of it has been characterized as follows:

- morphology (Dias *et al.* 1993) — 32 accessions;
- RFLP + isozymes (Dias *et al.* 1992) — 33 accessions;
- screening *Peronospora parasitica* + *Plasmodiophora brassicae* (Dias *et al.* 1993) — 44 accessions;

- screening *Leptosphaeria maculans* + *Xanthomonas campestris* (Ferreira *et al.*, in press) — 56 accessions.

Also, 32 accessions have been screened with downy mildew and white rust. The results were presented at the ISHS Symposium on Brassicas/Ninth Crucifer Genetics Workshop, 1994.

The germplasm has been used in breeding for horticultural characteristics using haploidization with anther and microspore culture and conventional breeding. A CEC-funded project is ongoing to screen material for resistance against downy mildew, white rust and cabbage aphid (CEC contract no. AIR3 - CT920463, coordinator Dr I.R. Crute, HRI, Wellesbourne).

Table 2. *Brassica* accessions collected in Portugal and stored in the Banco Portugues de Germplasma Vegetal (BPGV), Braga and at the Horticulture Research International (HRI), Wellesbourne

Year and location	BPGV	HRI
1989	1	—
1990: NW Portugal	101	135
1991: NW Portugal	934	—
1992: NE Portugal	149	118+32
1993: Centre/E Portugal	219	60
1994: NW Portugal	64	—
Total	668	345

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M.E. Ferreira, J.S. Dias, A. Mengistu and P.W. Williams. Screening of Portuguese cole landraces (*Brassica oleracea* L.) with *Leptosphaeria maculans* and *Xanthomonas campestris* pv. *campestris*. Euphytica (in press).

Status of the national *Brassica* collections in Spain

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Four main institutions keep accessions of cultivated *Brassica* seeds in Spain (see below the addresses and the contact persons). The oldest collections were kept in Pontevedra, and the development of cooperative horticultural research program in the last decade has improved the whole situation very significantly with new activities developed mostly by Valencia, Zaragoza and Pontevedra teams. The genebank of Alcalá de Henares was given the role of recipient for duplicates.

The main collected species are *Brassica oleracea* L. and *Brassica rapa* L. Table 1 lists the number of accessions that are stored at present (duplicate accessions are excluded). UPV also keeps 73 accessions of *Raphanus*. Collections of *B. napus* L. have been very limited.

Table 1. Cultivated *Brassica* seed accessions kept in four institutions in Spain

	B. oleracea	*B. rapa*
CRF, Alcalá de Henares	15	14
CSIC, Pontevedra	178	144
UPV, Valencia	289	45
SIA, Zaragoza	30	11
Total	512	214

Each institution has collected preferentially the landraces in its own geographic area, so that not much overlap is to be expected. The northwestern Peninsular region (Galicia, Asturias and Castilla-León) and the eastern regions (Cataluña, Valencia) are the best-collected areas. Also, 29 UPV cabbage accessions come from the Canary Islands. There are plans by Pontevedra and Valencia teams to collect in other regions such as Castilla-La Mancha, Murcia and Andalucía.

Duplication has been carried out but in a limited way. This is mostly because in the cooperative program, duplication was planned only with multiplied samples, and multiplication itself is slow. A number of duplicates of the UPV collection are now in the HRI genebank in the UK. Alcalá de Henares bank holds some 40 duplicates of different origins.

We have no information on the degree of integration of the above data in the Bras-EDB, but they are available as a whole from the Alcalá de Henares database, where information on Spanish collections of many crops is centralized.

Major institutions holding cultivated *Brassica* accessions in Spain

Departamento de Producción Vegetal
(Prof. Fernando Nuez)
Escuela T. S. Ingenieros Agrónomos
Universidad Politécnica de Valencia
Valencia

Servicio de Investigación Agraria
(Dr Miguel Carravedo)
Diputación General de Aragón
Montañana, Zaragoza

Misión Biológica de Galicia
(Dr Amando Ordás)
Consejo Superior de Investigaciones Científicas
Pontevedra

Centro de Recursos Fitogenéticos
(Dr Rafael Ponz)
Instituto Nacional de Investigaciones Agrarias
Finca 'La Canaleja'
Alcalá de Henares (Madrid)

Status of the UK collections of cruciferous crops

David Astley
Genetic Resources Unit, Horticulture Research International, Wellesbourne, UK

There are four main cruciferous crop collections in the United Kingdom, each having a different mandate. The Genetic Resources Unit, HRIW accepted a mandate from IBPGR to conserve a range of cruciferous crops in collaboration with the Centre for Genetic Resources the Netherlands (CGN). The current total of accessions for various taxa and an estimate of their availability is given in Table 1. Availability of accessions is determined by seed numbers and/or percentage germination. Two strategic test collections, S-allele lines and European Clubroot Differentials, are maintained, documented and distributed to research workers.

Seeds are stored at 5% moisture content, hermetically sealed in foil-laminate pouches at –20°C. A dBASE system is used for documentation. Data in the system are mainly passport, stored using ECP/IBPGR descriptors. We have an agreement with CGN to store mutual safety duplicates. A duplicate seed sample of new accessions is despatched as soon as possible after receipt, but accessions in store are being despatched routinely as and when the time permits. Currently only 30% of accessions are safety duplicated with CGN. Where characterization data exist, the descriptors are a combination of IBPGR and Union for the Protection of Plant Variety Rights (UPOV). Involvement in field collection has been concentrated in Portugal in collaboration with the National Gene Bank and Universities. The collections have been used to develop a preliminary core collection in collaboration with CGN in support of an EU research project. A Zeneca-funded research project has concentrated on a study of variation patterns in cauliflower and broccoli from Italy.

The Scottish Agricultural Science Agency, East Craigs is responsible for testing UK applications for Plant Breeder's Rights and additions to the National List of candidate cultivars. The protocols used for testing crops are agreed by the UPOV. The Vegetable Crops Section maintains well-characterized reference sets of obsolete and current cultivars totalling 680 accessions including broccoli, Brussels sprout, cabbage, kale, radish swede and turnip. Seeds are stored in plastic bottles at –20°C.

John Innes Centre, Norwich maintains working collections for molecular studies including: *Brassica napus* (60), old cultivars some of which are well studied; *Brassica rapa* (50), mainly from India plus a few wild populations; *Brassica juncea* (50), from China and India; a number of wild (x=9) taxa from Gómez-Campo and Snogerup collections.

Henry Doubleday Research Association, Ryton-on-Dunsmore holds a collection of 'heritage' varieties which are no longer available commercially. The collections are distributed to HDRA members and amateur gardeners, who also act as seed donors and multipliers. The crops maintained include broccoli (4), Brussels sprouts (1), cabbage (18), cauliflower (12), kale (31), kohlrabi (1), swede (3), turnip (9), mustard (2) and radish (10). A majority of these accessions are duplicated at GRU HRI.

Table 1. Cruciferous crops accessions of the Genetic Resources Unit, HRI Wellesbourne, UK

	Accessions	
Crop	**Total**	**Available[1]**
Brassica carinata	315	8
Brassica juncea	91	59
Brassica napus - Portugal	56	54
Brassica napus biennis	89	73
Brassica napus napobrassica	225	182
Brassica napus oleifera	29	22
Brassica nigra	3	1
Brassica oleracea acephala	423	322
Brassica oleracea alboglabra	26	20
Brassica oleracea botrytis	906	497
Brassica oleracea capitata	1129	521
Brassica oleracea gemmifera	1011	351
Brassica oleracea gongylodes	45	34
Brassica oleracea italica	383	227
Brassica oleracea costata	85	76
Brassica rapa Broccoletto Gp	86	84
Brassica rapa Neep Greens Gp	2	2
Brassica rapa chinensis	36	33
Brassica rapa oleifera	29	22
Brassica rapa parachinensis	6	3
Brassica rapa pekinensis	57	32
Brassica rapa purpurea	1	1
Brassica rapa rapa	458	315
Raphanus caudatus	3	3
Raphanus maritimus	5	5
Raphanus raphanistrum	6	6
Raphanus sativus	658	422
Sinapis alba	20	16
Sinapis arvensis	3	0
Wild taxa	86	25

[1] Availability determined by seed numbers and viability.

4. Collecting activities

Reports on the collecting activities carried out since the last meeting of the working group were presented by C. Gómez-Campo, E. Rosa and T. Gladis (some details about the accessions collected are mentioned in the respective national collections reports in Chapter 3).

T. Gladis reported on 15 multicrop collecting missions in seven countries, including Italy and Albania, carried out with support from IPGRI and private sponsors between 1991 and 1994; 71 new *Brassica* accessions were collected. In addition, the Gatersleben genebank received from breeders and other genebanks 281 further accessions.

E. Rosa reported on collecting missions in northern Portugal which focussed mainly on tronchuda and kale types. Between 1991 and 1994, a total of 566 accessions were collected and placed in the Banco Portugues de Germplasma Vegetal (BPGV), Braga. The material is partly duplicated at HRI Wellesbourne.

C. Gómez-Campo reported on the collection of single populations of at least eight taxa, including *B. bourgeaui*, which were added to the UPM genebank.

The group then discussed priorities for further collecting and the following recommendations were made:

Belgium: All *Brassica* landraces were reported to have been collected and no further collecting activities are required in the near future.

Czech Republic: Landraces of cabbage should be collected in the northeastern part of the country.

France: Further collecting of cabbage is recommended throughout the country, especially from home gardens.

Germany: It was noted that further collecting of horticultural *Brassica* types in the eastern part of the country was desirable.

Greece: Collecting of horticultural crops is recommended in those parts of the country which have not yet been collected.

Netherlands: Dutch *Brassica* material has been well collected. No further collecting is recommended.

Nordic Countries: Collection of horticultural types of *Brassica* from Sweden and Finland and agricultural types from Norway is recommended.

Poland: Further collecting of *Brassica* is required in the eastern part of the country, especially for oilseed rape.

Portugal: Further collecting is recommended for Portuguese landraces of *Brassica* and vegetatively propagated kales in the centre, eastern and southern Portugal. With the collaboration of C. Gómez-Campo, the collectors should also include *Eruca* and *Diplotaxis* species which are of interest to the Rocket network of IPGRI.

Spain: Further collecting of *B. oleracea* landraces is required in the centre and south of the country.

UK: The group recognized that there is no immediate need for further collecting in the UK.

The group also recommended that further collecting of vegetable and forage *Brassica* be encouraged in Bulgaria and Romania.

For wild *Brassica* species, the group recommended the collection of *B. cretica* from the Aegean and Ionian islands, *B. incarna* along the Dalmatian coasts and the wild/weedy types of *B. rapa* throughout Europe.

It was agreed that the Chairman and other members of the working group should be informed well in advance of any planned collecting mission. The other ECP/GR working groups will also be informed in order to encourage joint missions.

5. Research activities

Three research projects were reviewed by the group covering: the assessment of variation of landraces from Italy (D. Astley); isozyme analysis to test the bulking of accessions (I. Boukema) and to assess the shift in allele frequency during regeneration (M. Gustafsson).

D. Astley described the confirmation of the existence of regional clusters of cauliflower in Italy based on morphology and molecular analysis. The group recommended that the work be continued and given the necessary resources.

The group accepted that the justification for bulking of accessions by CGN based on common history and morphology had been confirmed by isozyme analysis. However, there was a consensus that this is a pragmatic approach for cross-pollinated crops where 'duplicates' are never identical.

The results of the group regeneration project presented by M. Gustafsson showed that significant shifts of allele frequency had occurred in the experimentally regenerated populations. The group recommended that a protocol for regeneration practice be developed by a subgroup (G. Synnevåg/NGB, Y. Hervé, J. Silva-Dias). This group agreed to prepare a final draft by the end of 1996. T. Gass will provide the available IPGRI in-house reports. M. Gustafsson agreed to continue the isozyme analysis of the regenerated material and publish the results.

CGN will continue their isozyme studies of genetic diversity by screening the *B. oleracea* preliminary core collection developed for the EU-funded pathology project.

C. Gómez-Campo informed the group of his intention to continue the IPGRI-supported trials of seed storage. The group agreed to send him samples and addresses for purchase of available storage materials which he will include in his experiments.

A study on the methods used for multiplication/regeneration of wild *Brassica* was recommended by the group, to be coordinated by IPK, Gatersleben in collaboration with C. Gómez-Campo, M. Gustafsson, N. Stavropoulos, D. Astley and J. Silva-Dias.

The group recognized that when research programmes are being developed there may be opportunities for a wider collaboration with members of the group to the benefit of the wider *Brassica* research community.

Assessment of ecogeographic variation, genetic diversity and genetic erosion in Italian landrace cauliflower and broccoli (*Brassica oleracea* L. var. *botrytis* L. and var. *italica* Plenck)[1]

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Background

Italy is the centre of diversity for cultivated cauliflower and broccoli, which are important economic resources. The HRI Genetic Resources Unit maintains a collection of Italian landraces collected as part of an EC Cruciferous Crop project in 1983/84 (0890 CP13+15). Additional material was collected in 1993 as part of this PhD project. The assessment of diversity and the relationships between perceived ecogeographic groups is important in the management, maintenance and utilization of genetic resources collections, e.g. bulking of accessions that are genetically very similar, informed supply of fewer accessions for screening, etc.

Genetic erosion

The 1993 collecting trip to Italy confirmed that genetic erosion was occurring with rapid loss of landraces. Genetic erosion in general has been documented frequently in southern Italy. The reasons for genetic erosion are socioeconomic, resulting from the rapid development of the past 20 years. Traditional landraces have been replaced mainly by F_1 hybrids because of the need to meet increasing competition, higher market demands for uniformity and quality, higher living costs, social demands and changes due to younger generation farmers. Fewer farmers maintain their own landraces and some regional types, e.g. Palla di Neve, have been replaced.

In situ ecogeographic variation

The 1993 trip confirmed that there were regional types, either adapted for the regional growing conditions or simply preferred by the local population. Purple cauliflowers are preferred widely in Sicily, the exception being Palermo where they grow a local green cauliflower. Other regional types include Romanesco which are virtually exclusive to Lazio; Di Jesi and Fano types in Marche; Calabrese in Puglia; Broccoletto (Cime di rapa) is preferred in Bascilicata. Historical boundaries and barriers to trade may have provided an environment for diversification of regional types and preferences.

Assessment on ecogeographic variation

Field and polytunnel experiments have been carried out at HRI Wellesbourne. Polytunnel experiments were carried out to assess leaf variation. Fifty-eight accessions, including controls and outliers from other countries, were used for both experiments.

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1 This project was funded by ICI Seeds Ltd. (now Zeneca), British Council Rome, and Agriculture & Food Research Council (now Biotechnology & Biological Research Council).

Polytunnel experiment

Plants (24) of each accession were grown in a randomized experiment over two sowing dates. Leaf 9 was harvested when fully expanded, pressed and dried. Characters were selected from the IBPGR descriptor list for *Brassica*, plus some additional ones. These were scored using a digitizer with the data being stored in a database. The characters were tested for variation using a one-way analysis of variation for continuous (metric) characters and a log-linear model for discrete (multistate characters). Characters which were variable owing to accession differences and not sowing dates were selected for further multivariate analysis.

Field experiment

Fifty-eight accessions were grown in rows randomized with respect to each other in two replicate plots. The aim was to harvest four heads per accession per plot, although owing to environmental factors this was not always possible. Heads were scored for selected characters by hand and data were input to a database.

Analysis

Head and leaf characters were analyzed using a cluster analysis to confirm whether regional clusters existed. The results from clustering of accession means confirmed this. A discriminant analysis was carried out and the canonical variates extracted and analyzed. Plots of the group means with respect to the canonical axes showed that groups could be discriminated, and the main characters responsible for discrimination identified.

Discriminant analysis was carried out within groups on individual accessions. In all groups accessions could be rationalized into fewer accessions on the basis of this work such that it may be possible to make scientific recommendations to bulk accessions.

RAPD

RAPDs are being used to compare results from molecular and morphological methods. Early results indicate that there are greater differences in banding patterns between groups than within groups. This work is continuing.

A more detailed paper will be published in the proceedings of the ISHS Symposium on Brassicas/Ninth Crucifer Genetics Workshop, 1994.

Isozyme analysis, a tool for verification of duplication in a *Brassica oleracea* germplasm collection

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Introduction
Many germplasm collections have grown over the years to considerable sizes. This can cause problems of different kinds. For the user of germplasm it becomes difficult to choose material. For the curator it becomes more and more difficult to manage the collection. Especially in the case of cross-pollinated crops, multiplying and rejuvenating large collections requires a large capacity. Lack of capacity can force a curator to choose between postponing multiplication, with the risk of loss, or reducing the standards of isolation and/or population size, with the risk of contamination and genetic drift.

This is why an important aspect of the work on the CGN *Brassica oleracea* collection was the attempt to reduce the redundancy in this collection (Boukema and Hintum 1994). Samples which appeared to be selections of the same old variety were bulked in groups. These groups were formed on the basis of the historical background and morphological resemblance of the vegetative mature plants. A group of crop specialists from research institutes and breeding companies assisted in this work. All components in a group were regenerated jointly in one isolation. To maintain the total genetic variation, all components were represented by an equal number of at least 20 plants. During the vegetative mature stage, a selection against off-types was made (Boukema 1993).

To verify whether the choice of components that were included in a group was correct, a genetical analysis of some of the groups and their components was made on the basis of electrophoresis of isoenzymes.

Terminology
In this paper the original accessions that were bulked to form a new accession will be referred to as 'the components', whereas the new accession produced by harvesting seed from all components in one isolation will be referred to as 'the group'. The word 'object' is used to indicate a component, a group or a pooled set of components or groups. If two objects are pooled they are considered as if they were one object.

Material and methods
A selection of white cabbages and Brussels sprouts was made to represent two crop types of *B. oleracea*. Eleven white cabbage groups comprising 43 components, and nine Brussels sprouts groups comprising in total 24 components were studied (see Table 1). An attempt was made to represent all kinds of groups. There were groups with many components such as the 'Langedijker Bewaar Gewoon' with 16 components, but also groups with few. Some groups of similar types were included, i.e. the four 'Langedijker' white cabbages. In some cases more than one group was created to represent an old variety. Two such cases, i.e. two groups of white cabbage 'Gouden Akker' and two groups of Brussels sprouts 'Bedfordshire', were included in the study.

Table 1. The groups and the number of components they were created from

Group code	Group name	No. of components
White cabbage		
WC01	'Gouden Akker' group 1	3
WC22	'Gouden Akker' group 2	2[1]
WC06	'Late Herfstdeen'	3
WC08	'Brunswijker'	3
WC09	'Amager Kortstronk'	2
WC11	'Langedijker Bewaar Gewoon'	16
WC12	'Langedijker Bewaar Graag'	4
WC13	'Langedijker Vroege Witte'	4
WC23	'Langedijker Vroege Herfstwitte'	2
WC14	'Delikatesse'	2
WC15	'Roem van Enkhuizen'	4
Brussels sprouts		
BS02	'Roem van Barendrecht'	3
BS04	'Hilds Ideaal'	2
BS05	'Elektra'	2
BS16	'Roem van Castricum'	4
BS17	'Bedfordshire' group 1	2
BS18	'Bedfordshire' group 2	2
BS19	'Roodnerf selectie Beemster'	4
BS21	'Odense Torve'	2
BS20	'Gleneagles'	3

[1] 'Gouden Akker' group 2 was later included as a group only; its components were not analyzed.

Each group and all of its components were described on the basis of starch gel electrophoresis of isoenzymes. After a preliminary survey, 12 systems were chosen: phosphoglucoisomerase (PGI), phosphoglucomutase (PGM, 2 systems), phosphoglucodehydrogenase (PGD), aconitase (ACO, 4 systems), shickimic acid dehydrogenase (SAD), alcohol dehydrogenase (ADH), leucine aminopeptidase (LAP) and peroxidase (PRX). Of each object, 30 plants were described. Owing to lack of variation (PRX) or problems in interpreting the results (ACO 2 systems) only the following nine systems were used in the analysis: PGI, PGM (2 systems), ACO (2 systems), SAD, ADH, LAP and PGD. For all these systems it was possible to recognize the genotype from the banding patterns, except for PGD. For PGD the banding pattern as such was used as a type. Pattern frequencies were used as if they were allele frequencies.

Genetic distance between two objects i and i' was calculated as defined by Gregorius and Roberds (1986) as the average sum of the absolute differences in allele frequency. Clustering was performed by a hierarchical agglomerative algorithm. To determine the extent to which the elements were correctly classified, the genetic distance between each element and the pooled elements of each group was determined. To calculate the distance between an element and its own group all other elements of this group were pooled. This resulted per element in a list of differences with each set of pooled elements. If the difference between an element and its own group was the smallest it was considered correctly classified (see Table 2).

Table 2. Number of elements per group, and the group they would be classified on the basis of their electrophoretic pattern

Element from group	Classified in group																		
	BS									WC									
	16	02	19	20	17	18	04	05	21	12	11	06	01	13	08	09	23	15	14
Brussels sprouts																			
BS16	4	.	.	.	.		.	.	.	.	.	.	.	.	.	.	.	.	
BS02	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BS19	.	1	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BS20	.	.	.	2	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
BS17	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
BS18		.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.
BS04	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	
BS05	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
BS21	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.
White cabbage																			
WC12	.	.	.	.	.	.	.	.	.	3	.	1	.	.	.	.	.	.	.
WC11	.	.	.	.	.	.	.	.	.	2	13	1	.	.	.	.	.	.	.
WC06	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.
WC01	.	.	.		.	.	.	.	.		.	.	2	1	.	.	.	.	.
WC13	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.
WC08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.
WC09	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
WC23	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	2	.	.
WC15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.
WC14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2

Results

The dendrogram of the groups (Fig. 1) shows that the isozymic markers that were used in this study were able to classify the groups according to expectations. All Brussels sprouts clustered together, with similar groups, such as the two 'Bedfordshire', close together. The same holds true for the white cabbages, although 'Delikatesse' appeared separate. This can be explained by a 'strange' isozymic pattern which did not correspond to the components of this group and was probably an artefact.

From the total of 67 components, 11 (16%) were misclassified (Table 2). Most of these misclassifications were with similar groups, such as the groups BS17 'Bedfordshire' group 1 and BS18 'Bedfordshire' group 2. But some of the components of the groups

'Langedijker Bewaar Gewoon', 'Langedijker Bewaar Graag' and 'Late Herfstdeen' (WC12, WC11 and WC06 respectively) also were misclassified. If the groups WC12, WC11 and WC06, and the groups BS17 and BC18 had formed two larger groups, only three components (4%) would have been misclassified.

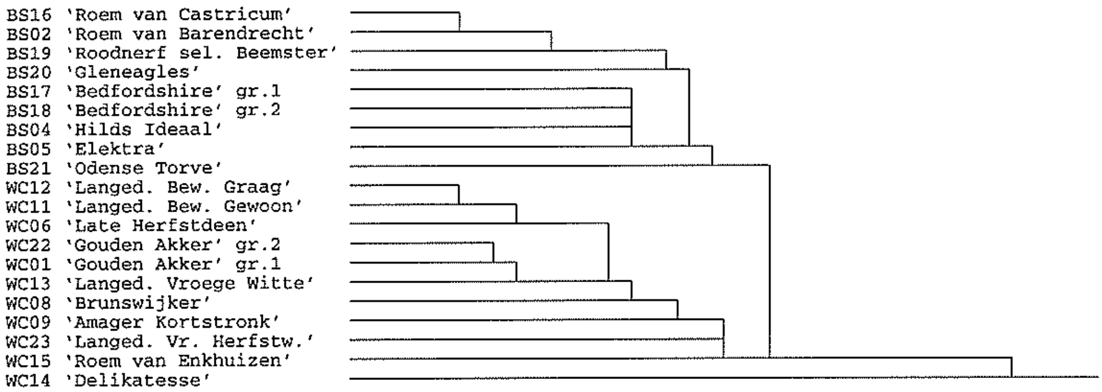

Fig. 1. Dendrogram showing the groups of white cabbage and Brussels sprouts

Discussion and conclusions

If duplication in a germplasm collection is to be reduced by bulking accessions, those accessions should be identical. It was shown by Hintum and Knüpffer (in press) and Hintum and Visser (in press) that this assumption is an oversimplification; in reality accessions in germplasm collections will only rarely be identical. Because of factors such as random genetic drift, natural and unintentional selection and contamination during rejuvenations, or intentional splitting of accessions, allele frequencies in probable duplicates will generally differ. This is even the case in self-pollinated varieties, which could be assumed to be homogeneous. In the case of cross-pollinated crops this phenomenon can be expected to be worse.

So, if bulking cross-pollinated accessions is considered, the criterion should not be that the accessions should be identical, but rather that the accessions share a common history and have common distinctive traits. This was the first step in creating the groups of *B. oleracea* accessions studied in this paper.

Verification of this procedure should answer the question if the groups created correspond to their genetic make-up. The approach that was used checked if a component not yet included in a group were to be classified in the same group, on the basis of the nine isozyme systems, as they were on the basis of history and morphology.

When looking at the results it should be noted that if one group had been made, or in this case two groups, i.e. Brussels sprouts and white cabbage, all components would have been correctly classified. So in the ideal case the ratio between the similarity within the groups and the dissimilarity between the groups would be maximal. A complicating factor is that sometimes the difference between varieties or landraces is based on only one gene with a major impact, for example a resistance gene or a colour gene. In this study, cases were included in which two groups were based on the same landrace, distinguished on the basis of continuous morphological differences, i.e. the two 'Bedfordshire' and the two 'Gouden Akker'.

Taking all these factors into account, it can be concluded from the results of the electrophoretical analysis that pooling of the components included in the study is justified. In two cases the isozymic patterns suggested that the groups could have been larger. Only in the case of the two groups of 'Bedfordshire' was this a real option. In the other case involving the groups 'Langedijker Bewaar Gewoon', 'Langedijker Bewaar Graag' and 'Late Herfstdeen' this was not an option since these landraces, although they have a common genetic background, clearly have a distinct identity and history.

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Isozyme variation and changes in allele frequencies in regenerated *B. napus* 'Topas'

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The aims of this project are to assess genetic changes in a number of isozyme systems in two populations of annual *Brassica* from the latitudinal extremes of Europe, following regeneration in various geopgraphical areas. The project has been coordinated by Mats Gustafsson and David Astley. The results, obtained in the study of *B. napus* 'Topas', were presented by Gustafsson during the ECP meeting.

Seeds from one accession of 'Topas' were distributed to European genebanks/ institutes for regeneration. The participants were told to use their common procedure for multiplication of genetic stocks, to note the number of individuals used for regeneration and to register the environmental conditions. The multiplied seeds were sent back for analysis. One example of the results is shown in Table 1. The genotypes of the enzyme DIA are FF, FS and SS. For this enzyme, as well as for most of the others, the allele frequencies vary from one regenerated population to another, in this case from 0.96 to 0.77 (F).

This investigation indicates that considerable shifts in allele frequencies may occur during multiplication and regeneration and that single alleles can easily be fixed or lost.

Table 1. Current regeneration in *Brassica* effect on genetic diversity

DIA banding patterns[1]

Allele

F

S

	FF	FS	SS

	Allelic frequencies	
Population	**F**	**S**
930001	0.88	0.12
930006	0.96	0.04
930008	0.86	0.14
930010	0.77	0.23
930012	0.85	0.15
930014	0.88	0.12
930016	0.89	0.11
930018	0.91	0.09
930020	0.87	0.13

[1] DIA = Diaphorase.

6. *In situ* conservation

C. Gómez-Campo and M. Gustafsson both presented prospects and strategies to conserve wild *Brassica in situ*. They pointed out that although many *Brassica* populations are located in sites difficult to access, others could be considered as threatened. It was recognized by the group that the *ex situ* conservation of *Brassica* was well advanced and that it was time to consider the ways in which *in situ* conservation could complement these activities. The group noted the wealth of ecogeographic information assembled during the IPGRI collecting missions.

The group also recognized the suitability of Sicily with its populations of *B. macrocarpa*, *B. villosa* and *B. rupestris* as first foci to gain knowledge about the population genetics and to develop *in situ* strategies. This could serve as an example for dealing with other crops in which the distribution is more continuous.

It was agreed that C. Gómez-Campo and M. Gustafsson would collaborate with F. Raimondo of Palermo, with IPGRI and possibly with H. den Nijs of the University of Amsterdam to further develop the strategy on *in situ* conservation of the above-mentioned taxa.

The group welcomed the initiative of IPGRI to submit a project on conservation of wild *Brassica* to the Italian government in collaboration with F. Raimondo and P. Perrino. It was recommended that interaction with the group listed above would be sought to further develop the formulation of the project if it was accepted.

It was agreed that as a priority, the populations from which the type specimen was identified need to be monitored/conserved.

T. Gladis informed the group of the presence of introgressions between wild and cultivated material in populations of South Italy. These dynamic populations are used by farmers as fodder and vegetable crops. The group agreed that on-farm conservation and documentation of these populations would be desirable. T. Gladis pointed out that a pilot project on on-farm conservation is being implemented for various other crops in Germany within a biosphere reserve. The group recommended that such activities be investigated and encouraged in other countries.

The working group is concerned with the fact that in several countries the legislation on seed trade forbids the trade of landraces and obsolete varieties because it prevents effective on-farm conservation of traditional varieties. The group also stressed that the proposed EU regulation on this matter will further limit the possibilities for on-farm conservation. The group recommended that every possible action be undertaken to obtain an amendment of the proposed regulation to include an alternative mechanism which would allow the exchange of local varieties and effective on-farm conservation of such germplasm.

The inclusion of *Brassica* species on lists of protected plants such as the Bern Convention and the European Red List was seen by the group as a useful step toward conserving valuable wild populations. The group noted that *B. glabrescens*, *B. hilarionis*, *B. insularis* and *B. macrocarpa* are included in the revised Annex I of the Bern Convention. The Group also noted that *B. glaberescens*, *B. insularis* and *B. macrocarpa* are included in the EC Red List (EC Directive 92/43).

The group strongly recommends that *B. villosa* and *B. rupestris* also be included on these lists as they are endemic to Sicily and restricted to about 10 populations.

M. Gustafsson together with C. Gómez-Campo agreed to develop a recommendation to the appropriate authorities for the inclusion of these species on the abovementioned conservation lists. These recommendations will be developed with the advice of F. Raimondo and IPGRI before March 1995 to be submitted to the Bern Convention Sub-Group on Plants, meeting during the summer of 1995 in France.

Prospects for *in situ* conservation of *Brassica oleracea* wild relatives

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Introduction

A group of at least nine wild species of *Brassica* related to cultivated cabbage is distributed along the Atlantic and Mediterranean coasts, from Wales to Israel. During a series of IPGRI-supported missions to collect germplasm, about 200 localities throughout the area were visited. Apart from seed material, many ecological data and other information of relevance to conservation were collected. Field data sheets included headings such as 'companion species' for a better definition of the ecological associations, and another on 'possible threats' affecting each site.

But most of all, and for several years, there were frequent and fruitful conversations on subjects such as evolution, conservation, etc. between the authors and with other members of the team (mainly A. Zamanis in Greece and P. Perrino in Italy), either *in situ* on the collecting sites or *ex situ* during leisure time.

Habitats

Wild *Brassica* species mostly grow on cliff systems not far from the sea, a trend which appears to be more accentuated in the extremes of the area (wild *B. oleracea* in the west and *B. cretica* in the east). Chalk cliffs in the Channel area, the cradle of *B. oleracea*, are often completely vertical and they show strong erosion dynamics. In other areas, cliffs commonly correspond to compact limestones. Only exceptionally, the cliffs are acidic. In general, the plants may grow on the top slopes, on the cliff walls themselves or at the foot of stony slopes.

In Greece, *Brassica*-bearing cliffs are characteristically associated with large earth volumes, massive enough to secure proper humidity in summer. Also, the more arid the condition, the higher the preference of the plants for north-oriented aspects.

Brassica montana is less chasmophytic, and it grows more frequently in stony slopes or flat lands with bushy Mediterranean vegetation (macchia). A similar behaviour can be found in some populations of *B. insularis* in Sardinian islets.

More accidentally, the plants grow in roadsides, nitrified areas, near human dwellings, in the backside of beaches, in the surroundings (or even the yards) of antique buildings such as castles, lighthouses, etc., in quarrying debris, or in other areas with strong human influence.

Threats

Actual or potential threats were detected in at least half of the populations. Overgrazing by goats, nearby constructions, fires, quarrying, competition by alien species and nitrification of the cliffs were among the most conspicuous. Genetic drift and reproductive collapse might be added for some extremely small populations.

Overgrazing by goats was found to be a real threat in Crete, where goats are abundant and are often raised completely free in valleys so steep that fencing is unnecessary. The scarcity of individuals in Cretan *Brassica* populations is probably an effect of this. In many other areas, the presence of goats was also conspicuous. In fact, seed collecting often consisted of the art of reaching plants that a goat cannot reach. But whether or not they posed a real risk was not at all clear in many cases.

Building activities in the proximity of *Brassica* sites were observed in several cases. In fact, a formerly recorded locality in northeast Sicily was found to be completely engulfed by the growth of a city. In some cases (Campania, Italy), the terraces of some houses were even used to collect from cliffs in the back. The situation was relatively more frequent in touristic areas (Mediterranean Riviera, Cote d'Azur and Costa Brava).

We refer to modern lucrative and aggressive construction because long-lasting antique buildings like the fortresses of Achrochorinthos, Kithera castle or Mte. Erice seem to attract *Brassica* populations.

Fire is a natural factor for the Mediterranean ecosystems, but its frequency and intensity in the past few years, at least in some areas, is raising a generalized concern. The danger for *Brassica* cliffs may increase because goat or livestock-raising activities are in recession and bushy vegetation accumulates at the foot of the cliffs.

Quarrying activities have been recorded in many places. In the Alpi Apuani (northwest Italy), they seem to favour the establishment of *B. montana* weedy populations, and in Col du Teghine (Corse) they do not produce apparent damage to the extensive recently discovered population of *B. insularis*. But in Montagnagrande (west Sicily) they have already sliced an important portion of the hill where a population of *B. villosa* exists.

On certain occasions, the invasion of the cliff crevices by weedy aliens is an important potential risk. A clear case for *B. rupestris*, near Palermo (Sicily), could be recently observed by all the participants of a meeting. Competition of this kind might be stimulated by the nitrification of the cliffs after any overload of domestic herbivores nearby.

Gene flux from neighbouring cultivated *B. oleracea* has only been observed in Casamicciola (Isquia, Italy) in a population of *B. incana*. Though all (n=9) *Brassica* are more or less interfertile, this phenomenon is not common, even between wild and cultivated *B. oleracea* in France and Great Britain.

Tiny populations were found in many occasions. Though they do not usually show symptoms of reduced variability with respect to the larger ones (as found by the second author of this report), the danger obviously exists. A population with a few poor-looking individuals visited in 1986 in Punta d'Aquella (Corse) has now completely disappeared (Guyot, pers. comm.). Such a fate was probably accelerated by a pathological problem.

When growing in weedy habitats, most *Brassica* populations seem to behave well. However, as they represent a secondary adaptation to human disturbances, they should not be given excessive consideration when *in situ* conservation activities are being planned. In addition, their overall frequency might be lower than that appreciated during collecting activities, since a justifiable selection for the most handy or accessible localities does occur.

Prospects for *in situ* conservation

To conserve the complex of (n=9) *Brassica* species is not an especially difficult task if we compare it with other plant conservation problems. Many of the sites are already naturally protected either by their own structure (cliffs) or because they are in relatively remote areas, i.e. massifs, capes or small islands. Also those populations in weedy habitats are usually well defended by their own opportunistic behaviour.

However, the application of some measures and policies seems necessary if we wish to maintain the situation, to improve it, or just to prevent future disasters. Once the conservation *ex situ* has been achieved with success, it is certainly time to think over what could be done *in situ*.

Legal protection of as many *Brassica* sites as possible should be a necessary first step, and for the time being, the elaboration of a catalogue of already protected sites would be very useful in this respect. However, legal protection should not remain a mere label for the involved areas, but it should be accompanied by the effective prevention of threats and by periodic monitoring of the conservation status of the flora, including present populations of *Brassica*.

Whenever possible, the presence of other rare plant or animal species sharing the same habitat should be studied and recorded, because it might be a stimulus for official declarations of protected sites. Though companion species were recorded during seed-collecting missions, rare species were seldom noted in the sheets.

Diverse types of action might also be necessary, because completely passive conservation has not been shown to be a good policy in all cases. The complete removal of herbivores, for instance, might be as deleterious as overgrazing if ecological succession leads to excessive competition by bushy vegetation and/or to an increase in fire risk. A proper grazing load should therefore be maintained and, wherever domestic animals tend to recede, the original wild herbivores should take their place.

In the cliffs (and in general), it is obvious that we should aim to maintain the status quo and not, for instance, help the plants to extend into flat lands or colonize new habitats. In this respect, several limitations (competition with bushes or grasses, allelopathic substances, grazing, etc.) prevent the wild kales from becoming fully established at the cliff foot. Snogerup's model for *Erysimum*, 'climbing' or 'descending' from the cliffs according to the existence of such limitations, might well be applied to chasmophytic *Brassica*, and should be taken into account.

The removal of competing weedy aliens, or the reinforcement of tiny populations with the artificial reintroduction of new individuals grown from seeds of the same origin, are also examples of other possible actions.

Although legal and actual protection of areas are among the competence of national or regional governments, international agencies could play an important role in this case by stimulating and coordinating the policies of those 10 countries where wild (n=9) *Brassica* species grow.

A strategy for *in situ* conservation of wild *Brassica*

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So far the ECP/GR *Brassica* Working Group has discussed collecting missions, different aspects of *ex situ* conservation and how and where to preserve these accessions. However, it should be remembered that *ex situ* and *in situ* conservation are complementary ways of preserving the diversity of plant species. While an integrated conservation strategy is particularly recommendable for wild relatives of crop plants, preference should be given to the conservation within the natural habitat, when that habitat is rich in other endemic species.

The wild species of the *Brassica oleracea* cytodeme are distributed along the Mediterranean coasts from Cyprus to the northeastern parts of Spain and along the Atlantic coasts of Spain, France and Great Britain (Fig. 1). They occur as vicarious species and are usually growing in maritime cliffs or small rocky islets. Some of the species are extremely chasmophytic while others may survive even in weedy or ruderal situations. About one-third of the known populations are small or very small.

Within the cytodeme two centers of diversity can be recognized: the East Mediterranean area and Sicily. The East Mediterranean species *B. cretica* is highly polymorphic as each population or group of populations has evolved its own typical set

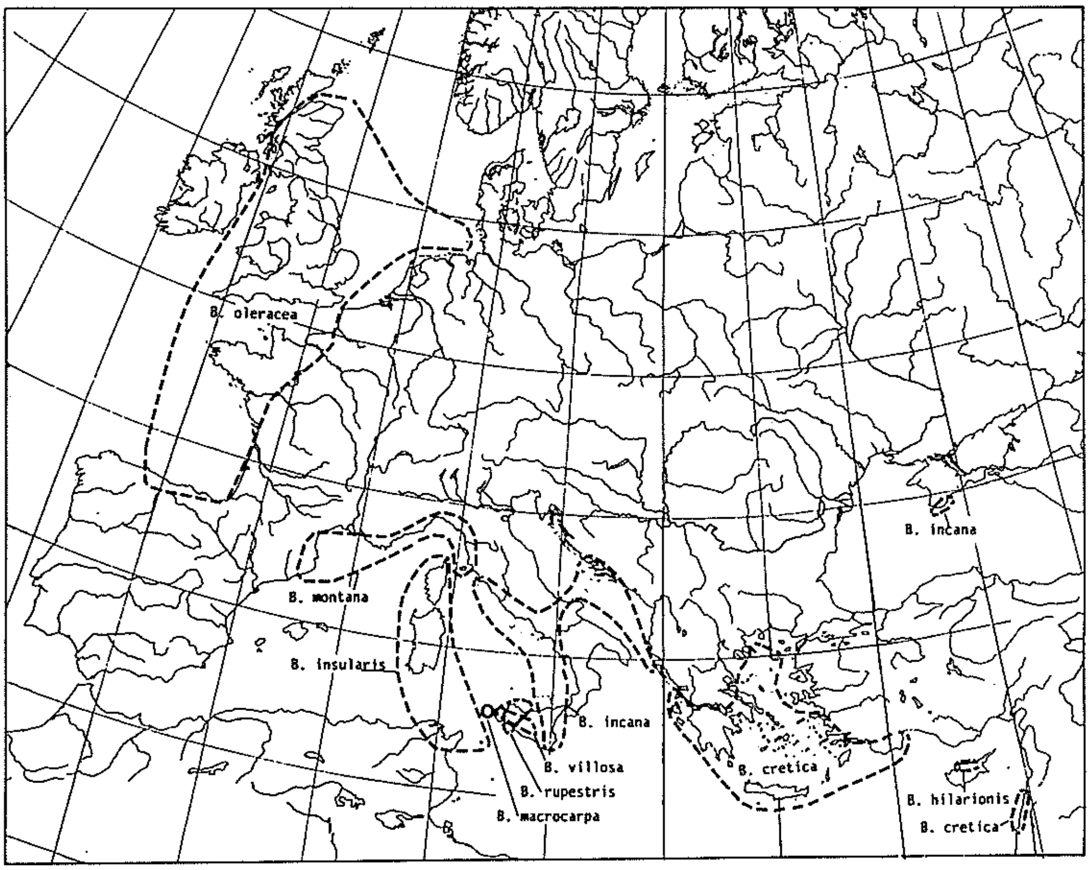

Fig. 1. Distribution of *Brassica* species according to Snogerup *et al.* 1990

of characteristics as a result of natural selection and random drift. However, the main centre of diversity of the group is located in Sicily, where the cytodeme is represented by several species. *Brassica incana* is represented by a few populations in the northeast, *B. villosa* and *B. rupestris* in the western parts of the island and *B. macrocarpa* is endemic to the small islands of Favignana and Maremettimo.

A programme for *in situ* conservation of wild, Mediterranean *Brassica* species should start with the preservation of genetic resources of the Sicilian species for the following reasons:

- the area concerned is limited;
- some of the cliff habitats are already protected;
- it will be fairly easy to define target populations;
- a high level of diversity can be expected to be found;
- presently many of the populations are influenced by human activities and need some kind of protection in order not to risk extinction.

A major obstacle for the conservation and management of wild relatives to cultivated plants is the lack of clarity with respect to the timing for phasing out research and initiating conservation and management practices. Thus, past experiences indicate that there is a great risk that research will continue for years and that conservation does not start. Therefore, a preliminary framework programme for dynamic conservation and management should be proposed at the beginning of the project. A conservation and management plan for wild *Brassica* species may consist of the following phases:

1. Designation of potential target populations and distribution of existing reserves.

2. Survey of potential populations, collecting information about:
   - habitat (rock and soil types, exposure, rainfall);
   - ecosystem (frequency of endemic species, companions, etc.);
   - population structure (size, dispersion, periodical fluctuations, gene flow);
   - reproductive capacity (flowering, pollination, seed set);
   - genetic diversity (identify variation within populations);
   - threats to the population (human activities, introgression).

3. Selection of target populations.

4. Collection of the available information into a database.

5. Formulation of management and monitoring plans.

6. Preparation of a program for public information.

Reference

Snogerup, S., M. Gustafsson and R. von Bothmer. 1990 *Brassica* sect. *Brassica* (Brassicaceae). I. Taxonomy and variation. Pp. 271-365 *in* Willdenowia 19 - 1990.

7. International collaboration

E. Frison, Director of IPGR's Europe Group, gave a presentation on the ongoing debate about access to genetic resources. He emphasized the importance of access to a wide range of diversity and, following the entry into force of the Convention on Biological Diversity, the necessity for an international agreement which would facilitate access to genetic resources. The justification for — and the main features of — a 'Multilateral System' for plant genetic resources were briefly presented.

D. Astley reported on his contacts with the USDA Crucifer Crop Advisory Committee. He submitted to the group extracts of a recent meeting of the committee.

S. Padulosi, Coordinator of IPGRI's project on Underutilized Mediterranean Species and D. Pignone, newly elected Chairperson of the Rocket Genetic Resources Network, presented the conclusions and principal recommendations of the Network's meeting which was held simultaneously with the 2nd ECP/GR *Brassica* Working Group meeting. The initiatives taken regarding rocket were welcomed and it was agreed that collaboration between the two groups would be encouraged, where possible. It was pointed out that a domain in which collaboration would be possible is multiplication as the required infrastructure could be used simultaneously for *Brassica* and rocket.

The group also discussed its collaboration with Non-Governmental Organizations (NGOs). It was noted that an NGO (The Henry Doubleday Research Association) had been invited to participate at their own cost but was unable to attend. The group strongly recommended that members actively seek contact with NGOs dealing with *Brassica* in their own country. Cooperation between NGOs and the national genebanks was considered as very desirable.

Access to genetic resources

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Introduction

Access to a wide range of genetic resources is a prerequisite for increased agricultural productivity. So far, the international cooperation on conservation and use of plant genetic resources has been based primarily on informal and not legally binding arrangements. In the changing environment which now prevails, we propose that a comprehensive 'Multilateral System' for the management of plant genetic resources for food and agriculture (PGRFA) be agreed upon at the global level. Continuing international cooperation in plant genetic resources conservation and use is required for several reasons.

International cooperation needed

Firstly, plant genetic resources are essential as:

- an immediate resource — genes and genotypes are valued for the particular characteristics they provide including agronomic characteristics such as pest resistance, drought tolerance, plant stature, as well as taste, colour and other factors of cultural importance;
- as genetic diversity *per se*, that is, as an insurance against unknown future needs/conditions, thereby contributing to the stability of farming systems at the local, national and global levels.

Major advances in plant breeding, based on an increased use of plant genetic resources, will continue to be a prerequisite to achieving the increases in food production necessary to feed the rapidly growing world population.

Secondly, cooperation is essential because of the interdependence of countries with respect to plant genetic resources. For their major agricultural crops, most regions of the world are more than 50% dependent on species that originated in other regions. For industrialized regions this dependency is over 95%. Even though many countries now hold a significant part of plant genetic diversity for these crops in genebanks and in farmers' fields, in the long term there will be a need for continued access to diversity from the centres of origin of the crop species, for instance, to find resistances to diseases. Incidents like the Irish potato famine, the *Helminthosporium* epidemic in the US maize crop, and the wipeout, due to rust, of the Sri Lankan coffee crop and its replacement by tea, provide drastic reminders of the need for greater genetic diversity in these introduced crops.

Thirdly, there is an economic rationale for cooperation. Genetic erosion can be understood as an economic process; without intervention at an international level, forces will lead to ever-accelerating genetic erosion. The replacement of a large number of traditional (and genetically more heterogeneous) varieties with a small number of modern (and genetically more uniform) ones is a process of conversion whereby diverse assets are replaced by a narrower range of assets which are more productive. Since, in economic terms, plant genetic resources are an international public good, international agreement is a prerequisite to their conservation.

Finally, there is a legal rationale: the effective implementation of relevant parts of the Convention on Biological Diversity will also require international mechanisms and further agreements which can only be developed multilaterally.

Multilateral system on plant genetic resources

A Multilateral System on plant genetic resources for food and agriculture with the following requirements should be developed. Such a system would not necessarily apply to other uses of plant genetic resources such as their exploitation for pharmaceutical substances. It should:

- ensure conservation of plant genetic resources of relevance to food and agriculture, *inter alia* by promoting conservation *in situ* through incentives;
- ensure that the benefits derived from such genetic resources are shared with the countries that provided them. This is not only a question of equity or of promoting development; it is also a prerequisite to providing incentives for effective conservation and a *quid pro quo* for continued access;
- promote continued access to plant genetic resources for food and agriculture, and provide mechanisms to regulate access where necessary and ensure that these agreements are respected;
- promote agricultural development through plant breeding;
- be based on effective action at the national level.

The Multilateral System on plant genetic resources must also have the following institutional features:

- democracy and equity, with the involvement of all nations on an equitable basis;
- transparency of decision-making and accountability of executive bodies;
- sustained funding underpinning international activities and the sharing of benefits.

Because of the interdependence between countries with regard to plant genetic resources, international cooperation is vital to ensure access to the required diversity, especially for food crops. Ready access to specifically needed characteristics and comprehensive scientific studies of a crop genepool are only possible in a system where the total range of genetic diversity is available. It would be difficult to develop a system wholly based on bilateral exchanges which could guarantee such access. This is particularly critical for those developing countries which are both poor financially and relatively poor in genetic resources. They have little prospect of obtaining genetic resources through bilateral exchange mechanisms since they do not have funds, technologies or major sources of original genetic diversity to exchange.

Mechanisms to establish a multilateral system

Discussions are ongoing in the FAO Commission on Plant Genetic Resources on the revision of the International Undertaking on Plant Genetic Resources, which could become a protocol to the Convention on Biological Diversity. Negotiations are now taking place within this framework, aimed at developing a multilateral agreement to guarantee the continued availability of plant genetic resources, and to a compensation mechanism for the benefit of countries providing genetic resources in the light of the Convention on Biological Diversity. A Global Plan of Action, including programmes and projects to promote the conservation of plant genetic resources and their sustainable use, is being elaborated in the context of the International Technical Conference on Plant Genetic Resources. A funding mechanism for this should be put in place, taking into consideration the concept of Farmers' Rights, that is, the "rights arising from the past, present and future contributions of farmers in conserving, improving and making available plant genetic resources."

These agreements will need to be developed as a part of a comprehensive Multilateral System for plant genetic resources for food and agriculture. This should guarantee access to plant genetic resources held in a country, and their conservation, in return for a share of the benefits through an international funding mechanism. A substantial international fund for plant genetic resources will need to be established on a sustainable basis through regular contributions, mainly from developed countries.

Conclusion

In conclusion, a comprehensive Multilateral System for plant genetic resource for food and agriculture is required which ensures the conservation of plant genetic resources and their utilization for human benefit at a global level. Such a system would incorporate agreements on access to plant genetic resources which ensured their availability; mechanisms for the sharing of benefits derived from plant genetic resources; conservation networks and information systems, and a research and plant breeding capacity which meets the needs of farmers worldwide. Such a system should be developed with the full participation of all groups involved in the management of genetic resources.

Reference

Cooper, D., J. Engels and E. Frison. 1994. A multilateral system for plant genetic resources: imperatives, achievements and challenges. Issues Papers No. 2. International Plant Genetic Resources Institute, Rome.

USDA Crucifer Crop Advisory Committee

David Astley
Horticultural Research International (HRI), Wellesbourne, UK

Extracts from the minutes of the meeting of the Crucifer CAC held in August 1994 at Oregon State University, Corvallis

The discussions covered the development of Bylaws for the Committee and a genetic vulnerability statement for crucifer crops; crucifer descriptors; reports by crucifer curators; proposal development; GRIN3 and responsibilities for new cruciferous crops.

Bylaws: This discussion covered the membership of the CAC, its objective and function, and reporting procedures. The Committee currently comprises a Chairman, Secretary, nine members from public and private sectors, and five *ex officio* members. The latter are representatives from the two main USDA crucifer collections at the Regional Plant Introduction Stations in Geneva (Jim McFerson) and North Central RPIS Ames (Rick Luhman); a GRIN specialist, Beltsville; Agriculture Canada; ECP. Jim McFerson has the task of preparing draft Bylaws for distribution to the Committee in due course.

Vulnerability statement: The Agricultural Research Service require a statement of current status of collections, etc. and proposed action in order to evaluate proposals for collection and evaluation. The statement is generally directed to US needs, but may present broader world perspectives. Two subcommittees, vegetable and oilseeds, were asked to prepare drafts for the Committee.

Descriptors: Curators and evaluators have data waiting to be entered into GRIN, but there is no USDA-approved set of descriptors for crucifers. The same subcommittees as above were asked to develop finalized lists of descriptors for their respective crops groups as soon as possible. The CAC felt it desirable to try and consolidate the vegetable and oilseed descriptors into a single list for crucifer crops.

Reports by crucifer curators: The Regional Plant Introduction Station, Geneva, New York has responsibility for horticultural crucifers. Jim McFerson's report summarized the collections in terms of total numbers, available, regenerated and distributed in 1993/94. Regeneration is carried out in field cages and glasshouses using bees; 364 accessions were seeded in 1993/94. Inventory data have been completely updated and uploaded into GRIN. All accessions have been repackaged in foil pouches and a new bar-code labelling system introduced.

Taxon	Total	Available
B. juncea	63	0
B. oleracea	1529	657
B. rapa	336	34
Brassica spp.	68	17

Significant progress has been made in the use of molecular markers to characterize *Brassica* accessions. RAPD and microsatellites have been used to assess genetic identity and relatedness.

The North Central Regional Plant Introduction Station, Ames, Iowa work with the oilseed crucifers including *Brassica, Camelina, Crambe, Eruca, Isatis, Lepidium* and *Sinapis.* Rick Luhman reported that 50% of the total 3974 Brassicaceae collections have PI numbers, and that 80% of these are available for distribution. At present, 36% of total accessions and 74% of the PI accessions are safety duplicated at NSSL. Problems in field seed production were encountered in the 1993 season because of prolonged rain. However, the 1994 season was extremely good for planting and harvesting, and hence seed production. Various characters were recorded during regeneration, namely flowering date, flower colour, siliqua arrangement, plant height, harvest date(s), number of plants harvested and weight of seed harvested. Comparative studies on pollinating insects (*Apis mellifera, Megachile rotundata* and *Osmia cornifrons*) indicate that *Osmia* is the superior pollinator for *Brassica.*

Proposal development: A proposal has been submitted to develop a glasshouse screen for resistance to green peach aphid.

GRIN3: GRIN is a centralized computer database used for the management and operation of the National Plant Germplasm System and to provide users with an information service. There are 440 000 accessions representing 8000 taxa catalogued in the database. Currently 27 USDA germplasm maintenance sites use GRIN for data management, and >800 public users (national and international) are registered for access. GRIN3 is the next step in project development with upgraded software and hardware increasing performance and accessibility to the user community. The new system will also contain databases for animal, insect, microbe and aquatic data. The system will need to cope with additional data from molecular studies and perhaps storage of images. PCGRIN is available as a menu-driven package for use as a downloading tool for specific subsets of the database.

Responsibilities for new cruciferous crops: The meeting considered that new crops such as *Crambe* and *Lesquerella* may be dealt with under the remit of the Crucifer CAC rather than the New Crops CAC. A report on current status of collections will be prepared.

The Rocket Genetic Resources Network: Summary of the first meeting, Lisbon, 13-15 November 1994

Stefano Padulosi
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This is the first meeting of the Rocket Genetic Resources Network since the Valenzano workshop held in March 1994. At that workshop, organized by the Underutilized Mediterranean Species Project (UMS), the Rocket Genetic Resources Network was formally established. The Lisbon meeting was organized just before the International Symposium on *Brassica* in order to take advantage of the presence in that city of several Network members. It was also organized in parallel with the ECP/GR *Brassica* Working Group meeting in order to create opportunities for a close interaction among participants from the two groups. The meeting was attended by 14 scientists from eight different countries (Italy, Israel, Portugal, Spain, Greece, Egypt, Turkey and Canada).

On the first day, relevant lectures given by experts on rocket provided an overview on the taxonomy, diversity, collection and conservation activities on *Eruca* and *Diplotaxis* species. Particularly interesting were the presentations of V. Bianco (his paper represents a vast source of information on rocket including a bibliography containing 130 references); M. Salah who provided an overview on the diversity, agronomy and uses of rocket in Egypt (the largest consumer of rocket in the Mediterranean region) and Y. Tuzel who informed about crop diversity and uses in Turkey, another country where rocket is also particularly appreciated, albeit neglected in research and conservation aspects. The presentations made by C. Gómez-Campo and S. Warwick on rocket taxonomy were also very interesting. These scientific presentations are an important reference for further discussions among Network members, particularly when addressing collecting issues and how to better conserve and use rocket genetic diversity.

The formal contributions were followed by a number of presentations made by the Greek, Portuguese, Italian, Spanish and Israeli colleagues summarizing the situation concerning the diversity and utilization of rocket in those countries.

The remaining two days of the meeting were spent discussing activities of the Network. An account of activities carried out since the Valenzano meeting was presented along with a Work Plan for the Network. The team spent some time reviewing the IPGRI *Brassica* descriptors list in order to adapt this to rocket species, and a rocket descriptors list was drafted. Among the topics discussed were the creation of a rocket database and a number of evaluation activities which will be carried out in the framework of the Rocket Genetic Resources Network on both *Eruca* and *Diplotaxis* species. These will include stress resistance to salt and pests, agronomy, nutritional values, accumulation of nitrates in the leaves and post-harvest physiology. Collecting expeditions to sample rocket germplasm are planned in southern Italy (islands of Pantelleria and Linosa; Pollino mountain area, Bari surroundings), Egypt, Israel and Portugal.

A discussion was also held on the possibility of submitting a joint rocket proposal to the EU in regard to regulation no. 1467/94 on plant genetic resources. D. Pignone volunteered to be the focal point for such an initiative.

The participants unanimously elected D. Pignone as Chairperson of the Rocket Genetic Resources Network.

8. Future of the Working Group

It was recognized that with the initiation of Phase V of ECP/GR and the availability of a full-time coordinator for the Programme, the necessary conditions are now in place for a more effective operation of the group. Furthermore, the composition of the group, which includes curators, breeders, pathologists and botanists, is favourable for a comprehensive approach to conservation and utilization of *Brassica* genetic resources.

Communication/Newsletter

The group recognized the need for increased communication among the members. It was agreed that Email would increasingly be used to communicate more efficiently.

D. Astley gave an overview of the advantages and constraints encountered with the *Allium* newsletter. It was agreed that a newsletter would be circulated twice a year; I. Boukema accepted responsibility for editing and distributing this newsletter.

All the members present agreed to send at least one contribution to I. Boukema before 1 April 1995 for the first issue. These contributions could be in the form of small abstracts, announcements of research or collecting activities, announcements of forthcoming meetings, enquiries or information on methodology, etc.

Participants were also invited to communicate information of interest to IPGRI's Newsletter for Europe.

Guidelines for the safe movement of *Brassica* germplasm

T. Gass informed the group that IPGRI intends to publish the Guidelines for the Safe Movement of *Brassica* Germplasm. Members were invited to suggest participants for this project. These should be renowned *Brassica* pathologists.

EU proposals

A meeting was held to develop a joint project to be submitted to the European Community Programme on the Conservation, Characterization, Collection and Utilization of Genetic Resources in Agriculture (Council Regulation (EC) No 1467/94 of 20 June 1994).

New Chairperson and next meeting

In conclusion the participants reviewed and accepted the report of the meeting. M. Gustafsson was unanimously re-elected to chair the group until its next meeting which is tentatively planned for the end of 1996.

Appendix I. List of participants

Chairperson

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