



Report of a Network Coordinating Group on Vegetables

Ad hoc meeting - 26-27 May 2000 - Vila Real, Portugal
L. Maggioni and O. Spellman, *compilers*



European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR)



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The European Cooperative Programme for Crop Genetic Resources (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, is overseen by a Steering Committee (previously Technical Consultative Committee, TCC) composed of National Coordinators nominated by the participating countries and a number of relevant international bodies. The Programme operates through ten broadly focused networks in which activities are carried out through a number of permanent Working Groups or through *ad hoc* actions. The ECP/GR networks deal with either groups of crops (cereals, forages, vegetables, grain legumes, fruit, minor crops, industrial crops and potato) or general themes related to plant genetic resources (documentation and information, *in situ* and on-farm conservation, technical cooperation). Members of the Working Groups and other scientists from participating countries carry out an agreed workplan with their own resources as inputs in kind to the Programme.

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Part I. Discussion and recommendations

Introduction

After an introductory welcome given by Eduardo Rosa on behalf of the University of Trás-os-Montes and Alto Douro, and a brief self-introduction of the participants, L. Maggioni, ECP/GR Coordinator, presented some information regarding the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) in general and more specifically on the Vegetables Network. He reminded the Group about the outcomes of a preparatory meeting held in Rome in May 1999 (report available at <http://192.168.227.3/ecpgr/Publications/Veg0599.htm>). At this meeting, the Working Groups' Chairs, D. Astley and G. Thomas, proposed to identify focal persons for the extended range of crops to be considered within the Vegetables Network. A number of issues were also suggested for consideration during the present meeting and were included in the meeting agenda. All the focal persons listed in Table 1 subsequently accepted the role.

Table 1. Vegetables Network Coordinating Group

Crop Group	Focal persons
<i>Allium</i>	Joachim Keller (Germany); Dave Astley (UK)
<i>Brassica</i>	Eduardo Rosa (Portugal); Grégoire Thomas (France)
Umbellifer Crops	Teresa Kotlińska (Poland); Dave Astley (UK)
Solanaceae (eggplant, pepper, tomato)	Marie-Christine Daunay (France)
Cucurbits	Fernando Nuez (Spain)
Leafy vegetables	Ietje Boukema (The Netherlands); Aleš Lebeda (Czech Republic)

The progress and future perspectives of the Working Groups on *Allium*, Umbellifer crops and *Brassica* were presented by the respective Group Chairs. Overviews of ongoing genetic resources activities in Europe for Solanaceae, Cucurbits and Leafy Vegetables were presented by the respective focal persons and I. Boukema presented the progress of the International *Lactuca* Database (ILDB), which is under development at CGN¹. Full articles are printed in Part II of this report. Activities on vegetables genetic resources in Portugal were presented by R. Farias. A collection of tables and data related to the importance of vegetables and their *ex situ* conservation in Europe, prepared by the ECP/GR Secretariat, was distributed to the Coordinating Group members (copies are available upon request).

Presentations and Discussion (Day 1)

The presentations (see Part II) were followed by a discussion. A summary of the relevant conclusion is given below:

Allium Working Group

Future action of the Group should focus on the following items:

- Development of the Database;
- Definition of the terms of reference for the maintenance of the international collections of vegetatively propagated crops;
- Improvement of the level of safety-duplication of all the collections, as a result of bilateral agreements, and possibly of a multilateral agreement in the case of vegetatively propagated crops;

¹ The International *Lactuca* Database is now available at <http://www.plant.wageningen-ur.nl/about/Biodiversity/Cgn/collections/ildb/>

- Continuation of the activities started by the EU funded 1467/94 project;
- Investment in research on cryopreservation as a means to conserve vegetatively propagated crops, which constitute about 30 % of the *Allium* accessions conserved in Europe;
- Collection of wild species;
- Identification of emergency actions and search for funding sources;
- Collaboration with other Networks on themes of horizontal interest, such as the issue of conservation of vegetatively propagated crops.

Umbellifer Crops Working Group

This Group was mentioned as a good example, since it is functioning although its members met only during a start-up meeting in 1997.

Future action of the Group should focus on the following items:

- Integration of the activities of the Group with the EU funded GEN RES carrot project, keeping in mind that the EU project is only focused on carrot and not other umbellifer genera; a high proportion of the European umbellifer collections is of *Daucus carota*. Anything else has mainly local importance (fennel in Italy, parsnip in the UK, etc.). The possibility was mentioned that the Working Group (and indeed every WG) be complemented by the participation of expert members for each of the crop genera included within the scope of the Working Group. It would, however, be recommended that Groups do not exceed a manageable size.
- Strengthening collaboration with non ECP/GR countries of eastern Europe;
- Development of the database;
- Collecting landraces of umbellifer crops in Mediterranean and eastern European countries;
- Definition of responsibility for the maintenance of all crops accessions. Samples that are not considered priority by certain genebanks could be transferred to different maintainers willing to accept them.

Brassica Working Group

Future action of the Group should focus on the following items:

- Acquire information from more countries on the status of *Brassica* genetic resources in Europe
- Complete the Database with missing data sets
- Finalize the minimum descriptors revised list
- Include minimum characterization data in the database
- Compile, agree and implement regeneration guidelines
- Ensure systematic and organized safety-duplication of the collections
- An upcoming meeting to be held in Portugal in October 2000 will be used to define a plan of action for the necessary regeneration of the Portuguese collection.

Other crops

Presentations offered by the focal persons on Cucurbits, Solanaceae and Leafy Vegetables emphasized the high interest and the need for increased Networking activities on these crops in Europe.

It was clarified that, among the Solanaceae, tomato is the leading species in terms of economical interest, followed by pepper and lastly by eggplant. Although these three crops are not of European origin, a long tradition of research and breeding in Europe has led to a unique richness of their genetic resources held there: richness of particular genetic material such as mutants and isogenic lines (tomato) or aneuploids and dihaploids lines (pepper), richness of early cultivars adapted to cold conditions (tomato) and richness of wild relatives (eggplant). For tomato and pepper genetic resources,

evaluation for many characters including disease resistance, as well as gene identification, is well advanced.

Among the Cucurbits, melon and cucumber were thought to be the most important crops to focus on, although genetic resources of *Cucurbita* species are also considered very important and of growing interest.

The following Leafy Vegetables were suggested for priority action: lettuce, spinach, chicory and asparagus.

Mode of operation of the Network

The Group acknowledged that the Vegetables Network should address a wider range of crops than those traditionally considered within ECP/GR. Recently approved EU funded projects on *Brassica*, carrot, eggplant and melon were considered an opportunity to organize small genetic resources meetings. These should be independent meetings, held during an extra day at the same location of the EU project meeting. Participants would be the EU funded ECP/GR members, plus additional ECP/GR funded non-EU partners chosen from countries where the respective crops' genetic resources are a priority.

Availability of funds for the Vegetables Network operation was estimated by the ECP/GR Coordinator to be roughly US\$25 000 (US\$13 000 deriving from the NCG meeting's savings, plus about US\$12 000 from the Small technical meetings budget).

For the future operation of the Network, G. Thomas proposed that the Group select among four different possible options, i.e.:

- 1) Concentrate on specific meetings of all the Groups in 2001-2002, including existing Working Groups and new informal Groups (IGs), with the aim of facilitating activities on an extended range of specific crops. A Network meeting in 2003 would give an overview of progress made and facilitate agreement on future action at the Network level.
- 2) Focus only on the three existing Working Groups that would proceed with their activities, dedicating funds to small meetings and to specific actions.
- 3) Focus on actions rather than meetings; define priority *ad hoc* activities either relevant for all the vegetables or for specific crops. Organize only small technical meetings at the end of Phase VI of ECP/GR, to review the progress made.
- 4) Focus on the new Informal Groups dedicating the Network effort to organizing their meetings, while the established Working Groups would rely on the EU funded GEN RES projects and on correspondence by email for the coordination of their activities.

The Group expressed its preference for the first option and made the following proposal for the future operation of the Vegetables Network, to be presented to the attention of the ECP/GR Steering Committee for approval.

Proposal for the future operation of the Vegetables Network

Step 1): Years 2001-2002. Organize small meetings (one per crop Group) focused on the extended range of crops of the Vegetables Network. The respective WG Chair and vice-Chair or Focal persons would be responsible for the local logistics and the technical organization of the meetings. Invitations to the meetings would be made in coordination with the ECP/GR Secretariat. A report of the meeting, including an agreed workplan, would be forwarded to the ECP/GR Secretariat by the responsible organizer.

The representation of countries funded by ECP/GR should be based on the principle that the link should be strengthened with those countries where vegetables genetic

resources are a priority, but tend to be excluded from the existing GEN RES Networking. Meetings of the following type are proposed:

- GEN RES groups (*Brassica*, Carrot, Eggplant, Melon) + ECP/GR funded partners from countries holding relevant collections for the respective genetic resources.
- *Allium* WG: small technical meeting to discuss about sharing of responsibilities for the maintenance of vegetatively propagated *Allium* germplasm.
- *Ad hoc* group on Leafy Vegetables

Table 1. Meetings proposed for the Vegetables Network (2001-2002)

Crop	Type of meeting	Location	Date	Responsible organizer	Self funded participants (GEN RES project)	Participants funded by ECP/GR **
<i>Brassica</i>	GEN RES Extra day	Catania, Italy	January 2002	<i>Brassica</i> WG Chair and vice-Chair	8-9	3-4
Carrot	GEN RES Extra day	Edinburgh, UK	November 2001	Umbellifer Crops WG Chair and vice-Chair	6	3
Eggplant	GEN RES Extra day		2001	Solanaceae Focal person	7	3
Cucumber and melon*	GEN RES Extra day	Vila Real, Portugal	September 2001	Cucurbits Focal person	4	2
<i>Allium</i>	Small technical meeting	Gatersleben, Germany	May 2001	<i>Allium</i> WG vice-Chair	-	6-7
Leafy Vegetables	Small technical meeting, possibly combined with EU Lettuce project meeting		End of 2001	Leafy Vegetables Focal persons	-	5
					Total: 25-26	Total: 22-24

* In the case of the cucurbits meeting, the focal person would organize the meeting in consultation with the coordinator of the GEN RES project.

**Choice of members funded by ECP/GR should be made in coordination with the Secretariat and the national coordinators.

Step 2): Year 2003. Plenary Vegetables Network meeting (about 25 people) to review progress made within the Network. This meeting (already scheduled in the ECP/GR workplan for Phase VI) will be organized in crop specific sessions and plenary sessions. In accordance with the ECP/GR rules and quotas of attending members taking part in the meetings, the meeting should be ideally attended by Chairs, vice-Chairs and focal persons of the active crop Groups, with the following representation: *Brassica* (2 people), *Allium* (2), Umbellifers (1), Leafy Vegetables (2), Solanaceae (1), Cucurbits (1), Melon (1), Minor Vegetables (1). An additional 14 members would complement the Group. With the objective of partially balancing the opportunities to meet, offered to EU members by the GEN RES projects, preference should be given in this case to the participation of eastern European countries.

An offer to host the Vegetables Network meeting in Rennes, France, was made by G. Thomas. The Group thanked him for the offer and decided to bear it in mind for a future decision.

Discussion (Day 2)

After the approval of the workplan for the future operation of the Vegetables Network, the Group continued the discussion and agreed on a number of recommendations and strategic decisions, as outlined below:

The scope of the new informal groups was defined as follows:

- Solanaceae: tomato, pepper, eggplant
- Cucurbits: all crops
- Leafy Vegetables: lettuce, spinach and chicory.

It was mentioned that the Informal Groups should not necessarily aim to establish Working Groups, but rather to identify *ad hoc* actions.

The role of the Focal Persons was defined as follows:

- Establish workplans for the respective Informal Groups. Priority would be to promote the development of Crop Databases and decide what is achievable with reference to the Steering Committee process analysis table, especially in terms of regeneration standards, duplication, rationalization of the collections and safety-duplication.
- Prepare one page of ideas, to be presented to the Steering Committee by December 2000, trying to develop a framework of action to be achieved in order to move things forward.
- Facilitate implementation of activities by seeking, from within the various national programmes, people interested in getting involved with the proposed workplan.

Existing Working Groups

The existing Working Groups (*Allium*, *Brassica* and Umbellifer crops) should re-align their workplans and consider how the work should be carried forward.

They will independently discuss specific items and the way to solve them. The ECP/GR Secretariat would be informed as appropriate of the planning of new actions. A. Lebeda remarked on the ongoing risk of genetic erosion for landraces and wild relatives of leafy vegetables, umbellifer and brassica crops, especially in eastern and southern Europe. He stressed the importance to continue the study of their distribution and level of genetic diversity, as well as the need to collect and characterize the existing material.

Documentation

The established Working Groups have identified crop specific descriptors. It is always useful that the different Working Groups interact whenever additional descriptors are defined, in order to make parallel and consistent decisions, when different Groups are adopting descriptors regarding the same type of characteristics.

Characterization

It is expected that the EU funded GEN RES projects will provide data to the European databases. To get an indication of priority characterization and evaluation data from the users' point of view, it was proposed that the choice of the ECP/GR funded participants to the GEN RES meetings could take into account their experience in the use of the genetic resources.

Non ECP/GR countries

Involvement of experts from these countries in the Network activities should be encouraged, whenever relevant, on the basis of the importance of the specific crop in the given country. In order to smooth the often existing problem of communication, the Group asked T. Kotlińska to be the focal person for relations between the Vegetables Network and the non ECP/GR countries of eastern Europe. Her role would be to help in making some of these countries more accessible and to give them an idea of what the Network's activities are.

Link with other Networks

An immediate link was established with the Minor Crops Network, thanks to the presence of Adolfo Rosati, focal person for Minor Vegetables within the Minor Crops Network Coordinating Group. Actions promoted within the Minor Crops Network will be made in close collaboration with the Vegetables Network.

It was reiterated that for oilseed brassicas, a close link should be maintained with experts from the Industrial Crops Network. It was acknowledged that *Beta* vegetables will be taken care of by the *Beta* Working Group.

A potential link between the *Allium* Working Group, the Potato Working Group and the Fruit Network could be established around the issue of the maintenance of vegetative crops. Considering that there might be scope for a small technical meeting in 2002, J. Keller agreed to present in due course a proposed agenda and list of participants to the attention of the ECP/GR Secretariat.

It was considered that the appropriate link with NGOs would be through local bilateral links, rather than at the Network level.

***In situ* conservation**

The ECP/GR Coordinator briefly summarized the outcome of the recent meeting of the *In situ* and On-farm conservation task forces. Their intention to prepare project proposals for eco-geographic surveys of wild relatives at the European level and for the *in situ* conservation of wild brassicas raised the Group's interest. The Group was informed that these two project proposals are being coordinated respectively by Nigel Maxted (n.maxted@bham.ac.uk or nigel.maxted@dial.pipex.com) and by Mats Gustafsson (mats.gustafsson@vsv.slu.se) and that potential partners are welcome to join the initiative. It was announced that the full report of the meeting is being prepared by the ECP/GR Secretariat².

Functioning of the Network Coordinating Group

It was agreed that any publication arising formally from the Secretariat or the Groups could be distributed to all the Network members. This would strengthen the members' sense of ownership of the Networks' activities.

It was also agreed that information published in the IPGRI Newsletter for Europe could be highlighted as "Vegetables Network" events, whenever appropriate.

It was agreed that whenever either of the Groups experience problems, it will be possible to take advantage of the expertise available within the Network Coordinating Group. The NCG members made themselves available to respond to queries.

It was considered useful to identify a horizontal subject that could be put on the agenda of all the planned technical Group meetings. Maintaining a high level of

² This report is available from the Secretariat: Laliberté, B., L. Maggioni, N. Maxted and V. Negri, compilers. 2000. ECP/GR *In situ* and On-farm Conservation Network. Report of a joint meeting of a Task Force on Wild Species Conservation in Genetic Reserves and a Task Force on On-Farm Conservation and Management, 18-20 May 2000, Isola Polvese, Italy. International Plant Genetic Resources Institute, Rome, Italy.

interaction among all the Network members on horizontal subjects would not only help to find solutions and agreements about specific subjects, but would also strengthen the cohesion of the Network. G. Thomas suggested that a first item to start with could be the definition and implementation of a system of safety-duplication.

EU funded project for the Establishment of a European Plant Genetic Resources Information Infra-Structure (EPGRIS)

E. Bettencourt and L. Maggioni briefly reported about the recent approval of the EPGRIS project. The objective of the project will be to promote the creation of national PGR inventories by offering coordination and technical support, and to create a European Search Catalogue (EURISCO). The catalogue will contain passport information of Plant Genetic Resources maintained *ex situ* in Europe, to be frequently and automatically updated from the national PGR inventories, and easily accessible via the Internet. It was mentioned that, while the European Central Crop Databases will initially be the main source of data for the European catalogue, at the end of the three year project, the catalogue should ideally become the most updated and immediate source of all the passport data. It will therefore be possible to retrieve directly from the catalogue all the necessary passport data to develop new central crop databases. The role of the Central Crop Databases is therefore expected to evolve towards increased specialization in offering characterization data and analyzing the data in support of the management and use of the collections.

Publications

A. Lebeda inquired about the opportunity to publish, as an IPGRI publication, the results of study and research carried out within the context of the Vegetables Network, such as in the fields of characterization, search for resistances, taxonomy work, etc. The ECP/GR Coordinator confirmed that the opportunity exists and that proposals from the Network can be taken into consideration on a case by case basis, provided ECP/GR funds earmarked for publications are available at the time of the request.

Conclusion

G. Thomas agreed to act as “facilitator” for the Vegetables Network Coordinating Group and the Group thanked him for accepting to take on this coordinating role.

The Group wished to thank E. Rosa and his collaborating staff of the Universidade de Trás-os-Montes, for their excellent organization of the meeting, resulting in a smooth running, efficient and pleasant event.

ECP/GR *Allium* Working Group

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Introduction

The *Allium* Working Group was established in 1984 as one of the original six Working Groups developed during the first phase of ECP/GR. The Group has met six times developing and updating workplans at successive meetings. The sixth meeting of the Group was held in Plovdiv, Bulgaria in October 1997. The workplan of the sixth meeting was revised in August 1999 and the main items for action are summarized in the short workplan given at the end of this paper.

Activities

The work of the ECP/GR *Allium* Working Group has benefited significantly from the work programme of the EU GEN RES *Allium* project, which ended on 31 March 2000. Various members of the ECP/GR Working Group were full partners in the GEN RES project. The GEN RES project involved all aspects of genetic resources work on onion/shallot, garlic, leek and chives including documentation, characterisation, regeneration, evaluation, core collection development and the collecting of material to fill gaps in the existing collections

A questionnaire was distributed to all *Allium* Group members and data donors to the EADB prior to the Vegetables Network meeting. The aim of the questionnaire was to assess the progress of the *Allium* Working Group and for national programmes to provide their perspectives and requirements for the future of the Working Group. Ten Working Group members responded to the questionnaire, namely from Belgium, Denmark, Germany, Netherlands, Poland, Portugal, Slovenia, Sweden, Switzerland and UK. All reported work in progress including collecting (Armenia, Daghestan, Greece and Turkey), documentation, characterisation and evaluation. Some of the work was funded directly by the EU GEN RES project. Other national programmes not funded under the EU project demonstrated significant activity, notably Poland and Portugal, whilst work in Belgium and Switzerland has concentrated on evaluation.

Documentation

The main achievement of the Working Group in the latter stages of Phase V and early period of Phase VI has been the development of a new European *Allium* Database (EADB) at the Genetic Resources Unit, HRI Wellesbourne (HRIGRU). The EADB is formatted using the ECP/GR multicrop passport descriptor fields plus 4 additional passport fields in MS ACCESS. Data of 8400 accessions from 20 institutions in 13 countries have been included in the database (tables 1 and 2). However, there are some notable absences where the data for some national programmes has still not been provided for inclusion in the EADB. Thus a major effort will be to obtain data from more national programmes for inclusion in the EADB. The database development has been aided through the inputs of the EU GEN RES *Allium* project. The EADB is available as a downloadable file (MS Access or MS Excel) from the HRIGRU web page (<http://www.hri.ac.uk/site2/research/pgb/ecpgr/ecpgr.htm>).

Table 1. Institutes providing data to the EADB 1999 (8400 accessions from 19 institutes in 13 countries plus the Nordic Gene Bank)

BGRGORNA	Experimental Station for Vegetable Crops, Gorna Orjahovitsa, Bulgaria
BGRIIPR	Institute of Introduction and Plant Resources, Sadovo, Bulgaria
BGRPLOVDIV	Institute of Vegetable Crops 'Maritsa', 32 Brezovsko Shosse, Plovdiv, Bulgaria
CHERAC	Station Federal de Recherches Agronomique de Changins, Nyon, Switzerland
CZEOLOMOUC	Vegetable Section, Genebank Department, Research Institute of Crop Production, Olomouc-Holice, Czech Republic
DEUBGRC	Braunschweig Plant Genetic Resources Centre, Federal Centre for Breeding Research on Cultivated Plants, Braunschweig, Germany
DEUGAT	Institut für Pflanzengenetik und Kulturpflanzenforschung, Gatersleben, Germany
ESPDGIFA	Centro de Investigacion y Desarrollo Agrario, C.I.F.A, Cordoba, Spain
ESPDGAZARA	Agricultural Research Service, Horticulture Department, Zaragoza, Spain
ESPPOLVAL	Departamento de Biotecnología, Universidad Politecnica de Valencia, Valencia, Spain
GBRHRIGRU	Genetic Resources Unit, Horticulture Research International, Wellesbourne, UK
GRCGGB	Greek Gene Bank, Agricultural Research Centre of Makedonia and Thraki, Thessaloniki, Greece
HUNRCA	Institute for Agrobotany, Tapioszele, Hungary
ISRVOLCANI	Volcani Centre, Bet Dagan, Israel
ISRREHOVOT	The Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot, Israel
NLDCGN	Centre for Genetic Resources, PRI, Wageningen, The Netherlands
POLSKV	Plant Genetic Resources Lab., Research Institute of Vegetable Crops, Skierniewice, Poland
PRTBPGV	Banco Português de Germoplasma Vegetal - DRAEDM, Braga, Portugal
REGNGB	Nordic Gene Bank, Alnarp, Sweden
SVKNZAMKY	Research Institute for Vegetables, Nove Zamky, Slovak Republic

Table 2. Number of accessions in the EADB

Taxa	Number of accessions
<i>Allium cepa</i>	2730
<i>Allium sativum</i>	2185
<i>Allium ampeloprasum</i>	564
<i>Allium fistulosum</i>	206
<i>Allium schoenoprasum</i>	83
<i>Allium</i> sp.	645
<i>Allium</i> - wild taxa	1987

The "availability" of the EADB on the Internet was promoted through the distribution of a flysheet to the ECP/GR Secretariat, ECP/GR collaborators, GEN RES collaborators and EU Genetic Resources National Coordinators. The fact that the EADB is now available on the Internet provides access to the data for a broad spectrum of potential users.

"Most original" wild taxa

The EADB has been available to all partners enabling them to identify the most original accession representing an identifiable germplasm collection. Genebanks record information in relation to material collected within their own programmes or where original collected seed is received. The problem lies in material being distributed widely to other genebanks and collections, which is subsequently regenerated, but retains the original collection number. It should be fairly easy to identify the "most original" material providing the collection number code is recognisable and well defined with links to a national programme, genebank, international organisation or individual.

Duplication in collections

Most national genebanks have been developed in isolation. Also material imported for use in research projects has often been included in genetic resources collections. These factors have inevitably led to the duplication of accessions between collections. Obviously any reduction in duplication will make the management of collections more efficient. However, it is difficult on a purely morphological basis to identify duplicates especially for heterogeneous, cross-pollinated material such as onion and leek. One objective of the GEN RES project was to grow rationalisation trials for onion and leek in order to identify putative duplicates based simply on morphological and agronomic characteristics. The selection of material for the onion and leek rationalisation trials was made using the EADB. The trials were grown by Ietje Boukema at CGN and 2 field meetings were organised to review the mature crops following harvest. Project partners, crop specialists including commercial and public sector breeders, and Variety Test staff were invited to assess the material. The review meetings were extremely valuable for the genebank managers to discuss their material with crop experts and identify putative duplicates and, in some cases, errors in identification of varieties. A molecular approach to the identification of duplicate accessions would provide additional information for use in the management of the collections, but such work was outside the scope and finance of the GEN RES project.

Safety duplication

There are some very good examples of bilateral agreements for safety duplication for seed propagated material using a "black box" system¹ between genebanks. However, there is still room for improvement with some collections not being safety duplicated at all. It is also evident that genebanks hold parallel collections based on joint collecting activities, but there has been no movement towards formalising a safety duplicate agreement.

The safety duplicate situation for vegetatively propagated crops is far less clear with no formalised agreements in place. The status and future funding of collections of vegetatively propagated crops were problems highlighted in comments by several national programmes. The 2 main aspects to this problem are firstly who should finance 'international' collections and secondly a requirement for the reliable maintenance of duplicate security collections. Inherent in the second comment is the continual requirement for labour for field maintenance, which makes a black box arrangement impossible.

Characterisation data

There has been slow progress in the development of characterisation databases for the various *Allium* crops. Minimum characterisation descriptors have been agreed for five crops and related taxa within the genus. The formats for crop specific characterisation

¹ Under a "black box" arrangement, the safety-duplicate seed sample is stored in long-term conditions according to international standards; it is not used, tested, regenerated or distributed to a third party.

files were agreed at the Working Group meetings in Skierniewice and Plovdiv. To date the only institutes that have forwarded characterisation data for onion, garlic and chives to HRI Wellesbourne are the partners in the GEN RES *Allium* project. The Banco Português de Germoplasma Vegetal has characterised garlic and onion collected in Portugal. DvP-CLO Gent Belgium has characterised landrace leek accessions, but the data are not available yet.

Taxonomy

There has been good collaboration between partners following the Plovdiv meeting proposal by Joachim Keller, Teresa Kotlinska and Pavel Havranek to offer their taxonomic expertise to colleagues to identify wild *Allium* taxa. ECP/GR supported travel for Reinhard Fritsch, a taxonomy specialist from IPK Gatersleben to visit Pavel Havranek in the RICP Gene Bank Olomouc in order to validate the taxonomy of accessions in the RICP Olomouc and RIVC Skierniewice collections from the Asian Republics. Joachim Keller and Reinhard Fritsch also assisted Francisco Mansilla in CIFA Cordoba in the identification of wild taxa.

***Allium* descriptors**

A new draft for the *Allium* descriptor list has been prepared by IPGRI in consultation with the ECP/GR *Allium* crop descriptor subgroups coordinated by Haim Rabinowitch. Collaboration between the GEN RES *Allium* project crop groups and the ECP/GR crop descriptor subgroups developed new characterisation descriptors for the specific *Allium* crops, which have been incorporated in the new draft descriptor list. The draft descriptor list will be distributed worldwide to *Allium* specialists for review before being published.

Problems Identified and the Future

- **Documentation** - What is the future for the EADB? Currently the database is available as a downloadable file in either MS Access or MS Excel. The national passport data files are stored separately with the EADB being produced as a collective view when required. This should make replacing any national programme data fairly simple providing the data are in the multicrop/*Allium* descriptor format. However, the new EU project in collaboration with ECP/GR aims to build a European database based on National Genetic Resources Inventories. The Inventories are an agreed requirement for signatory countries under the CBD. The Inventories will be uploaded to the ECP/GR Server and the combined data made available via the use of a full search engine. Therefore questions relating to the future of the European Central Crop Databases will remain until the objectives and work plan of the new project is clear. On this basis does the ECP/GR *Allium* Working Group wait to react or do we move towards an on-line searchable file? If the latter, do we rebuild the EADB with new national files?
- **Vegetatively propagated collections** - Under the CBD, national programmes are responsible for the maintenance of their own germplasm. Historically within the ECP/GR *Allium* Group, 2 institutes in the Czech Republic and Israel agreed to hold European collections of long-day and short-day adapted vegetative material respectively. These actions were agreed as inputs-in-kind to ECP/GR by the respective national programmes. However, there are no formalised agreements in place for the safety duplication of vegetatively propagated crops. So there is an urgent need to discuss the technical inputs, and political/financial requirements to ensure adequate back up maintenance of the vegetative collections.

In addition to the 2 collections mentioned above, there are many other collections of vegetative material existing within national programmes that are considered to be

extremely important scientifically. Examples of such collections are the garlic collections in IPK Gatersleben and CIFA Cordoba built up within the EU GEN RES *Allium* project, the taxonomy collection in IPK Gatersleben and the Nordic shallots and potato onions. In the present situation, it is doubtful whether the concentration of these collections into “long-day” and a “short-day” safety duplicate collections will ever be possible. So new solutions have to be found for this particular problem. It is possible to envisage an inter-institute network of vegetative *Allium* collections that agree mutual exchange of information and, step-by-step, the exchange of material under bilateral duplication agreements? Such an arrangement will require significant inputs in terms of staff and resources in comparison with the “black box” arrangements for seed collections. Joachim Keller has offered to act as an initial point of contact on this suggestion. The Group needs to review the maintenance of vegetative material. There is an opportunity within the Vegetable Network for the *Allium* Working Group to hold a small *ad hoc* technical meeting in 2001-2002. One option for this meeting is to provide the curators of the main vegetative collections with the opportunity to meet in order to develop proposals for the maintenance and security (safety duplicates or alternative solutions) of the vegetative collections.

The EU GEN RES *Allium* project ended on 31 March 2000. It is not clear if there will be a follow-on programme in the GEN RES format, i.e. funds dedicated to PGR core functions not in competition with research. It is difficult, therefore, to see who will fund the future maintenance of vegetative collections developed with an ‘international’ label such as those under the auspices of the ECP/GR and/or the EU GEN RES. One drawback of the early calls for projects under the GEN RES programme was the inability to include non-EU partners in projects. To an extent this was relaxed in the 3rd call for proposals, but without the provision of funds for such partners. ECP/GR has assisted the involvement of individuals in the planning and activities of some GEN RES projects. If there is a second GEN RES Programme, it will be useful for non-EU countries to be able to participate as per the Framework Programmes.

- **Horizontal approaches** -Advantages also exist in financing or supporting horizontal approaches in project collaboration between Working Groups, such as under the possible continuation of the GEN RES project. Horizontal approaches will finally lead to a safer and more efficient maintenance of the collections, for example, for cryopreservation, *in vitro* storage or even other areas such as safety duplication. This also provides a good means to establish links with other ECP/GR Networks, such as the potato and fruit crop Groups, in the case of *in vitro*/cryopreservation work.

European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) - *Allium* Working Group

Workplan (revised August 1999)

Please refer to the Report of the 6th *Allium* Working Group meeting (23-25 October 1997) for the exact wording of the actions agreed upon. These and the recommendations can be found as paragraphs in italics within Part I of the report.

Action	Carried out by	Deadline for completing action
EADB, is accessible on-line - assess accessions of wild taxa for uniqueness to identify "most original" and duplicates. Provide the resulting information to the DB manager	All	December 1999
Provide for safety duplication of all accessions using specific bilateral 'black box' arrangements.	All Working Group members to promote this action. (Safety duplicate gene banks: RIVC, Skierniewice, Poland; HRI, Wellesbourne, UK CGN, Wageningen, Netherlands; IPK, Gatersleben, Germany and NGB, Alnarp, Sweden).	ongoing
Inform EADB (D. Astley) about the nature and volume of available characterization data for material in the EADB.	All	December 1999
Clarify taxonomic status of wild material in collections. - P. Havranek, T. Kotlińska and J. Keller offer to help in solving difficult cases.	All, as appropriate	December 1999
Contribute to the preparation of the IPGRI <i>Allium</i> descriptors. (expected 2000)	All, under the coordination of H. Rabinowitch)	ongoing

ECP/GR Umbellifer Crops Working Group

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Background

An *ad hoc* Group of workers interested in carrot/*Daucus* corresponded both within Europe (ECP/GR) and with other scientists in USA and Japan. The European scientists presented a case to the ECP/GR Technical Consultative Committee in Nitra, Slovakia (September 1995) for the establishment of a *Daucus* Crop Working Group. The Steering Committee agreed to support an *ad hoc* meeting of the Group within the Vegetables Network of ECP/GR.

An *ad hoc* meeting of the Group was organized in August 1997 in conjunction with the fifth meeting of the Eucarpia Carrot Working Group hosted by the Dept. of Genetics, University of Agriculture, Kraków, Poland. There was broad interest in the *ad hoc* meeting with 17 participants from 13 ECP/GR member countries plus a representative from the USDA Root and Bulb Advisory Group.

Ad hoc meeting of the Group

The discussions led to the realisation that within the Group and national programmes there was a broader interest in umbellifers, in addition to carrot/*Daucus*. The Group decided it would be logical and more efficient to combine all these interests into an Umbellifer Crop Working Group. However, with such a potentially large number of genera within the Umbelliferae, a decision was taken to limit interest and activities to nine genera including *Anethum* (dill), *Apium* (celery), *Carum* (caraway), *Chaerophyllum* (chervil), *Coriandrum* (coriander), *Daucus* (carrot), *Foeniculum* (fennel), *Pastinaca* (parsnip) and *Petroselinum* (parsley). A report (Astley 1999)¹ of the meeting was published. The Group forwarded a recommendation to the ECP/GR Steering Committee seeking a formal endorsement of the Umbellifer Working Group within the ECP/GR Vegetable Network. This recommendation was accepted by the ECP/GR Steering Committee during the meeting in Braunschweig, Germany in July 1998.

There has been no co-ordinated effort in Europe, or indeed elsewhere, to collect, conserve, document and make available to users the genetic resources of these umbellifer crops and their wild relatives. In Kraków, the Group discussed all the aspects of genetic resources conservation for these genera highlighting specific areas requiring immediate action. The formalisation of a list of action points has already led to some significant developments within the Group. In preparation for the Vegetables Network meeting a questionnaire was distributed to National Coordinators, genebanks and curators of umbellifer collections requesting information on collections and the maintenance and management of germplasm. The information on the collections of the 9 crops selected by the genera Working Group and of other umbellifers in European collections is shown in Table 1.

¹ Astley, D. (compiler). 1999. Report of a Workshop on umbellifer crops genetic resources, 21 August 1997, Kraków, Poland. International Plant Genetic Resources Institute, Rome, Italy.

Table 1. Umbellifer Crops Accessions in European Collections (May 2000)

Country	Institution	<i>Anethum</i>	<i>Apium</i>	<i>Carum</i>	<i>Chaerophyllum</i>	<i>Coriandrum</i>	<i>Daucus cult.</i>	<i>Daucus wild</i>	<i>Foeniculum</i>	<i>Pastinaca</i>	<i>Petroselinum</i>	Others
Albania	Tirana	4					1	3			6	
Austria	Linz						6				4	
Belgium	Genappe	x	x	x		x		x		x	x	
	Merelbeke		25								10	
Bulgaria	Sadovo	3				3	2					
Czech Rep.	Olomouc	18	55	270		5	430		19	15	33	
France	INH Angers				20		585	26				
Germany	Braunschweig	49	77	17		49	169		80		24	
	Gatersleben	144	188		10	412	319		120	41	191	261
Greece	GGB	4	14				9				10	
	NAGREF	4	9									
Hungary	Tapioszele		49				170			29	118	
Italy	IDG Bari		24				15		31		24	
Latvia	Salaspils			1								
Lithuania	Babtai	2	10			4	110				4	
Netherlands	CGN			53								
Poland	Skierniewice	128	17		1	2	272	253	2	11	117	
Portugal	BPGV					41	5				46	
	Vila Real		x			x					0	
REGIONAL	NGB	3	15	7			42				13	
Romania	Vidra.Jud.Ilfov	5	1			26		1	3		2	
Slovakia	Nove Zamky	1	12				12			1	20	
Slovenia	Ljubljana	2				2	2		2		1	17
Spain	CRF Madrid					4	3			1	16	
	Zaragoza		10			4	27			1	78	
Switzerland	Nyon		5				47	1			4	
	St.Gallen						2				1	
	Wadenswil						2					
Turkey	AARI, Izmir	20	7		2		95	59	8		99	59
Ukraine	UDS,Poltava	97	11			68	122		39		30	30
	IOB, Kharkiv	127	39	3		47	341			9	54	
	IEL, Crimea	30				120			110			
UK	HRIGRU		25			3	735	61		20	21	
	SASA		116				548					
Russia	VIR	680	189	48	19	412	1201		130	49	71	666
ECP/GR Total		1321	898	399	52	1202	5272	404	544	177	997	1033

Figures based on EPG/GR Directory 4th Edition (1995) - updated from questionnaire results (May 2000)

X = undetermined number of accessions

Documentation

A European Umbellifer Database (EUDB) has been developed by the Genetic Resources Unit at Horticulture Research International (HRI), Wellesbourne, UK. Initially this will be limited to passport data stored in the IPGRI/FAO Multi-crop passport descriptors format. The EUDB contains data for 3506 accessions from 7 institutions in 5 countries (Tables 2 and 3). The EUDB will be made available shortly as a downloadable file on the Internet via the HRIGRU web site <http://www.hri.ac.uk/site2/research/pgb/gru/>.

Currently there are no agreed ECP/GR minimum characterisation descriptors for these crops. Sub-groups with specific interests in the various crops will develop the necessary characterisation and evaluation descriptors in due course. The Group was very aware of the value of a database in identifying gaps in existing collections and directing future characterisation, evaluation and collecting programmes.

Table 2. Number of Accessions per Genera in the European Umbellifer Database (EUDB) 99

Genera	No. of accessions
<i>Anethum</i>	70
<i>Apium</i>	205
<i>Carum</i>	298
<i>Chaerophyllum</i>	27
<i>Coriandrum</i>	80
<i>Daucus</i> cult.	2046
<i>Daucus</i> wild	263
<i>Foeniculum</i>	97
<i>Pastinaca</i>	91
<i>Petroselinum</i>	314
Others	15
Total:	3506

Table 3. Data Donors to the European Umbellifer Database (EUDB) 99

CZEOLOMOUC	Vegetable Section, Genebank Department, RICP, Olomouc-Holice, Czech Republic
CZETROUBSK	Research Plants Ltd., Troubsko, Czech Republic
DEUBGRC	Braunschweig Plant Genetic Resources Centre, Federal Centre for Breeding Research on Cultivated Plants, Braunschweig, Germany
ESPBGHZ	Banco de Germoplasma de Horticolas, Zaragoza, Spain
ESPINIAMAD	Centro de Recursos Fitogeneticos del Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria (CRF-INIA), Madrid, Spain
GBRHRIGRU	Genetic Resources Unit, Horticulture Research International, Wellesbourne, Warwick, UK
UKRNCPGRU	Ukrainian Centre for Plant Genetic Resources
DEUGAT	Institut für Pflanzengenetik und Kulturpflanzenforschung, Gatersleben, Germany-received May 2000, not incorporated yet
VIR	N.I. Vavilov Research Institute of Plant Industry (VIR) - minimal data currently available

EU GENRES project

Members of the ECP/GR Umbellifer Working Group are full partners in a carrot genetic resources proposal funded under the 3rd call of the EC 1467/94 GENRES programme. This project encompasses all aspects of genetic resources work for this important crop including documentation, characterisation, regeneration, evaluation, core collection development and the collection of material to fill gaps. The project team including

Teresa Kotlińska, funded by ECP/GR, met in Bologna, Italy in April 2000. One of the outcomes of this meeting was an agreement to use the Multicrop Passport descriptors in the project plus an agreement on additional passport descriptors and minimum characterisation descriptors. The GENRES Carrot project will give tremendous impetus to the overall work of the ECP/GR Umbellifer Working Group.

Regeneration

During the Kraków meeting, Tatyana Khmelinskaya, the curator of the *Daucus* collection at the N.I. Vavilov Institute of Plant Industry (VIR) outlined the status of that collection and the requirement for immediate action in the regeneration of some accessions. Several institutes offered to assist VIR, particularly for the regeneration of landraces of carrot. This collaboration has been particularly successful with 4 national programmes (France, Italy, Poland and UK) having regenerated more than 75 accessions in the 1998/99 season. This material is now being dried, cleaned and packaged ready for return to the Vavilov Institute.

Research

Several members of the European group have been to work with Phil Simon at the University of Wisconsin, USA to develop collaboration on the molecular characterisation of carrot and related wild *Daucus* taxa. This collaborative experience will benefit the molecular characterisation work in the EU GENRES Carrot project. In Poland (Agriculture University at Kraków) the assessment of genetic diversity in 31 carrot landraces from Poland, Slovakia and Ukraine and 5 carrot advanced cultivars from the Polish Gene Bank collection (POLSKV) were carried out using the RAPD technique.

Taxonomy

The Group recognised that the taxonomy of the various genera, and in particular *Daucus*, poses considerable problems for collection curators in both the management of collections and the distribution of unvalidated material. Where possible, national umbellifer representatives have identified taxonomic experts who are willing to assist in studies of the taxonomic problems associated with genetic resources collections.

Safety duplication

The safety need for duplication (black box bilateral agreements) of all genetic resources accessions was recognised. The participants were encouraged to assess the level of safety duplication in their collections and to identify other gene banks willing to collaborate in a bilateral black box arrangement.

Collecting

In 1999 Teresa Kotlińska and Stelios Samaras collaborated with Phil Simon, USDA carrot programme, in the collection of wild and landrace *Daucus* in Greece, Poland, Syria and Turkey. During this 7 week collecting mission 547 accessions were collected:

- in Greece 148 accessions of 35 species including 4 accessions of 3 cultivated and 87 accessions of wild umbellifer species;
- in Poland 145 accessions of 30 species, among them 17 accessions of 4 cultivated umbellifers;
- in Syria 115 collections of 39 species including 6 accessions of 4 cultivated and 59 accessions of wild umbellifer species;
- in Turkey 139 accessions of 17 species including 10 accessions of 3 cultivated and 112 accessions of wild umbellifer species.

Table 4. Vegetable accessions collected during the PGR/USDA expedition, 1999.

Name	Accessions collected				Total
	Syria	Turkey	Greece	Poland	
Carrot	2	8			10
<i>Daucus</i> sp.	51	39	11		101
<i>Daucus aureus</i>	1	7			8
<i>Daucus bicolor</i>		8	22		30
<i>Daucus carota</i>	4	28	27		59
<i>Daucus guttatus</i>		2	6		8
<i>Daucus involucratus</i>		11	1		12
<i>Daucus litoralis</i>	1	1			2
<i>Daucus muricatus</i>	2	16	20		38
Celery	1				1
Coriander	1			1	2
Dill	1	1	1	8	11
Fennel	1				1
Parsley	1		2	7	10
Parsnip				1	1
Umbelliferae	1				1
Onion + shallot	3		1	3 + 3	10
Bunching onion				1	1
Garlic	1		1	3	5
Leek			2		2
<i>Allium</i> sp.	13	8	18		39
<i>A. ampeloprasum</i>	2	1	7		10
Cabbage	1			2	3
Kale				1	1
Mustard				4	4
Rutabaga/swede				1	1
Turnip				1	1
<i>Brassica nigra</i>			1		1
Radish	2		1	1	4
<i>Raphanus</i> sp.	1				1
Cress	1				1
Lettuce	2		2	5	9
<i>Lactuca serriola</i>			1		1
Chicory	1				1
Endive			1		1
<i>Eruca sativa</i>	1				1
<i>Rumex</i>			1		1
Red beet			2	7	9
<i>Beta maritima</i>			2		2
Spinach	1	2	1		4
Cardoon			1		1
Artichoke	1				1
Peas				11	11
Bean		2	5	28	35
<i>Lupinus angustifolius</i>			1		1
Grass pea				1	1
Poppy seed				4	4
Tomato	1	1	1	10	13
Pepper	3	1		6	10
Okra			1		1
Rhubarb				1	1
Melon	2				2
Cucumber	1			10	11
Watermelon	1				1
Squash	2		1	12	15
Zucchini	1				1
Patisson				1	1
Total	108	136	141	133	518

The number of accessions collected in each country is given in Table 4. Collection in Syria and Turkey was carried out in collaboration with the national programmes. This collaborative collecting programme is likely to continue in Europe due to Phil Simon's interest in the collection of wild *Daucus* in France, Italy, Portugal and Spain.

Since 1997 the Polish Gene Bank in collaboration with national genebanks in Greece, Moldova, Slovakia, Turkey, Ukraine, and USDA organised 24 expeditions during which 2121 accessions were collected including 533 accessions of 7 umbellifer species. The area of collecting missions and number of accessions is given in Table 5.

Review of collecting needs

There was a review of collecting requirements during the Kraków meeting and these are detailed below by country.

Czech Republic

There may still be some landraces and certainly wild taxa to be collected.

France

A preliminary assessment of the collection requirements indicate the target areas as wild taxa in Brittany and southern France, landraces throughout the country and obsolete cultivars maintained by seed companies and NGOs for all crops.

Greece

There is an urgent need to collect wild taxa and landraces throughout the country. The Greek Gene Bank staff members have monitored genetic erosion in the landraces of all crops. The local selections of vegetables appeared to be maintained by householders and on small scale farms. However, it is becoming evident that this situation is changing as the social structure in agriculture changes and highly bred varieties become widely available, and therefore the landraces of vegetables are increasingly under threat.

Germany

Certainly wild taxa of umbellifer genera should be collected. It may also be possible to locate relic populations of parsnip, which is not a common crop in Germany.

Hungary

There seems little possibility to collect additional cultivated carrot in Hungary, but there may be material available in Transylvania. There are still wild taxa and some landraces of the minor umbellifer crops that require collection.

Italy

The priority for collection is the landrace material maintained in traditional agriculture, but also local cultivars selected and marketed in specific regions and sold in local markets. Changes in the seed laws and umbrella varieties may have serious consequences on the maintenance of many local selections.

Nordic Countries

There is a need to assess what material of Nordic origin exists in other collections for example in Europe and USA. The Nordic Gene Bank will try to acquire a sample of such material for storage. Collection will concentrate on wild taxa and landraces.

Poland

Priority will be given to the collection of landraces and the local knowledge associated with the germplasm especially horticultural practices, medicinal and aromatic uses. It will also be important to collect obsolete and current Polish cultivars from local seed companies.

Russia

It is still possible to collect landraces and old cultivars of carrot, parsley, parsnip and other umbellifer crops in certain regions.

UK

There is a need to collect wild taxa of *Daucus* covering the ecogeographic range of each taxon. This may be achieved in cooperation with the Royal Botanic Gardens Kew, one objective of which is to collect wild taxa in the UK.

Table 5. Accessions collected during missions organized by POLSKV since 1997

Month/Year	Area	Number of accessions										
		Total	No of species	Carrot	Daucus wild	Celery	Coriander	Fennel	Dill	Parsley	Parsnip	
Sept. 1997	Javorniky, Horna Orava, Slovakia	63	9	1	2				2			
Sept. 1997	Lvov Province, Ukraine	172	17	12	5	1			12	1		
Sept. 1997	Zarnovica-Banska Stiavn., Slovakia	20	6						2	1		
Oct. 1997	Bielsko Biala Province, Poland	68	15		9	1			3	6		
Nov. 1997	Zamosc Province, Poland	115	25	7	4				5	3		
Oct. 1997	Wielkopolska, Poland	9	4		1				1			
Aug.-Sept, 1998	Ukraine - Moldova	332	37	22	5	2		1	15	13	1	
Oct. 1998	Biala-Podlaska Province, Poland	146	25	5	4	1			9	5		
Oct. 1998	Bialystok Province, Poland	111	21	3	5				4	6		
Oct. 1998	Zamosc Province, Poland	143	20	1	3				6	5		
Nov. 1998	Pieniny-Bieszczady, Poland	58	7									
Nov. 1998	Zielona Góra Province, Poland	33	9	1	4	1			8	2		
Nov. 1998	Lomza Province, Poland	7	1									
May 1999	Romania	16	13	1						1	1	
Sept. 1999	Krym, Ukraine	1	1									
July 1999	Central - East, Poland	145	30				1		8	7	1	
July 1999	Syria	115	39	2	59	1			1	2		
Aug. 1999	Southwestern Turkey	139	17	8	112				1	1		
Aug. 1999	Greece	148	35		87			1	1	2		
Aug. 1999	Beskidy Mountains, Pol, Cze, Slv	18	12	1							1	
Sept. 1999	Zakarpacie, Ukraine	99	21	5					5	4	2	
Oct. 1999	Kielce Province, Poland	27	4									
Oct. 1999	Podkarpacie, Poland	73	16		1					2	1	
Oct. 1999	Narew, Poland	63	12	1						1		
Total		2121		70	301	7	1	2	83	62	7	
Total umbellifer accessions				533								

Solanaceae Genetic Resources in Europe

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Foreword

The information collected from the many people contacted was carefully analyzed, but not all the details have been included here for the sake of clarity.

Introduction

From February to May 2000 twenty-four countries (about 50 people) were contacted (see list at the end of this paper) for replying to a set of 11 questions concerning their collections of eggplant, pepper and tomato (content, storage, regeneration, availability, related information, potential interest in participating in a possible European Solanaceae network). Some institutes remain to be contacted and some responses have not been obtained in time to be incorporated in this paper.

National genetic resources management systems

Depending on the countries, the management of plant genetic resources is centralized in a national genebank (e.g. the Netherlands), or is performed in different places, which can be research institutes, universities, regional genebanks or others (e.g. Italy). France is developing a specific organisation, with several national networks, specializing in one given species or in a group of species (e.g. Solanaceae network); these networks bring together public institutions, private breeders and associations. Besides these official organisations, non governmental organisations (NGOs) also deal with Solanaceae genetic resources in some countries, such as in Switzerland and the United Kingdom.

Content of the collections in Europe

Most places have genetic resources of the three cultivated species, eggplant, pepper and tomato (Table 1). Depending on the countries, the genetic resources are maintained in a single place (e.g. Greece, the Netherlands) or in several places (e.g. Italy, Portugal).

On the whole, there are many more tomato accessions in Europe (23 210), than pepper (11 652) and eggplant (4 668); this fact is related to the respective economic importance of these species in Europe.

The number of accessions is very variable from one collection to another, from 1 accession up to over 7 000 (Table 1). The biggest collections for eggplant are located in France, Russia and the United Kingdom; for pepper they are located in France, Germany, Hungary, Netherlands, Russia and Spain; for tomato they are located in Bulgaria, Czech Republic, France, Germany, Hungary, the Netherlands, Russia and Spain.

For eggplant, pepper as well as for tomato, different kinds of material are maintained: either local cultivars, advanced cultivars, foreign varieties, breeding lines and/or isogenic lines, mutants, doubled haploid lines, aneuploids and cultivated as well as wild relatives.

Eggplant genetic resources comprise mainly *Solanum melongena* L. accessions; they also include other cultivated eggplants such as *S. aethiopicum*, *S. macrocarpon*, *S. muricatum* and *S. quitoense*, as well as the wild species related to each of them. An exhaustive list of the whole set of wild relatives cannot be provided as it concerns over 50 species. Only half of the wild eggplant relatives are kept in collections (mainly in Europe); the other species have never been collected and they simply only grow in the wild (mostly in Africa).

Pepper genetic resources comprise mainly *Capsicum annuum* L. accessions and also other cultivated species (such as *C. baccatum*, *C. chinense*, *C. frutescens*, *C. pubescens*) and wild species. The species (or sub-taxa) maintained in Europe are registered in the different European collections under the following names:

<i>Capsicum annuum</i> var. <i>annuum</i>	<i>C. eximium</i>
<i>Capsicum annuum</i> var. <i>aviculare</i>	<i>C. eximium</i> var. <i>tomentosum</i>
<i>Capsicum annuum</i> var. <i>dartashkenta</i>	<i>C. flexuosum</i>
<i>Capsicum annuum</i> var. <i>longum</i>	<i>C. frutescens</i>
<i>C. annuum</i> <i>grossum</i>	<i>C. galapagoense</i>
<i>C. annuum</i> <i>grossum-tetragonum</i>	<i>C. luteum</i>
<i>C. annuum</i> <i>longum</i>	<i>C. pendulum</i>
<i>C. baccatum</i>	<i>C. praetermissum</i>
<i>C. baccatum</i> var. <i>baccatum</i>	<i>C. pubescens</i>
<i>C. baccatum</i> var. <i>pendulum</i>	<i>C. testiculatum</i>
<i>C. cardenasii</i>	<i>C. tovari</i>
<i>C. chacoense</i>	<i>C. sp.</i> (not identified)
<i>C. chinense</i>	

Tomato genetic resources maintained in Europe comprise the single cultivated species, *Lycopersicon esculentum* Mill., as well as wild *Lycopersicon* and *Solanum* species. The species (or sub-taxa) maintained in Europe are registered in the different European collections under the following names:

<i>Lycopersicon cheesmanii</i>	<i>L. minutum</i>
<i>L. cheesmanii</i> f. <i>typicum</i>	<i>L. ochrantum</i>
<i>L. cheesmanii</i> f. <i>minor</i>	<i>L. parviflorum</i>
<i>L. chilense</i>	<i>L. pennellii</i>
<i>L. chmielewskii</i>	<i>L. pennellii</i> var. <i>puberulum</i>
<i>L. esculentum</i> <i>humboldtii</i>	<i>L. peruvianum</i>
<i>L. esculentum</i> <i>racemiflorum</i>	<i>L. peruvianum</i> var. <i>dentatum</i>
<i>L. esculentum</i> var. <i>cerasiforme</i>	<i>L. peruvianum</i> var. <i>glandulosum</i>
<i>L. esculentum</i> var. <i>uzbekistan</i>	<i>L. peruvianum</i> f. <i>glandulosum</i>
<i>L. esculentum</i> <i>validum</i>	<i>L. peruvianum</i> var. <i>humifusum</i>
<i>L. glandulosum</i>	<i>L. pimpinellifolium</i>
<i>L. hirsutum</i>	<i>L. pimpinellifolium</i> Bestomaat
<i>L. hirsutum</i> f. <i>glabratum</i>	<i>L. sp.</i> (not identified)
<i>L. humboldtii</i>	<i>Solanum juglandifolium</i>
<i>L. juglandifolium</i>	<i>S. lycopersicoides</i>
<i>L. lycopersicum</i>	<i>S. ochrantum</i>

The taxonomic identification used in different European countries for pepper and tomato species (as shown above) is far from correct and needs to be adapted to the current and official taxonomy of the *Capsicum* and *Lycopersicon* genera. One may also notice that in several collections, some accessions need to be botanically determined for they are quoted as *Solanum* sp., or *Capsicum* sp. or *Lycopersicon* sp.

Some collections contain many cultivated and wild species (Table 1):

- **eggplant:** INRA, France; University of Birmingham, United Kingdom; Nijmegen Botanical Garden, the Netherlands.
- **pepper:** INRA, France; Zöldségtermesztési Kutató Intézet Rt, Hungary; University of Torino, Italy; CGN & Nijmegen Botanical Garden, the Netherlands.

- **tomato:** Palacký University, Czech Republic; INRA, France; Istituto del Germoplasma Bari, Italy; CGN and Nijmegen Botanical Garden, the Netherlands; Research Institute of Vegetable Crops, Poland; Vavilov Institute, Russia; Polytechnic University Valencia, Spain).

Eggplant is an Asian species, whereas pepper and tomato are native to Central and South America. Therefore Europe is only a centre of secondary diversification of eggplant (*Solanum melongena*), pepper (*Capsicum annuum*) and tomato (*Lycopersicon esculentum*). The content of the collections maintained in European countries is related to the long tradition of research on and breeding of these three species in European countries. It is also related to the variable efforts of each European country for characterizing agronomic traits, developing genetic studies (e.g. creation of isogenic lines, aneuploids, double haploid lines), and for introducing foreign material. This explains the heterogeneity of the content and of the state of characterization of the accessions from one collection to another. Nevertheless, despite this heterogeneity between the collections, the main originality of the Solanaceae genetic resources maintained in Europe can be summarized as follows:

- **eggplant:** richness of wild taxa,
- **pepper:** richness of accessions from everywhere in the world, richness of particular genetic material such as triploids, doubled haploid lines (easy to regenerate, with well known gene combinations, finely characterized), advanced evaluation (and gene identification) of the genetic resources for many characters, in particular for disease resistance genes.
- **tomato:** richness of early cultivars adapted to cold conditions, of isogenic lines (in particular for disease resistance genes) and advanced evaluation of the genetic resources for many characters, in particular for disease resistance.

Storage, regeneration, availability

Depending on the places, working collections and/or long term collections (noted «L.T.» in Table 2) are maintained in conditions which are summarized in Table 2. The quantity of seeds stored is variable. For some collections, part of the accessions is considered as endangered for various reasons (few seeds, old seeds, bad germination).

Depending on the places, the regeneration frequency is predetermined (every 10 years for instance) or adapted to the actual reduction of seed variability (which is either regularly or occasionally monitored). Some collections have no regeneration policy.

For most of the collections, the accessions are available (on justified request), according to the availability of seeds.

Management of information on accessions (passport data and characterization data)

Passport data are, with few exceptions, mainly recorded on computer (Table 3). They are made available on the web for seven collections (see list of persons and institutes contacted on p.26 of this report). Concerning the characterization data, many people pointed out that the characterization work is far from complete.

Interest of the people contacted in participating in a possible European network

Most of the people contacted have a potential interest in participating in a network at the European level, either for the three Solanaceae, or only for one (tomato) or two (eggplant and pepper) of them. Sometimes, they express conditions for participating in a network, such as «if no supplementary work is required». Such a network has recently been

formed (2000-2004) for eggplant, thanks to the EU programme «EGGNET» (GEN RES 113). The members participating in EGGNET are listed in Table 3 (last column).

Additional comments received from the persons contacted

The specific role of some collection holders have been mentioned, such as the University of Torino (Italy) which maintains a duplicate of the collection of the *Capsicum* Genetic Cooperative (Table 4), or such as the CGN (the Netherlands) and the Genebank of Braunschweig (Germany) that developed collaborative activities through a Dutch-German cooperation programme.

Some places are only conservation sites, while others, besides that role, are also actively involved in research activities. Details of these aspects are not given in this paper. Many people mentioned the limitation of their activities due to financial constraints (lack of funds) and to limited time. Technical problems are also mentioned, such as pathological problems or seed production problems. The case of the Solanaceae collection of the University of Birmingham (UK), deserves special mention. This collection was built up between the fifties and the eighties and an exceptionally wide range of genera and species of the Solanaceae family was collected, mainly for botanical research purposes. People in charge of this collection, having no more facilities for maintaining it on the spot, are moving it presently to Montfavet (INRA) and Nijmegen (Botanical Garden), thanks to the agreements made within the EGGNET programme.

Conclusion

Many Institutes in Europe maintain genetic resources of eggplant, pepper and tomato. The volume (number of accessions) of the collections varies considerably from one place to another. Tomato represents the most part of these Solanaceae European genetic resources, with 23 210 accessions. The content of the Solanaceae collections varies from one location to another, some places maintain *Solanum melongena* and/or *Capsicum annuum* and/or *Lycopersicon esculentum*, and some are particularly rich in other cultivated species or wild relatives or in particular genetic material. There is surely a partial redundancy (same genetic material maintained in different places) between the different collections, the degree of which cannot be evaluated yet, for no central database management system is available.

The European Solanaceae collections have a particular value, for a part of their content is very original, compared to the material maintained in America or Asia e.g. richness in related species for eggplant, particular genetic material for pepper (e.g. aneuploids and doubled haploid lines) and tomato (e.g. isogenic lines).

The level of characterization (for morphological and agronomical characteristics) of the accessions is quite variable from one collection to another, but insufficient characterization has frequently been pointed out by the people contacted in this inquiry (in particular for eggplant).

Conditions of regeneration and storage may differ slightly for eggplant, pepper and tomato in some places, but generally speaking, one may consider these three Solanaceae as a coherent group because their biology is similar and their genetic resources are managed in similar ways. The existence of safety duplicates has rarely been mentioned by the persons contacted.

A correct taxonomic identification of the accessions, their better characterization, the organization of safety duplicates, as well as a better circulation of information (databases, etc.), techniques and material, all deserve further attention in the future, and can benefit from the promotion, by ECP/GR, of increased cooperation between the different European partners.

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Table 1. Number of species and accessions for eggplant, pepper and tomato (details per location)

Country and Institute	eggplant		pepper		tomato	
	Number of species	Number of accessions	Number of species	Number of accessions	Number of species	Number of accessions
Armenia, Scientific Center of Vegetables and Technical Cultures	6	22	1	25	5	105
Bulgaria, Inst. of Introduction and Plant Genetic Resources (Sadovo)	1	214	1	467	1	1057
Bulgaria, Maritza Institute (Plovdiv)	0	0	1	437	1	350
Czech Republic, RICP Genebank (Olomouc)	1	25	0	0	6	1604
Czech Republic, Palacký University (Olomouc)	0	0	0	0	17	170
France, INRA, Génét. et Amélior. Fruits et Légumes (Montfavet)	50	1202	11	1400	9	1360
Germany, Genebank (Gatersleben)	10	104	8	1433	3	2965
Germany, Genebank (Braunschweig)	4	13	3	71	4	459
Greece, Agricultural Research Center of Macedonia & Thraki	1	13	1	30	1	23
Hungary, Institute for Agrobotany (Tápiószele)	1	9	4	9	5	1644
Hungary, ZKI (Budapest)	0	0	11	1400	0	0
Italy, Istituto del Germoplasma, (Bari)	3	53	6	167	11	560
Italy, Università di Torino	0	0	11	400	0	0
Italy, Research Inst. for Vegetable Crops (Montanaso Lombardo)	9	10	0	0	0	0
The Netherlands, Center for Genetic Resources The Netherlands	12	296	12	1048	11	1700
The Netherlands, Nijmegen Botanical Garden	81	383	12	90	10	50
Northern countries, Nordic Gene Bank	1	0	1	9	1	55
Poland, Research Inst. of Vegetable Crops (Skierniewice)	1	10	1	165	13	782
Portugal, Banco de Germopl. Naci.+BPGV+Depart. Hort. e Floricult.	0	0	3	184	1	110
Romania, Suceava Genebank	1	35	1	41	1	51
Russia, N.I. Vavilov Research Institute of Plant Industry (VIR)	2	676	3	2259	12	7235
Slovakia, Research Institute of Vegetables (Nové Zámky)	1	4	1	58	1	81
Spain, Polytechnic University of Valencia	4	190	6	907	8	1645
Switzerland, Station Fédérale de Rech. en Prod. Végétale (Changins)	1	1	1	1	1	11
Switzerland, Pro Specie Rara (Aarau)	0	0	0	0	1	80
Turkey, Aegean Agricultural Research Institute	1	167	3	705	1	417
United Kingdom, University of Birmingham	46	1200	0	0	0	0
United Kingdom, Horticulture Research International (Wellesbourne)	0	0	0	0	2	129
United Kingdom, Scottish Agric. Sci. Agency (Cambridge to H.R.I)	0	0	0	0	1	94
United Kingdom, Henry Doubleday Research Association	1	2	1	7	1	148
Yugoslavia F.R., Center for Vegetable Crops	1	39	1	339	1	325
TOTAL		4668		11652		23210

Table 2. Seed stock management (conservation conditions, seed quantity, seed status, regeneration frequency)

Country	Institute	Stock working collection	Stock L.T. collection (base collection)	Endangered accession	Reasons	Regeneration frequency	Availability
Armenia	Scientific Center of vegetables & Technical Cultures	room temperature		yes	old seeds	5-7 years	yes
Bulgaria	Inst. of Introd. and Plant Genetic Resources (Sadovo)	+6°C / no limit	-18°C / 5000 seeds	yes	seed quantity	f (germin. ability)	part of the collection
	Maritza Institute (Plovdiv)	* no details given					
Czech Republic	RICP Genebank Olomouc		- 18°C / 50 g	no		15 years	yes
	Palacký University Olomouc	4-5°C / variable quantities		yes	few, germin.	variable	yes
France	INRA, Génét. et Amélior. Fruits et Légumes (Montfavet)	4°C / 30-40% RH / >1000 seeds		yes	many	13-20 years	part of coll. If request justified
Germany	Genebank Gatersleben		-15°C / 15-30 g	no		15-20 years	yes (collected before 1993)
	Genebank Braunschweig						
Greece	Agric. Res. Center of Macedonia & Thraki	0-5°C / 30% RH / 5000 seeds		yes	old, few seeds	15 years	yes
Hungary	Inst. for Agrobotany, Tápiószéle	0°C / 10-20 g	-20°C / 10-20 g				yes
	ZKI Budapest	insulated chamber / 140-400 seeds		no		5-6 years	yes
	ZKI RT Kecskemet	see Tápiószéle					
Italy	Istituto del Germoplasma, Bari		-20°C / 1-10 g	few accessions	old, few seeds	not pre-fixed	limited, if request justified
	Università di Torino (Genebank 20 years old)	desiccation & +4°C / 1-30 g	yes	yes	old, few seeds	not occurred yet	yes
	Res. Inst. For Vegetables Crops, Montanaso Lombardo	+10°C / 3-5 g		yes		7-10 years	yes
The Netherlands	Center for Genetic Resources The Netherlands Nijmegen Botanical Garden	desic. & 4°C / 35 seeds prepacked 2-4°C / silicagel / 2500 seeds	-20°C/1000 seeds(if regener.)	no few	old, few seeds	f (seed viability) 5-10 years	yes yes
Nordic countries	Nordic Gene Bank (20 years old)		desiccation & -20°C			f (germination)	yes
Poland	Res.Inst.of Veg.Crops,Skierniewice(seeds 18 years max)	desiccation & 15°C (0,5-400 g)	desic. & -15°C(0,5-400 g)				yes
Portugal	Banco de Germopl. Naci.+BPGV+Depart. Hort. e Floricultura	0-4°C / 45% RH	- 18°C / 6% RH				depends on the collections
Romania	Suceava Genebank	4°C		yes	few seeds	no regeneration	no
Russia	N.I. Vavilov Research Institute of Plant Industry (VIR)	10-15°C / 10-14% RH / 5-15 g	+4°C / 6-9 % RH / 10-15 g	yes	old, few, germ.	WC 3-10y/BC 25	yes (for research purposes)
Slovakia	Res. Inst. of Vegetables, Nové Zámky	0-5°C				f (germination)	yes
Spain	Polytechnic University of Valencia		-3°C / 5-6% RH / 200-5000 seeds	no		10-15 years	free or by contract
Switzerland	Stn Fédér. de Rech. en Prod. Végétale de Changins	4°C / 2000 seeds	- 20°C / 2000 seeds	f (germination)		10-15 years	yes
	Pro Specie Rara, Aarau	room T°C / 40% RH / 100-500 seeds	fridge			on farm (1-3years)	yes
Turkey	Aegean Agricultural Research Institute	desiccation / 0°C	desiccation / - 18 °C	yes	old, few, germ.	f (germination)	yes
United Kingdom	University of Birmingham	transferred to France & Netherlands		yes	many		not yet (regeneration, first)
	Horticulture Research International, Wellesbourne		desiccation / - 20°C	yes	few, germinat.	no policy	depends on seed availability
	Scottish Agricultural Science Agency	tomato in Cambridge/Dess.& 2-5°C	destined to H.R.I.			not directly	only obsolete cultivars
	Henry Doubleday Res. Assoc.(coll. established in 1975)	room T°C or fridge / large quantities	1/3rd of the Genetic Resources	no		centred around catalogue	yes (if membership)
Yugoslavia F.R.	Center for Vegetable Crops	8 °C / 5-20 g		yes	few, germinat.	10 years	yes

Table 3. Information management and interest in participating in a network

Country	Institute	Passport data/Support	Characterization data/Support	Interested in a European Solanaceae network ?
Armenia	Scientific Center of Vegetables & Technical Cultures	yes / paper (+ computer)	yes / paper (+ computer)	yes
Bulgaria	Inst. of Introd. and Plant Genetic Resources (Sadovo) Maritza Institute (Plovdiv)	yes / computer	yes / computer	yes
Czech Republic	RICP Genebank Olomouc Palacký University Olomouc	yes / computer yes / paper (+ computer)	yes / computer (for eggplant, paper) yes / paper (+ computer)	yes yes
France	INRA, Génét. et Amélior. Fruits et Légumes (Montfavet)	yes / computer (+ paper)	yes/ computer (+ paper)	EGGNET (eggplant); yes (pepper & tomato) if no suppl.work
Germany	Genebank Gatersleben Genebank Braunschweig	yes / computer yes / computer	yes / computer	belongs to EGGNET, depends on extra work necessary contribution as corresponding partner
Greece	Agric. Res. Center of Macedonia & Thraki	yes / computer	limited / computer	belongs to EGGNET, yes for pepper & tomato
Hungary	Inst. for Agrobotany, Tápiószele ZKI Budapest ZKI RT Kecskemet	yes / computer yes / computer	part of the collection / computer yes / computer	yes (wants further information)
Italy	Istituto del Germoplasma, Bari Universita di Torino Res. Inst. For Vegetables Crops, Montanaso Lombardo	yes / computer yes / computer (+ paper) yes / computer	no part of the collection / computer (+ paper) yes / computer	belongs to EGGNET project; interested for pepper & tomato yes (for pepper) yes, if there is grants for it
The Netherlands	Center for Genetic Resources The Netherlands Nijmegen Botanical Garden	yes / computer yes / computer	yes / computer few accessions	belongs to EGGNET; interested for pepper & tomato belongs to EGGNET; interested for pepper & tomato (f (conditions))
Nordic countries	Nordic GeneBank	yes / computer	yes (morphology) / computer	yes in principle
Poland	Res. Inst. of Veg. Crops, Skierniewice	yes / computer	yes / computer	yes (pepper & tomato)
Portugal	Banco de Germopl. Naci.+BPGV+Depart. Hort. e Floricult.	yes / computer (for each location)	yes (for each location)	yes
Romania	Suceava Genebank	yes / computer	no	
Russia	N.I. Vavilov Research Institute of Plant Industry (VIR)	yes / computer	part of the collection / paper	yes
Slovakia	Res. Inst. of Vegetables, Nové Zámky	yes / computer	yes / computer	yes
Spain	Polytechnic University of Valencia	yes / computer	part of the collection / partly computerized	belongs to EGGNET; interested for pepper & tomato
Switzerland	Stn Fédér. de Rech. en Prod. Végétale de Changins Pro Specie Rara, Aarau	yes / computer (& paper) yes / computer (& paper)	no yes / computer	no yes (with respect of existing frameworks & conditions of NGOs)
Turkey	Aegean Agricultural Research Institute	yes / computer		yes
United Kingdom	University of Birmingham Horticulture Research International, Wellesbourne Scottish Agricultural Science Agency Henry Doubleday Research Association	yes / computer yes / computer yes / yes / paper	no yes (collected information) / computer yes / partly / paper	belongs to EGGNET yes no yes
Yugoslavia F.R.	Center for Vegetable Crops	yes / paper	part of the collection / paper	yes

Table 4. Institutes holding the collections and additional comments received

Country	Institute	Additional comments received
Armenia	Scientific Center of Vegetables & Technical Cultures	future exchanges of information with other experts and organizations involved with Genetic Resources very welcome
Bulgaria	Inst. of Introd. and Plant Genetic Resources (Sadovo) Maritza Institute (Plovdiv)	interested in all aspects of genetic resources management
Czech Republic	RICP Genebank Olomouc Palacký University Olomouc	research collection for disease resistance and taxonomy
France	INRA, Génét. et Amélior. Fruits et Légumes (Montfavet)	limitation by time & money
Germany	Genebank Gatersleben Genebank Braunschweig	problems due to disease during regeneration problem of seed borne viruses for pepper; Dutch-German Cooperative Programme
Greece	Agric. Res. Center of Macedonia & Thraki	limited budget, staff & facilities
Hungary	Inst. for Agrobotany, Tápiószéle ZKI ZKI RT Kecskemet	no more extensive work in maintaining tomato GR
Italy	Istituto del Germoplasma, Bari Università di Torino Res. Inst. For Vegetables Crops, Montanaso Lombardo	limited budget for characterization has a duplicate of the collection of <i>Capsicum</i> Genetic Cooperative (USA) -most morpholog. and physiol. Genetic markers difficulties for plant maintenance during winter & problems with seed production
The Netherlands	Center for Genetic Resources The Netherlands Nijmegen Botanical Garden	
Nordic countries	Nordic Gene Bank	old material of the region unfortunately not represented
Poland	Res. Inst. of Veg. Crops, Skierniewice	coop. with public & private sector (charact., research); participation to national & internat. collecting missions; money problems
Portugal	Banco de Germopl. Naci.+BPGV+Depart. Hort. e Floricult.	lack of financial & human resources
Romania	Suceava Genebank	regener. difficulties (no isolated conditions available); field collections for 5 other institutes (Vidra, Bacau, Buzau, Iernut, Isalnita)
Russia	N.I. Vavilov Research Institute of Plant Industry (VIR)	
Slovakia	Res. Inst. of Vegetables, Nové Zámky	research (evaluation for breeding); not enough financial support for working properly
Spain	Polytechnic University of Valencia	
Switzerland	Stn Fédér. de Rech. en Prod. Végétale de Changins Pro Specie Rara, Aarau	regeneration on-farm (almost yearly); good collaboration between GO and NGO's such as Pro Specie Rara
Turkey	Aegean Agricultural Research Institute	
United Kingdom	University of Birmingham Horticulture Research International, Wellesbourne Scottish Agricultural Science Agency Henry Doubleday Research Association	collection moved to INRA (France) and Nijmegen Botanical Garden (NL) during EGGNET; abandon by Birmingham Univ. coll. of potato (940 acc.) at SASA; tomato cvs collection in Cambridge (registration for Nat. Listing); obsolete cvs to I.H.R. management of the collection has to be improved; limited space & isolation facilities for regeneration; membership necessary for seed exchanges
Yugoslavia F.R.	Center for Vegetable Crops	

General overview of the ECP/GR *Brassica* Working Group

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Introduction

The Brassica Working Group was established by the ECP/GR Technical Consultative Committee, now the Steering Committee, and has so far held three official Group meetings in Prague, Czech Republic (1991), Lisbon, Portugal (1994), Rome, Italy (1996) and an extraordinary meeting in Rennes, France (1997). The Group is made up of members from 29 participating countries and the Group's activities are determined by the workplan established at each Group meeting (Table 1).

Table 1. Countries involved in the Brassica Working Group

	Report received	Report for May 2000	Partner in GEN RES Programme	Missing Data set.
Austria	X	X		(X)
Belgium	X	X		
Bulgaria	X			
Croatia	X			X
Cyprus	X			X
Czech Republic	X	X		
France	X	X	X	
Germany	X		X	
Greece	X		X	
Hungary	X	X		
Italy	X	X	X	(X)
Netherlands	X	X	X	
Nordic Gene Bank	X		X	(X)
Poland	X	X		
Portugal	X		X	(X)
Russia	X			
Slovakia	X	X		X
Spain	X		X	
Switzerland	X			
Turkey	X			
United Kingdom	X	X	X	
F.R. Yugoslavia	X	X		X

(x): partial

Group Activities

The main features of the Brassica Working Group activities are the following:

- Status of Brassica genetic resources collections in the ECP/GR countries;
- Establishment of the Bras-EDB (managed by Ietje W. Boukema, CGN The Netherlands);
- Progress on minimum list descriptors;
- Various studies on regeneration and rationalization methods including: - regeneration procedures, collection storage and regeneration studies;
- Core collection development for Brassica;
- In situ conservation for wild relatives;
- Links with the EU Genetic Resources Programme (2000-2003) regarding Brassica collections for broadening agricultural use;

Present state of the Brassica workplan

The following tasks of the workplan need to be carried out or are currently underway:

Updating the database

Datasets for Austria, Portugal, Slovakia and Yugoslavia have recently been updated, but missing and partial datasets (see Table 1.) still need to be sent to the central database manager (I. Boukema) for inclusion in the Bras-EDB. The GEN RES Programme includes 9 European partners for evaluation and regeneration of accessions and constitution of core collection for *B. napus*, *B. oleracea* and *B. rapa*.

Minimum characterization descriptor list

A revised list of minimum characterization descriptors is currently being compiled by NGB.

Characterization data sets in the new format

The new format for minimum characterization descriptors, revised by G. Poulsen and M. Gustafsson, still needs to be distributed and all the characterization data presently available in genebanks, in the revised format, has to be sent for inclusion in the Bras-EDB.

Identifying unknown accessions

An offer to identify doubtful samples for all Working Group members was kindly made by C. Gomez-Campo.

Safety duplication

Safety duplication of all accessions has started (cf safety duplicates of HRI UK, Belgium held at CGN The Netherlands, Portugal and Poland). A complete inventory of duplicate collections is still to be done. It was suggested that a preliminary "black box" for very long term conservation with 50 critically rare Brassica samples (divided in 3 banks) be established.

Regeneration procedures

Many Group members have written down their regeneration procedures and NGB is now carrying out a compilation.

Near future for the Brassica Working Group

The Brassica Working Group should also concentrate on the following tasks in the near future:

- Extend information on the status of Brassica genetic resources collections to include new countries (countries to be decided) and countries which are "official members" but have not given news or sent a report recently;
- Completion of datasets for the Bras-EDB: some countries have only partly given their base to Bras-EDB manager;
- Finalize the revised list of minimum descriptors;
- Integrate characterization data according to the new minimum descriptor list;
- Obtain all possible characterization data from the different collections;
- Homogenize regeneration procedures according to the work carried out in common;
- Accentuate importance placed on safety duplicates by making black box lots and localizing them (several genebanks have offered this service).

Future perspectives for the Brassica Working Group

The following are a number of issues that the Brassica Working Group should focus its attention on:

- How to maintain workplan progress only with mail exchanges: Cf 2000 information given for this meeting by 10 members;
- The existing GEN RES Programme, although there are only a limited number of countries involved and the Programme only focuses on evaluation and regeneration;
- Sharing responsibilities for regeneration, evaluation and conservation;
- The possibility of extending regeneration activities beyond each owner's material;
- Constitution of an ECP/GR core collection;
- Establishing links with the other Vegetables groups (cf discussion item 3: how to work on the scale of a Vegetables Network).

Current State of Cucurbits Germplasm in European Collections

Fernando Nuez and Maria José Díez

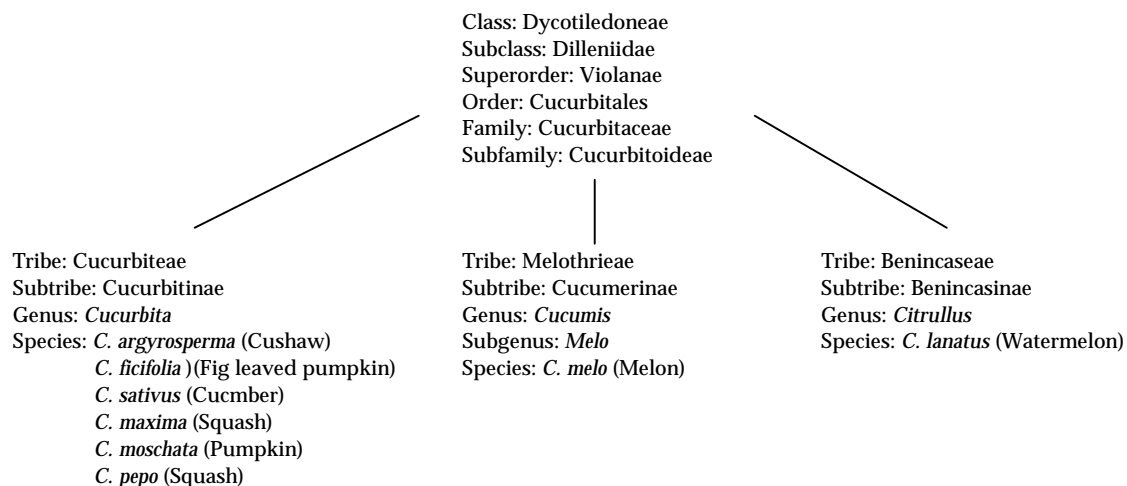
Biotechnology Department, Polytechnic University of Valencia/Universidad Politécnica de Valencia, Camino de Vera, 14, Valencia, Spain.

Introduction

"Cucurbits" is a term coined by Lyberty Hyde Bailey for cultivated species of the family Cucurbitaceae. During this century the term has been used not only for cultivated forms, but also for any species of the Cucurbitaceae.

The Cucurbitaceae, which is not closely related with any other plant family, consists of two well defined subfamilies, eight tribes representing varying degrees of circumscriptive cohesiveness, about 118 genera and 825 species (Jeffrey 1990). The four major cucurbit crops (watermelon, squash and pumpkin, cucumber, melon,) and five other important crops (loofah, bottle gourd, chayote, wax gourd, bitter melon) in the family belong to the Cucurbitoidae subfamily (Figure 1). They are all included in the tribes Cucurbitae, Melothriaceae and Benincaseae. Other cultivated species of less importance and wild relatives belong to the other tribes i.e. Joliffiaceae, Trichosantheae and Sicyeae.

Figure 1. Taxonomic classification of the most important cultivated species of Cucurbitoidae



Collecting

Number of accessions

More than 25 000 accessions of cucurbits are currently stored in European genebanks (Table 1). Approximately half of these accessions belong to the genus *Cucumis*, almost 7 000 accessions are of the *Cucurbita* genus and a little more than 4 000 of the *Citrullus* genus. The other species are scarcely represented in European collections of cucurbits. Most of the collections (23 199 accessions) are made up of the main cultivated species (*Citrullus lanatus*, *Cucumis melo*, *C. sativus*, *Cucurbita maxima*, *C. pepo*, *C. ficifolia*, *C. argyrosperma* and *C. moschata*), the number of wild species being very low.

Types of collections

European institutions holding cucurbits species can be grouped into three categories according to the number of cucurbits accessions.

Table 1. Number of accessions of each species, including landraces, breeding material and wild relatives.

<i>C. aedulis</i>	300	<i>Benincasa hispida</i> (Thunb.) Cogn.	54
<i>Citrullus colocynthis</i> (L.) Schrad.	269	<i>Benincasa cretica</i>	1
<i>C. lanatus</i> (Thund.) Matsum. et Nakai	3 621	<i>Bryonia</i> sp.	5
<i>C. nandeanus</i>	1	<i>Cucumeropsis</i>	1
<i>Citrullus</i> sp.	164	<i>Cyclanthera brachystachia</i> (Séér.) Cogn.	2
Total <i>Citrullus</i>	4 355	<i>C. pedata</i> (L.) Schrad.	34
		<i>C. tonduzii</i> Cogn.	1
<i>Cucumis africanus</i> Lindl.	9	<i>Diplocyclos palmatus</i> (L.) C. Jeffrey Do	4
<i>C. anguria</i> L.	33	<i>Ecballium elaterium</i> (L.) A. Rich.	7
<i>C. dintari</i>	1	<i>Ecballium</i> sp.	1
<i>C. dipsaceus</i> Ehrh.	31	<i>Echinocystis wrightii</i> (A. Gray) Cogn.	17
<i>C. ficifolius</i>	11	<i>Gynostemma</i> sp.	5
<i>C. figarei</i> Delile	4	<i>Kedrostis africana</i> (L.) Cogn.	2
<i>C. flexuosus</i>	2	<i>Lagenaria siceraria</i> (Molina) Standl.	140
<i>C. globosus</i> C. Jeffrey	1	<i>Lagenaria leucantha</i>	1
<i>C. heptadactylus</i>	1	<i>L. vulgaris</i>	253
<i>C. humifructus</i>	1	<i>Lagenaria</i> sp.	6
<i>C. leptodermis</i> Schweickerdt	3	<i>Luffa acutangula</i> (L.) Roxb.	6
<i>C. longipes</i>	1	<i>L. aegyptiaca</i> Mill.	1
<i>C. meeusei</i> Jeffrey	5	<i>L. cylindrica</i> (L.) Roem.	15
<i>C. melo</i> L.	7 553	<i>L. purgans</i> Mart.	2
<i>C. metuliferus</i> E. Mey. Ex Schrad.	11	<i>Luffa</i> sp.	140
<i>C. myriocarpus</i> Naud.	12	<i>Melothria japonica</i> (Thunb.) Maxim.	7
<i>C. prophetarum</i> L.	5	<i>M. pendula</i> L.	3
<i>C. pubescens</i> Willd.	1	<i>M. scabra</i> Naud.	2
<i>C. sagittatus</i> Wawra et Peyr.	3	<i>Momordica balsamina</i> L.	3
<i>C. sativus</i> L.	5 896	<i>M. charantia</i> L.	12
<i>C. zeyheri</i> Sond	10	<i>Momordica</i> sp.	16
<i>Cucumis</i> sp.	739	<i>Thladiantha dubia</i> Bunge	8
Total <i>Cucumis</i>	14333	<i>Trichosanthes cucumerina</i> L. T. sp.	17
		Total other species	766
<i>Cucurbita argyrosperma</i> Huber	9		
<i>C. ficifolia</i> Bouchéé	121		
<i>C. foetidissima</i> Kunth	10		
<i>C. fraterna</i>	6		
<i>C. lundelliana</i> Bailey	6		
<i>C. maxima</i> Duch. ex Lam.	1 705		
<i>C. mixta</i>	20		
<i>C. moschata</i> (Duch. ex Lam.) Duch. ex Po.	753		
<i>C. okechobeensis</i> Bailey	1		
<i>C. palmata</i> Wats.	5		
<i>C. pepo</i> L.	3 541		
<i>C. sororia</i> Bailey	1		
<i>Cucurbita</i> sp.	759		
Total <i>Cucurbita</i>	6 937	TOTAL CUCURBITS:	26 391

Large collections

Most of the cucurbits accessions are stored in eleven genebanks (Table 1). Duplicates are included among these accessions and their detection is an urgent necessity. This would allow a more exact knowledge of the real number of accessions held in European genebanks. The eleven institutions and genebanks considered as holding large collections of cucurbits are the following:

Bulgaria: Institute of Introduction and Plant Genetic Resources K. Malkov, Sadovo (L. Krasteva, Curator tomato and melon). The Institute of Introduction and Plant Genetic Resources was established in 1977 in Sadovo. This Institute works on five independent programmes, grouped into two main departments i.e. plant resources and breeding. Other Institutions, such as the Institute of Vegetable Crops Maritsa (M. Alexandrova, collection

breeder) collaborate closely with the Institute of Sadovo.

Czech Republic: Genebank Department, Research Institute of Crop production (RICP), Prague. Vegetable Section, Olomouc (E. Křístková, Curator of the collection). A national information system on plant genetic resources was developed at RICP Prague during the 1970s and the 1980s. It is used by all collection curators in the Czech Republic. Eva Křístková is responsible for the cucurbits collection, which is located in Olomouc. The Vegetable Section in Olomouc works closely with the RICP.

Germany : a) Genebank, Institute for Plant Genetics and Crop Plant Research (IPK), Gatersleben (A. Boerner, responsible for cucurbits). b) Institute of Crop Science. Federal Research Centre for Agriculture in Braunschweig (BAZ) (L. Frese, Curator, Plant Genetic Resources Programme Coordinator). The two major genebanks in Germany are the IPK in Gatersleben and the BAZ in Braunschweig, which take care of a wide variety of different crops. The Information Center for Genetic Resources (IGR), with a centralized documentation system on plant genetic resources has been established at the Center for Agricultural Documentation and Information (ZADI) in Bonn to act as focal point for international contacts.

Hungary: Institute for Agrobotany, Tápiószele (L. Horváth, Head of Field Crop Department). All crop genetic resources activities are coordinated by the Institute for Agrobotany. All activities concerning collecting, multiplication and regeneration, characterization, evaluation and documentation of genetic resources are the main activities of the Institute, including the participation in the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) and coordination of Hungarian activities.

The Netherlands: Center for Genetic Resources (CGN), Wageningen (I. Boukema, Curator Horticultural Crops). The Plant Genetic Resources activities in the Netherlands are mainly concentrated at the Center for Genetic Resources, The Netherlands (CGN). The CGN was established in 1985. It has the facilities that a genebank needs for proper management of *ex situ* seed collections. Multiplication is carried out using the facilities of the Centre for Plant Breeding and Reproduction Research (CPRO-DLO) now Plant Research International. The CGN is concerned with the collection, documentation and seed storage of crops of importance to the Netherlands.

Poland: Plant Genetic Resources Laboratory Research Institute of Vegetable Crops, Skierniewice (T. Kotlińska, responsible for cucurbits in Poland). The National Crop Genetic Resources Conservation Programme in Poland is based on multi institutional input. Three universities, eight branch institutes, breeding stations, the Botanical Garden of the Polish Academy of Sciences and the Botanical Garden of Plant Breeding and Acclimatization Institute (PBAI) are responsible for all activities concerning plant genetic resources.

Russian Federation: N.I. Vavilov Research Institute of Plant Industry, St. Petersburg (S. Alexanian, Head Foreign Relations Department). The N.I. Vavilov Research Institute of Plant Industry is the only research institution in Russia that is fully involved in plant genetic resources activities for food and agriculture. It houses over 350 000 accessions, representing various agricultural crops and their wild relatives.

Spain: a) Center of Plant Genetic Resources (CRF), Madrid (L. Ayerbe, Director). b) Center for the Conservation and Breeding of Agrodiversity, Valencia (F. Nuez, Director). c) Genebank of Vegetable Crops, Zaragoza (BGHZ), (M. Carravedo, responsible for Vegetables). In 1993 a Programme for the Conservation and Use of Plant Genetic Resources was created by the Ministry of Agriculture in order to coordinate efforts on genetic resources. There is a Commission of the programme that acts as a technical advisory

committee. The Programme is managed by the Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA), which also provides financial support for all activities related to genetic resources. The Centro Nacional de Recursos Fitogenéticos within INIA acts as a centre of conservation and as a base collection. There is a close collaboration with other institutions like the CSIC and Universities.

Table 2. Number of accessions stored in large collections

Curator/Institute	<i>Citrullus</i>	<i>Cucumis</i>	<i>Cucurbita</i>	Others	Total
L. Krasteva Institute of Introduction and Plant Genetic Resources K. Malkov, Sadovo (Bulgaria)	300	444	---	---	744
E. Krístková Genebank Department, Research Institute of Crop production (RICP), Prague (Czech Republic)	---	984	629	---	1 613
A. Boerner Genebank, Institute for Plant Genetics and Crop Plant Research (IPK), Gatersleben, (Germany)	254	975	857	175	2 261
L. Frese Institute of Crop Science. Federal Research Centre for Agriculture in Braunschweig (BAZ), Braunschweig (Germany)	15	167	211	---	393
L. Horváth Institute for Agrobotany, Tápiószel, (Hungary)	409	383	732	44	1 568
I. Boukema Center for Genetic Resources (CGN), Wageningen (The Netherlands)	---	1386	---	---	1386
T. Kotlińska Plant Genetic Resources Laboratory Research Institute of Vegetable Crops. (Poland)	19	390	177	9	595
S. Alexanian N.I. Vavilov Research Institute of Plant Industry, St. Petersburg, (Russian Federation)	2 556	4 818	2 037	471	9 882
L. Ayerbe Center of Plant Genetic Resources (CRF), Madrid (Spain)	144	718	509	20	1 391
F. Nuez Center for the Conservation and Breeding of Agrodiversity, Valencia (Spain)	226	720	889	21	1 856
M. Carravedo Genebank of Vegetable Crops, Zaragoza (BGHZ) (Spain)	147	777	349	---	1 273
Total	4 070	11 762	6 390	740	22 962

Small collections

Five institutions are considered to be holding small collections of cucurbits (Table 3):

Albania: Plant Breeding and Seed Production Section, Agricultural University of Tirana (L. Xhuveli, Head). Albania is an old centre of cultivated plants. Eleven *ex situ* collections of Agricultural Research Institutes, the Agricultural University of Tirana and the Research Institute of Forest and Pasture preserve the collections of germplasm. However, part of the local cultivars has not yet been collected and is endangered by genetic erosion. The

Gatersleben Genebank (Germany) and the Germplasm Institute, Bari (Italy) and Radsików have participated in recent collecting missions supported by IPGRI.

Czech Republic: Genebank Department, Division of Genetics and Plant Breeding, Research Institute for Crop production, Prague (L. Dotlacil, Director).

Italy: Istituto del Germoplasma Consiglio Nazionale delle Ricerche (P. Perrino, Director). Only one genebank is officially present, the Germplasm Institute (IdG) of the National Research Council (CNR). IdG is responsible for plant germplasm of interest to Italian and Mediterranean agriculture. In addition, at least another 16 institutions maintain seed germplasm collections, mainly for their use in specific research programmes.

Portugal: Banco Português de Germoplasma Vegetal (BPGV), Braga (R. Farias, Curator). In 1992 the Genebank in Braga was designated as the Portuguese Plant Germplasm Bank (Ministry of Agriculture).

F.R. Yugoslavia: Institute for Field and Vegetable Crops, Novi Sad (J. Berenji, Cucurbits breeder). The organization of Plant Genetic Resources in Yugoslavia is recent. The national project "Plant Genetic Resources of Yugoslavia" is carried out and financed by the government. The project is implemented through two subprojects: development of the Yugoslavian Genebank and collection of plant species from the Yugoslavian territory. The Yugoslavian Genebank performs all activities regarding genetic resources except evaluation, which is carried out by specialized scientific and research institutions on plant breeding.

Table 3. Number of accessions stored in "small collections"

Curator/Instiute	<i>Citrullus</i>	<i>Cucumis</i>	<i>Cucurbita</i>	Others	Total
L. Xhuveli Plant Breeding and Seed Production Section, Agricultural University of Tirana (Albania)	9	23	16	---	48
L. Dotlacil Genebank Department, Division of Genetics and Plant Breeding, Research Institute for Crop production, Prague (Czech Republic)	3	139	4	---	146
N. Polignano Istituto del Germoplasma, Consiglio Nazionale delle Ricerche, Bari (Italy)	73	143	141	29	386
R. Farias Banco Português de Germoplasma Vegetal (BPGV), Braga (Portugal)	17	110	144	4	275
J. Berenji Institute for Field and Vegetable Crops, Novi Sad (F.R. Yugoslavia)	---	---	145	---	145
Total	102	415	450	33	1 000

Breeder collections

Most of the accessions stored in breeders' collections belongs to the *Cucumis* genus. Melon and cucumber are the two cucurbits crops to which a big breeding effort is dedicated at present (Table 4).

France: Institut National de la Recherche Agronomique, Montfavet (M. Pitrat, Curator *Cucumis*). The Station d'Amelioration des Plantes Maraîcheres carried out research on six vegetable species, of which their main activities were related to disease resistance, breeding

for quality, biotechnology and selection. Germplasm collections are maintained, including breeding materials, landraces and wild relatives.

Hungary: Department of Plant Genetics and Breeding, University of Horticulture and Food Industry, Budapest (I. Koleda, Head). Vegetable Crops Research Institute, Station Budapest (J. Bittsánszky, Director).

Romania: Genebank of Suceava, Suceava (S. Strajeru, Director). S. Strajeru is the current Director of the Suceava Genebank and National Coordinator for PGR. The Plant Genebank was established in Suceava following a decision taken by the Romanian Government in May 1990. In Romania plant genetic resources activities are considered research activities and they are developed in collaboration with the National Committee on Plant Genetic Resources. The management of the National Committee on Plant Genetic Resources is located at the Suceava Genebank. The Suceava Genebank acts as a focal point for any institutions interested in collaborating in the field of genetic resources activities. The Genebank also collaborates with important institutes dealing with vegetable crops, such as:

- The Vegetable Research Station, Vidra-Ilfov;
- The Central Research Station for Plant cultivation on sands, Dabuleni-Dolj;
- The Vegetable Research Station, Bacau.

Spain: Experimental Station "La Mayora", Consejo Superior de Investigaciones Científicas CSIC, Málaga (M.L. Gómez-Guillamón, Director). The research lines carried out at "La Mayora" have always been oriented towards solving the agricultural problems of vegetable crops and tropical fruits cultivated in southern Spain. Genetic breeding of melon, tomato and other vegetable crops and acclimatization of subtropical species are important contributions of this Institution.

Table 5. Number of accessions stored in "Breeder collections".

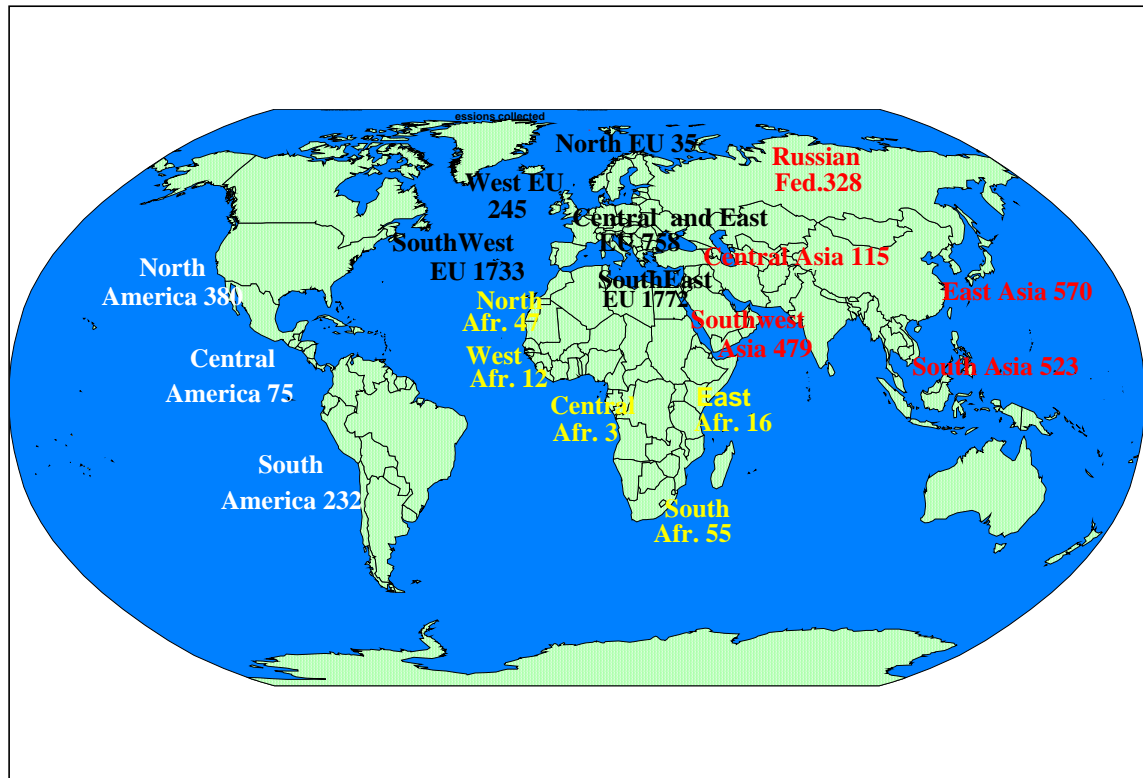
Curator/Institute	<i>Citrullus</i>	<i>Cucumis</i>	<i>Cucurbita</i>	Others	Total
M. Pitrat Institut National de la Recherche Agronomique, Montfavet (France)	---	605	---	---	605
I. Koleda Department of Plant Genetics and Breeding, University of Horticulture and Food Industry, Budapest (Hungary)	134	221	---	---	355
J. Bittsánszky Vegetable Crops Research Institute, Station Budapest (Hungary)	---	498	---	---	498
S. Strajeru Genebank of Suceava, Suceava (Romania)	51	280	91	---	422
M.L. Gómez-Guillamón Experimental Station "La Mayora", Consejo Superior de Investigaciones Científicas CSIC, Málaga (Spain)	---	561	---	--	561
Total	185	2 165	91	---	2 441

Origin

Data of five collections considered as "large collections", maintained at the Institute of Plant Introduction and Genetic Resources in Sadovo (Bulgaria), the Genebank Department, RICP, Prague (Czech Republic), the CGN (The Netherlands), IPK, Gatersleben (Germany), BAZ (Germany), the Plant Genetic Resources Laboratory (Poland) and the Center for the Conservation and Breeding of Agrodiversity, Valencia (Spain), from which we know the country of origin of each accession, have been included in Figure 2. Only accessions

belonging to the most important cultivated species (*Citrullus lanatus*, *Cucumis melo*, *C. sativus*, *Cucurbita argyrosperma*, *C. ficifolia*, *C. maxima*, *C. pepo* and *C. moschata*) have been included. The collection stored in the Vavilov Genebank (9 882 accessions) comes from 97 countries and has not been included for lack of accurate information. The number of accessions has been indicated in the map according to their areas of origin. The countries listed below Figure 2 have been included in each area.

Figure 2. Number of accessions belonging to the main cultivated species collected in each area



Central Asia: Afghanistan, Kazakhstan, Kyrgyzstan, Latvia, Tajikistan, Turkmenistan, Uzbekistan;

East Asia: China, Japan, Korea, Mongolia, Taiwan;

Southwest Asia and the Near East: Armenia, Azerbaijan, Georgia, Iran, Iraq, Israel, Lebanon, Sri Lanka, Syria, United Arab Emirates;

South Asia: Bangladesh, Indonesia, India, Malaysia, Nepal, Pakistan, Philippines, Thailand, Vietnam.

North Europe: Denmark, Finland, Sweden;

Central Europe: Austria, Czech Republic, Germany, Hungary, Poland, Switzerland;

South and Southeast Europe: Albania, Bulgaria, Croatia, Cyprus, Greece, Italy, Macedonia FYR, Moldova, Romania, Turkey, Yugoslavia;

Eastern Europe: Ukraine;

Western Europe: France, Ireland, The Netherlands, United Kingdom;

Southwest Europe: Portugal, Spain.

Central America: Costa Rica, Cuba, Guatemala, Mexico, Porto Rico, El Salvador;

North America: Canada, USA;

South America: Argentina, Bolivia, Brasil, Chile, Colombia, Ecuador, Peru.

North Africa: Egypt, Morocco, Tunisia;

Central Africa: Congo;

East Africa: Ethiopia, Somalia;

West Africa: Burma, Mauritania, Niger, Nigeria, Senegal;

South Africa: South Africa, Surinam, Zambia.

Russian Federation

Europe is the continent most represented, followed by Asia. Few collecting missions have been carried out in Africa, centre of origin for melon, watermelon and wild relatives and America, centre of origin for the majority of species of *Cucurbita* genus.

Collecting needs

The low number of wild species stored in genebanks, compared with the cultivated species, highlighted the urgent need for collecting wild species in their centres of origin and diversity.

The need for collecting germplasm has been stressed by some of the persons responsible for the European collections. They have also pointed out the lack of funds for organizing collecting expeditions:

Eva Křístková (Czech Republic) and F. Nuez (Spain) sustain that collecting expeditions should be carried out not only in the centres of origin, but also in other underexplored regions.

Janos Berenji (F.R. Yugoslavia) believes that if funds were available from international agencies, it would still be possible to collect many local genotypes maintained by farmers (the Balkans being considered a secondary centre of origin).

Teresa Kotlińska (Poland) considered insufficient funds for expeditions within Poland, where valuable local forms still exist, to be the biggest problem.

Conservation and Regeneration

Most of the accessions are maintained in the most important European genebanks, ensuring good storage conditions (cool and dry) for their conservation. However, many samples could be small and/or of uncertain viability, making their regeneration to prevent further genetic erosion necessary. This could be the particular case of the collection of the Russian Federation.

Other collections, like the breeder or working collections, are stored in non-standardized conditions. The need to supply the required facilities is particularly important in this type of collections not established as genebanks. An example could be the collection maintained in F.R. Yugoslavia (conserved in paper bags at room temperature, with no humidity control) and some breeder collections in Romania. A solution for solving the problem of conservation and regeneration is the creation of core collections. The establishment of a core collection of *Cucurbita* genus has been started in the Center for Conservation and Breeding of the Agrodiversity, Valencia (Spain).

Characterization and Evaluation

Only parts of these collections have been characterized for minimal descriptors. Evaluation has been carried out only in some cases and molecular characterization is only being carried out at IPK (Gatersleben).

A small part of these collections has been screened for resistance/tolerance to biotic and abiotic stresses. The following is a list of pathogens for which evaluation is being carried out:
Viruses: Papaya Ringspot Virus, Cucumber Mosaic Virus, Zucchini Yellow Mosaic Virus, Lettuce Infectious Mosaic Virus, Cucumber Yellow Virus, Squash Mosaic Virus, Cucumber Mottle Mosaic Virus, Cucurbit Aphid Borne Yellow Virus, Watermelon Mosaic Virus.

Fungus: *Dydimella bryoniae*, *Fusarium* spp., dieback (*Monosporascus cannonballus*, *Acremonium cucurbitacearum*), powdery mildew (*Sphaerotheca fuliginea* and *Erysiphe cichoracearum*), downy

mildew (*Pseudoperonospora cubensis*), *Phytophthora melonis*, *Pseudomonas syringae*, *Cladosporium cucumerinum*.

Insects: *Bemisia tabaci*, thrips.

These screenings are mainly carried out by private or institutional researchers. Data on screening are frequently not well documented and there is insufficient information available.

Research

Most of the research is supported by public funds. The main effort is concentrated on the evaluation of collections for disease resistance (Nuez *et al.* 1991; McCreight 1991; 1992; Pitrat *et al.* 2000).

At present the French breeder Dr. Pitrat (INRA, France) is studying the collection held at IPK (about 400 accessions) using morphological and phytopathological descriptors as well as molecular markers.

Sources of resistance found in wild species are underutilized due to the existence of strong crossability barriers between cultivated and wild species. Some methods, like embryo rescue and its *in vitro* culture (Lebeda *et al.* 1996; Ondrej *et al.* 2000) or the fusion of protoplasts are being studied at present to solve this problem (Fellner *et al.* 2000).

Breeding work for heterosis, earliness, parthenocarpy and quality is also being carried out at present.

An EU funded project titled "Management, conservation and valorisation of genetic resources of *C. melo* and wild relatives", coordinated by M. L. Gómez Guillamón of the High Council of Scientific Research (CSIC) of Spain, has recently begun. The main objectives of this project are the establishment of a core collection and the implementation of an European Database. Germany, Portugal, Spain and Turkey are participating in this project

However, the majority of European genebanks are not participating. Therefore, only a small part of the existing *Cucumis* genus resources would be included in the core collection.

Documentation

In most of the collections, except the breeder collections, all the passport data are computerized. In many cases evaluation data are not computerized. The hardware and software used do not offer problems of mutual compatibility. Access to the main European genebanks is now available through the Internet. The implementation of a European database that facilitates the revision and comparison of collections is considered a priority.

The realization of catalogues containing passport and characterization data would facilitate the transmission of information to users (Nuez *et al.* 1996; 1998).

Problems and suggestions related to cucurbits genetic resources

The main constraints identified by experts are: 1) a lack of funds; and 2) the difficulty in pollination control during regeneration. The first constraint has been outlined by many persons responsible for collections as having implications with regard to:

- Multiplication and testing for disease resistance;
- Characterization, evaluation and, in particular, collecting activities;
- The need for collecting local accessions in the Balkans (as a secondary centre).

Some institutions suffer financial restrictions which, in some cases, seriously compromise their short-term survival.

The second constraint highlighted, requires efficient conditions for regeneration:

- Ensuring suitable and efficient conditions for regeneration;
- Hand pollination and greenhouse requirements;
- Difficulties in plant protection during multiplication for conservation;
- Evaluation and multiplication of accessions.

Other proposals and requirements have been put forward by Bulgaria:

- The possibility for Bulgaria to participate in EU programmes;
- Establishment of a Working Group for cucumbers within ECP/GR;
- Creation of a European database (revision and comparison of collections);
- Revision of lists of descriptors;
- Development of documentation;
- Creation of systems of safety-duplication;
- Saving old varieties and landraces in Europe (and in other continents) (if not included in the existing collections);
- Study of accessions (taxonomy, morphology, biological features etc.);
- Lack of capacity for systematic evaluation of materials;
- Necessity to implement on-farm conservation;

Conclusion

Collecting

The need for collecting cultivated species is urgent in areas in which landraces still exist and are endangered by genetic erosion. For example, there are nearly twenty different kinds of cucurbits cultivated as vegetables. Apart from their edible value, other aspects such as specific sex mechanisms, or disease resistance are other interesting characteristics of the Indian types of cucurbits. Indeed, India is the only area where resistance to Zucchini Yellow Mosaic Virus (ZYMV) has been found and it is the main origin of resistance for *Sphaerotheca fuliginea* and for downy mildew.

Wild species constitute only a very small proportion of cucurbits genetic resources stored in European collections. Collecting such species should be prioritized, mainly in their areas of origin and diversity, as they constitute the main source of genes for resistance to diseases.

Characterization and evaluation

A large proportion of accessions stored have been characterized only for a few descriptors and evaluation data are incomplete and difficult to obtain. Evaluation should be organized at European level, not only for disease resistance, but also for other aspects, such as earliness, fruit quality and resistance to abiotic stresses. Coordination among experts on different breeding aspects ought to be established.

Descriptors should be revised and completed to allow the characterization of wild species.

Documentation

Although in most cases passport data are recorded electronically, evaluation data are generally still only hand-written, making them virtually inaccessible to other researchers. The implementation of a Central European Database, would be extremely useful.

List of cucurbit experts identified in a recent survey

Janos Berenji (F.R. Yugoslavia);
Lajos Horváth (Hungary);
Teresa Kotlińska (Poland);
Helmut Knüpffer (Germany);
Lilia Krasteva (Bulgaria);
Eva Křístková (Czech Republic);
Fernando Nuez (Spain);
Michel Pitrat (France);
Silvia Strajeru (Romania).

Cooperation and exchange of expertise ought to be promoted to improve the effectiveness of

activities for the conservation and use of genetic resources of cucurbits.

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Leafy vegetables genetic resources

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Introduction

The group of leafy vegetables is represented by a large number of vegetable crops from different botanical families. It includes vegetables of which the edible plant part (organ) is leaf or leaves (George 1999, Rubatzky and Yamaguchi 1997). There is no precise distinction between leafy and "non leafy" vegetables. In this paper the leafy vegetables are considered in a more specific viewpoint.

Conservation of biodiversity of plant genetic resources for food and agriculture is considered a most important milestone for the new millennium (Gass *et al.* 1999). Compared to other crops the conservation of the genetic resources of vegetables in general and of leafy vegetables in particular has received relatively little attention (Cross 1998). These activities were mostly focused on the genera *Lactuca*, *Cichorium* and *Spinacia*. A recent overview of the most important germplasm collections of these genera was summarized by Hintum and Boukema (1999). They concluded that about 23 000 accessions of leafy vegetables (*Lactuca*, *Cichorium*, *Spinacia*) recently available in the world collections, represent less than 0.5 % of the plant genetic resources collections. The *Cichorium* and *Spinacia* collections are very limited (only about 15 % of accessions). Other leafy vegetable crops had, until now, very low priority in the field of genetic resources conservation.

Table 1. List of leafy vegetables considered in this report

Family/genera	Species	Common name
Asteraceae		lettuce
<i>Lactuca</i> L.	<i>L. sativa</i> L., <i>L. serriola</i> L., <i>L. saligna</i> L., <i>L. virosa</i> L. and other wild <i>Lactuca</i> spp.*	
<i>Cichorium</i> L.	<i>C. endivia</i> L. <i>C. intybus</i> L.	endive/escarole chicory, leaf and witloof chicory
Chenopodiaceae		
<i>Spinacia</i> L.	<i>S. oleracea</i> L. <i>S. oleracea</i> spp. <i>spinosa</i> (Moench) Peterm. <i>S. turkestanica</i> Iljin	spinach
<i>Atriplex</i> L.	<i>A. hortensis</i> L.	French spinach
Valerianaceae		
<i>Valerianella</i> L.	<i>V. locusta</i> (L.) Latterrade em. Betcke	lambs lettuce, corn salad
Polygonaceae		
<i>Rumex</i> L.	<i>R. acetosa</i> L. <i>R. acetosella</i> L., <i>R. scutatus</i> L.	garden sorrel, sour grass
<i>Portulaca</i> L.	<i>P. oleracea</i> L.	purslane
Tetragoniaceae		
<i>Tetragonia</i> (Pall.)	<i>T. expansa</i> Murr.	New Zealand spinach
Liliaceae		
<i>Asparagus</i> L.	<i>A. officinalis</i> L. <i>A. acutifolius</i> L., <i>A. maritimus</i> (L.) Miller	asparagus

* - For further details see Lebeda and Astley (1999)

This review on leafy vegetables germplasm activities focuses on the most important crops/genera cultivated in Europe (Table 1) and their wild relatives. Crops of tropical areas, leafy aromatic and medicinal plants, or crops (e.g. *Beta* spp., see International Database for *Beta* /IDBB of the International *Beta* Genetic Resources Network (Frese and Doney 1994)), which fall under the activities of other ECP/GR Crop Working Groups, have been excluded. Another group of minor leafy vegetables may also be considered (Table 2).

Of the Brassicaceae leafy vegetables the rocket (*Eruca* spp.) genetic resources were dealt with as an independent activity (Padulosi 1994, Padulosi and Pignone 1997), while the *Brassica* species are included in the Working Group on *Brassica* (IBPGR 1993, IPGRI 1995, 1997). However, *Lepidium sativum* and genera like *Cynara*, *Chrysanthemum*, *Taraxacum*, *Chenopodium* and *Rheum* are not yet being dealt with by ECP/GR (Table 2).

Table 2. Underutilized and/or unusual leafy vegetables to be considered by the Network
Coordinating Group

Family*	Genera*	Species*	Common name
Asteraceae	<i>Cynara</i> L.	<i>C. cardunculus</i> Spr. ^{6, 14}	Cardoon
		<i>C. scolymus</i> L.	globe artichoke
	<i>Chrysanthemum</i> L.	<i>Ch. coronarium</i> L. ⁶	garland chrysanthemum
	<i>Taraxacum</i> Wiggers	<i>T. officinale</i> Wiggers ^{6, 13, 14}	dandelion
Brassicaceae	<i>Eruca</i> L.	<i>E. vesicaria</i> (L.) Cav. subsp. <i>sativa</i> (Mill.) Thell. ^{6, 8, 14}	rocket salad
	<i>Lepidium</i> L.	<i>L. sativum</i> L. ^{6, 9}	garden cress
Chenopodiaceae	<i>Chenopodium</i> L.	<i>Ch. bonus-henricus</i> L. ^{6, 13}	Good King Henry, mercury
Polygonaceae	<i>Rheum</i> L.	<i>R. rhabarbarum</i> L. ^{6, 9, 13}	rhubarb

* - Collection No. (1-17) (see Table 3) where the species is maintained

Review of collections in Europe

Until now the basic information on PGR collections of leafy vegetable crops was summarized in the Directory of Germplasm Collections, Vol. 4. Vegetables (Bettencourt and Konopka 1990). This source and some personal information were used as the starting basis to build on for updating the available information. Requests for updated information was sent to 33 institutions in 21 countries. Responses were received from 13 countries and 17 institutions (1-17). In some cases (PUV /14/) some previously published information was also used (Pico and Nuez 1999). The responses are summarized by country and institutions (numbered 1-17) in Table 3.

The germplasm collections listed in Table 3 are mostly maintained in state institutions or they are under government control (e.g. CGN Wageningen, The Netherlands, HRI Wellesbourne, UK). There are large differences in the status of the collections. Only a few institutions (Nos. 2, 7, 14) have all three types of collections (base, active, working). Most institutions have base and active collections, however, Palacký University (3) for example only has a working/research collection. This collection is partly a duplicate of No. 2 (Table 3). In all the collections the material as well as the data linked with the accessions are mostly freely available, however, in some specific cases there are some limitations (e.g. permission of donor, availability only for scientific purposes through the signature of material transfer agreements, limited amount of seed, some breeding lines are not available). In the case of some very small collections the institutions (e.g. 1, 5, 13,

15) are prepared to discuss and share the responsibility with another genebank under the precondition of a clear legal framework. Safety duplication is very rare, however, for most collections, arrangements are in preparation.

Table 3. European institutions holding germplasm collections of leafy vegetables

Country/ Collection No.	Institution/ Responsible person	Crop (species, genus)	No. of accessions (c,l,w) ¹
Austria (1)	Research Station for Special Crops Austrian Genebank of Cultivated Plants Gaisseregg 5 8551 Wies Ing. Helmut Pelzmann Tel: +43/7242/3465/2423 Fax: +43/7242/3465/2844	<i>Lactuca sativa</i> <i>Atriplex hortensis</i> <i>Valerianella locusta</i>	4 ^c 1 ^c 1 ^c
Czech Republic (2)	Research Institute of Crop Production Praha-Ruzyně Division of Genetics and Plant Breeding Department of Gene Bank Šlechtitel 11 783 71 Olomouc-Holice Dr. Eva Krístková (<i>Cichorium</i> , <i>Lactuca</i>) Ing. Vera Chytilová (other leafy vegetables) Tel: +420/68/5228355 Fax: +420/68/5228355 Email: olgeba@pvtnet.cz	<i>Lactuca sativa</i> <i>Lactuca</i> spp. <i>Cichorium</i> spp. <i>Spinacia oleracea</i> <i>Valerianella locusta</i> <i>Tetragonia expansa</i>	823 ^c 920 ^{w*} 22 ^c 17 ^c 1 ^c 3 ^c , 12 ^l
(3)	Palacký University, Faculty of Science Department of Botany Šlechtitel 11 783 71 Olomouc-Holice Prof. Dr. Aleš Lebeda Tel: +420/68/5223325 Fax: +420/68/5241027 Email: lebeda@prfholnt.upol.cz	<i>Lactuca sativa</i> <i>Lactuca</i> spp.	60 ^c 600 ^w + related genera
France (4)	INRA Unité de génétique et d'Amélioration des fruits et légumes BP94 84143 Montfavet Cedex Dr. Brigitte Maisonneuve Tel: +33/4/32722702 Fax: +33/4/32722702 Email: maisonne@avignon.inra.fr	<i>Lactuca sativa</i> <i>Lactuca</i> spp. <i>Chondrilla</i> sp. <i>Mycelis muralis</i>	500 ^c 200 ^w 7 ^w 7 ^w
Germany (5)	Federal Centre for Breeding Research on Cultivated Plants- Genebank Bundesallee 50 38116 Braunschweig Dr. L. Frese Tel: +49/531/596617 Fax: +49/531/596365 Email: l.frese@bafz.de	<i>Lactuca sativa</i> <i>Cichorium endivia</i> <i>Cichorium intybus</i> <i>Spinacia oleracea</i> <i>Atriplex hortensis</i> <i>Valerianella locusta</i>	93 ^c 91 ^c 263 ^c 37 ^c 13 ^c 9 ^c
(6)	Institute of Plant Genetics and Crop Plant Research (IPK) Department of Genebank Corrensstraße 3 06446 Gatersleben Dr. A. Boerner Tel: +49/39482/5310 Fax: +49/39482/5155 Email: boerner@ipk-gatersleben.de	<i>Lactuca sativa</i> + <i>Lactuca</i> spp. <i>Cichorium endivia</i> <i>Cichorium intybus</i> <i>Cichorium</i> sp. <i>Spinacia oleracea</i> <i>Atriplex hortensis</i> <i>Valerianella locusta</i> <i>Rumex acetosa</i> <i>Portulaca oleracea</i> <i>Tetragonia expansa</i> <i>Asparagus officinalis</i>	870 89 ^c 137 ^c 7 ^{l,w} 165 ^{c,l} 42 ^c 15 ^c 39 ^{c,w} 15 12 ^c 8 ^c
Hungary	Institute for Agrobotany	<i>Lactuca sativa</i>	401 ^c

(7)	2766 Tápiószele Dr. Árpád L. Kiss Dr. Béla Baji Tel: +36/53/380070 Fax: +36/53/380072 Email: akiss@agrobot.rcat.hu	<i>Lactuca</i> spp. <i>Cichorium endivia</i> <i>Cichorium intybus</i> <i>Spinacia oleracea</i> <i>Atriplex hortensis</i> <i>Rumex acetosa</i> <i>Tetragonia expansa</i> <i>Asparagus officinalis</i>	3 ^w 2 ^c 4 ^c 105 ^c 29 ^c , 3 ^w 109 ^c , 4 ^w 2 ^c 2 ^c
The Netherlands (8)	Plant Research International Centre for Genetic Resources The Netherlands (CGN) P.O.Box 16 6700 AA Wageningen Ir.I.W.Boukema Tel: +31/317/477077 Fax: +31/317/418094 Email: i.w.boukema@plant.wag-ur.nl	<i>Lactuca sativa</i> <i>Lactuca</i> spp. <i>Spinacia oleracea</i> <i>Spinacia turkestanica</i>	1515 ^{c, l} 859 ^w 379 ^{c, l} 3 ^w
Poland (9)	Research Institute of Vegetable Crops Plant Genetic Resources Laboratory Konstytucji 3 Maja 1/3 96100 Skierniewice Dr. Teresa Kotlińska Tel: +48/46/8332947 Fax: +48/46/8333186 Email: tkotlin@inwarz.skierniewice.pl	<i>Lactuca sativa</i> <i>Lactuca</i> spp. <i>Cichorium endivia</i> <i>Cichorium intybus</i> <i>Spinacia oleracea</i> <i>Atriplex hortensis</i> <i>Valerianella locusta</i> <i>Rumex acetosa</i> <i>Asparagus officinalis</i>	192 ^c , 58 ^l 27 ^w 1 ^c 1 ^c , 7 ^l , 1 ^w 16 ^c , 3 ^l 4 ^w 1 ^l 1 ^c , 6 ^l 54 ^c
(10)	National Centre for Plant Genetic Resources Plant Breeding and Acclimatization Institute Radzików 05870 Blonie, Radzikow near Warsaw Dr. Wieslaw Podyma Tel: +48/22/7252611 Fax: +48/22/7254715 Email: w.podyma@ihar.edu.pl	<i>Lactuca sativa</i> <i>Lactuca</i> spp. <i>Cichorium intybus</i> <i>Spinacia oleracea</i> <i>Atriplex hortensis</i> <i>Rumex acetosa</i> <i>Asparagus officinalis</i>	200 ^c 43 ^w 5 ^c 16 ^c 3 ^l 1 ^c , 4 ^l 38 ^c
Slovak Republic (11)	Research Institute of Vegetables Andovská 6 94001 Nové Zámky Dr. Magdaléna Valšíková Ing. Alzbeta Víteková Tel: +421/817/400795 Fax: +421/817/401892 Email: valsikovam@vuznz.sk	<i>Lactuca sativa</i> <i>Spinacia oleracea</i>	8 ^c 1 ^c
Slovenia (12)	Agricultural Institute of Slovenia Department of Crop and Seed Production Hacquetova 17 1000 Ljubljana Dr. Vladimir Meglič, J.Š.Vozlič Tel: +386/1/4375375 Fax: +386/1/4375413 Email: vladimir.meglic@kis-h2.si jelka.vozlic@kis-h2.si	<i>Lactuca sativa</i> <i>Cichorium intybus</i> <i>Valerianella locusta</i>	4 ^c , 167 ^l 4 ^c 4 ^c
Spain (13)	Diputacion General de Aragon Servicio de Investigación Agraria Banco de Germoplasma de Plantas Hortícolas de Zaragoza (BGHZ) Apartado 727 50080 Zaragoza Dr. Miguel Carravedo Tel: +34/76/716362 Fax: +34/76/716335 Email: mcarravedo@aragob.es	<i>Lactuca sativa</i> <i>Lactuca serriola</i> <i>Cichorium endivia</i> <i>Cichorium intybus</i> <i>Spinacia oleracea</i> <i>Spinacia oleracea</i> spp. <i>spinosa</i> <i>Atriplex hortensis</i> <i>Valerianella locusta</i> <i>Rumex acetosa</i> <i>Rumex acetosella</i> <i>Rumex scutatus</i> <i>Tetragonia expansa</i> <i>Asparagus officinalis</i> <i>Asparagus acutifolius</i> <i>Asparagus maritimus</i>	511 ^{c, l} 2 ^w 41 ^{c, l} 10 ^{c, l} 45 ^{c, l, w} 3 20 ^w 2 ^c 1 ^w 3 ^w 1 ^w 5 ^w 1 ^w 5 ^w 1 ^w

(14) **	Polytechnic University of Valencia Department of Biotechnology Center for the Conservation and Agrodiversity Camino de Vera 14 46022 Valencia Dr. Fernando Nuez Tel: +34/96/3877421 Fax: +34/96/3877429 Email: fnuez@btc.upv.es	<i>Lactuca sativa</i>	244 ^c
		<i>Cichorium endivia</i>	23 ^c
		<i>Cichorium intybus</i>	1 ^c
		<i>Spinacia oleracea</i>	34 ^c
		<i>Rumex acetosa</i>	2 ^c
		<i>Asparagus officinalis</i>	1 ^c
Switzerland (15)	Federal Agricultural Research Station Route de Duillier BP 254 1260 Nyon Dr. G.Kleijer Tel: + 41/22/3634722 Fax: + 41/22/3615469 Email: geert.kleijer@rac.achmin.ch	<i>Lactuca sativa</i>	28 ^{c(l)}
		<i>Cichorium endivia</i>	1 ^c
		<i>Cichorium intybus</i>	23 ^{c(l)}
		<i>Spinacia oleracea</i>	8 ^{c(l)}
		<i>Atriplex hortensis</i>	1 ^c
		<i>Valerianella locusta</i>	5 ^c
Turkey (16)	Aegean Agricultural Research Institute (AARI) P.O.Box 9 Menemen 35661 Izmir Dr. A. Ertug Firat Tel: +90/232/8461331 Fax: +90/232/8461107 Email: aari@service.egenet.com.tr	<i>Lactuca sativa</i>	164 ^l
		<i>Lactuca</i> spp.	28 ^w
		<i>Spinacia oleracea</i>	150 ^l
		<i>Atriplex hortensis</i>	3 ^l
		<i>Rumex acetosella</i>	2 ^l
		<i>Portulaca oleracea</i>	9 ^l
UK (17)	Horticulture Research International Genetic Resources Unit Wellesbourne Warwick CV35 9EF Dr.D.Astley Tel: + 44/1789/470382 Fax:+ 44/1789/470552 Email: dave.astley@hri.ac.uk	<i>Lactuca sativa</i>	701 ^c
		<i>Lactuca</i> spp.	66 ^w

^l c – cultivar, l – landrace, w - wild

* - more details in Krístková and Lebeda (1999); ** - data also from Pico and Nuez (1999)

Facilities for gene banking

In all the institutions holding leafy vegetable genetic resources (Table 3) basic facilities for gene banking are available (regeneration, drying/cleaning, germination tests, packing, storage). Nevertheless, most of these institutions need, in some cases urgently new facilities and equipment. In Germany (5) and Slovenia new isolation cages for regeneration are needed. There are no problems with cleaning, however, in some collections (Czech Republic, Poland, Slovak Republic, Slovenia) this procedure is not yet mechanized. Germination tests are carried out for all the collections, but for some of them no modern equipment is available (Poland). A similar situation exists with regard to seed drying (Poland, Slovenia). In some collections (Poland, Slovak Republic, Slovenia) no proper equipment for vacuum packing is available. It seems that the most important problem is storage of seed samples. In many institutions the storing capacity is limited (Czech Republic, Poland, Slovak Republic, Spain) or the technical facilities for storage are old (Germany /5/).

Characterization and evaluation of the collections

The following characters are considered part of these activities: plant systematics (validity of taxonomic determination), morphological description, growing characteristics, caryology, phytochemistry, biochemical and molecular markers, resistance to diseases/pests/abiotic factors, photo-documentation and some other characteristics.

Plant systematics covers the areas of classification (nomenclature and identification), phylogeny and evolution (Koopman 1999). Validity of nomenclature and taxonomic identification in wild relatives is very limited. This situation could be demonstrated

using the example of wild *Lactuca* spp. (Lebeda and Astley 1999, Lebeda *et al.* 1999). As for most of the other wild relatives there are no taxonomists specialized on these genera. All of the above mentioned institutions are carrying out basic morphological description and evaluation of production characteristics of maintained accessions of leafy vegetables. These activities are mostly based on basic field characterization and evaluation. However, for most of the vegetable crops (Table 1) IPGRI descriptors are lacking. Only some national ones are available (e.g. for chicory in France). In some institutions (Slovak Republic) the UPOV descriptors are used. There is an urgent need to develop descriptors for the most important leafy vegetable crops, including some wild relatives. Until now there is a limited extent of systematic photo documentation and herbarization of genetic resources. Probably the most intensive work in this field with *Lactuca* spp. is in progress in the Czech Republic (Lebeda *et al.* 1999) and partly in France, and for cichory in Germany (5). Only CGN in Wageningen has photographic records of almost all the material stored.

Recently there are only limited activities in the field of genetic resources characterization for biochemical and molecular markers. The most advanced work is on lettuce in the Netherlands (Hintum 1999) and Germany – IPK (K. Dehmer 2000, pers. comm.). Some work with biochemical markers was started recently in the Czech Republic (Lebeda *et al.* 1999). In other crops and their relatives there are no activities in this field.

Resistance to diseases and pests is considered one of the most important objectives in breeding programmes in most of the leafy vegetable crops. However, there has been limited evaluation of genetic resources for resistance. Probably the best characterized crop is lettuce including wild *Lactuca* spp. (Hintum and Boukema 1999, Lebeda and Pink 1997, Lebeda *et al.* 1999, Lebeda *et al.* 2000, Maisonneuve *et al.* 1999, Reinink 1999). Nevertheless evaluations only carried out on a limited number of diseases (LMV, *Bremia lactucae*, powdery mildew) or pests (aphids). With regard to spinach some work was done with *Peronospora effusa* (Hintum and Boukema 1999, Lebeda and Schwinn 1994) and, with *Peronospora valerianellae* for lambs lettuce (Pietrek and Zinkernagel 1999). In general, there is a need for more intensive evaluations for disease and pest resistance of genetic resources of leafy vegetable crops and their wild relatives.

There is no information on evaluation for other characters (e.g. influence of abiotic factors, chemical compounds). Fundamental research activities linked with the collections are needed.

Documentation

Documentation is divided in three parts: 1) Type of information (passport, characterization/evaluation of data); 2) Type of information storage (hardware, software); 3) Availability (downloadable/searchable). In the documentation of leafy vegetables genetic resources there are enormous differences (quality, quantity, technical background and availability) between institutions. The recent status is summarized in Table 4.

CGN has recently started developing an international database for lettuce, including all *Lactuca* spp. (Hintum and Boukema 1999). Such a database makes access to *Lactuca* genetic resources much easier (www.plant.wageningen-ur.nl/cgn/ildb). An international database can also contribute to the rationalisation of genetic resources activities, because it makes the tracing of duplicate accessions and of gaps possible. It was already concluded that the extent of duplication between lettuce collections is enormous (Hintum and Boukema 1999).

Table 4. The degree of documentation of leafy vegetable genetic resources

Country/ Collection No.	Type of information		Information storage (database management system)	Internet Availability
	Passport	Characterization/ evaluation		
Austria (1)	Partly	Partly	Manual notes	No
Czech Republic (2)	Yes (EVIGEZ)	Partly	Manual notes, computer files, photodocument., herbaria	genbank. vurv/genetic/ resources/ default.thm
(3)	See (2)	Partly	Manual notes, computer files, photodocument., herbaria, publications	See (2)
France (4)	No	Partly (resistance data)	Excel database	No
Germany (5)	Yes	Yes	Oracle computer files (currently reorgan.)	www.bafz.de
(6)	Yes	Yes	FoxPro	
Hungary (7)	Yes	Partly	dBase IV	No
Netherlands (8)	Yes	Yes	Oracle Access, Excel (for output)	www.cpro.wageningen- ur.nl/cgn/
Poland (9)	Yes	Yes	dBase IV, Access, Excel	No
(10)	Yes	Yes	dBase IV, Access, Excel	www.ihar.edu.pl/gene_b ank
Slovak Republic (11)	Yes	Partly	Excel, Word	No
Slovenia (12)	Yes (95%)	Partly	PC-XLS, MSW files	No
Spain (13)	Yes	Partly	Access, DT4	No
(14)	Partly (75%)	Partly (50%)	Access	No
Switzerland (15)	Yes	Partly	Excel	No
Turkey (16)	Yes	Yes	Access , dBase IV, Visual dBase	No
UK (17)	Yes	Partly	MS Access	No

Collecting activities

Collecting activities are the basis for plant biodiversity conservation (Guarino *et al.* 1995). Nevertheless, field exploration of genetic diversity of wild ancestors and relatives of leafy vegetables in Europe and elsewhere has received little attention. This is reflected in the fact that relatively few accessions of wild material of these vegetables, their progenitors and wild related species or genera exist in the collections. Another gap in leafy vegetables collections is that, besides lettuce, many other species/genera are

scarcely represented or are even missing (Tables 1 and 2). On a national and international level there is limited and decreasing financial support for collecting activities.

Table 5 summarizes the most important collecting activities carried out on a national and international level in the last ten years.

Table 5. Target countries of leafy vegetables collecting missions (mainly *Lactuca* spp. and related genera)

Target country (collecting institution)*	
National expedition	International expedition
Czech Republic (2, 3)	Austria, France, Germany, Italy, Netherlands, Slovak Republic, Switzerland, Turkey, UK (2, 3)
Netherlands (8)	Armenia, Russia (Daghestan), Georgia, Italy, Turkey (5, 8), Uzbekistan (8)
Poland (9)	Albania, Greece, Latvia, Lithuania, Moldova, Russia (Altajy Mount., Siberia), Slovakia, Soviet Union, (Asiatic Repts. – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan), Syria, Turkey, Ukraine (9)
Slovenia (12)	
Spain (13, 14)	

*- Numbered according to Table 3

The results of some of these collecting activities were also published (CGN 1990; Frese and Burenin 1990, 1994; Frese *et al.* 1990; Křístková and Lebeda 1999; Lebeda *et al.* 1999, 2000; Pico and Nuez 1999; Soest *et al.* 1998)

National and international cooperation

Cooperation between institutions on a national and international level is still rather limited. About 40% of the collection holders (2, 3, 4, 8, 9, 13 and 14) have created some national cooperation mainly focused on characterization, evaluation and exchange of material, with research institutes, universities and breeding companies. International contacts and cooperation are frequently based on bilateral contacts (2, 3, 8, 9, 12, 16 and 17). Recently there is tendency for more intensive international contacts and cooperation based on bilateral or multilateral research projects. However, more exchange of information and coordination of activities are still required.

Conclusions and recommendations

General

- 1) For leafy vegetables the species and genera mentioned in Table 1 should be covered by the Vegetables Network. Some of the species given in Table 2 need to be considered, but may be better covered in a Minor Crops Group. The leafy vegetables group needs to establish contacts with the ECP/GR Working Groups focussing on related crops like *Beta*, *Brassica*, *Eruca* etc.
- 2) European central crop databases should be created, not only for lettuce, but also for other leafy vegetable crops. This enables the tracing of duplicate accessions and gaps.
- 3) For many collections safety duplication has not been arranged. Urgent actions are needed.

Specific

- 4) In some countries (e.g. Czech Republic, Germany, Poland, Slovak Republic) financial support by the national government is decreasing and facilities for a proper conservation of genetic resources are far from optimal. This needs urgent action.

- 5) For characterization activities the development of international descriptor lists for the most important leafy vegetable crops and wild progenitors, are urgently needed.
- 6) The general process of genetic erosion is noticeable also in leafy vegetables and their wild progenitors. In some countries (e.g. Czech Republic, Baltic states, Italy, Poland, Russia, Slovak Republic, Slovenia, Spain etc.) valuable local forms (landraces) still exist, but are very endangered. In Europe the hotspot (*in sensu* Myers *et al.* 2000) for biodiversity conservation, collecting and research of leafy vegetables and their wild progenitors is the Mediterranean Basin. Collecting expeditions are therefore urgently needed.
- 7) Cooperation of genebanks with Universities, research institutes and breeding companies in various fields (e.g. taxonomy, ecobiology, population biology, vegetation science, plant pathology, physiology, biochemistry, molecular biology, prebreeding etc.) is still limited and must be extended.

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The International *Lactuca* Database

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Introduction

The Centre for Genetic Resources the Netherlands (CGN) is presently creating an International Database for lettuce, called the International *Lactuca* database (ILDB). The necessity of a database for lettuce became apparent during the “Eucarpia Leafy Vegetables Meeting”, June 1999 at Olomouc, Czech Republic. It was shown that *Lactuca* is relatively well represented in genebanks, but that access to information on lettuce collections is not optimal and that there is considerable duplication between *Lactuca* collections (Hintum and Boukema 1999).

Content

The database concentrates initially on passport data of germplasm collections worldwide. Collections mentioned in the IPGRI Directory of Germplasm Collections (www.ipgri.cgiar.org) with more than 19 accessions were selected to be included in the ILDB. This regards 34 collections from 26 countries. Curators or database managers of these collections were requested to send their passport data. In some cases the data were downloaded from the Internet.

The data were transformed to fit the fields of the IPGRI/FAO Multi-crop passport descriptors. A few other fields (e.g. original botanical name) were added. For the cultivated lettuce (*L. sativa*), the names of subtaxa were standardised according to phenotypic groups (Butterhead, Crisp, Latin, Cos, Cutting, Stalk and Oilseed).

On 22 May 2000 16 collections out of the 34 had been included in the ILDB. Of the 18 collections not yet included two data sets were already received but transformation not yet completed (Sadovo, Bulgaria and Salinas, USA), the other contributors will be reminded to send their data. The number of accessions per data source is given in Table 1. The total number of accessions included in the ILDB was 10 049, which is about 73% of the world *Lactuca* holding. Table 2 gives the number of accessions per species.

Further details of the database will be published in the Plant Genetic Resources Newsletter.

Access

The ILDB will be made available on the Internet (www.plant.wageningen-ur.nl/cgn/) downloadable as well as online searchable.

Table 1. Number of *Lactuca* accessions per data source

Country	Institute	Town	No. of acc. in ILDB	Still to be included*
Brazil	CCTA	Campos dos Goytacazes		113
Bulgaria	IIPGR	Sadovo, District Plovdiv		583
China	CAAS	Beijing		684
Cuba	INIFAT	Boyeros, Habana		30
Czech Republic	RICP	Olomouc - Holic	1328	
France	GEVES	Brion	534	
France	INRA	Montfavet (was Versailles)		650
Germany	IPK	Gatersleben	870	
Germany	BGRC	Braunschweig	147	
Greece	GGB	Thermi, Thessaloniki		38
Hungary	RCA	Tapioszele	330	
Iran	S.P.I.I.	Karaj		38
Italy	Exp. Inst. Veg. Crops	Pontecagnano, Salerno		50
Italy	IDG-CNR	Bari		31
Lithuania	Lithuanian Hort. Inst.	Babtai, Kaunas District		74
Mexico	INIFAP	Celaya, Guanajuato		31
Mexico	INIFAP	Col. San Rafael, México D.F.		31
Netherlands	CGN	Wageningen	2359	
Philippines	IPB/UPLB	Laguna		36
Poland	Res. Inst. Veg. Crops	Skierniewice	283	
Portugal	BPGV	Braga		120
Russia	VIR	St. Petersburg	709	
Slovakia	Res. and Br. Inst. Veget.	Nove Zamky		40
Slovenia	Agricultural Inst.	Ljubljana	171	
Spain	UPV	Valencia	244	
Spain	Banco de Germoplasma	Zaragoza	472	
Spain	CRF	Alcala de Henares, Madrid		290
Sweden	NGB	Alnarp		19
Switzerland	RAC	Nyon	32	
Turkey	AARI	Izmir	256	
United Kingdom	HRI	Wellesbourne	770	
USA	WRPIS	Pullman	1315	
USA	Agric. Res. Station	Salinas		863
USA	NSSL	Ft. Collins	229	
Total			10049	3721

*data not yet received, except Bulgaria and Salinas, USA. Numbers according to IPGRI

Table 2. Number of *Lactuca* accessions per species

<i>Lactuca</i> species	Number of accessions	<i>Lactuca</i> species	Number of accessions
<i>L. aculeata</i>	6	<i>L. raddeana</i>	1
<i>L. alpina</i>	1	<i>L. saligna</i>	181
<i>L. altaica</i>	12	<i>L. sativa</i>	8151
<i>L. angustana</i>	1	<i>L. sativa</i> x <i>L. serriola</i>	18
<i>L. biennis</i>	5	<i>L. scariolooides</i>	11
<i>L. canadensis</i>	3	<i>L. serriola</i>	1216
<i>L. capensis</i>	1	<i>L. serriola</i> x <i>L. sativa</i>	3
<i>L. dentata</i>	3	<i>L. squarrosa</i>	2
<i>L. denticulata</i>	1	<i>L. taraxacifolia</i>	1
<i>L. dregeana</i>	7	<i>L. tatarica</i>	4
<i>L. georgica</i>	1	<i>L. tenerrima</i>	9
<i>L. homblei</i>	2	<i>L. undulata</i>	1
<i>L. indica</i>	12	<i>L. viminea</i>	14
<i>L. livida</i>	11	<i>L. virosa</i>	236
<i>L. perennis</i>	36	<i>Lactuca unknown</i>	92
<i>L. quercina</i>	7		
		Total	10049

References

Hintum, Th. J. L. van and I. W. Boukema. 1999. Genetic resources of leafy vegetables. Pp. 59-71 in *Eucarpia Leafy Vegetables '99* (A. Lebeda and E. Křístková, eds.). Palacký University, Olomouc, Czech Republic.

Appendix I. Agenda

FIRST MEETING OF THE ECP/GR VEGETABLES NETWORK COORDINATING GROUP

Hotel Miracorgo, Vila Real, Portugal, 26-27 May 2000

Friday 26 May 2000

8.30 Introduction

- Welcome from the Universidade de Trás-os-Montes e Alto Douro (*E. Rosa*)
- Brief self-introduction of the participants
- The Vegetables Network Coordinating Group (*L. Maggioni*)

Discussion

10.30 Coffee break

11.00 The Working Groups (session chaired by G. Thomas)

- *Allium* Working Group: Review of the Group progress and future perspectives (*D. Astley and J. Keller*)

Discussion and recommendations

- Umbellifer Crops Working Group: Review of the Group progress and future perspectives (*D. Astley and T. Kotlínska*)

Discussion and recommendations

12.30 Lunch

14.00 - The Working Groups (continued)

- *Brassica* Working Group: Review of the Group progress and future perspectives (*E. Rosa and G. Thomas*)

Discussion and recommendations

15.30 Coffee break

16.00 Review of other vegetable crops genetic resources in Europe, extent of existing expertise, potential areas of collaboration for conservation and use at a regional level (Session chaired by I. Boukema)

- Solanaceae (*M.C. Daunay*)

Discussion and recommendations

- Cucurbits (*M.J. Diez Niclós*)

Discussion and recommendations

- Leafy vegetables (*I. Boukema and A. Lebeda*)

Discussion and recommendations

Social dinner in town

Saturday 27 May 2000

9.00 Network issues for discussion (*Coordinating Group members are invited to come prepared to discuss the items below, with the aim of planning a feasible medium-term strategy for the vegetables network*) (**Session chaired by D. Astley**)

(Coffee break at 10.30)

- Identifying the full range of crops that should be covered by the Network and establishing priorities for action (i.e. developing new Central databases, proposing collecting missions, proposing the constitution of new WGs, etc.)
- Monitoring the conservation mechanisms (regeneration standards, rationalization of collections, safety duplication, sharing of responsibilities) and suggesting lines for action
- Identifying emergency situations and looking for possibilities of intervention
- Coordinating future development of the databases
- Monitoring the needs for characterization/evaluation and the interaction with users, suggesting lines for action
- Looking at the possibility of integrating non-ECP/GR countries into the Network activities
- Establishing links with other Networks
- Planning for a full Vegetables Network meeting in 2002-2003
- How the Vegetables Coordinating Group will continue in its function

13.00 Lunch

Afternoon boat trip from Régua to Pinhão along the Douro River

Appendix II. List of Participants

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