Report of a Working Group on Grain Legumes

Second meeting – 1-3 October 1998 – Norwich, United Kingdom

L. Maggioni, M. Ambrose, R. Schachl and E. Lipman, ***compilers***

ECP/GR

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

IPGRI is a FUTURE HARVEST Centre

Report of a Working Group on Grain Legumes

Second meeting
1-3 October 1998
Norwich, United Kingdom

L. Maggioni, M. Ambrose, R. Schachl and E. Lipman, ***compilers***

The International Plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization, supported by the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of genetic diversity for the well-being of present and future generations. IPGRI's headquarters is based in Rome, Italy, with offices in another 19 countries worldwide. It operates through three programmes: (1) the Plant Genetic Resources Programme, (2) the CGIAR Genetic Resources Support Programme, and (3) the International Network for the Improvement of Banana and Plantain (INIBAP).

The international status of IPGRI is conferred under an Establishment Agreement which, by January 2000, had been signed and ratified by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

Financial support for the Research Agenda of IPGRI is provided by the Governments of Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, F.R. Yugoslavia (Serbia and Montenegro), Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Macedonia (F.Y.R.), Malta, Mexico, the Netherlands, Norway, Peru, the Philippines, Poland, Portugal, Romania, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, the UK, the USA and by the Asian Development Bank, Common Fund for Commodities, Technical Centre for Agricultural and Rural Cooperation (CTA), European Environment Agency (EEA), European Union, Food and Agriculture Organization of the United Nations (FAO), International Development Research Centre (IDRC), International Fund for Agricultural Development (IFAD), Interamerican Development Bank, Natural Resources Institute (NRI), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), Nordic Genebank, Rockefeller Foundation, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), Taiwan Banana Research Institute (TBRI) and the World Bank.

Citation:
Maggioni, L., M. Ambrose, R. Schachl and E. Lipman, compilers. 2000. Report of a Working Group on Grain Legumes, Second meeting, 1-3 October 1998, Norwich, United Kingdom. International Plant Genetic Resources Institute, Rome, Italy.

ISBN 92-9043-453-8

IPGRI
Via delle Sette Chiese, 142
00145 Rome
Italy

Contents

Part I. Discussion and Recommendations

Introduction 1
The European Grain Legume Databases 4
Sharing of responsibilities for conservation 7
Regeneration needs 9
Safety-duplication 10
Status of National Collections 11
***In situ* and on-farm conservation** 17
Utilization of grain legume genetic resources 19
Inter-regional cooperation 20
Research activities 21
Conclusion 23

Part II. Presented Papers

European Grain Legume Databases

Status of the European *Cicer* database
M.G. Pereira and M.M. Tavares de Sousa 26
Status of the European *Vicia faba* Database
J. Le Guen, G. Morin, G. Duc and F. Moussy 28
Status of the European *Phaseolus* Database
Rudolf Schachl 31

Status of National Collections

Grain legume collections in Bulgaria
S. Angelova and Tz. Stoilova 41
The groundnut collection in Bulgaria
Stanko Georgiev 44
Status of the grain legume collections in Cyprus
Athena Della 48
The status of grain legumes in the Czech Republic
Miroslav Hýbl 50
French activities on grain legume collections
G. Duc and J. Le Guen 54
Status of plant genetic resources and research on grain legumes in Germany, 1998
S. Bücken, T. Gladis and S. Wetzel 55
Description of the CGN grain legume collection
Loek J.M. van Soest, Harm Dijkstra and Noor Bas 61
Status of the grain legume collections in the Nordic Countries
Gert B. Poulsen 64
Grain legume collections in Portugal
André Mendes Dordio 66
Status of the grain legume collection in Romania
Silvia Strajeru and Mirela Nimigean 68
Current status of the grain legume collection in the Vavilov Institute of Plant Industry, Russia
Margarita Vishnyakova 70
Grain legume collections in the Slovak Republic
F. Debre and M. Žáková 73

Status of the grain legume collection in Slovenia
Vladimir Meglič 78
Activities involving grain legumes conducted in F.R. Yugoslavia
Dragan Jovićević 80

Utilization

Screening and evaluation of confectionery peanut germplasm
Andreas Hadjichristodoulou 82
Pea composite crosses
Simo Hovinen 84
Winter varieties of grain legumes in Italy
P. Ranalli and C. Paoletti 85

Research

Molecular differentiation of common bean (*Phaseolus vulgaris* L.) landraces
J. Kraic, M. Závodná, O. Horňáková, E. Gregová and F. Debre 86
Morphological and physiological studies on some faba bean (*Vicia faba* L.) genotypes under the conditions of Bucovina zone, Romania
G. Saghin, Silvia Strajeru and Mirela Nimigean 89
The origin of *Phaseolus*
Rudolf Schachl 93

Appendix I. Grain Legume Passport Descriptors **95**

Appendix II. Abbreviations and acronyms **98**

Appendix III. List of Participants **100**

Part I. Discussion and Recommendations

Introduction

M. Ambrose welcomed the participants to the UK, Norfolk and Norwich. He hoped that their visit would be both enjoyable and productive. He noted that the number of participants was larger by two than for the first meeting of the Working Group on Grain Legumes and he especially welcomed the presence of FAO, VIR and a representative from the informal sector as observers to the meeting. He thanked Siyka Angelova from Bulgaria, Laszlo Holly from Hungary and Miroslav Hýbl from the Czech Republic as corresponding members for their written contributions. He asked all the participants to briefly introduce themselves. The apologies of Mr Shahal Abbo from Israel and of Mr Wojciech Swiecicki from Poland, who were not able to attend, were transmitted to the Group. It was noted that a member from Italy was also unable to attend, but a written contribution on winter varieties of grain legumes in Italy was received for inclusion in the present report. The agenda was approved.

ECP/GR toward Phase VI. A new mode of operation

Lorenzo Maggioni welcomed the participants on behalf of IPGRI and thanked Mike Ambrose and the John Innes Centre for hosting the meeting in Norwich. He reminded the Group that Phase V of ECP/GR would be concluded at the end of the current year. He also gave a brief summary of the activities carried out within crop and thematic networks during the past five years. The number of participating countries in ECP/GR had recently increased to 32 members, with Slovenia the last to join. A special word of welcome was addressed to the Slovenian participant as the first representative of his country to attend an ECP/GR meeting. During Phase V of ECP/GR two full-time Coordinators were appointed, with Thomas Gass serving in this position from 1994 to 1996, prior to his appointment as Director of the IPGRI Regional Office for Europe. His replacement, L. Maggioni, took up the position of Coordinator from September 1996 up to the present.

An account was given of the Seventh ECP/GR Steering Committee meeting, held in Braunschweig, Germany, 29 June and 4-5 July 1998. On this occasion the Steering Committee approved the continuation of the Programme for a further five years (1999-2003). A new set of objectives was defined for the Programme. New emphasis was given to the combined use of *in situ* and *ex situ* strategies for long-term conservation, to promoting the integration of countries currently not members of ECP/GR, cooperation with NGOs (non-governmental organizations) and private breeders and the need to encourage sharing of responsibilities for plant genetic resources in Europe. The inclusion of a representative of NGOs as an observer to the Steering Committee meeting was seen as representing an opening of ECP/GR to the informal sector. This effort was continued by welcoming an observer from the Henry Doubleday Research Association to attend the present meeting.

He explained that a modified mode of operation will characterize Phase VI. Although the various ECP/GR Working Groups will continue to be the main frameworks for the implementation of workplan activities, the role of the Networks will be enhanced with the definition of Network Coordinating Groups, composed of Working Group Chairs and Vice-Chairs or Database managers. These groups will work closely with the Secretariat to which they will submit proposals for activities and review progress, achievements and future workplans.[1] It is hoped that an enhanced internal coordination within the networks will facilitate better planning and follow-up of the agreed workplans. At the same time, a

[1] Maggioni, L. and T. Gass, editors. 1998. Report of the Steering Committee. Seventh Meeting, 29 June and 4-5 July 1998, Braunschweig, Germany. International Plant Genetic Resources Institute, Rome, Italy.

reduced number of Working Groups meetings is envisaged, which should enable the Programme to invest funds in small technical meetings addressing relevant issues identified within the Networks. An increased scope and flexibility of operation is the expected result of these operational changes. Practical consequences for the Working Group on Grain Legumes, which is the only Working Group within the Grain Legumes Network, is that only one full meeting of the Network is planned to be held during Phase VI, between the third and fifth years. Therefore the importance of the Group making use of the current meeting to identify a Network Coordinating Group, with the aim of guiding the Working Group in the years to come, was stressed.

Complementary activities will be implemented within ECP/GR as separate programme modules. The undertaking of **emergency actions**, **cooperation with EU-funded projects** and **training activities** will be initiated as soon as possible, pending the availability of sufficient funding, which will be sought from various sources. Other themes will be taken into consideration for additional complementary activities, as recommended by the European Symposium on the implementation of the Global Plan of Action, held in Braunschweig on 30 June-4 July 1998. Proposed themes are the following and the Working Group on Grain Legumes could consider getting involved in one or more of them:

- Surveying and inventorying PGRFA
- Compiling crop-specific regeneration guidelines
- Supporting planned and targeted collecting
- Expanding characterization, evaluation and number of core collections to facilitate use
- Studying genetic diversity to analyze comparative genetic diversity in wild relatives and their respective crop genepools
- Undertaking genetic enhancement of prebreeding genepool via base-broadening
- Inventorying and monitoring legal framework of seed production and distribution in Europe.

Chair's report

The comments presented below are additional to the report appearing under *3.5.1 Grain Legumes Working Group* in the document for Agenda Item No. 2 of the Steering Committee Meeting, Braunschweig, Germany, July 1998.

The first meeting of this Working Group was attended by 17 participants, paying testimony to the importance and interest in grain legumes within ECP/GR funding countries. While it was recognized that each species had its own agenda and priorities, the inclusion of a range of species was of considerable benefit to the discussions. During the meeting:

- collective in-depth discussions were helped by the specific experiences and expertise from the various species represented
- differences in state of progress and PGR in one species could be compared and contrasted in-depth in relation to others
- also discussed were the involvement of minor species that would not be otherwise covered within the ECP/GR Programme.

Awareness and recognition of the expertise within this Working Group (WG) is growing. In addition to involvement with the PHASELIEU FAIR programme, the WG now has a nominated member on the newly formed *Lathyrus* Genetic Resources Network (LGRN, International network). Prof. Karl Hammer has been nominated to this position.

Activities of the ECP/GR WG on Grain Legumes were presented in a contribution on *Pisum* made at the 4th International Research Conference on Food Legumes held in Adelaide, Australia in October 1997, in a report on global *Pisum* genetic resources activities.

A second European Crop Database is now on-line. The European *Phaseolus* Database went on-line at the beginning of July 1998 and is now available through the ECP/GR

platform pages. The database combines information on 28 000 accessions from 30 institutions in 20 countries.

Benefits and assessment of the Working Group

The most important benefit arises from the meeting of participants, establishing contacts and focusing on common goals. The ECP/GR meetings provide a unique forum for managers of collections in the region to meet, and the meetings remain at the core of the ECP/GR Programme. Communication between WG members has been valuable and effective and I would especially single out the action of WG members and IPGRI in the case of the emergency action over the University of Cambridge *Phaseolus* Collection in the UK. The more successful contacts over the interim period have been between managers of collections. In many instances these would exist independently of ECP/GR Group but the Programme forms a valuable additional item to many bilateral working agendas.

The participation and links with breeders have proved less sustainable over the interim period. Breeders provided valuable opinions as to which descriptors should be included alongside passport data in the Central Crop Databases. The value of breeders at the meeting to represent end-users was useful to a degree. The diversity of Europe as a region with respect to breeding strategies priorities and resources leads me to question whether the present mechanism for their involvement is the most efficient within the present meeting and WG structure. In most cases links with breeders remain on a bilateral basis with individual institutions. It is my view that this is the most efficient and productive model for this form of interaction where each collaboration requires highly specific practical and technical detail.

Progress on the workplan

As reported, there has been good progress on a number of the agreed items but less on others. This is largely owing to the varying resources and limitation of work undertaken by the different participating institutions as payment in kind to the Programme. This is acknowledged in the ECP/GR Coordinators' end of Phase V report and ultimately stems from institutional differences, various levels of resources and diverse systems of national funding strategies.

Future plans/considerations

- Completion of existing workplan objectives remains the primary goal. Some Central Crop Database systems are coming on-line and others will shortly follow, thus providing easier access to information on holdings. Further development and standardization of formats will be encouraged.
- High levels of duplication are known to exist within a number of the legume collections, not only in Europe but worldwide. Central Crop Database initiatives remain an essential prerequisite step toward addressing this situation. It is likely that the ECP/GR WG will take the lead in this at the international level as no other key players are presently considering the problem.
- Concomitant with the issue of duplication and rationalization is the identification of country of provenance with respect to the identification of accessions within National Collections, which will feature on the agenda of the forthcoming WG agenda.
- The participation of breeders in the Working Group requires careful thought. Their participation within the current meeting format is not wholly satisfactory and other mechanisms for serving the breeding community should be explored.
- Contacts with the informal sector are ongoing with a number of WG members. These will be discussed at the next WG meeting with a view to raising their profile and exploring more sustainable working models between NGO/GO collaboration and for their contribution to ECP/GR activities.

Consideration from the Chair

The ECP/GR offers a unique platform for the plant genetic resources (PGR) community for grain legumes in the European region to meet and work together at the technical level. In the climate of contracting funds this remains a highly valuable forum and in many cases the only forum for these contacts to be sustained.

Discussions during the Seventh Meeting of the ECP/GR Steering Committee held in Braunschweig (July 1998) focused on the working operations of the ECP/GR Networks and Working Groups. As a party to those discussions my experience as Chair of the Working Group on Grain Legumes provided me with proof of the ability of a group to deal with a number of crop species within its remit. Changes agreed at the meeting to the operation of Networks, Working Groups and mechanism for assessing working priorities require responsibilities for future actions to be undertaken by more of the Working Group members. The second meeting of the Working Group on Grain Legumes – following on some four months from the Steering Committee meeting – will provide the opportunity to reshape the Group to meet the requirements set out by the Steering Committee and to parallel the structures agreed in the other Crop Networks.

The European Grain Legume Databases

Representatives from the countries hosting the ECP/GR Grain Legume Databases presented an update of the status of these databases. Since the last meeting of the Working Group, updating has proceeded for several of these.

Status reports from the database managers

(when available, full reports are included in Part II)

European *Lens* Database

(Aegean Agricultural Research Institute, Menemen, Turkey)

Nevin Açikgöz presented the status of the European *Lens* Database, informing that the request for data was sent to 18 countries and a response was received from 9 countries. Currently the database includes data for 1516 accessions, 528 of which are of Turkish origin. Information is still missing from countries hosting important European collections, such as France, Italy, Russia. The database will be distributed soon as a diskette to the collaborating countries.

European *Cicer* Database

(Estação Nacional de Melhoramento de Plantas, Elvas, Portugal)

André Mendes Dordio reported information on the European *Cicer* Database, which is available on-line from the NGB server in a searchable form. The database structure follows the IPGRI/FAO Multicrop descriptors and it includes the five characterization descriptors agreed upon at the first WG meeting in Copenhagen. A diskette with the structure of the passport file was supplied together with the request for data, to overcome the problem of heterogeneity of the available data. Out of 32 institutions contacted, data were received from 16 institutions from 10 countries. The database includes data on 3664 accessions, representing 14 different species. However, this number is estimated to represent only 38% of the accessions held in European genebanks. An update of the database is planned in the near future.

European *Glycine* Database

(N.I. Vavilov Research Institute of Plant Industry, St. Petersburg, Russia)

Margarita Vishnyakova informed the Group that the European *Glycin*e Database has been available on-line from the ZADI server since October 1997. The database contains passport data

for a total of 11 925 accessions from 6 institutes. Data from 3 additional institutes were received recently. A. Omeltchenko from VIR will soon complete the incorporation of these additional data, which will be displayed on the Internet, thanks to the collaboration with ZADI, Bonn.

European *Vicia faba* Database
(INRA, Station d'Amélioration des Plantes, Le Rheu, France)

Gérard Duc reported on the effort to establish the *Vicia faba* database. Data were requested from 57 institutions and 26 replies were received. At present the majority of the most important collections are represented in the database, which contains data for 13 000 accessions, including 52% of European origin. However, data were not yet received from VIR, where it is estimated that about 1200 accessions are conserved. Establishment of the database was started before the Budapest agreement on the multicrop descriptors and therefore very heterogeneous data were received. The rate of duplication of the European collections is estimated to be high and the database will have to be analyzed in the future to sort out the duplicates.

European *Phaseolus* Database
(Federal Office of Agro-Biology, Linz, Austria)

R. Schachl presented the status of the *Phaseolus* database. Data were collected since the start by providing the database structure (IPGRI/FAO Multicrop passport descriptors) to the collections curators. Twenty-two institutions replied to the request for data and data on 27 000 accessions were collected. It is estimated that data for about 80% of the existing accessions in Europe are therefore included in the database. However, data from large collections of special value, such as those from France, Greece, Poland, Romania and Turkey, still need to be forwarded. The database is accessible on Internet as a searchable database and is also available as a CD-ROM upon request. Although the coverage of passport data is good, few characterization data have been received up to the present. There is an absolute need to standardize the characterization and evaluation descriptors before continuing the work. A first step in this direction was done by the FAIR Project PHASELIEU during its first meeting held this spring in Pontevedra, Spain.

European *Lupinus* Database
(Institute of Plant Genetics, Poznan, Poland)

An update of the status of this database was not received before the publication of the present report.

European *Pisum* Database
(John Innes Centre, Norwich, UK and Institute of Plant Genetics, Poznan, Poland)

M. Ambrose informed about the status of the *Pisum* database, which currently includes data for about 6000 accessions. Data from VIR were also received with thanks and they were already entered in the database. A conversion to the multicrop list structure was started, although it is not yet complete. The level of duplication is estimated to be about 60%. A project student will soon analyze the database to sort out the duplicates. All the information is available at the moment as a flat file, available upon request.

Recommendations

- *The Group acknowledged the good progress made in the establishment of the Grain Legume Databases after the first meeting. However, gaps remain in several databases, owing to lack of response to the request for data from the database manager. Database managers will make sure that relevant Working Group members and the Chair are kept informed about missing datasets. Each Working Group member will endeavour to make sure that all the grain legume collections data available in the respective countries are sent in appropriate format to the European database managers.*

- *Offers were received from both Laszlo Holly, Institute for Agrobotany, Tápiószele, Hungary and from the Federal Office for Agro-Biology, Linz, Austria, to host a European Central Crop Database (ECDB) for* Vigna. *Both were thanked by the Group. Considering the progress made by the* Phaseolus *database, Linz was suggested as the most appropriate location for the database of this closely related species. The database will be named the European* Vigna *Database (EVDB).*
- *The establishment of a European* Arachis *Database is considered important. The Group agreed that the Network Coordinating Group explore the possibility that the database be managed in Sadovo, Bulgaria or that an alternative hosting institute is found before the end of June 1999.*[2]
- *The Group encourages the Grain Legume Databases managers to start analyzing their databases, with the aim to identify duplicates and therefore facilitate the rationalization of the collections.*

Internet presence of the Grain Legume Databases

L. Maggioni briefly summarized how the recommendations emerging from the Documentation Workshop (Budapest, October 1996) were implemented by establishing a home page on the Internet, to provide common access to on-line ECP/GR databases. This is now the home page of the European Information Platform for Crop Genetic Resources, available at <http:/cgiar.org/ecpgr/>. Standard entry pages of the European *Cicer*, *Glycine* and *Phaseolus* databases were shown to the Group. These now provide access to the respective on-line searchable databases. The development of the European Information Platform has been the result of the collaborative work of the Internet Advisory Group of ECP/GR.[3] This Group is available to assist in the technical preparation of European databases for on-line presentation and the possibility to temporarily host them on the CGN, IPGRI, NGB or ZADI servers is also offered.

Recommendations

Database managers of the Lens, Lupinus, Pisum *and* Vicia faba *databases will provide the ECP/GR Coordinator with an electronic logo of their institute and a short description of the content of their database by 31 December 1998. Entry pages will then be prepared by IPGRI and presented on the Internet European Information Platform. They are also invited to make their databases available as diskettes or CD-ROMs and to undertake the steps to make them available on Internet in downloadable and/or searchable form. The ECP/GR Internet Advisory Group will be available for help and consultation.*

IPGRI/FAO Multicrop passport descriptors

M. Ambrose reminded the Group of the recommendation made at the Documentation Workshop in Budapest (October 1996) by the European Central Database managers, regarding the adoption of the IPGRI/FAO Multicrop passport list for data exchange. He pointed out the example of the *Phaseolus* database, which is already based on this list. L. Maggioni added that all the ECP/GR Working Groups had already adopted this format for data request and data exchange. The Minor Fruits and the Potato databases (under construction within EU-funded projects) are also using this list in full or partially. M. Ambrose explained that all the ECP/GR Working Groups had already chosen to approve the list and that they usually decided to add to the list one or more crop-specific passport descriptors. L. Maggioni gave the examples of the Forages, Barley and *Avena* passport lists, mentioning the additional passport descriptors included in the respective lists.

M. Ambrose invited the Group to proceed with a formal adoption of the list as the standard format to use for data exchange within the Grain Legume Databases. A discussion followed about the opportunity to add additional descriptors to the Multicrop list.

---

[2] The Sadovo institute subsequently welcomed this idea and offered to host the European *Arachis* Database (see also Part II, National Collections: Grain legume collections in Bulgaria, p. 41 and The groundnut collection in Bulgaria, p. 44).

[3] Members of the Internet Advisory Group are Theo van Hintum (CGN), Samy Gaiji (IPGRI), Morten Hulden (NGB), Daniel Jimenez Krause (ZADI) and Brigitte Laliberté (IPGRI) as coordinator.

Recommendations

- *The Group adopted the IPGRI Multicrop passport descriptors for data exchange. The optional inclusion of the remaining FAO WIEWS descriptors (1-6) in the data exchange format is also recommended to the database managers.*
- *The Group agreed to include a descriptor indicating whether the safety-duplicate was made or not (Yes/No).*
- *The Group agreed to the proposal of the Barley and the* Avena *Working Groups to add the attribute 'genetic stock' under descriptor '14 Status of sample', by using a separate state 6.*

Opportunities to include characterization and evaluation data

Database managers referred to the difficulty of receiving characterization data and the consequent variable coverage of these descriptors in the databases. After some discussion the Group agreed that a minimum set of characterization data would be important to offer the users a better idea at first glance of the type of material available from the collections.

R. Schachl explained the comparative usefulness of images with respect to numerical data. He suggested that a picture of each accession could be obtained and imported into the *Phaseolus* database as well as displayed on Internet.

Recommendations

- *The inclusion of the minimum set of characterization descriptors, as agreed in Copenhagen in 1995 was confirmed (see Report of the WG first meeting, page 17). The definition of the states for these descriptors will be determined by the Group, under the coordination of the Network Coordinating Group, before the end of February 1999.*
- *The* Phaseolus *database manager is invited to pursue the attempt to obtain pictures showing the pod and the grains of each accession and to make these images available on CD-ROM and/or on Internet.*

Sharing of responsibilities for conservation

L. Maggioni reminded the Group that the sharing of conservation responsibilities for PGRFA in Europe was identified by the Steering Committee as an objective for ECP/GR during Phase VI. An enhanced and formalized system of responsibility, as well as benefit-sharing, is seen as the most efficient way to go in a context of limited resources and of reduced funding for public interest commitments.

During the European Symposium in Braunschweig (June-July 1998), different approaches of responsibility-sharing were discussed. The main options considered were to share responsibility on an 'accession basis' (each country to take responsibility for a number of accessions) or on a 'crop-by-crop basis' (a few countries to take responsibility for entire crop collections). A third option would be to share responsibility in an integrated way on 'a subregional basis.[4]

Within ECP/GR the 'crop-by-crop' option is already applied, for example in the case of the European *Allium* collections, which are respectively maintained in the Czech Republic (long-day vegetatively propagated *Allium* species), Israel (short-day vegetatively propagated *Allium* species) and UK and The Netherlands (seed-propagated *Allium* species). The 'accession basis' option also has been taken into consideration by several Working Groups. The establishment of decentralized European collections was planned by the *Secale ad hoc*

[4] Gass, T. and F. Begemann. 1999. International efforts to sustain *ex situ* collections: options for a closer cooperation in Europe. Pp. 109-115 *in* Implementation of the Global Plan of Action in Europe – Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. Proceedings of the European Symposium, 30 June-3 July 1998, Braunschweig, Germany (T. Gass, L. Frese, F. Begemann and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome.

Group and by the Forages, Barley and *Prunus* Working Groups. These collections would comprise accessions that European genebanks would agree to maintain on behalf of all member countries of ECP/GR. Formal commitments would be taken by database managers and by curators in agreement with National Coordinators or the relevant national authority (see Report of a Workshop on *Secale* genetic resources, Poland 1996; Report of the Sixth meeting of the Forages Working Group, Norway 1997; Report of the Fifth meeting of the Barley Working Group, Germany 1997; Report of an Extraordinary meeting of the *Prunus* Working Group, Spain 1997).

Before the recent Steering Committee meeting, all the Working Groups had not started to apply such a system, since they were waiting for the conclusion of a debate at higher level and for the approval of the National Coordinators. At Braunschweig, the Steering Committee encouraged the Working Groups that have developed proposals for the sharing of responsibilities to elaborate on these and to seek to implement them. At the same time, all the Working Groups are encouraged to analyze the advantages and disadvantages of the various options for sharing responsibilities for their respective crop, including the technical conditions to be fulfilled.

In the following discussion M. Ambrose invited the participants to share with the Group their experience of responsibility-sharing in their respective countries, as well as their feelings and reservations for the different options presented.

L. van Soest expressed satisfaction for the bilateral collaboration whereby Germany maintains the responsibility for *Beta* genetic resources and The Netherlands takes care of the potato collection. He informed about ongoing discussion to include more crops in the bilateral collaboration.

G. Duc explained the success of the French system, which is formalizing the maintenance of a decentralized National Collection. He stressed the visible advantage of reducing costs through responsibility-sharing.

According to G. Poulsen the subregional collaboration of the Nordic countries is the most appropriate approach for that region, since one genebank is sufficient for the needs of the five countries, while it would not seem convenient to maintain several genebanks.

R. Schachl informed that in Austria a combination of the 'accession' and 'crop-by-crop' options is starting to be accepted. One step in the direction of increasing mutual trust between the countries would be to undertake formal agreements for safety-duplication between countries. He also informed that the negotiations for the revision of the International Undertaking are currently at a stall and that the risk is that the debate will be transferred to the Convention on Biodiversity forum. He therefore stressed the importance of being aware and thinking about a European way, independently from the unpredictable outcome of the international negotiations.

M. Ambrose explained that in the UK there are models of the 'crop-by-crop' option. However, some features of the French model are also being taken in consideration in the ongoing discussion at the governmental level.

A. Hadjichristodoulou reminded the Group that countries with small breeding programmes may not be inclined to openly share the limited original material when they have to buy expensive modern lines for their agricultural systems.

A. Ramos Monreal informed the group that the mandate of the Genebank in Madrid was to conserve material of Spanish origin, in line with the Convention on Biodiversity. Help to maintain genetic resources of foreign origin could also be offered, in case of need, to less equipped countries. On the other hand, there would be reluctance to entrust to a different country the maintenance of Spanish genetic resources. Therefore a mechanism of decentralized responsibility-sharing seems the more acceptable.

Recommendation

The Group acknowledges the need for a thorough investigation of the advantages and disadvantages deriving from the application of each of the three options, when applied to the different grain legume crops within the existing European context. The Network Coordinating Group will strive to organize, within the Working Group, a comparative, analytical study of the available options for responsibility-sharing, taking into consideration costs, savings, technical, scientific and political constraints and benefits.

Regeneration needs

The Cambridge collection of *Phaseolus*

L. Maggioni reported to the Group the background leading to an ECP/GR emergency action, carried out to address the urgent need of regenerating the Cambridge collection of *Phaseolus.*

A collection of *Phaseolus* germplasm comprising about 4000 accessions from all parts of the world was assembled in Cambridge, UK, in the 1960s and 1970s, largely at the expense of the British Overseas Development Administration (ODA). The collection was maintained by the University of Cambridge until 1995. With the closure of applied plant science research facilities at Cambridge, support was provided on an informal basis by Horticulture Research International (HRI), Wellesbourne, UK, for both the long- and short-term storage of the material. However, financial direct assistance for the regeneration of accessions and the continuing maintenance of the collection is currently uncertain. Part of the collection was last regenerated in 1993 at Cambridge. All other accessions were grown in Cambridge in 1990 or earlier. The longevity of dry beans stored under ambient conditions is between 7 and 12 years. The 1990 and 1993 material was dehumidified to 5% RH and stored at –20°C in 1995. The 1990 material was therefore facing an urgent need of rejuvenation.

The ECP/GR Working Group on Grain Legumes, made aware of the endangered status of the Cambridge *Phaseolus* collection, became active by involving the European *Phaseolus* Database (EPDB) manager in Linz, Austria, with the purpose of identifying a priority list of accessions in need of urgent regeneration. This list was obtained by comparing the Cambridge database with the EPDB, so that priority could be given to unique accessions in Europe. Accessions with a PI number, which were thought to be duplicated at Fort Collins, CO, USA, were also not considered as priority, since they should be available from the US collection.

A first priority list of 508 accessions last regenerated in 1990 or earlier was defined. HRI were able to confirm that only 403 of these accessions were actually stored in their genebank. A second list includes 1937 accessions, last regenerated in 1993.

As a result of action taken by the ECP/GR Working Group on Grain Legumes, four institutions were identified in Italy, offering their availability to share the task to regenerate the first batch of 403 accessions:

200 accessions	• Dipartimento di Agrobiologia e Agrochimica, Università della Tuscia, Viterbo, Italy. • Istituto Sperimentale per l'Orticoltura, Sezione di Montanaso Lombardo, Milano, Italy. • Dipartimento di biotecnologie agrarie e ambientali, Università di Ancona.
203 accessions	• Istituto Sperimentale per le Colture Industriali, Bologna, Italy.

Accessions were shipped to the above institutions on 1 May 1998 from HRI, UK and the seed was received by the addressees in May 1998.

The following workplan was agreed by the Italian institutions, which are being partially reimbursed for their work with Emergency funds from Phase IV of ECP/GR:

1. Grow out the *Phaseolus* accessions received and provide for their regeneration, insofar as the seed is viable. A minimum of 20 plants (if seed available) should be grown per accession. Regenerated seed of each accession should be distributed in two or more paper bags, containing about 100-200 g of seed each. It should be ensured that each parent plant contributes with an equal amount of seed to the regenerated sample. Each regenerated accession should be given an identification number.
2. Identify the genus, species and possibly subspecies of each accession, when this information is missing in the original database.
3. Carry out, as much as possible, characterization/evaluation of the accessions, using the list of "Descriptors for the European *Phaseolus* Database - Characterization data", made available by the EPDB manager.
4. Distribute the regenerated seed of all viable accessions in at least two equal parts to be sent to the Federal Office for Agro-Biology, Linz, Austria and HRI, Wellesbourne, UK. The seed will be dried and prepared for safety-storage at the recipient station. The seed should always be accompanied by an electronic file (ideally .xls or .dbf), containing the data of points 2 and 3 (regenerated seed should be sent to Wolfgang Kainz, Linz, Federal Office for Agro-Biology, Austria and to Dave Astley, HRI, Wellesbourne, UK).
5. Provide the Federal Office for Agro-Biology, Linz, Austria and HRI, Wellesbourne, UK with a list of the accessions of which a sample is retained, specifying whether they will be maintained in long-/short-term storage and/or used for research or breeding purposes.

The regeneration of the second batch of 1937 accessions, last regenerated in 1993, remains a point for consideration by the Working Group.

Collections of *Vicia faba*

G. Duc informed the group that several *Vicia faba* collections in Europe may face the risk of being abandoned in the near future. This is due to declining market interest shown for this crop, which is affecting both the private and public breeding sector activities. He stressed the importance of the Group closely monitoring the fate of the broadbean collections and that adequate space for storage in long-term conditions be found whenever it is possible to prevent the loss of entire collections.

Safety-duplication

M. Ambrose stressed the importance of safety-duplicating the grain legume collections. L. Maggioni added that formal agreements would ensure official recognition to the safety-duplication and also that any emergency situation could be dealt with according to procedures planned in advance. The Memorandum of Understanding between the Nordic Gene Bank and the Institute of Biology, Latvia, as published in the report of the Sixth meeting of the Working Group on Forages (Norway, 1997), was presented as an example of safety-duplication agreement with a 'black-box' type of arrangement.

A survey on the availability to host safety-duplicates under black-box arrangements was made during the meeting and resulted in the following table:

Institute	Country	Storage conditions: Temperature (°C)	Storage conditions: Relative humidity (%)	Availability to host safety-duplicates of grain legumes under 'black-box' arrangements: Yes/No	Comments
JIC	UK	+1.5	7-10	Yes	
CRF	Spain	-20		Yes	
INRA Dijon, Rennes, Versailles	France	+4		No	
EAN, Oeiras	Portugal	-20	8-10	No	
IAR	Yugoslavia	+4		No	
ARI	Cyprus	+4	50	No	
AARI	Turkey	+4, 0, -20	6-8	No	
VIR	Russia	+4, -4, -20			
NGB	Nordic countries	-20, -20, -4	6-8	No	Presently no space
CGN	The Netherlands	-20, +4 (users samples)	Seed moisture content 5-7% in aluminium foils	Yes	Reciprocal
BGRC/IPK	Germany	-10,-15	5-10	Yes / no black-boxes	see report 1995
AIS	Slovenia	+4	Seed moisture content 5-7%	No	
RIPP, Piešťany	Slovakia	+4,-17	Seed moisture content 5-7%	Yes	
FOA	Austria	-20	Seed moisture content 5-7%	Yes	only *Phaseolus* accessions of collaborators to the European Database

Status of National Collections

(when available, full reports are included in Part II)

Austria

R. Schachl reported that, following the FAO Conference in Nitra, Slovakia, the National Austrian Programme for Conservation of Genetic Resources was established, and in view of the 4th Conference of the Parties of CBD a strategy paper was designed on the basis of the Global Plan of Action. The activities, implemented by the Working Group on Conservation of Genetic Resources, include the genetic resources in forestry, husbandry, beans and fish. At present five genebanks within Austria deal with collections of agricultural and horticultural crops.

In respect of grain legumes a collection of *Vicia faba* is maintained at the Federal Office and Research Centre for Agriculture in Vienna (1226 Wien, Spargelfeldstr. 126) and another one of *Phaseolus* beans in the Federal Office of Agro-Biology in Linz (4020 Linz, Wieningerstr. 8). Whereas the *Vicia* collection mostly covers commercial varieties and bred lines, the *Phaseolus* collection mainly consists of landraces collected during the late 1980s in the district of Styria. Regarding other grain legumes important for human consumption, such as lentil or *Pisum*, the local races already had been given up at the end of last century and therefore could not be included in the collections. Though *Pisum* rose again in importance during the last decades especially as a field crop, new bred cultivars were offered, mostly brought in from abroad. *Lupinus*, on the other hand, never was of importance and cultivation never reached a level going much further than beyond an experimental stage. Others like *Cicer* are not known at all.

The collecting activities on *Vicia* and *Phaseolus* might be considered to be finished as no additional material can be expected. At present both collections are maintained in base collections and partially in working collections; samples of most of the accessions are available.

Bulgaria

A report on the status of grain legume collections in Bulgaria was received from S. Angelova. IIPGR, Sadovo, holds the grain legume collections of pea, beans, lentil, lupin, chickpea and faba beans. The larger collections are those of pea (2100 accessions) and beans (1710). Wild species are maintained *in situ* in different parts of the country. According to maturity all legumes are divided into extremely early, early, medium-early, late, very late. The pea and lentil collections belong mainly to the early and medium-early groups and those of field beans, lupin and chickpea to the medium-early and late groups. An important trend is the creation of collections of winter-resistant accessions. This is done mostly for pea, and work has started also for lentil and lupin. For field beans, research focuses on accessions germinating at low temperatures, early in spring. *Ex situ* collections of *Pisum elatius* have been created in Sadovo. A network for ecological trials of the pea collections allows periodical selection of the accessions which are most plastic and adapted to Bulgarian conditions, for inclusion in the different breeding programmes. A 3-year collaborative study of grain cultivars has been undertaken together with INRA, France. The data revealed great differences in the grain yield of the tested cultivars.

Another contribution describing the *Arachis hypogaea* collection held at the Sadovo Genebank in Plovdiv was received after the meeting from S. Georgiev. The collection includes 317 accessions from 32 countries, belonging to the subspecies *fastigiata* and *hypogaea*. The collection has largely been characterized in its morphological and agronomic traits. Accessions adapted to different climatic conditions have been defined and resistance to diseases such as *Fusarium, Sclerotinia, Oidium*, etc. have been identified. The affinity to local strains of *Rhizobium* and the reaction to common agricultural practices (mechanized harvest, use of herbicides, etc.) have been investigated.

Under consideration of the existence of other groundnut collections in Europe and the potential interest for groundnut cultivation in southern and southeastern Europe, the institute in Plovdiv kindly offered to host a European Arachis *Database.*

Cyprus

A. Hadjichristodoulou presented a report by the National Coordinator, Ms Athena Della, on the present status of the grain legume collection in Cyprus. A total of 174 accessions have been collected and stored in the Genebank (101 faba bean, 28 chickpea, 12 ochrus vetch, 19 lentil, 6 haricot bean and 8 cow pea). Passport data of all accessions were forwarded to the European databases. Characterization and evaluation of 101 faba bean accessions were completed. A selected line obtained from these accessions was recommended for release. Furthermore, selected lines were crossed with imported genetic material at Wye College, England, for the development of lines for the freezing and canning industry. The best selected line is currently under multiplication.

Czech Republic

A report was received from M. Hýbl on the status of grain legumes in the Czech Republic. The activities of the Czech national grain legume collections, established at the same time as the breeding programme based on national germplasm (1952), are coordinated by the "National Programme for Saving Biodiversity", financially supported by the government. Passport and characterization data are fully computerized and available. The collections include a total of 4384 accessions belonging to seven genera (*Pisum, Vicia, Phaseolus, Glycine,*

Lupinus, *Cicer* and *Lathyrus*) representing 11% of the total national germplasm holdings. Germplasm collections include Czech original landraces, old and recent varieties, and wild forms collected in expeditions. They contain accessions from Europe, Asia, Africa, America and Australia. Germplasm is generally kept under good storage conditions, but is held in several institutions: AGRITEC, Ltd. Sumperk (2409), Research Institute of Crop Production (RICP), Gene Bank Department, Olomouc (1931) and Research Institute for Fodder Plants, Ltd., Troubsko (91). The main priorities are mass regeneration and storage in the central long-term storage in the Research Institute of Crop Production (RICP) in Prague, because of the high cost of maintaining collections in several institutes. The Czech and Slovak National Genebanks have recently concluded an agreement on safety-duplication (1998). Implementation of this agreement will be a priority in the near future.

France

G. Duc reminded the group that collections in France are held by different institutions (INRA, GEVES, private companies). Major collections are kept by INRA-Versailles for pea, INRA-Lusignan for lupins, and INRA-Rennes and INRA-Dijon for faba bean. A collection of French bean is also held in the Magneraud GEVES Station. Under the frame of the Bureau des Ressources Génétiques (BRG), a general agreement called *Charte*, linking the different institutions, has been established. It defines the sharing of responsibilities and guidelines for genetic resources maintenance for a national collection (= French core collection), in addition to (or in parallel with) the working collections used for breeding purposes by INRA and the different private companies. Pea and lupin collections are regenerated in the field, while faba bean is regenerated under isolation from insects. Seeds are kept in low humidity cold rooms (3°C) and sometimes at room temperature in the case of short-term collections. There is no safety-duplication arrangement at –20°C at present, but the BRG *Charte* foresees such maintenance conditions in the future.

Characterization of faba bean genetic resources has been interrupted, together with the respective breeding programme. The working collection derived from past breeding work will soon be added to the present 2000 accessions entries. Future availability of this breeding material to users outside INRA is currently uncertain.

Characterization of pea genetic resources is managed by a group of coordinated INRA laboratories. A Web site is under progress and probably will be available for access next year.

Germany

T. Gladis summarized the main changes since 1995 in the grain legume collections of German genebanks. Current collections total about 7500 grain legume accessions in Braunschweig and more than 19 000 in Gatersleben. It is planned to transfer the *Glycine* collection from Gatersleben to Hungary in 1999. Details on the level of regeneration carried out in 1998 and the current availability of the collections were given. The collecting missions annually organized by Gatersleben were briefly mentioned, including the missions planned for the future to Italy, Albania and South Korea. T. Gladis provided extensive lists of German institutions and plant breeders keeping collections of grain legumes and of research projects with relevance to grain legume germplasm ongoing in Germany.

Italy

C. Paoletti, representing P. Ranalli, was unable to attend. A contribution from Italy was not received before the publication of the present report.

The Netherlands

L. van Soest presented the status of the grain legume collections maintained at CGN, Wageningen. The collection consists of 1803 accessions of *Pisum*, *Vicia faba* and *Lupinus*. The collection was established in 1985 and most of the material originated from the former Foundation for Agricultural Plant Breeding (SVP). However, some accessions of consumption peas were received from the former Institute for Horticultural Plant Breeding (IVT). Lately the *Pisum*, *Vicia faba* and to a small extent the *Lupinus* collections were extended with material from the Centre for Plant Breeding and Reproduction Research (CPRO-DLO) and accessions received from several breeding companies in The Netherlands. Furthermore some landraces from two East European genebanks were included. The grain legume collection does not have a high priority in the CGN system and receives less emphasis.

Nordic countries

G. Poulsen explained that the mandate of the Nordic Gene Bank (NGB) covers conservation and promoting utilization of plant genetic material with Nordic origin. Among grain legumes, this comprises the following species: *Lupinus luteus*, *Lens culinaris*, *Pisum sativum*, *Vicia faba* and *V. sativa.* The ordinary Nordic collection holds 170 grain legume accessions, and in addition there is the special collection from Weibullsholm of which approximately 450 type lines are maintained in collaboration with the John Innes Center (JIC), with NGB holding the base collection while JIC is responsible for the active collection. Additionally, the Weibullsholm collection comprises 700 accessions of Nordic origin, 500 accessions are stored for specific purposes and 1200 are presumed duplicates.

Poland

W. Swiecicki was unable to attend. A contribution from Poland was not received before the publication of the present report.

Portugal

A. Mendes Dordio presented a report on the activities of the Portuguese grain legume germplasm collections held in different institutes in the country (Portuguese Plant Germplasm Bank, Braga; ESA, Castelo Branco; ENMP, Elvas; ISA, Lisboa; EAN, Oeiras; UTAD, Vila Real). The number of accessions collected was reduced, but the number of accessions characterized and evaluated is significant. Regarding safety-duplication, 26% of the total accessions stored are safety-duplicated. It is planned to duplicate all accessions maintained in all collections existing in the country.

Romania

A contribution sent after the meeting by S. Strajeru described the Romanian grain legume collections, which are held in the Research stations of Fundulea, Suceava, Turda, Bacau and Iernut. The largest collections are those of soyabean and beans, mainly consisting of foreign material. Extensive collecting activity was carried out throughout Romania in the last 10 years by the Suceava Genebank. Several landraces and old varieties of beans, peas, faba beans and lentil were found, still under cultivation because of their good local adaptation and for tradition. Regeneration, multiplication and characterization activities are carried out at the genebank at a lower rate than is necessary, since the available financial resources are often very limited.

Russia

M. Vishnyakova reported that the national grain legume collection of VIR contains 43 866 accessions, including 13 genera and 147 species. The main activity of the Institute is currently the completion of a duplicate subset for long-term storage. At present about 70% of the collection is stored in medium- and long-term conditions at +4°C and –20°C. Other

activities are also continued, such as acquisition of additional foreign genetic resources, evaluation, prebreeding and breeding work, provision of seed to breeding companies, documentation of the collections and germplasm exchange. She also mentioned that the multiplication of accessions of southern origin has become a low priority for the Institute. However, this type of accession could be multiplied by partner countries offering collaboration.

A. Ramos expressed interest in collaborating in the regeneration of material of Spanish origin, such as chickpea, Lupinus albus*, lentil and* Vigna*. The Group thanked Spain for their offer of help on this problem.*

Recommendation

The Group suggested that VIR prepare a list of grain legume germplasm of southern origin in need of regeneration. The Central Crop Databases should be used to identify unique accessions for priority action. M. Vishnyakova is to provide a list to the Chair by 31 December 1998.

Slovakia

F. Debre informed the group that the Coordination of the Programme on biodiversity conservation is currently ensured as a state project, funded and supported by the Ministry of Agriculture. Mandate for coordination was given to the leading institute in plant production in Slovakia: Research Institute of Plant Production, Piešťany (RIPP). Under the coordination of RIPP another 18 stations in Slovakia participate in PGR activities. These altogether form one research group, dedicated to PGR work. Among grain legumes, the largest is the pea collection (1300 accessions), stored in Horna Streda Plant Breeding Station at Statny Podnik and at the Nitra University of Agriculture. This is followed by the *Phaseolus* collection (1150 accessions), stored at Piešťany.

Slovenia

V. Meglič reported on the status of the grain legume collection held at the Agricultural Institute of Slovenia, consisting of 1051 accessions (*Phaseolus vulgaris* 964, *Ph. coccineus* 53 and *Vicia faba* 34). All grain legume accessions are well documented for IPGRI minimum passport descriptors, with minor gaps. Establishment of an information and database management system for the Slovenian Genebank is under way. Bean and faba bean collections will serve as pilot databases. New accessions are assayed according to morphological, agronomic and ecological characteristics and molecular data are also efficiently used for this purpose. A subsample of the Slovenian *Phaseolus* germplasm collection was compared with a group of check accessions representing the Andean and Mesoamerican genepools. A group of Slovenian accessions revealed a fair amount of distinctness from both, representing a possible set of unique germplasm. Evaluation of the faba bean collection showed that most accessions appeared to be of *equina* type, with one of *minor* and the rest of *major* type.

Spain

A. Ramos Monreal reported that all genetic resources activities are now held under the responsibility of the Ministry of Agriculture and that a National Council on Genetic Resources is evaluating, every three years, projects submitted for funding. In the grain legume area, the following programmes are currently approved for funding:

- Rationalization of *Pisum* collections of Spanish origin conserved at CRF (Centro de Conservación de Recursos Fitogenéticos), Madrid
- Establishment of an active collection of *Lupinus* at SIA (Servicio de Investigación Agraria), in Estremadura

- Control of conservation procedures and of genetic erosion in the genebanks of CRF
- Inventory and collecting of autochthonous Spanish genetic resources
- Grain legume genetic resources of CIFA (Centro de Investigación y Formación Agraria), Cordoba: multiplication and documentation of *Vicia faba* germplasm
- Establishment of an active *Phaseolus* genebank at Principado de Asturias
- Routine conservation at the CRF genebank
- Permanent inventory of *ex situ* collections of MAPA (Ministerio de Agricultura Pesca y Alimentación)
- Characterization, multiplication and documentation of grain legume collections of CRF-INIA (Centro de Conservación de Recursos Fitogenéticos–Instituto de Investigación Agraria)
- Establishment of a core collection of *Pisum,* beans and barley.

Turkey

N. Açikgöz presented an account of the grain legume genetic resources conserved at AARI, which has exceeded 4950 accessions, collected between 1964 and 1998 by AARI. Germplasm also has been received recently from the extension services throughout the country. Largest collections are those of *Phaseolus* (2071 accessions), *Cicer* (1725 accessions) and *Lens* (596 accessions). Collecting activities were carried out in collaboration with CLIMA in 1996. Collecting of *Cicer* and *Phaseolus* landraces was undertaken recently by the Provincial directorates of the Ministry of Agriculture. Systematic characterization of the chickpea collection is an ongoing activity. Breeding programmes in Turkey make large use of the genetic resources. For example, five *Lens* varieties and one faba bean variety were improved from AARI plant genetic material and were registered for the market. All material conserved at AARI is freely available, but feedback information on its use is requested.

F.R. Yugoslavia

D. Jovićević reported that the Yugoslav Bank of Plant Genes (BBGJ) concentrated its work during the period 1989-92 on the following grain legumes: *Glycine*, *Phaseolus*, *Pisum*, *Vicia faba*, *Lupinus*, *Cicer* and *Lens.* In its final form, the information system of the Yugoslav Bank of Plant Genes included data on 542 samples of grain legumes. After the break-up of the former Yugoslavia, the national collection of the Yugoslav Bank of Plant Genes presently includes only samples of *Glycine* (60) and *Phaseolus* (290). The samples are stored in chambers for mid-term storage (at +4°C) rented from the Maize Research Institute in Zemun Polje. The overall activity of the Bank is considerably reduced owing to financial difficulties at the national level. It had been planned for the Yugoslav Bank of Plant Genes to have storage capacity for 100 000 samples and equipment for long-term storage at -20ºC. However, the construction of the Bank, which started in 1990, has not been completed yet.

United Kingdom

M. Ambrose mentioned that a new long-term storage facility (–20°C) had been set up at East Craig in Scotland and a reference collection will be conserved there. Regarding the collection conserved at the John Innes Centre (JIC), he informed the Group that the level of safety-duplication is as high as 80%, although this is only based on informal arrangements. An agreement with the Nordic Gene Bank is under formulation. M. Ambrose also reported that JIC is maintaining the base collection of genetic stocks and that additional genetic stocks will be included in the future, including collected stocks that were thought to have been lost. Finally, he explained that the proportion of requests, especially made via Internet, for material conserved in the genebank has been increasing.

In situ and on-farm conservation

M. Ambrose welcomed Alan Gear from the Henry Doubleday Research Association (HDRA) to the meeting. He underlined the importance in the participation of a representative from the informal sector, who are an important group of stakeholders, to the Working Group meetings and the exploration of complementarity and collaboration with the informal sector that would ensue.

M. Ambrose reminded the Group of the recommendations made at the Braunschweig Symposium, where ECP/GR was invited to address the subjects of *in situ* and on-farm conservation, in line with the recommendations of the Global Plan of Action.

He invited the Group members to report examples of *in situ* and on-farm conservation activities ongoing in their respective countries and to give some accounts of the existing interaction with NGOs.

N. Açikgöz informed the Group about the progress of the *in situ* project under way in Turkey since 1993. Seven Gene Management Zones were identified in three pilot conservation zones: Kazdag in western Turkey for wild plums and chestnut, Ceylanpinar in southeastern Turkey for wild wheats and wild lentil, and the Tourous Mountains for wild legumes. In this last area, candidate Gene Management Zones were identified for the conservation of *Lens ervoides* and *L. orientalis* (3 zones), *Pisum* spp. (3 zones) and *Vicia johannis* (2 zones). Gene Management Plans are currently under preparation and they will include the involvement of local NGOs, as well as a programme of public awareness for the local population.

T. Gladis reported about the existing cooperation in Germany between NGOs and the formal sector (genebanks, research institutions). He explained that NGOs as well as private persons maintain seed collections and provide seeds, mainly from vegetables, spices, ornamentals and some cereals and fruits (e. g. VEN, Association for the conservation of crops diversity; VERN, Association for the conservation and recultivation of crops in Brandenburg). Other organizations are international, such as Arche Noah, with about 1500 German members, and the US Seed Saver Exchange. NGOs in collaboration with GOs are currently developing strategies for extensification in agriculture and for fruit production (e.g. federal and local groups of NABU e.V. (German Society for the protection of nature) and BUND e.V. (Friends of the Earth Germany). Some are also participating in joint projects (IPK-Gatersleben with Arche Noah, VERN, in the EU-funded potato project and for the reintroduction of traditional cereal varieties in agriculture). Private initiatives of 'Eco-breeders' started to develop for bio/eco farmers cereal varieties specifically adapted for ecological farming systems. These require low input, and have improved weed competitivity (soil shading ability, density), good resistance and quality (taste, digestibility) characters. Organizations such as 'Slow food' are working for the improvement of direct market channels for farmers to sell their ecological products.

L. van Soest reported that during the last two years discussions were held between CGN and ecological farming groups in The Netherlands. Some of these groups stated that the genebank was only working for the private sector and research institutes and not for the traditional farming community. After several discussions, an intention agreement was signed between some ecological farming groups and CGN to work together and commit themselves to obtain funds for PGR activities for ecological farming. Initially wheat and lettuce were selected but other vegetable crops may be considered. During the last two years, CGN conducted activities for ecological farming in wheat (evaluation) and lettuce (development of a core collection). The parties agreed to find funding to conduct further evaluations. Criteria for evaluation include disease resistance, lodging resistance, optimal rooting system, and ability to suppress weeds during early growth.

A.R. Monreal mentioned a case in Spain which can be considered as an example of on-farm conservation. This is the case of the cultivation of *Triticum spelta*, which is grown in small areas for limited production of traditional food for local recipes. *In situ* conservation in

Spain is dedicated to wild plants and it does not include agricultural systems. There are NGOs in Spain who are dedicated to genetic resources conservation; however, A. Monreal was not aware of any coordination established to date with the formal sector.

Small efforts of ongoing *in situ* conservation for legumes were reported from Bulgaria by a correspondence from Siyka Angelova.

S. Hovinen reported that in Finland such activities have started, mainly on cereals. The farmers get financial support from the government for using local varieties, thus making it possible to save some diversity. The administration is within the responsibility of the State Institute of the Seed Testing Department.

G. Poulsen reported that to increase knowledge about *in situ* conservation and on-farm conservation, NGB and the Baltic Genebank organized an *in situ* symposium in Lithuania where most working groups were represented.

Attention was also drawn to the fact that a key element for on-farm conservation on a larger scale would be the introduction of legislative measures which allow distribution and commercialization of landraces and obsolete varieties, as recommended by article 203e of the Global Plan of Action. R. Schachl announced that Austria and Germany had elaborated a formulation in close cooperation with seed control service, genebanks and people concerned, such as plant breeders and representatives from the ecological farming community, to open the existing legal regulations to allow trade of seed of those types of genetic resources to a certain extent. Within the Austrian EU Presidency this paper should be discussed with other Member States and the Commission to find a common EU regulation, to be possibly approved before the end of the year.

The Henry Doubleday Research Association (HDRA) was presented by Alan Gear. HDRA is a NGO which started its activity 40 years ago as an association of gardeners for organic growing. In the meantime the organization, with 25 000 members, became the biggest one still based on organic farming and not supported by the government. The organization keeps demonstration gardens running throughout the country; they receive enormous public interest. To increase awareness it is intended to establish a vegetable museum. Research work is preferably done on contract basis, mainly in the direction of pest control and trials for variety testing to find the most suitable varieties for organic farming. Another part of the activity, in cooperation with Third World Countries, aims to introduce organic farming as a low-input farming system. For that purpose a small collection of tropical trees is also maintained. Genetic resources conservation activities started in the mid-1970s. Seed is available from a catalogue published every year and will be sent on request. Seed production is largely done by seed gardeners, a selected group of members who deal with certain crop species. There is no restriction of the material, all is taken on board and thus some very old races could be preserved. To find old and obsolete varieties, so-called “seed detectives” are employed, searching in home gardens for gaps in the already existing collection. In view of long-term conservation of the material, cooperation with genebanks is sought, such as the genebanks of Wellesbourne, UK or Linz, Austria. Although the organization has become renowned at international level, the main problem remains: how to improve the links between NGOs themselves throughout Europe. It is hoped that a solution to this problem can be developed as an outcome of the Braunschweig symposium on PGRFA.

M. Vishnyakova reported that, as part of the national programme, VIR is now studying theoretical approaches to *in situ* conservation of wild relatives of grain legumes. A list of target species is being prepared and methodological aspects are being discussed.

Utilization of grain legume genetic resources

Screening and evaluation of peanut germplasm for calcareous Mediterranean soils

A. Hadjichristodoulou gave a presentation on the screening and evaluation of peanut germplasm for calcareous Mediterranean soils (see p. 82). He explained that soils in Cyprus and other Mediterranean countries have high $CaCO_3$ (up to 25%) and active lime (up to 10%). Under such conditions, peanuts suffer from lime-induced iron chlorosis and their yields may be reduced dramatically, even down to zero. It is possible to correct chlorosis by applying expensive treatments with iron chelates. 'Cyprus Local' and the Israeli variety 'Shulamit' are relatively tolerant to chlorosis. A large number of peanut lines, developed at ICRISAT, India, were screened for tolerance to chlorosis. After several years of selection 12 tolerant lines were selected. They are also higher-yielding (20-30%) than 'Cyprus Local' and show a long shelf-life and a larger kernel size than 'Cyprus Local'. Three released varieties were registered jointly with ICRISAT by the Crop Society, USA. Seed may be obtained from USA, Cyprus or ICRISAT.

M. Ambrose went on to outline the main recommendation relating to utilization of PGR made at the Braunschweig Symposium, highlighting core collection, genetic enhancement and improved collaboration between public, private and informal sectors.

Core collections

M. Ambrose updated the group on the *Pisum* core collection work. Molecular marker studies had been undertaken by colleagues at the John Innes Centre over the past two years on a subset of the core collection. The resulting phylogenetic trees would feature in a presentation to be made in session 7.

A. Monreal briefly mentioned that a core collection of peas of Spanish origin had been formed and a comparison made of 11 different sampling methods. A paper was to be presented at the forthcoming 3rd European Grain Legume Conference in Valladolid later that month.

M. Vishnyakova informed the Group that they were preparing to form a core collection from the VIR collection of *Glycine* and asked for information on the practical aspects and experience from those who had already undertaken the formation of such collections.

G. Duc highlighted the need to consider the formation of a core collection within European holdings of *Vicia faba*. Over the past few years the area of *Vicia faba* has fallen and breeding interest in the crops declined.

R. Schachl intends to request the members of the PHASELIEU project to cooperate in the establishment of a *Phaseolus* core collection. He hoped that the wider *Phaseolus* community would also help in this initiative.

Genetic enhancement

M. Ambrose outlined the discussions that were taking place in the UK on the gap that had developed in the flow of exotic germplasm into breeding programmes following the privatization of breeding programmes some 10 years ago. This represented a market failure in the transfer of information on material in the public sector to the private sector.

G. Duc stated that in his experience breeders were reluctant to consider exotic material that was too far from the cultivated form. This was especially the case where a crop was in decline such as *Vicia faba*.

L. van Soest commented that prebreeding at governmental level had declined.

S. Hovinen informed the Group that composite crosses will be developed by Boreal Plant Breeding, Finland, starting from ordinary breeding material of field peas. The objective is to preserve pea genetic resources with high adaptability to the Nordic countries environment. Material obtained from this prebreeding programme will be documented and stored at the Nordic Gene Bank.

M. Ambrose outlined the model of the GSP which is funded out of the levy on seed sales.

The GSP works with a series of paying breeding companies on a circular crossing programme for a series of traits. All members get to select from the resulting segregating progeny and undertake their own selections. Exotic material was used in this operation.

Molecular techniques

M. Ambrose mentioned that areas of collaboration between collections and commercial breeders are increasing.

G. Duc reported that France was building a strong molecular marker programme bringing the public and private sectors together.

A. Monreal stated that Spain had recently initiated a 4-year programme of molecular characterization of peas of Spanish origin, and that high-quality molecular characterization of landraces of *Vicia faba* accessions was still ongoing at the University of Cordoba in the laboratory of J. Cubero.

Priority problems

There followed a discussion of priority problems in relation to germplasm utilization. Main problems identified for the various crops were the following:

- *Cicer: Ascochyta rabiei* (Ascochyta blight) in Turkey.
- *Vicia faba*: the problem of salt tolerance was reported in regions of eastern Europe and the southern Mediterranean. *Orobanche* was reported as a serious problem in regions of southern Spain and areas of Turkey, severely restricting the growing of faba bean in these regions.
- *Phaseolus*: narrow genetic base of the current European cultivated material.
- *Pisum: Ascochyta pinodes* and *Fusarium* resistance in the Russian Federation.
- *Lens:* cold tolerance in the Central Anatolian region of Turkey.

Recommendations

- *Core collections of grain legumes: the Group agreed to help G. Duc collate and develop a strategy for the development of a core collection of* Vicia faba *in European collections.*
- *The Group welcomed the initiative of the Federal Office for Agro-Biology in Linz, to work toward the formation of a* Phaseolus *core collection.*
- *The Network Coordinating Group was charged to further develop the review of genetic enhancement on crop-by-crop and geographical area bases.*
- *The Network Coordinating Group is asked to explore the possibilities of improving the links to the work on overcoming the problem of* Orobanche *to grain legume production area in Europe and the genetic resources community. Following this exercise the NCG is asked to assess the need and funding opportunities of multidisciplinary project proposals in this area.*

Inter-regional cooperation

A. Monreal reported on the Spanish exchange programme on plant genetic resources with the South American region. An annual international PGR course is run in Madrid.

A. Dordio reported on the Portuguese contacts with new Portuguese-speaking African countries.

G. Poulsen outlined the Nordic Gene Bank's long-term programme in southern African countries.

T. Gladis reported on activities in Germany. IPK genebank staff is involved with checklists and joint collecting missions of plants, e.g. in Albania, Central America and Cuba, Italy, and in North and South Korea. The DSE (German Foundation for International Development) in cooperation with genebanks, universities and NGOs runs long-term and short courses.

M. Ambrose reported on the MSc and MPhil courses on conservation and utilization of

plant genetic resources run by the University of Birmingham in conjunction with the University of Reading and Royal Botanic Gardens, Kew.

Cyprus and Turkey are both members of WANANET which is a cooperative programme for plant genetic resources in West Asia and Northern Africa, coordinated by the IPGRI regional office of CWANA in Aleppo.

Recommendations

The Chair of the Group will contact the IPGRI WANANET Coordinator to exchange information on activities and explore areas of working contact in relation to database activities.

Research activities

Studies of molecular diversity in a number of grain legumes

N. Ellis from the John Innes Centre mentioned the use of molecular markers to analyze genetic distances between different grain legumes, in order to find pattern relationships. He explained how they use a combination of a series of marker types.

CABINET Network: Carbohydrate Biotechnology Network for grain legumes

C. Hedley from the John Innes Centre explained how the CABINET Network had been set up to carry out work on carbohydrates. Its objective is improving the quality of carbohydrates in legume seeds from both a nutritional and agricultural point of view. The network took advantage of an INCO-COPERNICUS contract with the EU, whereby a concerted action programme with 29 partners (including Estonia, Moldova, Russia and Ukraine) was started in February 1997. The action has a 3-year duration and an availability of 207 000 Euro. The activities will not only focus on meetings, but also on the production of a book. The CABINET Network is addressing carbohydrates from the following several angles:

1. Chemist – Collate information on composition of starch, soluble carbohydrates and fibre fractions of grain legumes.
2. Nutritionist – Identify and characterize those carbohydrates which act as anti-nutritional factors and should be reduced within the diet and those which should be enhanced.
3. Physiology – Identify and characterize those carbohydrates which play a beneficial role in plant development, in protecting plants and seeds from temperature stress and desiccation.
4. Biotechnology – Utilize biotechnology expertise to develop strategies for genetically manipulating the biochemical pathways.
5. Breeding – Develop strategies for breeding.
6. Processing technology – Identify processing techniques which reduce antinutritional effects.

The origin of *Phaseolus*

R. Schachl gave a short account on the latest developments of the research on the origin of *Phaseolus* and its expected variation, as presented during the last EUCARPIA Symposium on breeding of protein and oil crops, held this spring in Pontevedra, Spain. In this symposium, P. Gepts from the University of California showed that the domestic genepool consists of two main geographic genepools, the Andean and the Mesoamerican, corresponding to the main domestication centres. In addition, an intermediate genepool was identified, distributed on the Pacific slope of the Andes in Ecuador and Northern Peru. Unlike the two major genepools, the latter genepool contains only wild populations and was never cultivated. The intermediate nature of the third genepool could be theoretically the result of hybridizations of the two domesticated ones, or be attributed to common ancestry. The PCR-based survey of the distribution of tandem direct repeats in phaseolin genes showed that the only bean

genotype lacking any of the repeats surveyed is the population of the intermediate group. This observation suggests that the intermediate population is the presumed ancestor of *P. vulgaris.*

Diversity analysis of bean landraces

F. Debre presented the work carried out on molecular differentiation of 85 bean landraces collected in Slovakia, with the use of minisatellite and microsatellite markers.

Representation of ECP/GR WG on Grain Legumes in regional and global initiatives

M. Ambrose reviewed some examples of cooperation including the publication of a special edition on genetic resources in *Grain Legumes*, the journal of the European Association for Grain Legume Research. Working Group members are involved in two grain legume projects. R. Schachl is a member of the EU concerted action project PHASELIEU and K. Hammer of IPK is the Group's nominated representative on the *Lathyrus* Genetic Resources Network (LGRN).

LINK

The group was informed by G. Duc about the project called LINK (Legume Interactive Network). This information, complemented by a message from Anne Schneider (AEP Executive Secretary Delegate), indicates that LINK is going to be launched in 1999 and will be carried out until the end of 2001. It is a "thematic network" and is supported financially by the European Commission. Its objectives are:

- to stimulate interactions between the different ongoing programmes related to grain legumes and to explore the most appropriate areas of research to follow
- to identify the requirements from production sector and from end-users in feed / food / non-food grain legumes
- to combine different expertise during meetings and thematic workshops to discuss, define and implement key actions in research on grain legumes.

LINK is conceived as an open network and its initial partners should be able to extend their interaction with additional partners. Cliff Hedley from JIC, coordinator of CABINET, is one of the LINK partners. Genetic resources will of course be considered under LINK.

The PHASELIEU project

R. Schachl, in his capacity of participating member of the EU-funded concerted action PHASELIEU for the improvement of sustainable *Phaseolus* production in Europe for human consumption, informed the Group that he was to take part in the second project meeting next week in Belgium, where he would represent the ECP / GR Working Group on Grain Legumes. He provided the following information on the project background and objectives.

Background

Phaseolus bean are also known as green, dry, dwarf, haricot, French and runner beans. An improved sustainable and more economic *Phaseolus* production in Europe, leading to high-quality products, would, on one hand, contribute to the diversification of agricultural systems and the development of more environmental agricultural practices. On the other hand, it would allow for an increased independence from the world market, which is characterized by cost fluctuation and unpredictable supply. Currently large amounts of dry *Phaseolus* beans are important to the EU. Regarding green *Phaseolus* beans, the self-sufficient grade in the EU export is much higher.

Objectives

The overall aim of PHASELIEU is to coordinate the ongoing research on *Phaseolus* and to elaborate an integrated strategy model for the improvement of *Phaseolus* production in Europe for human consumption. Also, this project would like to avoid duplication of current research and other RTD activities at national and transnational level on *Phaseolus*.

The detailed objectives of PHASELIEU are, through concertation and coordination of ongoing research:

1.1 to analyze the potential and opportunities of *Phaseolus* beans for European agriculture
1.2 to improve the management of genetic resources at European level in cooperation with the ECP/GR and widen the genetic base of *Phaseolus*, including introduction of new germplasm sources of variation and interspecific hybridization
1.3 to set up an EU-wide trial system for multiplication, characterization and evaluation of different genetic material for the above characteristic
2.1 to identify the biotic and abiotic stresses that contains a wide distribution of *Phaseolus* beans in some European areas
2.2 to seek improved non-chemical methods of crop protection related to biotic stress (bean fly, aphids, mosaic virus, *Pseudomonas, Xanthomonas*) and abiotic stress (drought and cold tolerance)
2.3 to optimize diverse farming systems incorporating *Phaseolus* varieties and monoculture and mixed-cropping systems
2.4 to seek increased nutritional and organoleptic quality and improved cooking characteristics including HTC (hard to cook) character
3.1 to develop a widely applicable transformation and regeneration protocol for *Phaseolus*
3.2 to develop molecular markers for use in *Phaseolus* breeding.

Recommendation

F. Debre mentioned the opportunity for the Working Group on Grain Legumes to establish a contact with the FAO ESCORENA network on soyabean, with the purpose of exploring common areas of interest and collaboration, such as the establishment of databases.

Conclusion

Presentation and adoption of the report

The section *Discussion and Recommendations* of the report was presented to the participants and it was approved with minor modifications.

Election of the Chair and Vice-Chair; the Network Coordinating Group

Mike Ambrose was elected Chair of the Group until the end of the next meeting. He will be joined in the coordination of the Network by Gérard Duc (as Working Group Vice-Chair) and by Rudolf Schachl. Siyka Angelova will be approached to check if she is available to join in the Network Coordinating Group.

Closing remarks

The Chair informed the group that Andreas Hadjichristodoulou had recently retired from his Institute. During his career he made many important contributions to development and utilization of genetic resources for a range of crops including legumes and cereals. Although he has not yet stopped his activity, he was offered the Groups' thanks for his contributions to both meetings of the ECP/GR Working Group on Grain Legumes and wished a long and happy retirement. The Chair thanked all the participants for attending this meeting and contributing to all the sessions. He wished the Group to continue in the direction it was

moving and reminded that its work will have to be recorded and reported so as to be accountable to the Steering Committee. The Group conveyed its warm thanks to Mike Ambrose and to the John Innes Centre for the excellent organization of the meeting and for the nice environment encountered during the Group's pleasant stay in England.

Part II. Presented Papers

European Grain Legume Databases

Status of the European Cicer *database*

M.G. Pereira and M.M. Tavares de Sousa
Estação Nacional de Melhoramento de Plantas (ENMP), Elvas, Portugal

Introduction

The European *Cicer* database was established in 1995, following the first meeting of the ECP/GR Working Group on Grain Legumes, held in Copenhagen, Denmark. It is maintained by the National Plant Breeding Station in Elvas, Portugal, and is now searchable on-line through the Internet server of the Nordic Gene Bank (NGB) at <http:www.ngb.se/databases/ECP/cicer>.

Materials and methods

The structure of the database was organized according to the guidelines of the IPGRI/FAO Multicrop Passport Descriptor List (Appendix II *in* Lipman *et al.* 1997).

From the "Directory of European Institutions Holding Crop Genetic Resources Collections" (Frison and Serwinski 1995), 32 institutions were recognized as potential owners of databases for *Cicer*. These institutions were contacted in December 1995 and in July 1997. In the first call, we asked for passport data and for the five recommended characters selected at the first meeting of the Working Group: growth habitat, flower colour, seed shape, seed colour and seed weight. In the second call, a diskette was supplied with the structure of the passport file, to overcome the problem of non-uniformity of the different databases.

The data are compiled in Microsoft Access version 2.0 for Windows.

Results and discussion

A total of 16 institutions from 10 countries sent the passport data of the material maintained in their germplasm collections (Table 1).

Table 1. Institutions participating in the *Cicer* database

Institution	Country
Agricultural Research Institute – Plant Genetic Research and Herbarium	Cyprus
Institute of Crop Science – Federal Research Centre for Agriculture (FAL)	Germany
Genebank Institute for Plant Genetics and Crop Plant Research (IPK)	Germany
Institute for Agrobotany	Hungary
Fleischmann Rudolph Agricultural Research Institute – University of Agricultural Sciences	Hungary
Israel Gene Bank for Agricultural Crops	Israel
Plant Genetic Resources Laboratory – Research Institute of Vegetable Crops	Poland
Portuguese Plant Germplasm Bank	Portugal
National Plant Breeding Station	Portugal
Estação Agronómica Nacional – Banco de Germoplasma Genética	Portugal
Genebank of Suceava	Romania
Centro de Recursos Fitogeneticos – Banco de Germoplasma Vegetal	Spain
Banco de Germoplasma de Horticolas	Spain
Aegean Agricultural Research Institute – Plant Genetic Resources Dept.	Turkey
Vicieae Germplasm Collection – School of Biological Sciences – University of Southampton	United Kingdom
Biology Dept. – School of Biological Sciences – University of Southampton	United Kingdom

The database contains information on 3664 accessions (advanced cultivars, primitive cultivars/landraces, breeding materials and wild accessions) representing 14 species of *Cicer* (Table 2). Most of the accessions belong to the cultivated species.

2. Species included in the *Cicer* database

Species	Number of accessions	%
C. anatolicum	2	0.05
C. arietinum	3599	98.23
C. bijugum	4	0.11
C. pinnatifidum	1	0.03
C. cuneatum	2	0.05
C. echinospermum	5	0.14
C. flexuosum	2	0.05
C. grande	1	0.03
C. judaicum	7	0.19
C. maracanthum	2	0.05
C. montbretii	2	0.05
C. pinnatifidum	15	0.41
C. reticulatum	11	0.30
C. songaricum	1	0.03
Cicer sp.	10	0.27

The number of accessions included in the *Cicer* Database represents only 38% of the total number of accessions existing in Europe (Frison and Serwinski 1995). This reflects one of the problems detected during the establishment of the *Cicer* database. It is difficult to obtain the data from the institutions holding the collections. The problem of non-uniformity of the data was also encountered.

An update of the database is planned soon.

References

Frison, E. and J. Serwinski. 1995. Directory of European Institutions Holding Plant Genetic Resources Collections. Vols. 1 and 2. International Plant Genetic Resources Institute, Rome, Italy.

Lipman, E., M.W.M. Jongen, Th.H.L. van Hintum, T. Gass and L. Maggioni, compilers. 1997. Central Crop Databases: Tools for Plant Genetic Resources Management. International Plant Genetic Resources Institute, Rome, Italy / CGN, Wageningen, The Netherlands.

Status of the European Vicia faba *Database*

J. Le Guen[1], G. Morin[1], G. Duc[2] and F. Moussy[2]

[1] *INRA, Le Rheu, France*

[2] *INRA, Dijon, France*

At the first meeting of the ECP/GR Working Group on Grain Legumes in Copenhagen in 1995, INRA took charge of the European database on *Vicia faba* genetic resources. G. Morin and J. Le Guen, who conducted the work at the beginning, have been recently reinforced for this task by G. Duc and F. Moussy.

A first request for data was sent by mail in 1996 and its results are summarized in Table 1. Further to the 57 letters sent to presumed *Vicia faba* collection curators in Europe, 34 answers were received and it was possible to include data from 26 seed collections for a total of 12 981 accessions. This list includes all the well-known European collections, except those of the Vavilov Institute (VIR, Russia) and of a few private companies which were not contacted originally.[5]

These collections mostly contain cultivars and farmer's populations resulting from collecting missions, and apparently very few breeder's working lines. No information is available on the technique used to maintain the material (under pollen isolation? is the material still alive?). A statement mentioning free access to the material was not always associated with the data files received.

Passport data

We had asked for a minimum of eight passport descriptors: Country and Institution, Species, Accession code, Botanical name, Origin, Country of the collecting, Donor, Donor accession code. After processing the available passport data, we obtained a standardized data file, **ipgri\eurvicia.dbf**, which was built under dBase software and made of 19 columns (see Table 2). Up to now, this work permitted the collation of 24 collection files (9478 accessions). The objective is now to add the few missing files and to work on the elimination of duplicates. This will be a long and difficult task, because of the many variations in the spelling of cultivar names, donor codes, and even of country codes.

On the 9478 accessions, 30% have cultivar names, 17% have unknown geographic origin and 52% are of European origin.

Characterization data

We had asked for five important descriptors: type (*minor, major, equina*), flower colour, spring or winter type, 1000-seed weight and seed shape. Only 10 collections were available with characterization data, and in most cases they were very incomplete in comparison with our demand. Therefore, we did not work on standardization of these data.

Conclusions and perspectives

- The gathering of passport data on *Vicia faba* genetic resources was rather successful, showing a considerable size of European collections (13 000 accessions).
- In the first step of our query, requests were sent mostly to public institutions. In a further step it would be interesting to find out which collections could be accessible from private companies.

---

[5] As of 15 December 1999, additional data were received for inclusion in the database: 110 accessions from BFL (Institut für Pflanzenbau), Vienna, Austria; 77 accessions from AARI (Aegean Agricultural Research Institute), Turkey; 1268 accessions from VIR (N.I. Vavilov Research Institute of Plant Industry), Russian Federation. With these data, the number of accessions in the European *Vicia faba* Database reaches a total of 14 436.

Table 1. European Base of *Vicia faba* collections 15.09.98

INSTCODE	Answer	Location of collection	No. accessions	COL. CODE	Characterization data
ALB001	no				
ALB007	no				
AUT034	no				
BEL017	yes	U. Gent	9	17	yes
BEL087	no				
BGR001	no	Inst. Plovdiv	75	22	?
CHE001	yes	Inst. Changins	3	16	yes
CHE008	yes				
CHE063	yes	PSR St. Gallen	10	15	no
CHE075	yes	SAVE St. Gallen	4	18	yes
CYP004	yes	Inst. Cyprus	100	19	yes
CZE090	yes	Agritec, Sumperk	315	7	yes
CZE122	yes	Inst. Prague	45	13	no
DEU001	yes	BAZ Braunschweig	2038	1	yes
DEU004	yes				
DEU005	yes				
DEU013	no				
DEU146	no				
DEU358	yes		1507		no
ESP004	yes	INIA Madrid	1003	2	yes
ESP011	no				
ESP027	yes	Germplasm Zaragoza	44	21	no
ESP046	yes	INIA Cordoba	1105	3	yes
FIN020	yes				
FRA010	yes	INRA–Rennes	830	23	yes
FRA043	yes	INRA–Dijon	1140	24	yes
FRA051	yes				
FRA215	no				
GBR001	no				
GBR011	no				
GBR040	yes	NIAB Cambridge	180	10	no
GRC005	yes	Gene Bank Thessaloniki	150	11	no
GRC006	yes				
HUN003	yes	Inst. Tápiószele	240	8	no
HUN011	no				
HUN017	no				
HUN018	yes				
ISR002	yes	Gene Bank Bet Dagan	297	20	yes
ITA004	yes	Gene Bank Bari	2249	4	no
ITA021	no				
ITA043	no				
LTU001	yes				
NLD027	yes				
NLD037	yes	CGN Wageningen	607	6	yes
POL003	yes	Inst. Radzików	795	5	no
POL030	yes	PGR Skierniewice	15	25	no
PRT001	no				
PRT005	yes	Inst. Oeiras	66	12	no
PRT014	no				
PRT083	no				
ROM007	no				
SVN019	no				
SWE002	yes	Nordic Gene Bank	40	14	yes
TUR001	no				
UKR001	yes	Inst. Kharkov	114	9	yes
UKR008	no				
Total			**12981**		

- In the last few years, there was a clear reduction of investment from public and private groups in *Vicia faba* germplasm in Europe. This means that a large part of the conserved material may be abandoned and die in the near future. This problem is amplified by the allogamy of this crop which makes the maintenance of the material more expensive and difficult. This makes it urgent to define a core collection for this species and the means of its maintenance.
- A key point to achieve this objective is to rapidly analyze the duplicates in the database. This will be the next phase of our activity, representing a heavy workload and for which the possibilities of INRA may be limiting.

Table 2. Structure of the passport data table in eurvicia.dbf

Column	Name	Type	Size
1	NEWNUM	numeric	6
2	INSTCODE	alpha	7
3	ACCESS_NO	alpha	12
4	GENUS	alpha	5
5	SPECIES	alpha	7
6	SUBSPECIES	alpha	7
7	VARIETY	alpha	15
8	V_NAME	alpha	45
9	SEL_LEVEL	alpha	17
10	O_COUNTRY	alpha	15
11	O_DISTRICT	alpha	20
12	O_LOCATION	alpha	66
13	O_LOCATIO2	alpha	50
14	DONOR	alpha	28
15	DONOR_NO	alpha	35
16	LATITUD	alpha	8
17	LONGIT	alpha	8
18	ALTITU	numeric	4
19	ANCEST	alpha	40
Total			**396**

Example of passport data available for five accessions:

NEWNUM	INSTCODE	ACCESS_NO	GENUS	SPECIES	SUBSPECIES	VARIETY	V_NAME	SEL_LEVEL	O_COUNTRY	O_DISTRICT
1	DEU001	2768	VICIA	SEPIUM					DEU	
2	DEU001	4366	VICIA	FABA	EU–FABA	MINOR / EQUINA	THROWS MS	CULTIVAR	GBR	
3	DEU001	4367	VICIA	FABA	EU–FABA	MINOR / EQUINA	COCKFIELD	CULTIVAR	GBR	
4	DEU001	4368	VICIA	FABA	EU–FABA	MINOR / EQUINA	MARIS BEAD	CULTIVAR	GBR	
5	DEU001	4369	VICIA	FABA	EU–FABA	MINOR		LANDRACE		

O_LOCATION	O_LOCATION2	DONOR	DONOR_NO	LATITU	LONGIT	ALTITU	ANCEST
		DEUHLFHEF					
		GBRRHM					
		GBRRHM					
		DEUFALPZBS					

Status of the European Phaseolus *Database*

Rudolf Schachl
Federal Office of Agro-Biology, Linz, Austria

During the meeting of the Working Group on Grain Legumes in Copenhagen in 1995, it was agreed that the establishment of the database involves two steps:

1. to develop a proposal for the database, putting emphasis on the field structure, taking care only of passport data and four botanical characters which should help the curator identify quickly the material;
2. to assemble the data obtained from the various genebanks. To do so, two possibilities were taken into consideration:
   a. requesting the data in a form which already coincides with the structure of the database
   b. requesting the data as they are and do the transformation ourselves.

The activity was scheduled to be completed within 1.5 years, and in any case before the present meeting of the Working Group on Grain Legumes.

From the "Directory of European Institutions Holding Crop Genetic Resources Collections" (Frison and Serwinski 1995), 49 institutes listed were contacted. Out of these, 24 institutes answered and 22 institutes also sent data. Not all institutes appeared to be holding collections, owing to reorganizations in national programmes. However, 25 institutes did not reply; these include genebanks where we can expect larger collections of special value, such as the genebanks of Turkey, Greece or Romania.

In total 28 271 accessions are currently included in the European *Phaseolus* Database. Table 1 lists the number of accessions recorded in the database per species, and Table 2 according to the status of sample.

Table 1. Contents of the *Phaseolus* Database per species

Species	No. of accessions
Phaseolus vulgaris L.	26607
Phaseolus coccineus L.	1132
Phaseolus lunatus L.	311
Phaseolus acutifolius Gray	53
x *multigaris* Lamprecht	55
Phaseolus radiatus L.	16
not defined	88

Table 2. Contents of the *Phaseolus* Database per status of sample

Type of sample	No. of accessions
commercial varieties	3794
breeding lines	280
landraces	4899
wild or weedy types	337

The status of sample is known for only 1/3 of the accessions. For the rest we might assume that 2/3 belong to landraces and 1/3 to commercial varieties, with the percentage of commercial varieties higher in central Europe, and that of landraces in southern and eastern Europe.

According to the "Directory of European PGR Collections" the number of accessions is estimated at 35 000 accessions. Thus 80% of the material reported or expected in European genebanks is currently recorded in the *Phaseolus* Database.

The *Phaseolus* Database is available on the Internet at <http://www.agrobio.bmlf.gv.at/phaseolus>.

Data were requested in the form as managed individually by the genebanks, and were assembled by the Federal Office of Agro-Biology in Linz in a common form based on the FAO/IPGRI Multicrop Passport Descriptors, in view to facilitate the exchange of information with other networks, e.g. WIEWS. During the Copenhagen meeting it was discussed whether management data, like minimum characters, have to be taken into account in addition to the passport data in helping the genebank curator in searching and identifying accessions. For *Phaseolus* the inclusion of three highly heritable descriptors were agreed, namely: plant type (bushy or climbing), seed colour and seed size.

We suggest to rely for the near future on DOS 16-bit standard format, the advantage being that the data as distributed in the European *Phaseolus* Database can be easily processed by all common data-processing programmes, individually available to users. Thus the database does not need to be linked to a special genebank programme.

In general, the accessions of almost all genebanks are very well described by passport data. The description by characterization and evaluation data, however, appears poor, and even the three management (characterization) data requested were not available. There is an absolute need to standardize the characterization and evaluation descriptors before continuing the work.

Three sets of descriptors are commonly used: IPGRI descriptors, UPOV descriptors and COMECON descriptors. The IPGRI descriptors are very well detailed and adequate for accessions of wild and weedy types and landraces, but do not sufficiently take care of bred cultivars. On the other hand, the UPOV descriptors do, but neglect the possible variation in primitive races. The COMECON descriptors still offer a wide range of characters, but are outdated, especially in respect to how the characters are recorded. For the purposes of the European genebanks comprising in their collection landraces as well as commercial varieties, a synthesis of IPGRI and UPOV descriptors could be taken into consideration.

This problem has been addressed by *Phaseolus* experts, within the framework of the EU-funded project PHASELIEU. A revised list of passport data (Annex 1) and a preliminary list of characterization data (Annex 2) were agreed for adoption in the European *Phaseolus* Database.

Very little is known about genetic variation of the accessions represented in the database. Grouping the accessions according to their origin and location of collection, as far as it is known, results in the following.

Origin	Number of accessions
Latin America	2295
Middle East Gene Centre	985
Accepting the theory of Vavilov and considering that in the conditions of a gene centre, genesis of new types is higher than loss by selection and dominant genes accumulate, this material might be of special value.	
Mediterranean Region	4664
Portugal and Spain	3502
Italy, Greece, Albania (although the collection of Greece is not included yet). Since the initial exchange of *Phaseolus* beans occurred between the American centres of origin and the Iberian Peninsula, originality in the material might be expected to some extent.	1162
Area of the former Austro-Hungarian Monarchy	6139
There was a strong cultural link between Spain and Austria through the Hapsburgs in the 17th century, and intensive exchange of agricultural goods within the Austro-Hungarian countries was only limited by environmental boundaries, so that a certain uniformity in the material can be expected.	

There are also big collections resulting from international exchange and collecting activities: Cambridge, UK (2200 accessions); Gatersleben, Germany (7272); VIR, St. Petersburg, Russia (6136).

In the context of widening the genetic base and introduction of new germplasm, priority may be given to some extent to the evaluation of the material already existing in Europe.

However, more than 28 000 accessions is a number which requires a consequent strategy on how to proceed in the evaluation in view of the incurred workload and costs. To some extent, especially for large collections, the establishment of a core collection could probably help to handle the number of accessions to be subsequently evaluated.

Apart from that, broadening the genetic base will be an absolute need, considering that we may not expect a very wide genetic variation in the accessions available in Europe.[6]

Reference

Frison, E. and J. Serwinski. 1995. Directory of European Institutions Holding Plant Genetic Resources Collections. Vols. 1 and 2. International Plant Genetic Resources Institute, Rome, Italy.

[6] see also paper by same author on "The origin of *Phaseolus*" (p. 93, this volume).

Annex 1. Minimum multicrop passport descriptors adapted for the *Phaseolus* database.

1. Institute code **(INSTCODE: C 12)**
Code of the institute where the accession is maintained. The code consists of 3-letter country code plus number as specified in the institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) consist of a 3-letter country code and an acronym.

2. Accession number **(ACCENUMB: C 12)**
This number serves as a unique identifier for accessions and is assigned when an accession is entered into the collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number is still not available for re-use. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).

7. Accession name **(ACCNAME: C 70)**
Either a registered or other formal cultivar designation given to the accession.

4. Scientific name
Full botanical name without authority. Following abbreviations are allowed; sp.; subsp.: var.; convar.

4 Genus **(GENUS: C 20)**
5 Species **(SPECIES: C 25)**
6 Subspecies, botanical variety, ... **(SUBTAXA: C 70-256)**

8. Country of origin **(ORIGCTY: C 3)**
Name of the country in which the sample was originally collected or bred. Use the ISO 3166 extended codes (i.e. current and old ISO codes).

3. Collecting number **(COLLNUMB: C 20)**
Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.

15. Collecting source **(COLLSRC: C 3)**

1 Wild habitat 1.1 Forest 1.2 Shrubland 1.3 Grassland 1.4 Desert/tundra
2 Farm 2.1 Field 2.2 Orchard 2.3 Garden 2.4 Fallow 2.5 Pasture 2.6 Store
3 Market 3.1 Town 3.2 Village 3.3 Urban 3.4 other exchange system
4 Institute/Research organization
0 Unknown
99 Other (Elaborate in REMARKS field)

9. Location of collecting site
Subdivision below the country level and other locality information that describes where the accession was collected or the distance in kilometres and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S means 7 km south of Curitiba).

13. Collecting date of original sample [YYYYMMDD] **(COLLDATE: C 8)**

10. Latitude of collecting site **(LATITUDE: C 5)**
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data should be indicated with hyphen (e.g. 10—S).

11. Longitude of collecting site **(LONGITUDE: C 6)**
Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data should be indicated with hyphen (e.g. 076—W).

12. Elevation of collecting site [m asl] **(ELEVATION: C 4)**

14. Status of sample **(SAMPSTAT: C 2)**

1 Wild
2 Weedy
3 Traditional cultivar / Landrace
4 Breeders line
5 Advanced cultivar
(6 Population)
0 Unknown
99 Other (Elaborate in REMARKS field)

16. Donor institute code **(DONORCODE: C12)**

Code for the donor institute. The code consists of 3-letter ISO country code plus number as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) consist of a 3-letter ISO country code and an acronym.

17. Donor number **(DONORNUMB: C 12)**

Number assigned to an accession by the donor.

18. Other number(s) associated with the accession **(OTHERNUMB: C 12)**

Any other identification number known to exist in other collections for this accession (other than Collecting number). Other numbers can be added.

19. Additional information on the accession **(REMARKS: C 70 - 256)**

FAO WIEWS DESCRIPTORS

1. Location of safety-duplicates **(DUPLSITE: C 12)**

Code of the institute where a sample has been duplicated. The code consists of 3-letter ISO country code plus number as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) consist of a 3-letter ISO country code and an acronym.

2. Availability of additional passport data **(PASSAVAIL: C 1)**

(i.e. in addition to what has been provided)
0 Not available
1 Available

3. Availability of characterization data **(CHARAVAIL: C 1)**

0 Not available
1 Available

4. Availability of evaluation data **(EVALAVAIL:C1)**

0 Not available
1 Available

5. Acquisition type of the accession **(ACQTYPE: C 1)**

1 Collected/bred originally by the institute
2 Collected/bred originally by joint mission/institutions
3 Received as a second repository

A. Acquisition date (optional) [YYYYMMDD] **(ACQDATE: C 8)**

6. Type of storage **(STORTYPE: C 5)**

Maintenance type of germplasm. If germplasm is maintained under different types of storage, multiple choices are allowed, separated by a semicolon (e.g. 2;3). Refer to FAO/IPGRI Genebank Standards, 1994.

1 Short-term
2 Medium-term
3 Long-term
4 *In vitro* collection
5 Field genebank collection
6 Cryopreserved
99 Other (Elaborate in REMARKS field)

27. Breeder (optional) **(BREEDER: C 20)**

Expressed as Breeder acronym or as Institute code; e.g.: Fehleken (see table BREEDER).

Annex 2. Descriptors for the European *Phaseolus* Database characterization data[7]

The **Phaschar.dbf** file is currently providing the following data:

Institute **(INSTCODE: C 12)**
(Code of the institute where the accession is maintained. The code consists of the 3-letter country code plus number as specified in the institute database available from FAO, Institut.dbf)

Accession number **(ACCENUMB: C 18)**

Flower / blossom colour of standard (vexillum) **(BLOSVEX: C 1)**

IPGRI	1 white	6 dark lilac with purple outer edge
	2 greenish	7 dark lilac with purplish spots
	3 lilac	8 carmine red
	4 white with lilac edge	9 purple
	5 white with red stripes	99 other (specify in ADDCHAR-field)

Flower / blossom colour of wings **(BLOSWING: C 1)**

IPGRI	1 white	5 strongly veined in red to dark lilac
	2 greenish	6 plain red to dark lilac
	3 lilac	7 lilac with dark lilac veins
	4 white with carmine stripes	8 purple
		9 other (specify in ADDCHAR-field)

Days to flowering **(DAYSBLOS: C 3)**
IPGRI Counted as days from emerging to 50% of plants are flowering

Duration of flowering **(DURBLOS: C 3)**
IPGRI Number of days from 50% of the plants flowering to the stage when 50% of the plants have stopped flowering

Leaf shape **(LEAFSHAPE: C 1)**

IPGRI		1 triangular	4 ovate
	2 quadrangular	5 ovate/lanceolate	
	3 round	7 lanceolate	9 hastate

Leaf colour of chlorophyll (intensity of green colour) **(LEAFCHLORO: C 1)**
IPGRI 3 pale green 5 medium green7 dark green

Leaf colour of anthocyan (presence of anthocyan) **(LEAFANTHO: C 1)**
IPGRI 0 absent 9 present

Leaflet length **(LEAFLENGTH: C 2)**
IPGRI (in mm, on terminal leaflet of third trifoliate leaf from pulvinus to leaf tip)

Leaf persistence (when 90% of pods are dry) **(LEAFPERS: C 1)**
IPGRI 3 all leaves dropped 5 intermediate 7 all leaves persistent

[7] To be completed.

Pods position **(PODPOSIT: C 1)**

IPGRI
1 base
2 center
3 top
4 combination of 1,2 and 3
9 other (specify in ADDCHAR field)

Pods per plant **(PODPLANT: C 3)**

IPGRI Average number of pods per plant out of 10 plants at crop density

Pod - length **(PODLENGTH: C 2)**

IPGRI (average length measured in cm of the largest fully expanded immature pods from 10 random normal plants)

Pod - width (at centre of green-mature pods) **(PODWIDTH: C 2)**

(average width measured in mm of the largest fully expanded immature pods from 10 random normal plants)

Pod - cross-section (fully expanded immature pods) **(PODCROSS: C 1)**

IPGRI
1 very flat
2 pear-shaped
3 round elliptic
4 figure of eight
9 other (specify in ADDCHAR-field)

Pod - curvature (fully expanded immature pods) **(PODCURV: C 1)**

IPGRI
1 straight
3 slightly curved
5 medium curved
7 strongly curved
9 recurving

Pod - suture strings (average of 10 pods) **(STRING: C 1)**

IPGRI
0 absent
3 few strings
5 moderately stringy
7 very stringy

Pod - ground colour (at fully expanded immature pod) **(PODCOLIMM: C 2)**

IPGRI
1 dark purple
2 carmine red
3 purple stripe on green
4 carmine red stripe on green
5 pale red stripe on green
6 dark pink (rose)
7 normal green
8 shiny green
9 dull green to silver grey
10 golden or deep yellow
11 pale yellow to white
99 other (specify in ADDCHAR field)

Pod - pattern colour (at immature pod) **(PODPAT: C 7)**

IPGRI c (more than one possible, separated with semicolon, e.g.: 3;5)
0 no pod pattern
1 pink
3 red
5 violet
7 black
9 other (specify in ADDCHAR-field)

Pod - density of pigment spots **(PODSPOT: C 1)**

UPOV
3 sparse
5 medium
7 dense

Pod - colour at physiological maturity **(POCOLMAT: C 1)**

IPGRI
1 dark purple
2 red
3 pink
4 yellow
5 pale yellow with coloured mottling stripes
6 persistent green
9 other (specify)

Pod - dry pod colour **(DRYPODCOL: C 2)**

IPGRI
1 dark purple
2 carmine red
3 purple stripe on green
4 carmine red stripe on green
5 pale red stripe on green
6 dark pink (rose)
7 normal green
8 shiny green
9 dull green to silver grey
10 golden or deep yellow
11 pale yellow to white
99 other (specify in ADDCHAR field)

Pod - wall fiber /constriction (at dry maturity) **(PODWALL: C 1)**

UPOV/IPGRI
0 no constriction
1 slightly constricted
3 medium constricted
5 strong contracting around seeds
7 leathery podded (no spontaneous opening)
9 excessive shattering with strong twisting

Pod - beak position **(BEAKPOSIT: C 1)**

IPGRI 1 marginal 2 non marginal (central) 9 other

Pod - beak orientation **(BEAKORIENT: C 1)**

IPGRI
3 upward (curving to dorsal side)
5 straight
7 downward (curving to ventral side)

Pod - beak length (measured in mm from end of last loculus) **(BEAKLENGTH: C 2)**

IPGRI

Pod - locules per pod **(PODLOCULES: C 2)**

IPGRI (number of locules from longest pod of 10 random normal plants)

Pod - number of seeds **(PODSEED: C 2)**

IPGRI (average number of seeds per pod out of 10 pods)

Plant type **(TYPE: C 1)**

IPGRI
1 determinate bush
2 indeterminate bush with erect branches
3 indeterminate bush with prostrate branches
4 indeterminate bush with semi-climbing main stem and branches
5 indeterminate bush with moderate climbing ability and pods evenly up the plant
6 aggressive climbing ability and pods mainly on the upper plant
9 other (specify in the ADDCHAR-field)

Plant height **(HEIGHT: C 4)**

IPGRI (average of 5 plants at maturity, expressed in cm)

Lodging **(LODGING: C 1)**

IPGRI 3 upright (all plants) 5 intermediate 7 lodged (all plants)

Maturity **(MATURITY: C 3)**
IPGRI (number of days from emergence until 90% of pods are mature)

Seed - ground colour (**main colour**, at freshly harvested seeds) **(SEEDCOLOR: C 2)**
UPOV / add.

1 white / off-white	7 red
2 green or greenish	8 violet / blue
3 grey / bluish	9 black
4 yellow	10 purple / wine-red
5 yellow-brown (buff)	11 pink / lilac
6 brown	99 other (specify in ADDCHAR-field)

Seed - pattern colour (**minor colour**) **(SEEDPAT: C 9)**
UPOV / add. (more than one expression possible, separated with a semicolon, e.g.: 3;5)

1 white / off-white	7 red
2 green or greenish	8 violet / blue
3 grey / bluish	9 black
4 yellow	10 purple / wine-red
5 yellow-brown (buff)	11 pink / lilac
6 brown	99 other (specify in ADDCHAR-field)

Seed - character of pattern (seed coat pattern) **(PATCHAR: C 2)**
IPGRI

	0 no pattern	6 marginal pattern
1 constant mottled	7 broad striped	
2 striped	8 bicolour	
3 rhomboid spotted	9 spotted bicolour	
4 speckled (punctatus)	10 pattern around hilum (face)	
5 circular mottling	99 other (specify in ADDCHAR field)	

Seed - veining **(SEEDVEIN: C 1)**
IPGRI / UPOV 0 absent 3 weak 9 strong

Seed - length **(SEEDLENGTH: C 2)**
IPGRI (average in mm of 10 seeds from 10 plants; measured parallel to the hilum)

Seed - height **(SEEDHEIGHT: C 2)**
IPGRI (average in mm of 10 seeds from 10 plants, from hilum to opposite side)

Seed width **(SEEDWIDTH: C 2)**
IPGRI (average in mm of 10 seeds from 10 plants)

Seed - shape longitudinal (at median longitudinal section) **(SEEDSHAPEL: C 1)**
IPGRI / UPOV

	1 round / circular	3 cuboid / elliptic
2 oval / circular to elliptic	4 kidney shaped	
	5 truncated (barrel shaped)	

Seed - shape cross (at median cross section) **(SEEDSHAPEC: C 1)**
UPOV

	1 very flat	4 broad elliptic
2 narrow elliptic	5 circular	
3 elliptic	6 square oval	

Seed - hundred kernel mass **(SEEDHKM: C 5)**
IPGRI/ISTA (Mass of 100 seeds at a moisture content of 12-14%, expressed in grams with one decimal, as average of 800 seeds)

Seed - protein content **(PROTEIN: C 4)**
IPGRI (expressed in % with one decimal)

Pedigree **(PEDIGREE: C 70)**

Additional characterizations **(ADDCHAR: C 254)**
(data referred to as *other* in the above list)

Status of National Collections

Grain legume collections in Bulgaria

S. Angelova and Tz. Stoilova

Institute for Introduction and Plant Genetic Resources "K. Malkov" (IIPGR), Sadovo, District Plovdiv, Bulgaria

Grain legumes are of great importance for Bulgaria. In the collections of IIPGR, Sadovo, they are represented by pea, beans, lentil, lupin, chickpea and faba beans. Their study and evaluation is carried out in relation to the different breeding programmes and use in the country (Angelova and Guteva 1995; Angelova and Yancheva 1996a).

The two larger collections, pea and bean, are represented by the following more important species: *Pisum sativum, P. arvense, P. asiaticum, P. transcaucasicum* convar. *speciosum, P. hortense, P. elatius, Phaseolus vulgaris, Ph. multiflorus, Ph. lunatus, Ph. angularis* and *Ph. aureus.* The status of grain legume collections is shown in Table 1.

Table 1. Status of grain legume collections in Bulgaria

		Long-term	Working collection			
Genus	Total	conservation	total	% cultivars	% lines	% others
Pisum	2100	610	1490	65	5	30
Phaseolus	1710	708	1000	67	5.5	27.5
Lupinus	284	70	217	85	–	15
Cicer	285	285	55	100	–	–
Lens	512	385	150	96	2.5	1.5
Vigna	267	101	160	65	–	35

The Bulgarian accessions are mostly old local cultivars and populations, all newly bred cultivars and released cultivars. Foreign accessions consist mainly of cultivars and breeding lines from France, Russia, Poland, USA, The Netherlands and the Czech Republic. The wild species are included in *in situ* conservation (Table 2).

Table 2. Number of Bulgarian accessions

Genus	Total	Cultivars	Breeder's lines	Old populations	Wild
Pisum	198	25	100	69	4
Phaseolus	276	14	–	262	–
Lens	10	8	–	–	2
Cicer	11	6	2	–	3
Vigna	2	–	–	2	–
Lupinus	6	–	–	–	6

Pea has not been a major protein crop in the past in Bulgaria; until 1970 it occupied only 25 000 ha. However, during 1980-89, pea became the most important grain legume crop and reached up to 300 000 ha. Later it decreased by about 10 times owing to the changes that took place in agriculture. Now it is again appreciated by the farmers, mostly for feeding livestock.

Field beans are a traditional crop for Bulgaria and are of considerable importance as a food crop. In the 1950s they occupied the greatest area of all legumes – more than 100 000 ha. Later, and for a long period of time, only about 60 000 ha remained under cultivation. At present their acreage is increasing.

An intensive breeding programme has been developed for those two crops in three institutes in Bulgaria: Pleven, General Toshevo, Obraztsov Tchiflik. IIPGR works in close collaboration with them. Breeding is mainly targeted toward earliness, winter resistance and lodging resistance.

Lentil was mostly grown in Bulgaria during the 1930s, on 14 000 ha. Then its area decreased progressively and since 1963 to the present it is not more than 2000-3000 ha. Greater commercial interest in the last few years led to increases in and renewal of lentil collections and breeding was directed toward cultivars with higher yields and larger seeds.

Chickpea is an old crop in Bulgaria. The maintenance and enlargement of the lupin collections is carried out for education and research. The studies are directed toward the biochemical composition of the grain and its alkaloid content. In the past it was widely used for green manure.

The most important character for grouping of the collections is maturity (Makasheva 1973; Angelova and Guteva 1995). According to that character all legumes are divided into extremely early, early, medium-early, late, very late. The pea and lentil collections belong mainly to the early and medium-early groups and those of field beans, lupin and chickpea to the medium-early and late groups. The early accessions express their potential best and they are the most requested by breeders.

The medium-early accessions have good properties but their yield is not stable throughout the years, depending mostly on the temperatures during flowering and the rainfall during grain formation. The dry and hot Bulgarian summer does not allow for the late cultivars to express their potential and their grain yield is variable.

The very late cultivars produce less seeds. Their cultivars are difficult to maintain and they have almost no place in the cultivar list of the country.

An important trend is the creation of collections of winter-resistant accessions. This is done mostly for pea. The valuable quality of winter resistance is possessed by about 400 accessions of pea. The percentage of plant survival has been checked for 10 years (Angelova and Yancheva 1996b). In the first place a certain number of local and old foreign populations of subsp. *arvense, austrianum* type can be mentioned, with more than 95% winter survival. Among these are 'CAA', 'P-226' from Russia, 'Shampaign' from France, 'N37', 'N63', 'E-48', 'P-1' from Bulgaria. The accessions 'N37-Kneja' and '63' from Kalofer are original local forms and 'E348' is an accession from the Bulgarian-Russian expedition in 1959.

An ecological trial in five sites in the country shows that a great part of the accessions of forage type overwinter successfully for a long period of time. The grain cultivars, including the *afila* type, are typical for the great instability of this character, the percentage of overwintered plants ranging from 50 to 90 (Angelova and Yancheva 1996a; Anonymous 1998a, 1998b).

The pea accessions with quick growth and development are very valuable in the Bulgarian climate when used for green forage because they accumulate dry matter quickly. Numerous cultivars from Bulgaria, Poland and Sweden have been selected.

Work has started on the creation of winter lentil and lupin collection forms. For field beans, research focuses on accessions germinating at low temperatures, early in spring.

The percentage of local cultivars populations and forms kept in the genebank in Sadovo is greatest for the field beans among all legumes (Table 3). During collecting expeditions, seeds from mountains, semi-mountainous and flat parts of the country have been collected and are now preserved. These accessions are extremely diverse and polymorphic as a result of many years of local breeding. In many parts of Bulgaria old local beans are still grown in kitchen gardens. Local populations of the other legume crops are preserved too but they are not as numerous since they are not grown in the private farms. Possibilities for on-farm conservation are considered, in collaboration with NGOs, private farmers, etc. for protection of old plant forms.

The following species are maintained *in situ* in different parts of the country (Strandja, Black Sea coast, East Rhodope): *Lupinus angustifolius, Lupinus graecus, Cicer montbretii, Lens ervoides, Lens nigricans* and *Pisum elatius* (Table 4).

Ex situ collections of *Pisum elatius* have been created in Sadovo.

Table 3. Status of the *Phaseolus* collection at IIPGR, Sadovo

	Number					Conservation		
Species	**local**	**introduced**	**unknown**	**total**	**%**	**short-term**	**long-term**	**Evaluated accessions**
Ph. vulgaris	263	1263	121	1647	96.3	1647	381	565
Ph. coccineus	13	10	–	23	1.35	23	5	5
Ph. lunatus	–	15	–	15	0.88	15	5	5
Ph. acutifolius	–	25	–	25	1.46	25	4	–
Total	**276**	**1313**	**121**	**1710**	**100**	**1710**	**395**	**570**

Table 4. *In situ* conservation of grain legumes in Bulgaria

Species	Sites	Distribution
Lupinus angustifolius *Lupinus graecus*	East Rhodope mountain	single plants
Cicer montbretii	Strandja mountain	single plants
Lens ervoides *Lens nigricans*	Strandja mountain East Rhodope mountain	single plants
Pisum elatius	North and South Black Sea coast East Rhodope mountain	associations

A network for ecological trials of the pea collections has been created. This allows periodic selection of the accessions which are most plastic and adapted to Bulgarian conditions, for inclusion in the different breeding programmes (Anonymous 1998a, 1998b). A 3-year collaborative study of grain cultivars has been undertaken together with INRA, France (Table 5).

Table 5. Grain yield of different pea cultivars (100 kg/ha). Ecological international studies, 1994

	Bulgaria			France		
Sowing date	**Sadovo 14/03**	**Ressen 24/03**	**Kubratt 24/03**	**Mons 14/03**	**Dijon 09/03**	**Rennes 17/03**
Solara	17.3	23.7	25	53.4	66.75	64.6
Baccara	19	24	265	57.0	74.80	76
Alex	16.5	23.3	27.4	59.1	59.42	68.6
Messire	17.8	25.5	26.6	53.8	66.45	71.9
Countess	13.6	23	22.0	31.65	56.21	67.1
Ducat	16.7	21.6	24.5	42.18	44.15	59.35
Jubileen	13.7	20.4	21.17	41.97	52.71	46.66

The data revealed great differences in the grain yield of the tested cultivars for the different countries and for the ecological trials in the countries (Anonymous 1998a, 1998b).

The maintenance and enlargement of the grain legume crop collections, including diverse genetic material, helps the development of an effective breeding in Bulgaria and the creation of cultivars suitable for the country. The collected information allows the use of the collections for different purposes now and in the future.

References

Angelova, S. and J. Guteva. 1995. Biological and economical characterization of some local and introduced pea cultivars. Plant Sci. 32:1-2.

Angelova, S. and Ch. Yancheva. 1996a. Comparative evaluation of some accessions of winter forage pea for grain. Plant Sci. 33:10.

Angelova, S. and Ch. Yancheva. 1996b. Biological and agricultural characteristics of some accessions of winter forage pea. Plant Sci. 33:10.

Anonymous. 1998a. Contribution au développement du pois protéagineux en Bulgarie. INRA, Laboratoire de génétique et d'amélioration des plantes, Mons, France.

Anonymous. 1998b. Le pois protéagineux en Bulgarie – un problème de températures. Lycée agricole de Grézancy, France.

Makasheva, R.K. 1973. Gorokh [Peas]. Kolos, Leningrad, USSR. 312pp.

The groundnut collection in Bulgaria

Stanko Georgiev

Institute for Introduction and Plant Genetic Resources "K. Malkov" (IIPGR), Sadovo, District Plovdiv, Bulgaria

The history of groundnuts in Bulgaria dates back to over 100 years. They were first imported in 1896 and sown on 0.7 ha. During 1899-1900 they were grown at the Agricultural School in Sadovo. During 1902-07 the first experiments were carried out by the former Agricultural Experimental Station in Sadovo (currently IIPGR) in order to specify their economic traits and possibilities for cultivation in the country. The results were filled with hope: the crop offered good perspectives and its dissemination began in the Plovdiv region. In 1926 the area under this crop was 57.4 ha and gained economic importance (Georgiev 1992). During the last nine years, in spite of the difficulties due to the transition to a market economy, the area cultivated to groundnuts was between 10 000 and 15 000 ha, thus ranking second after sunflower among oil crops. Bulgaria is the biggest producer of groundnuts in Europe with about 81% of the continental cultivated area and 56% of the production (Bentcheva and Georgiev 1997; Georgiev and Bentcheva 1998). The first experiments carried out in the former Agricultural Experimental Station during the period 1902-07 consisted of introduction and investigation of varieties from different countries. With periods of interruption and restoration (1912-18, 1934-45), this activity has continued up to the present in Sadovo. Originally the groundnut collection was created as a small working collection and it was supported and used by groundnut breeders. This activity was enlarged with the establishment of IIPGR in 1977 in Sadovo, and during 1977-84 the collection contained 199 accessions. From 1984 to 1998 the number of accessions in the collection increased to 317, including those whose investigation is not completed (Table 1).

Table 1. Status of the groundnut (*Arachis hypogaea* L.) collection in Bulgaria

				Type				
				Cultivars				
Subspecies	Variety	Botanical type	Total number	Foreign	Local	Unknown	Long-term conservation	For investigation
fastigiata	*fastigiata*	Valencia	101	75	9	17	98	3
	vulgaris	Spanish	124	111	2	11	116	8
	subtotal		225	186	11	28	214	11
hypogaea	*hypogaea*	Virginia	92	63	4	25	7	5
	hirsuta	Peruvian	–	–	–	–	–	–
		runner	–	–	–	–	–	–
Total			**317**	**249**	**15**	**53**	**301**	**16**

The collection covers the whole botanical diversity of the species *Arachis hypogaea* L. with the exception of variety *hirsuta* of subsp. *hypogaea*, which has a long vegetation period and spreading habit, and with limited dissemination in Brazil and Peru. It is impossible to maintain the groundnut collection containing the whole botanical diversity of the species *Arachis hypogaea* under field conditions in Bulgaria or any other European country because of the limiting temperature factor. The collection includes varieties and accessions from 32 countries with different geographic origins (Table 2).

Table 2. Distribution of accessions by country of origin

Country	Number	Country	Number
Algeria	1	Libya	1
Argentina	4	Morocco	17
Australia	3	Mexico	1
Brazil	1	Egypt	8
Bulgaria	20	Portugal	35
Vietnam	7	USA	46
Guinea	1	Former Soviet Union	29
Greece	6	Senegal	1
Israel	8	Syria	2
India	16	Somalia	1
Indonesia	1	The Netherlands	1
Italy	20	Hungary	31
Iraq	1	Turkey	3
China	8	Yugoslavia	7
Congo	3	Japan	7
Cuba	2	Given by hand	4
Laos	5	**Total**	**301**

In a first stage, the collection of 199 accessions was fully studied on a taxonomic basis for 39 morphological and economic characters, including productivity, early maturity, resistance to diseases, adaptability to mechanized cultivation, reaction to local strains of root-noduling bacteria from the genus *Rhizobium*, reaction to herbicides applied in the agricultural practice, economically important traits of the pods and seeds, and chemical composition of the seeds. To distinguish the most promising accessions, as an initial material for breeding programme and production, the collection was quantitatively estimated by the 100-point system method, improved by Georgiev (1988). This method is based on the so-called 100-point system, a mechanism to assign a weighted value to accessions under investigation, in comparison with ideal accessions, varieties taken as standards, and parents of breeding material which possess all positive characteristics expressed at the highest degree, and are disease resistant. The estimation of the comparative value of the accessions under investigation is obtained by multiplying the values of their phenotypic expression of the traits, with weighted values (points) ranging from 0 to 100, according to the economic importance of the crop. The variation of some quantitative traits in different taxonomic varieties under temperate climate is determined by a coefficient of variation. With the aim to assist plant breeding, the relations between quantitative traits and between these and the yield, according to the taxonomic variety, are determined by correlation and path coefficients (Georgiev 1988, 1994). During the last few years a new direction was included: resistance to carbonate chlorosis, caused by lack of iron in carbonate soil with pH above 7.

On the basis of the taxonomic investigation of the groundnut collection in IIPGR-Sadovo, the following conclusions were drawn and are taken in account for groundnut introduction and breeding:

1. Under temperate climate conditions (central and south Bulgaria), the accessions of subsp. *fastigiata* var. *fastigiata* 'Valencia' type are the highest yielding with an average pod yield of 2924 kg/ha. During the study period the highest yields of the best 'Valencia' type varieties reached 4984 kg/ha, but no accessions produced more than 'Sadovo 2609' and 'Kalina' (controls). The accessions of 'Spanish type' rank second with an average yield of 2834 kg/ha, the highest yield being 4676 kg/ha. Varieties of subsp. *hypogaea* are low yielding: the pod yield of 'Virginia Bunch' is 1869 kg/ha and that of 'Virginia spreading' type 1692 kg/ha.
2. The vegetation period of the accessions of 'Valencia' and 'Spanish' types under the conditions in Sadovo averages 136 days, and those of 'Virginia' types ('Virginia Bunch' and 'Virginia spreading') 156 days. Under our climatic conditions they do not complete their vegetation cycle and a large part of pods and seeds do not mature before the first

frost. For this reason, the accessions of this subspecies are less productive under our climatic conditions in spite of their higher productive potential. For the same reason, only a few accessions are maintained in the collection, since their reproduction and preservation in field conditions involve a high risk of losses, and their cultivation in greenhouse is very expensive.

3. The accessions of 'Virginia' type are more resistant to diseases (*Fusarium* sp., *Sclerotinia arachidis, Phyllosticta arachidis, Oidium arachidis*) than those of subsp. *fastigiata.* Within subsp. *fastigiata,* the 'Spanish' type is more sensitive than the 'Valencia' type. This character varies widely between the cultivars of 'Valencia' and 'Spanish' types, and less for 'Virginia Bunch' and 'Virginia spreading' types. In each botanical group there are cultivars with good resistance and others with high sensitivity to the mentioned diseases. An estimation of the reaction of the varieties to these diseases is carried out according to a 1-5 point system and they are classified into groups. In this respect, under the conditions of temperate climate, all resistant accessions from subsp. *fastigiata* are more suitable as breeding material because they have a shorter vegetation period than those of 'Virginia' type and because the long vegetation period in the hybrid generations has a dominant inheritance.
4. The accessions of both taxonomic subspecies of groundnuts do not show specific reaction to herbicides. This conclusion assisted us in further work and this aspect was eliminated in the following investigations with new accessions.
5. The accessions of subsp. *hypogaea (*'Virginia' type) generally show better affinity with local strains of *Rhizobium* and the yield increase with root-noduling bacteria averages 14.8%, whereas for subsp. *fastigiata* it is 7.8%. Moreover, the level of reaction has been established for each botanical variety, showing that some varieties increase their yield by 24.2%, while others show little or no effect.
6. Varieties of subsp. *fastigiata* and botanical type 'Virginia Bunch' are suitable for mechanized cultivation, owing to their erect habit (respectively score 1.8 and 2.6) and compact distribution of the pods around the crop root. Those of 'Virginia spreading' type are unsuitable because of their spreading habit (score 4.9).
7. The varieties of subsp. *fastigiata* surpass those of subsp. *hypogaea* for some economic traits. The ripe pods of the first subspecies average 72.5%, against 59.2% for the second. The average rate of seed shelling is 67.5% in subsp. *fastigiata* and 60% in subsp. *hypogaea.* The seeds of the varieties of subsp. *hypogaea* are bigger than those of subsp. *fastigiata,* with a 1000-seed weight of 619 g against 416.4 for 'Valencia' type and 361.4 g for 'Spanish' type.
8. The fat and protein contents in the seeds of the varieties of subsp. *fastigiata* are 50.4% and 28.6% respectively, while for subsp. *hypogaea* they are 46.9% and 26.7% respectively.
9. Because of the long vegetative period and high percentage of unripe pods under the Bulgarian climatic conditions, the varieties of subsp. *hypogaea* develop a bad flavour. They are not suitable for production and can be used only as groundnut breeding material.

These conclusions have been confirmed by the last investigations with the new accessions. The results of these investigations have been presented as part of a Doctor of Science Thesis (Georgiev 1988) and are successfully used in groundnut breeding in Bulgaria (Georgiev 1994).

Owing to the limiting temperature factor, groundnut is grown only on a small scale in other countries of southern and southeastern Europe (Italy, Greece, Former Yugoslav Republic of Macedonia, Romania and Hungary), which also maintain a limited number of accessions. In connection with the future development of the groundnut collection in Europe, it is necessary that a Central Crop Database be established in the framework of the ECP/GR Working Group on Grain Legumes in order to support breeding work in these countries. Bulgaria is situated at the centre of the Balkan Peninsula and is able to set up and maintain this database.

References

Bentcheva, N. and S. Georgiev. 1997. Situation and prospects of groundnuts production in Bulgaria. J. Agric. Econ. and Manage. 7-8:43-48.

Georgiev, S. 1988. Agrobiological and technological studies on groundnut taxonomical variability of the species *Arachis hypogaea* L. under conditions of Central Southern Bulgaria. Dr Sc. Thesis, Agricultural Academy Sofia, Bulgaria.

Georgiev, S. 1992. Groundnut production. Aliga, Haskovo.

Georgiev, S. 1994. Utilization of the plant resources in the groundnut breeding. Plant Sci. 31: 3-4.

Georgiev, S. and N. Bentcheva. 1998. Peanuts production costs according to forms of ownership. J. Agric. Econ. and Manage. 8:27-32.

Status of the grain legume collections in Cyprus

Athena Della
Agricultural Research Institute, Nicosia, Cyprus

Collection/conservation

Accessions (n=101) of the local variety of faba bean (*Vicia faba* L. var. *major*), which is still the main variety grown, were collected in 1980 from different areas of Cyprus (Della 1980). Twenty-eight accessions of the local varieties of chickpea (*Cicer arietinum* L.), 12 of ochrus vetch [*Lathyrus ochrus* (L.), DC.] and 19 of lentil (*Lens culinaris* Medik) were collected during a multicrop collection mission in 1984 (Della 1984). Six accessions of haricot bean (*Phaseolus vulgaris* L.) and eight accessions of cowpea (*Vigna unguiculata* L.) were collected during 1990 (Della 1995, 1996, 1997).

Germplasm is stored at the National (CYPARI) Genebank at 0-4°C and 50% RH in laminated foil bags. Duplicates were sent to several institutions. Viability tests are carried out regularly and regeneration of the material is carried out when necessary.

Lathyrus ochrus (L.) DC. and *Lens culinaris* have been recorded in the wild (Meikle 1977). Seed has not been collected, as yet, from the wild to be conserved in the National Genebank and no measures have been taken for their conservation *in situ.*

Documentation

A database was created to record the conservation and regeneration / multiplication of the germplasm collection in the National Genebank using Microsoft Access version 2.0. The fields used are: accession number (accno), line number (line no), species, previous regeneration, last regeneration, weight (g), other information. The total number of records so far is 11 394 (7987 records of *Triticum durum* collection and 3407 of *Hordeum vulgare*). The computerization of seed stock data concerning the grain legumes collection will follow. In addition, the passport data of *Triticum durum*, *Hordeum vulgare*, *Vicia faba*, *Vicia sativa*, *Vicia ervilia*, *Lathyrus ochrus*, *Lathyrus sativus*, *Lens culinaris*, *Cicer arietinum*, *Pisum sativum* and *Amygdalus communis* were computerized.

The passport information concerning grain legumes was forwarded to the European databases.

Characterization/evaluation

Broad bean

The collection of broad bean (101 accessions) was grown during 1980-82 under irrigation and under rain-fed conditions for characterization / preliminary evaluation. In total, 38 descriptors were studied. The local cultivar was not uniform for a number of characters such as grain size and shape, earliness, grain yield, plant height, protein content, etc. The results of this study as well as the collecting data and the variation present were reported by Della (1986, 1988).

Selected Cyprus germplasm was tested in yield trials, 1981-87, under both irrigated and dryland conditions. Significant differences in the agronomic traits studied, such as grain yield, 1000-grain weight, time to flowering, plant height and protein content, were detected among accessions. A high-yielding, early flowering and large-seeded population of the local cultivar was recommended and released to farmers (Della 1990).

Other grain legumes

Characterization / evaluation has not as yet been carried out on other leguminous crops conserved in the National Genebank.

Breeding faba bean for the freezing and canning industry

This programme was initiated in 1987, with the aim to create a white-flowering, white-seeded variety, suitable for the freezing and canning industry. Selected germplasm of the Cyprus landrace, crossed and backcrossed at Wye College, UK, during 1987-88, was grown at Athalassa, for selfing, intercrossing and selection from 1987 to 1991. Seeds from selected white-flowering, white-seeded plants were grown at Zygi (1991-96), and at Paphos (1992-93) for further selection and multiplication. Plants were grown in insect-proof screen cages, and bumble bees were used to promote pollination. The white-flowering, white-seeded population was tested in 1993-94 in preliminary yield trials at Morocambos and Astromeritis. Using selected seed from the isolated plots at Zygi, trials were conducted in 1994-97 at the same sites. Results for 1995-97 (mean of six environments) are given in Table 1. The new variety is under multiplication.

Table 1. Yield and other characteristics of faba beans tested during 1994-97

Varieties	Yield (100 kg/ha)	1000-grain weight (g)	Flowering (days)	Plant height (cm)	Protein content (%)
Local (check)	43.46a	1890a	77b	76.6b	29.50a
Selected population	31.70b	1086b	83a	93.7a	29.73a

References

Della, A. 1980. Broad bean collecting in Cyprus. Plant Genet. Resour. Newsl. 44:17-19.

Della, A. 1984. Report on a mission to collect grain and forage legumes in Cyprus, May / June / July, 1984 (unpublished).

Della, A. 1986. Collection of local broadbeans at the CYPARI Genebank: Passport, characterization and preliminary evaluation information. Miscellaneous Reports 27, Agricultural Research Institute, Nicosia. 47pp.

Della, A. 1988. Characteristics and variation of Cyprus faba bean germplasm. FABIS Newsl. 21:9-12.

Della, A. 1990. Selected local faba beans (*Vicia faba* L. var. *major*) for cultivation. Technical Bulletin 115, Agricultural Research Institute, Nicosia. 10pp.

Della, A. 1995. History and geography combine to make Cyprus a floristic wonder. Diversity, Special issue on the Mediterranean region.

Della, A. 1996. Report on grain legume germplasm in Cyprus. Pp. 36-37 *in* Report of a Working Group on Grain Legumes. First meeting, 14-16 July 1995, Copenhagen, Denmark (T. Gass, M. Ambrose, J. Le Guen, A. Hadjichristodoulou and S. Blixt, compilers). International Plant Genetic Resources Institute, Rome, Italy.

Della, A. 1997. Collecting, conserving and utilizing plant genetic resources in Cyprus. Agricultural Research Institute, Nicosia, Cyprus. Miscellaneous Reports 65. 12pp.

Meikle, R.D. 1977. Flora of Cyprus. Vol I. Bentham-Moxon Trust, Royal Botanic Gardens, Kew. 832pp.

The status of grain legumes in the Czech Republic

Miroslav Hýbl

AGRITEC, Research, Breeding & Services, Ltd., Sumperk, Czech Republic

Introduction

Between 1993 and 1997, grain legume production in the Czech Republic decreased from 90 110 ha to 49 630 ha (Table 1). This decrease was due to economic reasons: grain legumes could not compete with cereals in yield stability and market prices. However the harvested area increased to 58 148 ha (17%) in 1998 (Ministry of Agriculture of the Czech Republic 1997). The low quality and quantity of seed material, resulting from poor weather conditions during maturity and harvest periods in the main production centres last year, prevented further increase.

Pea, the most important grain legume species in the Czech Republic, contributed a great deal to this increase. It is commonly grown on 90% of the grain legumes area, the other species (beans, lentil, faba bean, vetch) taking approximately 10%. Peas are mostly grown for dry seeds, rich in proteins, and about 75-80% of the production is exported. Only 10% of the total pea production is used for fodder and the rest is seed material and reserve.

Despite the high yield potential of **beans**, the current yield is not satisfactory. Beans are very sensitive to poor growing conditions and profitability is dependent on high investments

Table 1. Production of grain legumes in the Czech Republic

	Area	Total production		Import	Export
Year/species	(1000 ha)	(1000 t)	(t/ha)	(1000 t)	(1000 t)
Pea					
1993	82.5	201.7	2.45		
1994	61.7	149.3	2.42	8.9	104.6
1995	52.2	130.4	2.50	3.8	94.1
1996	47.2	120.1	2.55	6.8	75.9
1997	44.4	93.0	2.12	5.4	43.0
1998	51.7	146.0(*)	2.51(*)	–	–
Beans					
1993	0.22	0.270	1.21		
1994	0.29	0.220	0.76	7.0	2.4
1995	0.29	0.378	1.32	5.0	1.5
1996	0.34	0.480	1.40	4.0	1.6
1997	0.28	0.370	1.30	4.0	1.5
1998	0.33	0.570	1.70	3.9	0.5
Lentil					
1993	0.08	0.073	0.92		
1994	0.27	0.170	0.65	7.1	0.7
1995	0.01	0.010	0.87	7.7	1.1
1996	0.01	0.010	0.89	7.4	1.0
1997	0.003	0.003	0.90	7.5	0.9
1998	0.003	0.002	0.50	7.1	1.3
Other species (faba bean, vetch, chickpea)					
1993	10.8	25.4	2.36		
1994	8.7	13.6	1.56	0.09	0.8
1995	7.4	13.3	1.80	0.07	1.3
1996	7.1	14.9	2.11	0.20	3.3
1997	6.5	13.5	2.10	0.15	1.2
1998	6.1	11.6	1.9	0.12	0.6

Source: Czech Statistical Office 1997, (*) estimated value AGRITEC.

in harvesting technology. Given the high imports of beans, their production could be increased to 600-700 t but owing to limiting soil and climatic conditions the area cultivated under this crop cannot be increased further.

Lentil is much appreciated in the traditional Czech diet, but its soil, climatic and technology requirements limit its production, as for beans.

Although **faba bean and other species (vetch, chickpea)** are traditional species in the Czech Republic, their production decreased rapidly during recent years. Their varieties have the highest yield potential of all grain legume species grown in the Czech Republic. They require a high level of technology, and their sensitivity to the existing climate and high sensitivity to chemical treatments result in an average yield of 2 t / ha.

The grain legume breeding programme based on national germplasm started in 1952. Several good varieties (e.g. 'Bohatyr', 'Smaragd', 'Duel') were bred and registered in many countries. The Czech national grain legume collections were established at the same time as the breeding programme The collections include genetic resources which are important for breeders and for preservation of biodiversity.

The activities of the Czech national grain legume collections are coordinated by the "National Programme for Saving Biodiversity", financially supported by the government. Passport and characterization data are fully computerized and available. The collections include a total of 4384 accessions belonging to seven genera, representing 11% of the total national germplasm holdings. Grain legume holdings are listed in Table 2.

Table 2. Grain legume holdings in the Czech Republic

Genus	Number of accessions	% of total
Pisum	2016	42.1
Vicia	723	15.1
Phaseolus	1281	26.7
Glycine	192	4.0
Lupinus	80	1.7
Cicer	70	1.5
Lathyrus	22	0.5
Total	**4384**	**100**

Introduction, characterization and evaluation

Introduction, characterization, regeneration, evaluation and documentation of new accessions are carried out on the basis of "Frame Methods", which are updated every 4 years.

New material is obtained through collaboration with different foreign and Czech institutes, genebanks, universities and seed production companies. Expeditions for the collecting of wild species are organized, particularly in natural reserves.

Germplasm collections include Czech original landraces, old and recent varieties, wild forms collected in expeditions. They contain accessions from Europe, Asia, Africa, America and Australia.

New seed samples are multiplied in glasshouse or small plots. During multiplication, the health status is observed and a preliminary characterization is made. Evaluation and regeneration of accessions are carried out in trial plots (6 m^2). Regeneration of the accessions stored in short-term conditions is done every 4 years to maintain the germinative ability. The accessions of *Pisum* spp., *Phaseolus vulgaris, Glycine max* and *Cicer arietinum* are characterized for approximately 30-35 morphological traits, using the EVIGEZ Descriptor lists (scale 1-9). Descriptor lists are defined according to COMECON standards and were established and updated on the basis of consultation with grain legume breeders. A descriptor list was developed for *Lupinus* (Hýbl and Faberová 2000). *Vicia* and *Lathyrus* accessions will be evaluated on the basis of Lists of selected descriptors which are part of the EVIGEZ database description system.

Passport and characterization data are held in the database information system EVIGEZ, managed under FoxPro. Passport data are fully computerized and freely available.

Regarding characterization data, only 1699 accessions (35.6%) were evaluated and their data computerized.

Conservation

Germplasm is generally kept under good storage conditions, but is held in several different institutions (Table 3). The main priorities of the "National Programme for Saving Biodiversity" are mass regeneration and storage in the central long-term storage in the Research Institute of Crop Production (RICP) in Prague, because of the high cost of maintaining collections in several institutes. Seed samples are dried (5% moisture), put into glass jars and stored at low temperature in working (-10°C) and base (-25°C) collections. There are 2727 accessions of grain legumes in long-term storage conditions. Seed samples are freely available for scientific purposes.

The Czech and Slovak National Genebanks have recently concluded an agreement on safety-duplication (1998). The main objective of this agreement is to protect the most valuable part of the collection from damage. Implementation of this agreement will be a priority in the near future.

Table 3. Grain legume collections held in the Czech Republic

- **AGRITEC, Ltd. Sumperk**

Curator: M. Hýbl, Zemedelska 16, 787 01 Sumperk

Species	No. of samples
Pisum sativum	1155
P. elatius	2
P. abyssinicum	1
Vicia sativa	255
V. pannonica	19
V. villosa	60
V. faba	330
V. narbonensis	3
Other *Vicia* spp.	14
Phaseolus vulgaris	253
Glycine max	192
Lupinus spp.	68
Cicer arietinum	57
Total	**2409**

- **Research Institute of Crop Production (RICP), Gene Bank Department, Olomouc**

Curator: J. Losik, Slechtitelu 11, 783 71 Olomouc-Holice

Species	No. of samples
Pisum spp.	858
Vicia faba	45
Phaseolus spp.	1028
Total	**1931**

- **Research Institute for Fodder Plants, Ltd.**

Curator: Dr I. Zapletalova, Zahradni 1a, 664 41 Troubsko u Brna

Species	No. of samples
Cicer spp.	13
Lathyrus	22
Lupinus spp.	12
Vicia spp.	44
Total	**91**

Conclusions

The main objective of plant genetic resources work is to contribute to the understanding of genetic variation and its conservation. In the Czech Republic, priority was given to the collecting, evaluation and conservation of the species utilized in breeding programmes. The results of studies undertaken on the collections are regularly presented in scientific articles or annual reports.

The strategy of the "National Programme for Saving Biodiversity" is to collect the widest possible biodiversity and ensure long-term conservation of collections important for plant breeding in the Czech Republic and elsewhere. Considering that all passport data are computerized and continuously updated, the main activities at present are regeneration and storage of the germplasm under controlled conditions. Long-term storage facilitates dedicating more activities to evaluation and detailed study of the collection. In a first step, morphological evaluation of germplasm is undertaken. Polyacrylamide electrophoresis is used for more detailed evaluation and a catalogue of morphological and electrophoresis identification has been published (Pošvec and Griga 1997; Samec *et al.* 1998). It is planned to complete regeneration during the next 2 years and focus afterwards on detailed germplasm evaluation. Characterization and evaluation of the genus *Pisum* (Pavelkova *et al.* 1986), *Phaseolus* (Hornakova *et al.* 1991), *Glycine* (Pastucha *et al.* 1987) and *Cicer* (Hýbl *et al.* 1998) are carried out on the basis of national descriptor lists. A Descriptor list was developed for *Lupinus* and Lists of selected descriptors were generated for *Vicia* and *Lathyrus*. The lists will be derived partly from the UPOV, IPGRI and COMECON descriptor lists.

The agreement on safety-duplication seems to be very useful. Storage of the rarest Czech germplasm in the Slovak genebank increases its safety and opens possibilities for further collaboration.

References

Hýbl, M. and I. Faberová. 2000. Descriptor List *Lupinus* L. AGRITEC Sumperk, Genetic Resources No. 78. RICP Prague-Ruzyně. (*in press*).

Hýbl, M., M. Smolikova and I. Faberová. 1998. Descriptor List *Cicer arietinum* L. AGRITEC Sumperk, Genetic Resources No. 67. RICP Prague-Ruzyně. 14pp.

Hornakova, O., P. Hofirek, D. Hajek, G. Bolebruch, L. Gablechova, M. Teclova, E. Pippalova, L. Pastucha, I. Bareš and J. Sehnalova. 1991. Descriptor List genus *Phaseolus* L. Genetic Resources No. 54. RICP Prague- Ruzyně.

Ministry of Agriculture of the Czech Republic. 1997. Grain Legumes - situation report. Ministry of Agriculture of the Czech Republic. (in Czech).

Pastucha, L., T. Sinsky, P. Hofirek, I. Bares and J. Sehnalova. 1987. Descriptor list genus *Glycine* Willd. Genetic Resources No. 36. RICP Prague-Ruzyně.

Pavelkova, A., J. Moravec, D. Hajek, I. Bares and J. Sehnalova. 1986. Descriptor list genus *Pisum* L. Genetic Resources No. 32. RICP Prague-Ruzyně.

Pošvec, Z. and M. Griga. 1997. Utilization of isoenzyme and protein spectra for identification of pea (*Pisum sativum* L.) cultivars. Pp. 55-65 *in* New methods for documentation and characterisation of PGR (J. Pelikán, I. Zapletalová and R. Pokorný, eds.). Research Institute for Fodder Plants, Troubsko.

Samec, P., Z. Pošvec, J. Stejskal, V. Našinec and M. Griga. 1998. Cultivar identification and relationships in pea (*Pisum sativum* L.) based on RAPD and isoenzymes. Biol. Plant. 41 (1):39-48.

French activities on grain legume collections

***G. Duc*[1] *and J. Le Guen*[2]**

[1] *INRA, Dijon, France*

[2] *INRA, Le Rheu, France*

Since the last report presented in 1995 in Copenhagen, little new information can be added.

Germplasm collections in France are held by different institutions (INRA, GEVES, private companies). Major collections are kept by INRA-Versailles for pea, INRA-Lusignan for lupin, INRA-Rennes and INRA-Dijon for faba bean. A collection of French bean is also held in the GEVES Station at Le Magneraud.

Under the frame of BRG (Bureau des Ressources Génétiques), a general agreement called *Charte* linking the different institutions has been established. It defines the sharing of responsibilities and guidelines for genetic resources conservation for a National Collection (= French core collection), in addition to (or in parallel with) the working collections used for breeding purposes by INRA and the different private societies. Our collections are renewed in field situations for pea and lupin and under isolation from insects for faba bean. Seeds are kept in low-humidity cold rooms (3°C) and sometimes under laboratory conditions for the short-term collections. There is no safety-duplicate at –20°C at present, but the BRG *Charte* foresees such maintenance conditions.

Characterization of faba bean genetic resources has stopped with the arrest of breeding programmes. Characterization of pea genetic resources is managed by a group of coordinated INRA laboratories.

Following the termination of *Vicia faba* breeding programmes, the related faba bean working collection will soon be added to the present 2000 accessions. No conclusion is presently proposed for the future availability of this breeding material for users outside INRA.

Our Web site is being prepared and will be available for access in the near future.

Status of plant genetic resources and research on grain legumes in Germany, 1998

S. Bücken[1], T. Gladis[2] and S. Wetzel[3]

[1] *BAZ (Federal Centre for Breeding Research on Cultivated Plants) - Gene Bank, Braunschweig, Germany*

[2] *ZADI/IGR (Central Agency for Agricultural Documentation and Information/Information Centre for Genetic Resources), Bonn, Germany*

[1] *IPK (Institut für Pflanzengenetik und Kulturpflanzenforschung) - Gene Bank, Gatersleben, Germany*

The most important grain legume collections in Germany are conserved in the two genebanks (BAZ, Braunschweig and IPK, Gatersleben). Additional material is available from botanical gardens, and even breeders maintain their working collections. The tables presented below summarize the changes in content since 1995 (see Diederichsen and Hammer 1996).

Grain legumes in Braunschweig (BAZ) and Gatersleben (IPK) genebanks

Table 1. Grain legume accessions in the German genebank collections

Species	Braunschweig	Gatersleben
Cajanus cajan (L.) Huth	0	7
Cicer	142	287
Cicer arietinum L.	142	277
Cicer sp.	0	10
Glycine	128	2965
Glycine max (L.) Merr.	128	1414
Glycine soja Sieb. et Zucc.	0	31
Glycine sp.	0	1520
Lablab purpureus (L.) Sweet	0	22
Lathyrus	15	468
Lathyrus sativus L.	6	202
Lathyrus sp.	9	266
Lens	92	336
Lens culinaris Medik.	69	320
Lens sp.	23	16
Lupinus	1987	856
Lupinus albus L.	135	212
Lupinus angustifolius L.	405	274
Lupinus luteus L.	252	127
Lupinus mutabilis (L.) Sweet	998	26
Lupinus sp.	197	217
Phaseolus	898	7609
Phaseolus acutifolius A. Gray	2	15
Phaseolus coccineus L.	26	354
Phaseolus lunatus L.	2	35
Phaseolus vulgaris L.	841	7066
Phaseolus sp.	27	139
Pisum	2252	3160
Pisum fulvum Sibth. et Sm.	10	4
Pisum sativum L. subsp. *abyssinicum* (A. Braun) Berger	9	61
Pisum sativum L. subsp. *elatius* (Stev.) Schmalh.	1	22
Pisum sativum L. subsp. *sativum*	1969	2989
Pisum sp.	263	84
Vicia	2001	3181
Vicia faba L.	1781	1507
Vicia ervilia (L.) Willd.	21	137
Vicia narbonensis L.	13	69
Vicia sp.	186	1468
Vigna	34	442
Vigna angularis (Willd.) Ohwi et Ohashi	0	80
Vigna mungo (L.) Hepper	0	8
Vigna radiata (L.) Wilcz.	0	73
Vigna umbellata (Thunb.) Ohwi et Ohashi	0	8
Vigna unguiculata (L.) Walp.	34	29
Vigna sp.	0	244
Total	**7549**	**19333**

Table 2. Breeding varieties of grain legumes in the German genebank collections

	Relative part of breeding varieties and strains (% of the collection)	
Group	**BAZ Braunschweig**	**IPK Gatersleben**
Cicer	1	8
Glycine	16	29
Lathyrus	13	8
Lupinus	6	18
Phaseolus	56	30
Pisum	42	52
Vicia	15	16
Cajanus, Lablab, Lens	16	13

It is planned to transfer the Gatersleben collection of *Glycine* to Hungary in 1999. Limited quantities of each accession, i.e. safety-duplicates, should remain and even be reproduced at the IPK genebank because soyabeans are one of the oldest, traditional model plants of the Institute since its foundation. Increasing cross-pollination might occur in southern countries.

Origin of the genebank accessions

Table 3. Origin of the genebank accessions

Group	**BAZ-accessions from collecting missions (*)**	**% of the collection**	**IPK-accessions from collecting missions**	**% of the collection**
Cicer	20	14	211	74
Glycine	12	9	79	3
Lathyrus	5	33	289	62
Lupinus	934	47	446	52
Phaseolus	371	42	3767	50
Pisum	606	27	1096	35
Vicia	432	22	1047	61
Cajanus, Lablab, Lens, Vigna	12	10	536	66

(*) The BAZ genebank in the past mainly assumed responsibility for the long-term maintenance of collections received from many institutions in Germany and abroad. The figures therefore represent accessions with known collection data. The rest comes from other sources.

Storage, reproduction and evaluation strategies of the genebanks

Regarding technology at IPK Genebank, see Diederichsen and Hammer 1996. Regarding storage strategy at BAZ Genebank, see Bücken and Frese 1998.

Table 4a. Reproduction and availability of grain legumes at Braunschweig in 1998

Group	**No. of accessions regenerated**	**% of the collection**	**Availability % of the collection**
Cicer	0	0	14
Glycine	0	0	56
Lathyrus	0	0	60
Lupinus	4	0.2	60
Phaseolus vulgaris	0	0	87
Phaseolus coccineus	0	0	23
Other *Phaseolus* spp.	0	0	13
Pisum	0	0	96
Vicia faba	0	0	45
Other *Vicia* spp.	7	3.2	22
Cajanus, Lablab and *Vigna*	0	0	35
Total	**11**	**0.1**	

Table 4b. Reproduction of grain legume groups at Gatersleben in 1998

Group	No. of accessions regenerated	% of the collection	Place
Cicer	62	18.0	field
Glycine	41	2.7	field
Lathyrus	70	15.6	field
Lupinus	44	5.3	isolation sites
Phaseolus vulgaris	659	8.8	field, greenhouses
Phaseolus coccineus	32	8.5	isolation sites
Other *Phaseolus* spp.	4	2.1	isolation sites
Pisum	178	5.5	field
Vicia faba	86	5.6	isolation sites
Other *Vicia* spp.	103	6.5	isolation sites
Cajanus, Lablab and *Vigna*	53	11.2	greenhouses
Total	**1332**	**8.2**	

Databases describing the genebank accessions

No further progress.

Collecting missions

BAZ

- **Collecting missions since 1995**

The former genebank of West Germany in Braunschweig (Lower Saxony) has been established as a service unit and integrated element of breeding research and commercial plant breeding (Bommer 1972). Furthermore this genebank worked as an information and germplasm acquisition centre, which resumed responsibility for the long-term maintenance of collections received from many institutions in Germany and abroad. In principle this genebank functioned as an outsourcing facility which managed seed collections and data sets linked with it for the benefit of research institutes and breeders. Therefore the BAZ genebank is organizing collecting missions mainly in cooperation with other institutions. Joint missions regarding the collection of grain legumes have not been carried out since 1995.

- **Planned collecting missions**

There are no collecting missions planned on grain legumes.

IPK

- **Collecting missions since 1995**

1995: Albania, Spain, Central Asia, Turkey, Morocco, Italy.
1996: Spain, Israel, Canada, Albania, Italy, Croatia.
1997: Croatia, Italy.
1998: Bulgaria.

- **Planned collecting missions**

Italy, Albania, South Korea.

German institutions and plant breeders keeping collections of grain legumes

(names of the genera in brackets)

- Lochow-Petkus GmbH, Bollersdorfer Weg 5, D-29303 Bergen / Wohlde (200 accessions of *Pisum sativum*, 100 accessions of *Vicia faba*)
- BAZ-Genebank (Bundesanstalt für Züchtungsforschung; BGRC, Braunschweig Genetic Resources Centre), Bundesallee 50, D-38116 Braunschweig (see Table 1)

- IPK-Genebank (Institut für Pflanzengenetik und Kulturpflanzenforschung), Corrensstr. 3, D-06466 Gatersleben (see Table 1)
- Lehrgebiet Molekularbiologie der Universität Hannover, Herrenhäuser Str. 2, D-30419 Hannover (200 accessions of *Cicer*, 50 accessions of *Phaseolus vulgaris*)
- Verein zur Erhaltung der Nutzpflanzenvielfalt e.V., VEN, Sandbachstr. 5, D-38162 Schandelah (5 accessions of *Lens*, 90 of *Phaseolus*, 51 of *Pisum*, 50 of *Vicia faba*, 20 accessions of *Vigna unguiculata*)
- Landessaatzuchtanstalt der Universität Hohenheim (720), D-70593 Stuttgart (630 accessions of *Vicia faba* and 245 accessions of *Lupinus mutabilis*)
- Institut für Nutzpflanzenkunde gemäßigter, subtropischer und tropischer Regionen, Fachbereich 11, Universität Gesamthoschschule Kassel, Steinstr. 19, D-37213 Witzenhausen (5 accessions of *Cajanus*, 9 accessions of *Lupinus*, 19 accessions of *Vigna*).

Research with relevance to grain legume germplasm conducted in Germany

Fundamental taxonomic research

Since 1996 there are no publications available on classical taxonomic research on cultivated grain legume species. This is the consequence of a stagnation (BGRC) or a remarkable loss in personal resources at the scientist and technician levels (IPK). The availability of limited technical expertise bears the danger of a latent genetic erosion in genebanks.

Recent research on grain legume germplasm

Specht, C.-E., E.R.J. Keller, U. Freytag, K. Hammer and A. Börner. 1997. Survey of seed germinability after long-term storage in the Gatersleben genebank. Plant Genet. Resour. Newsletter 117:64-68.

Specht, C.-E., U. Freytag, K. Hammer and A. Börner. 1998. Survey of seed germinability after long-term storage in the Gatersleben genebank (part 2). Plant Genet. Resour. Newsletter 115:23-28.

Grain legumes in general

Kathen, A. de. 1996. The impact of transgenic crop releases on biodiversity in developing countries. Biotechnology and Development. Monitor No. 28:10-14. Amsterdam.

Riemer, H.M., B. Kessel, M. Klemisch, W. Link, F.X. Maidl, C. Moellers and H.C. Becker. 1997. Genotypic variability for N efficiency in winter barley, winter rapeseed and grain legumes. Proc. Int. Conf. Sustainable Agric. FAL Braunschweig, June 22-28.

Single genera or species of grain legumes

- ***Lens***

Horneburg, B. and H.C. Becker. 1998. Landraces of lentil - from the genebank via the farmers field into the stomach. Schr. Genet. Res. 8:235-238.

- ***Lupinus***

Römer, P. 1998. Anthracnose 1997: Bestandsaufnahme und Lösungsansätze. Pp. 99-115 *in* Lupinen in Forschung und Praxis (M. Wink, ed.). Univ. Heidelberg.

Römer, P., P.D.S. Caligari, M.A. Rahim, C. Huyghe, A. Hardy, J. Neves Martins and E. Sawicka-Sienkiewicz. 1999. Breeding perspectives of *Lupinus mutabilis* in middle Europe. Pp. 353-356 *in* Towards the 21st century. Proceedings of the 8th International Lupin Conference, Asilomar, California, USA, 11-16 May 1996. International Lupin Association, Canterbury, New Zealand.

- ***Vicia***

Link, W., B. Schill, A.C. Barbera, J.I. Cubero, A. Filippetti, L. Stringi, E. von Kittlitz and A.E. Melchinger. 1996. Comparison of intra- and inter-pool crosses in faba beans (*Vicia*

faba L.). I. Hybrid performance and heterosis in Mediterranean and German environments. Plant Breed. 115:352-360.

Link, W., B. Schill and E. von Kittlitz. 1996. Breeding for wide adaption in faba bean. Euphytica 92:185-190.

Link, W., W. Ederer, R.K. Gumber and A.E. Melchinger. 1997. Detection and characterization of two new CMS systems in faba beans (*Vicia faba* L.). Plant Breed. 116:158-162.

Schill, B., E. von Kittlitz, A.E. Melchinger and W. Link. 1997. Züchterische Brauchbarkeit von Intrapool- und Interpool-Kreuzungen des mitteleuropäischen und mediterranen Genpools bei der Fababohne (*Vicia faba* L.). Vortr. Pfl.-z. 38:127-145.

Schoen, C.C. 1997. Züchtungsfortschritt bei Ackerbohnen. Vortr. Pfl.-z. 39:122-125.

Schoen, C.C. and W. Link. 1998. Application of different biometrical methods for description of genetic diversity. Schr. Genet. Res. 8:110-117.

Stelling, D. and W. Link. 1997. Progress in faba bean breeding. Grain Legume 19:16-19.

Vaupel, J.C., W. Eder, E. von Kittlitz and W. Link. 1998. *Vicia faba*: Genebank accessions as source of new CMS systems. Schr. Genet. Res. 8:271-274.

Vaupel, J.C. and W. Link. 1998. Das System CMS199 bei *Vicia faba* L. Vortr. Pfl.-z. 42:181-183.

Ongoing research projects (in addition to Diederichsen and Hammer 1996)

Ebmayer, E., H.-J. Jacobsen and E. Maiß. Current project 1994-98. Transgene Erbsen: Berücksichtigung alternativer Strategien zur Etablierung einer stabilen, gentechnisch vermittelten Resistenz gegenüber PSbMV-Infektionen . [Transgenic peas: Consideration of alternative strategies for the establishment of a stable resistance, created by gene technology, to PSbMV infections]. Lehrgebiet Molekulargenetik, Fachbereich Biologie der Universität Hannover, Lochow-Pertkus GmbH. GFP, BML (Coordinator: H.-J. Jacobson, Hannover, Germany).

Jacobsen, H.-J. Current project 1997-99. Improving chilling tolerance in *Phaseolus* - a cooperative research project with CIAT, University of Hamburg, funded by BMZ/GTZ. Genetic engineering of beans. BMZ. *Ph. acutifolius, Ph. vulgaris*. (Coordinator: H.-J. Jacobson, Hannover, Germany).

Jacobsen, H.-J. and T. Pickardt. Current project 1997-2000. PRELEG - Pathogen-resistant grain legumes using gene transfer methods No FAIR 3-CT96-1529 - 7 partners. German partners: Lehrgebiet Molekulargenetik, Universität Hannover, Institut für Angewandte Genetik: Jacobsen, H.-J., Freie Universität Berlin: Th. Pickardt. EU-project SCRI G. Ramsey, UK; University of Naples: E. Filippone, M. Duparque, France, PBI Cambridge, G. Jarvis, (FAIR-programme).

Kahl, G. and H.-J. Jacobson. Current project 1996-99. DNA-marker assisted breeding and genetic engineering of ICARDA-mandated crops. Restricted Core, funded by BMZ/GTZ Project No 95.7860-0.00101. Contracted by ICARDA for Genetic engineering of chickpea for resistance against Ascochyta blight. *Cicer*-transformation. DAAD. (Coordinator: G. Kahl, Frankfurt, Germany).

Link, W., H. Riemer, E. Ebmeyer and O. Sass. Current project 1996-98. Untersuchungen zur genotypischen Variabilität der Stickstoff-Effizienz bei Ackerbohnen und Körnererbsen [Investigations into the genotypic variability of the nitrogen efficiency of beans and peas]. Institut für Pflanzenbau und Pflanzenzüchtung der Universität Göttingen; Deutsche Bundesstiftung Umwelt, Osnabrück. Lochow-Petkus GmbH, Bergen; NPZ, Lembke KG, Holtensee. (Coordinator: W. Link, Institut für Pflanzenbau und Pflanzenzüchtung der Universität Göttingen).

Link, W., O. Sass, C.C. Schoen and J. Vaupel. Current project 1996-99. Neue CMS-Systeme für die Produktion von Minor- x Major Hybridsorten bei *Vicia faba* L. Genetische und züchterische Analyse [New CMS systems for the production of Minor x Major hybrid varieties of *Vicia faba* L. genetic and breeding analysis]. BML and GFP. Institut für Pflanzenbau und Pflanzenzüchtung, Universität Göttingen; Landessaatzuchtanstalt,

Universität Stuttgart-Hohenheim; NPZ, Lembke KG, Holtensee. (Coordinator: W. Link, Göttingen, Germany).

Link, W. and M. Surahman. Current project 1998-2000. Erstellung einer Kopplungskarte bei Ackerbohnen mit Hilfe von molekularen Markern, insbesondere RAPDs . [Production of a linkage map for beans, using molecular markers, especially RAPDs]. (Coordinator: W. Link, Göttingen, Germany).

Roemer, P. Current project 1997-2000. Lupin utilization and production in Europe. Creation of varieties and technologies for increasing production and utilization of high quality protein from the white lupin in Europe.

Ron, A.M. de *et al.* Current project 1998-2000. Improvement of sustainable *Phaseolus* production in Europe for human consumption - PHASELIEU, FAIR5-PL97-3463. Partners: A.M. de Ron (Coordinator) ES-GR (Group of Genetic Resources in Spain) Misión Biológica de Galicia, Consejo Superior de Investigaciones Científicas (MBG-CSIC). Pontevedra, ES; R. Schachl, Linz, AT; G. Angenon, Gent, BE; J. P. Baudoin, Gembloux, BE; H.-J. Jacobsen, Hannover, DE, C. Asensio, Valladolid, ES; J. Taylor, Wellesbourne (Warwick), UK; G.P. Soressi, Viterbo, IT; V.P. Carnide, Vila Real, PT; J. Kigel, Rehovot, Israel; D. Bleton, Choisy-le-Roi, FR; T. Langin, Orsay, FR; A.C. Zeven, Wageningen, NL.

References

Bommer, D. 1972. Entwicklung und Bedeutung von Genbanken in der Welt und in der Bundesrepublik Deutschland. Saatgutwirtschaft - SAFA, 24. Jahrgang, Nr. 15/16. Sonderdruck.

Bücken, St. and L. Frese. 1998. Differential and hierarchical seed stock management - a new alternative for the management of large-sized genebank holdings. Pp. 96-101 *in* Implementation of the Global Plan of Action in Europe – Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. Proceedings of the European Symposium, 30 June-3 July 1998, Braunschweig, Germany (T. Gass, L. Frese, F. Begemann and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome.

Diederichsen, A. and K. Hammer. 1996. Status of plant genetic resources and research on grain legumes in Germany, 1995. Pp. 45-50 *in* Report of a Working Group on Grain Legumes. First meeting, 14-16 July 1995, Copenhagen, Denmark (T. Gass, M. Ambrose, J. Le Guen, A. Hadjichristodoulou and S. Blixt, compilers). International Plant Genetic Resources Institute, Rome, Italy.

Description of the CGN grain legume collection

Loek J.M. van Soest, Harm Dijkstra and Noor Bas

Centre for Plant Breeding and Reproduction Research (CPRO-DLO), Centre for Genetic Resources The Netherlands (CGN), Wageningen, The Netherlands

The collection

The collection consists of 1803 accessions of the grain legumes *Pisum*, *Vicia faba* and *Lupinus* (Table 1). The collection was established in 1985 and most of the material originated from the former Foundation for Agricultural Plant Breeding (SVP); however some accessions of consumption peas were received from the former Institute for Horticultural Plant Breeding (IVT) (van Hintum and van Soest 1997). Lately the *Pisum*, the *Vicia faba* and to a small extent the *Lupinus* collections were extended with material from the Centre for Plant Breeding and Reproduction Research (CPRO-DLO) and accessions received from several breeding companies in The Netherlands (van Soest and Boukema 1995). Furthermore some landraces from two East European genebanks were included. The grain legume collection does not have a high priority in the CGN system and receives less emphasis.

Table 1. Grain legume collection of CGN

Species	No. of accessions	Cultivars	Landraces	Breeding material	Unknown incl. wild
Pisum sativum	978	448	341	91	98
Pisum abyssinicum	1	–	–	–	1
Pisum arvense	1	–	–	–	1
Pisum elatius	3	–	–	–	3
Pisum (unknown)	25	–	–	–	25
Total *Pisum*	**1008**	**448**	**341**	**91**	**128**
Vicia faba	726	228	393	10	95
Lupinus albus	13	1	2	10	–
Lupinus luteus	56	18	–	35	3
Total *Lupinus*	**69**	**19**	**2**	**45**	**3**
Grand total	**1803**	**695**	**736**	**146**	**226**

Pea (*Pisum*)

The collection consists mainly of material of *P. sativum*. Only a few wild species, including *P. abyssinicum, P. arvense* and *P. elatius* are available (Table 1). The 25 accessions described as "*Pisum* (unknown)" are primitive forms of *P. sativum* and probably some unidentified wild species. The collection includes over 341 landraces, 53 of which originate from Europe including three from The Netherlands ('Grauwe erwt', 'Noord-Hollandse Rozijnenerwt' and 'Wijker Vale'). The other European landraces are mainly from eastern and southern Europe. More than 250 landraces originate from the centres of origin in Asia (168) and Africa (88). This material is rather primitive and not well adapted to north European conditions. It includes nearly 150 accessions from Pakistan and Ethiopia, material collected with Dutch participation (Hashmi *et al.* 1981). The cultivars (448) form the greater part of the collection and consist of dry peas for animal feed and peas for human consumption. The latter group includes over 140 cultivars. Most of the cultivars are of European origin while a limited number is obtained from North America and Australia. In addition there are 91 accessions classified as research material, particularly from Europe and the USA. The population type of a relatively large group of accessions is not defined, further updating may result in additional information on this group. Furthermore the country of origin of 248 accessions is not known.

Faba bean (*Vicia faba*)

The faba bean collection consists of 726 accessions of the cultivated species *V. faba.* There are

393 landraces in the collection, largely from Asia (188) and Africa (114). These landraces were collected in the centres of origin of the faba bean, particularly in a number of countries of the Middle East such as Syria, Afghanistan, Pakistan, Iraq and Turkey. Also present are 78 landraces from the centre of diversity in Ethiopia. Only 54 landraces from Europe are found in the collection, including the old Dutch landrace 'Oldambster'. The faba bean collection includes 228 cultivars. The accessions are mainly from Europe (195), particularly from The Netherlands (49), Germany (60), United Kingdom (20), France (16) and Russia (11). Some old Dutch cultivars presented in the collection are 'Mansholt's Wierboon' (1892), 'Adrie' (1919) and 'Wierboon C.B' (1931). Only a few cultivars from Asia, Africa and America are present in the collection. Ten accessions belong to the population type 'research material'. The country of origin and the population type of, respectively, 58 and 95 accessions are not known.

Lupin (*Lupinus*)

This small collection includes only 69 accessions of the species *L. albus* and *L. luteus* (Table 1). In the collection there are only two landraces from eastern Europe and 19 cultivars from The Netherlands, Germany and Poland. The other material mainly consists of research material of the former Foundation for Plant Breeding (SVP) and Poland (van Soest and Boukema 1995).

Regeneration and characterization

Faba beans and lupins are regenerated in plots spatially isolated in winter rye fields with a distance of approximately 50 m between the plots. The size of the plots is 8 m^2, and normally 200 seeds are sown directly in the field. In the case of pea, 100 seeds per accession are sown against a fence, directly in the field without isolation. During the growing season the accessions are monitored both visually and by means of serological tests for Pea Seed-borne Mosaic Virus (PSMV). Plants positive for PSMV are removed entirely. Nearly all material listed in Table 1 has been regenerated and is available to *bona fide* users.

During regeneration, accessions of *P. sativum* and *V. faba* are characterized for 14 and 13 different agromorphological traits respectively, using CGN minimal descriptor lists (Dijkstra and van Soest 1986). The lists are partly derived from the IPGRI and UPOV descriptor lists and were developed after consultation with several grain legume breeders in The Netherlands. Presently 7700 characterization data of *Pisum* and over 8300 data of *V. faba* are included in the information system GENIS (van Soest and Boukema 1995).

Prof. J. Kraft (USDA-ARS, Prosser WA, USA) evaluated several *Pisum* accessions of Pakistan for resistance against three diseases (*Fusarium solani* f.sp. *pisi*, race 2 of *Fusarium oxysporum* f.sp. *pisi* and *Aphanomyces euteiches)*. The evaluation data are included in GENIS.

The two *Lupinus* species have only been characterized for two traits: plant type and flower colour.

Documentation

The 1803 accessions of the different grain legumes are all documented for passport data in GENIS, an information system based on the database management system ORACLE (van Hintum 1989). The passport data of some accessions are not complete. There is a lack of data for the landraces of *P. sativum* and *V. faba*, collected in the centres of origin in Asia and Africa (Ethiopia). Further updating of the passport data of the *Pisum* collection started in 1998 and will be completed in the near future. Thereafter a new set of passport data will be sent to the respective European Grain Legume Database.

Since April 1998 data of most CGN collections can be found on CGN's Web site (<http://www.plant.wageningen-ur.nl/about/Biodiversity/Cgn>). Presently only information on passport data is accessible and can be searched on-line or downloaded via Internet.

Storage and safety-duplication

After regeneration the seeds are cleaned and dried to a moisture content of 5-7°C. The seeds are packed in laminated aluminium foil bags and stored at –20°C for long-term storage. The users' samples are, however, stored in medium-term storage conditions at 4°C.

Eighty percent of the collection is stored for safety-duplication in the HRI Genebank at Wellesbourne, UK, at –20°C. Some recently regenerated material also needs to be duplicated.

Utilization

Since 1988 CGN has distributed 894 accessions of *Pisum* to users in The Netherlands and abroad. During the same period 142 accessions of *V. faba* and 11 of *Lupinus* were distributed. Users are supplied with 50 seeds and additional information on the requested material.

References

Dijkstra, H. and L.J.M. van Soest. 1986. Descriptor list Pulses: lupines, peas and faba beans. CGN, Wageningen. 8pp.

Hashmi, N.I., L.J.M. van Soest, A.R. Rao, M. Mesken and Zahoor Amad. 1981. Collecting in Baluchistan, Pakistan. Plant Genet. Resour. Newsl. 47:31-35.

van Hintum, Th.J.L. 1989. GENIS: A fourth generation information system for the database management of genebanks. Plant Genet. Resour. Newsl. 75/76:13-15.

van Hintum, Th.J.L. and L.J.M. van Soest. 1997. Conservation of plant genetic resources in the Netherlands. Plant Var. & Seeds 10:145-152.

van Soest, L.J.M. and I.W. Boukema, editors. 1995. Diversiteit in de Nederlandse Genenbank. Een overzicht van de CGN collecties [Diversity in the Dutch genebank. An overview of the CGN collection]. Centrum voor Genetische Bronnen Nederland (CGN). Centrum voor Plantenveredelings- en Reproduktieonderzoek (CPRO-DLO), Wageningen. 126pp.

Status of the grain legume collections in the Nordic Countries

Gert B. Poulsen
Nordic Gene Bank (NGB), Alnarp, Sweden

The mandate of the Nordic Gene Bank (NGB) covers conservation and promoting utilization of plant genetic material with Nordic origin comprising the following species:

Vegetables	
Soyabean	*Glycine max* (L.) Merrill
Beans	*Phaseolus vulgaris* var. *vulgaris*
Garden peas	*Pisum sativum* subsp. *sativum* L.
Broad bean	*Vicia faba* var. *faba* L.
Tuberous vetch	*Lathyrus tuberosum* L.
Legumes	
Lentil	*Lens culinaris* Medicus
Yellow lupin	*Lupinus luteus* L.
Field peas	*Pisum sativum* L. subsp. *arvense*
Horse bean	*Vicia faba* var. *equina* Pers.
Common vetch	*Vicia sativa* subsp. *sativa* L.

Our ordinary collection holds 170 grain legume accessions, and in addition the special collection from Weibullsholm of which approximately 450 type lines are maintained in collaboration with the John Innes Center (JIC), with NGB holding the base collection while JIC is responsible for the active collection.

Additionally, the Weibullsholm collection comprises 700 accessions of Nordic origin; 500 accessions are stored for specific purposes and 1200 are presumed duplicates.

The NGB collection comprises 96 commercial varieties, 51 accessions of locally cultivated material and 23 newly arrived material (Table 1). The latter consists of accessions of peas, beans and broad beans which have been donated to the NGB during the last couple of years. These are now being described in order to determine whether they are unique and must be accepted for long-term storage. The majority of the material is of Swedish origin; there is no Icelandic material (Table 2). Additionally, 152 breeding lines of soyabean from an abandoned Swedish breeding programme are held.

Table 1. NGB grain legume collection

	Field peas	Garden pea	Beans	Soyabean	Lentil	Tuberous vetch	Faba beans	Common vetch	Yellow lupin	Total
Commercial varieties	40	26	10	3	2	1	8	5	1	96
Local cultivated material	9	0	17	0	0	0	23	2	0	51
New and unverified culta	4	5	6	0	0	0	7	1	0	23
Total	**53**	**31**	**33**	**3**	**2**	**1**	**38**	**8**	**1**	**170**
Safety-duplicates (no.)	33	18	10	3	1	0	26	5	1	97
Safety-duplicates (%)	62	58	30	100	50	0	68	63	100	57

Table 2. Country of origin

	Field peas	Garden pea	Beans	Soyabean	Lentil	Tuberous vetch	Faba beans	Common vetch	Yellow lupin	Total
Denmark	9	15	3	0	0	0	0	1	1	29
Finland	5	0	0	0	0	0	29	0	0	34
Iceland	0	0	0	0	0	0	0	0	0	0
Norway	1	9	5	0	0	0	0	0	0	15
Sweden	32	7	21	3	2	1	11	6	0	83
Other	5	14	4	0	0	0	0	1	0	24
Total	**52**	**45**	**33**	**3**	**2**	**1**	**40**	**8**	**1**	**185**

The safety-duplicates of NGB material are stored in the permafrost store in an abandoned coal mine on Svalbard. On average 57% of our material is safety-duplicated; the remaining material will be included as soon as it is justified for long-term storage.

Presently our Nordic working groups on vegetables and legumes are active in three projects on genebank material:

WG5 26	Multiplication and characterization of pea accessions
WG6 FI:3	Composite cross populations of peas
WG6 FI:2	Collection, multiplication and characterization of farmers varieties.

Regeneration

Peas are germinated individually in peat pots, and transplanted to a pathogen-free field nethouse when the risk of frost is over. For each accession, 75-150 plants are grown without isolation between accessions. High-growing accessions are supported by poles and wires. During the cultivation, standard plant protection is carried out and plants infected with PSMV (Pea Seed-borne Mosaic Virus) are immediately removed to reduce spread of the virus.

Accessions are evaluated for 38 characters during cultivation using genetic descriptors (Blixt 1972, 1975, 1977); seeds are harvested in bulk and using type selection.

Beans are germinated in a similar way and cultivated in greenhouse in order to extend the growing season. Recently, fewer plants (30-40) were used because of limited availability. UPOV (1979) descriptors are used for characterization of the material.

Storage

NGB accessions are stored in a base collection and the active collection at -20°C after drying to 5-10% moisture (FAO/IPGRI 1994). The safety-storage is subject to natural conditions at -4°C. Generally, we store 4000 viable seeds in the base collection, 10 000 in the active collection and 500 in the safety-store.

Bibliography

Blixt, S. 1972. Mutation genetics in *Pisum*. Agri Hortique Genetica 30:1-239.

Blixt, S. 1975. The Pea. Pp. 181-221 *in* Handbook of Genetics. Vol. 2: Plants, plant viruses, and protists (R.S. King, ed.). Plenum Press, New York, USA.

Blixt, S. 1977. Gene-symbols of *Pisum*. *Pisum* Newsletter 9 (supplement).

FAO/IPGRI. 1994. Genebank Standards. Food and Agriculture Organization of the United Nations, Rome/International Plant Genetic Resources Institute, Rome.

UPOV. 1979. Revised general introduction to the Guidelines for the conduct of test for distinctness, homogeneity and stability of new varieties of plants. TG/1/2. International Union for the Protection of New Varieties of Plants, Geneva.

Grain legume collections in Portugal

André Mendes Dordio

Estação Agronómica Nacional, Quinta do Marquês, Oeiras, Portugal

Status of national collections

The activity of the Portuguese grain legume germplasm collections for the last 3 years is presented in Table 1. It can be observed that the number of accessions collected was reduced, but the number of accessions characterized and evaluated is significant, with 382 accessions collected, mainly of the genus *Lupinus;* 875 accessions were characterized for morphological traits and 30 for molecular traits, while 408 were evaluated.

Safety-duplication

Table 2 represents the status of the safety-duplication of the Portuguese grain legume germplasm collections. It can be noticed that 26% of the total accessions stored are safety-duplicated. Although this figure is relatively low, it represents an effort of the last 3 years and work continues in order to duplicate all accessions maintained in all collections existing in the country.

Table 1. Activities developed on germplasm collections (1995-98)

		Characterization			
Species	**Collection**	**Morphological**	**Chemical**	**Molecular**	**Evaluation**
Portuguese Plant Germplasm Bank, Braga (2191 accessions in 1995)					
Cicer arietinum	7	–			
Lupinus albus	4	–			
Lupinus luteus	2	–			
Phaseolus coccineus	4	–			
Phaseolus vulgaris	106	60			
Pisum sativum	5	–			
Vicia faba	7	–			
Vicia sativa	4	–			
Vigna unguiculata	3	25			
Plant Biology Lab. ESA, Castelo Branco (70 accessions in 1995)					
Vigna unguiculata	17	27			
Sec. Grain Legumes ENMP, Elvas (184 accessions in 1995)					
Cicer arietinum	6	90		6	181
Pisum sativum	19	52		6	–
Vicia faba	13	85		–	130
Sec. Past. Forag. ENMP, Elvas (184 accessions in 1995)					
Lens spp.					
Lupinus spp.					
Vicia spp.					
Dept. Bot. Biol. Engineering ISA, Lisboa (728 accessions in 1995)					
Lupinus albus	–	131			39
Lupinus angustifolius	83	129			45
Lupinus hispanicus	12	34			–
Lupinus luteus	15	30			–
Forage Breed. Sec. EAN, Oeiras (196 accessions in 1995)					
Cicer arietinum		–			10
Vicia sativa		50			–
Genebank Genetics Section EAN, Oeiras (2234 accessions in 1995)					
Cicer arietinum	–	–			
Lupinus angustifolius	15	–			
Lupinus hispanicus	21	–			
Lupinus luteus	9	–			
Phaseolus vulgaris	–	30			

Species	Collection	Characterization			Evaluation
		Morphological	Chemical	Molecular	
Genetics Section EAN, Oeiras (288 accessions in 1995)					
Lupinus angustifolius		3		–	–
Lupinus cosentinii		3		3	–
Lupinus luteus		3		–	3
Dep. Genetics Biotechnology UTAD, Vila Real (22 accessions in 1995)					
Phaseolus vulgaris	30	8		15	

Table 2. Status of the safety-duplication of the grain legume germplasm collections

Institution	No. of species	Total no. of accessions	No. of accessions duplicated	% of safety-duplication
Portuguese Plant Germplasm Bank, Braga	12	2323	312	13
Plant Biology Lab., ESA, Cast. Branco	1	87	–	–
Sec. Grain Legumes, ENMP, Elvas	4	463	311	67
Sec. Past. Forages, ENMP, Elvas	3	184	–	–
Dept. Bot. Biol. Engineering, ISA, Lisboa	12	838	22	3
Forage Breeding Section, EAN, Oeiras	9	196	130	66
Genebank, Genetics Section, EAN, Oeiras	20	2279	752	33
Genetics section, EAN, Oeiras	1	228	210	73
Dept. Genetics Biotechnology, UTAD, Vila Real	1	52	–	–
Total		**6710**	**1737**	**26**

Status of the grain legume collection in Romania

Silvia Strajeru and Mirela Nimigean
Suceava Genebank, Romania

Activities on grain legume conservation and utilization in Romania are currently carried out by six governmental institutions, as follows: Genebank of Suceava, one research institute, four research stations. Except for the Genebank of Suceava, all collections are maintained as working collections for breeding or research purposes.

A survey of grain legume resources in Romanian collections kept by the institute and research stations is given in Table 1. The largest collections are of *Glycine max* (L.) Merr (2402 samples) and *Phaseolus vulgaris* L. (1813 samples); of these only 13% and 28%, respectively, are local populations.

Grain legume collection in the Suceava Genebank

Collecting activities

Around 30 collecting missions were undertaken in 10 years of Suceava Genebank's activity. During these missions, 76 ecological areas were explored in 35 Romanian districts, resulting in 5113 accessions of which 1803 samples belong to grain legume species (*Phaseolus vulgaris, Pisum sativum* L., *Vicia faba* L. and *Vigna sinensis* L.). The distribution of collected grain legume resources in the main districts is shown in Figure 1. The Suceava district was noted as having the greatest variability in *Phaseolus* sp., concerning seed size and shape, hilum colour, seed basic and pattern colours, seed pattern kind and protein content.

In some districts of the north of Bucovina, Maramures and Apuseni Mountains, old varieties of beans, peas, faba beans and lentils are still cultivated in individual gardens. The reasons why these primitive cultivars are used by peasants in the respective areas are: tradition, perfect adaptation to the pedo-climatic conditions and, last but not least, lack of financial resources to buy modern varieties. All the material collected by the Genebank's team is represented by landraces or old varieties.

Regeneration and multiplication

Regeneration is carried out when seed viability decreases below 80%, and multiplication when seed stock is under 1000 seeds. Both activities being very expensive, about 80% of accessions need either regeneration or multiplication. The capacities in terms of space and staff are sufficient while funds are limited. Old and freshly regenerated material is conserved separately. Characterization and evaluation of grain legume accessions are done for a limited number of samples because of the high cost of these activities. A descriptor list based on IPGRI descriptors completed by descriptors of interest to breeders is used for evaluation.

Table 1. Institutions working with grain legume resources in Romania (as of 1 May 1998)

Institution	No. of accessions	Species
Research Institute for Cereal and Industrial Crops – Fundulea	1425	*Phaseolus vulgaris*
	1600	*Glycine max*
	820	*Pisum sativum*
Agricultural Research Station – Suceava	877	*Vicia faba*
Agricultural Research Station – Turda	802	*Glycine max*
	287	*Phaseolus vulgaris*
	11	*Pisum sativum*
Legumes Research and Production Station – Bacau	101	*Phaseolus vulgaris*
	12	*Vicia faba*
Legumes Research Station – Iernut	15	*Pisum sativum*

Fig. 1. Number of accessions collected in the explored districts.

Conservation

In the first 10 years of activity, grain legume genetic resources have been introduced in conservation in the following three main ways:

- collection (1803 accessions)
- acquisition of working collections from various institutions (904 accessions)
- exchange with partner institutes worldwide (19 accessions).

This material, numbering about 2726 accessions belonging to 14 species, is kept as an active collection. The bean collection, with its vast number of samples, is regarded as one of the most valuable sets of accessions (Table 2).

Table 2. Type of grain legume accessions stored at the Suceava Genebank

	Species							
Type	***Phaseolus vulgaris***	***Pisum sativum***	***Vicia faba***	***Lens culinaris***	***Cicer arietinum***	***Lupinus* sp.**	***Vicia sativa***	***Vigna* sp.**
Landraces	1590	80	281	14	2	7	1	15
Breeding lines	441	–	131	–	10	46	–	15
Cultivars	44	1	28	7	–	7	–	5
Other forms	–	–	–	1	–	–	–	–
Total	**2075**	**81**	**440**	**22**	**12**	**60**	**1**	**35**

Parameters of seed storage

Containers	glass jars (400, 800 or 1000 ml according to the seed and sample size)
Moisture content of seed	6–8% according to the species
Storage temperature	+4°C

Current status of the grain legume collection in the Vavilov Institute of Plant Industry, Russia

Margarita Vishnyakova

Vavilov Institute of Plant Industry (VIR), St. Petersburg, Russia

Introduction

The collection of grain legumes in VIR was initiated in the 1920s. It is remarkable as being very representative of the world diversity of cultivated plants and their wild relatives.

The main objectives of the Institute since the early times have been exchange, preservation and evaluation of the world germplasm of crops and their wild relatives used in national breeding programmes.

Recently, the funding of scientific activities in Russia has been considerably limited owing to the transition period and the changed priorities in the activities at VIR. One of the main problems is currently the need to regenerate the entire collection. This is especially necessary for the samples of southern origin, as VIR no longer owns some experimental stations based in former Soviet Republics in the south.

The objective of the Institute's activities at this stage is to save the germplasm with the creation of a duplicate set of accessions for storage in refrigerators. At present more than half of the collection is duplicated in refrigerators at the headquarters in St. Petersburg and about two-thirds at the National Seed Store in Kuban, near the city of Krasnodar.

Conservation and maintenance

The collection of seeds, including genetic stocks collections of pea and soyabean, comprises 43 853 accessions. It contains 13 genera and 146 species of Fabaceae: pea, soyabean, vetch, lupin, faba bean, lentil, chickpea, cowpea, mung bean, common bean, and some species of tropical legumes (*Cajanus, Cyamopsis, Dolichos, Cannavalia*) (Table 1). Because of financial constraints, field multiplication in the near future has to be reduced (Table 2).

Table 1. Taxonomic composition of the VIR grain legume collection

Genera	No. of species	No. of accessions
Lupinus L.	28	3098
Vicia L.	48	3354
Lathyrus L.	37	1232
Glycine Willd	6	6922
Phaseolus L.	5	9762
Faba Mill.	1	1750
Cicer L.	3	2703
Pisum L.	2	8695
Lens Mill.	2	3318
Vigna Savi.	8	4000
Dolichos L.	1	105
Cajanus DC.	1	54
Cyamopsis DC.	1	147
Ervilia Link.	1	672
Cannavalia Adans.	1	17
Macroptilium (Benth.) Urban	1	11
Total	**146**	**45840**

Table 2. Germplasm conservation and multiplication of the VIR grain legume germplasm collection and its regeneration in 1995–99

Year	No. of accessions	Field multiplication	% of multiplication
1995	43576	8575	19.6
1996	43526	7762	17.8
1997	43853	8195	18.6
1998	45372	9958	21.9
1999	45840	7830	17.1

Evaluation/characterization

For many years the evaluation of the collection has been carried out in the frame of a network of experimental stations covering several different geographical areas. At present this activity has been reduced. Evaluation of new accessions and screening of the collection for the main traits are being carried out without the possibility to compare data obtained in such a wide range of different ecological/geographical conditions as was the case before. The germplasm evaluation starts in the field with the evaluation of agronomic traits. Afterwards, in collaboration with the research laboratories and other institutes, evaluation of the following main characters is carried out: chemical composition, resistance to diseases, pests, soil acidity, drought, cold, nitrogen-fixing ability. The objective is to find sources of genes that can help solve the "bottle-neck" problems of grain legume breeding for different regions of the country. For every crop, the traits related to time of maturity and high productivity are always being investigated as a rule. For every crop the most important specific characteristics are evaluated. For instance, for pea, priorities are the sources of resistance to *Aphanomyces* root rot, *Ascochyta pisi*, *Mycospherella pinodes*, *Bruchus pisorum* the lima-bean pod borer, spring drought, as well as the traits for *afila* leaf type, high efficiency of nitrogen fixation, non-shattering pods and small seeds. For soyabean, priority is given to samples with neutral reaction to photoperiod, cold resistance, with a high efficiency of nitrogen fixation, good seed quality, high height of the first pod, resistance to diseases. For lupin, stable and low content in alkaloids, determinate branching, resistance to *Fusarium* wilt and high efficiency of nitrogen fixation are very important. For vetch, material with cold resistance before flowering, leaflets fall before maturation, resistance to root rot and good seed quality are the most desirable. As a result all curators have at their disposal "working collections" for the main regions where the crop is cultivated. In addition, "trait collections" are created for prebreeding work. At present in VIR some "donors" of valuable genes as well as new varieties have been created.

Breeding and prebreeding

New varieties

- ***Faba bean* var. *Virowskie***: highly productive, cold resistant, tasty, with white flowers and yellowish seeds. 100-seed weight: 86-120 g. Period of maturation: 88-106 days.
- ***Lupinus polyphyllus* var. *Pervenetz***: low alkaloid content with early maturing seeds. For regions with limited warmth. Long-living, cold resistant, not too demanding regarding soil fertility. Green mass yield 40-60 t/ha, seed yield 0.8-1.5 t/ha.

New prebreeding lines

- ***Pea - hybrid lines*** F 5-6: highly productive, with sugary pod, non-shattering, determinate growth. Donors of the genes *p, v, def, det*. Period of maturation 76-85 days. For breeding grain fodder varieties.
- ***Common vetch - mutant lines***: with high seed productivity (15-17 pods/plant), seeds, leaflets fall before maturity. For breeding of grain forage early maturing varieties.

- ***Phaseolus - mutant*** early maturing ***lines***: determinate growth, with early maturing seeds (80-90, 85-95 days). For breeding of vegetable and grain varieties.
- ***Soyabean –*** cold resistant soyabean lines ("northern ecotype") are bred. Period of maturity 90-100 days, resistant to cold soil.

In situ conservation

In situ conservation priorities are being discussed and in the process of being implemented. The list of wild relatives of cultivated species in Russia is being established and preliminary recommendations for their conservation *in situ* have been made.

Databases

At present the databases contain the passport and conservation data. The coverage of evaluation data is still incomplete in the databases.

The first version of the full passport database of VIR grain legume collection is available on-line at <http://www.dainet.de/genres/vir/data/dbf.htm>. New data are being added as new accessions are entered into the collection.

Data for *Phaseolus, Cicer, Pisum, Lupinus* and *Glycine* have been included in Central Crop Databases. *Lens* and faba bean data will be sent for inclusion in the European databases later on.

Germplasm exchange

Seed material is available for breeding programmes and for scientists, both within the country and abroad. Every year several sets of seed are sent to national breeding centres throughout the country according to requests. On the other hand, breeders supply VIR with their own new varieties.

International activities concern joint evaluation and exchange of seed samples. Every year many requests from foreign genebanks and users are fulfilled (Table 3). Sometimes the requests regard the repatriation of accessions to their countries of origin.

Table 3. Germplasm distributed and introduced in 1995-98

Year	Requested	Distributed	Introduced
1995	4093	1854	663
1996	2250	1842	344
1997	1632	1684	610
1998	1423	1053	1236

Germplasm distribution abroad: Syria, Australia, Spain, Germany, Japan, France, Republic of Korea, USA, Ukraine, Israel, Canada and others.

Germplasm introduction: USA, Syria, Germany, France and others.

Now the large set of accessions originated from arid regions is being evaluated in Mediterranean nurseries of Syria, Ethiopia and Australia in the frame of a joint project with ICARDA-CLIMA.

Future activities for the next 2-3 years

- To complete the formation of the duplicate set of the collection for long-term storage in the refrigerators
- To continue evaluation of new accessions
- To continue updating passport databases as new accessions are received
- To create evaluation databases
- To work out means of conservation of wild relatives *in situ*
- To work out a methodology for the creation of core collections.

Grain legume collections in the Slovak Republic

F. Debre and M. Žáková

Research Institute of Plant Production (RIPP), Genebank of Slovak Republic, Piešťany, Slovak Republic

Since 1951 the Research Institute of Plant Production (RIPP) at Piešťany has been working with plant genetic resources (PGR) and currently it has a mandate for the coordination of the National Programme. The coordination of the programme for biodiversity conservation of plant genetic resources for food and agriculture is ensured by a project commissioned and funded by the state, titled "Conservation of Cultural Plant Gene Pool in the Slovak Republic", in which 18 collaborating stations from the whole country participate. This programme is decentralized to specialized research and breeding institutes and stations, located in regions suitable for the respective crops. Institutes take care of the collecting of accessions and increase of the collections, documentation, evaluation, conservation and regeneration. The collections now comprise over 23 000 samples, including duplicates. Pea is the most important species among grain legumes. A survey of the evaluation and utilization of grain legume genetic resources (GLGR) in 1997 and of total grain legume genetic resources as of 31.12.1997 is presented in Table 1.

The National Genebank in RIPP Piešťany began operation in November 1996.

Table 2 lists for each grain legume genus the number of characters observed.

Collecting of *Phaseolus* and *Lens*

Within the framework of the National Programme, several collecting expeditions were organized on the territory of Slovakia in 1995-98: Muranska Planina, Povazie, Polana, Vysoke Tatry, Spis, Fatra, Kysuca, Sitno. A total of 793 samples of *Phaseolus* and *Lens* were collected, including 2 samples of *Lens*.

Computerization of passport data for Slovakian grain legumes is 60% complete. A few gaps still occur in the database system, which needs to be renewed. Passport data of *Phaseolus, Glycine, Lupinus* were sent to the respective European databases. Approximately 90% of grain legume collection at Piešťany are characterized for a minimum of characters.

Documentation of genetic resources in Slovakia

After the documentation meeting in October 1996 in Budapest we accepted the new suggested structure for passport data.

An information system called ISGZS (**I**nformacny **S**ystem **G**enetickych **Z**drojov **S**lovenska - Information System of Genetic Resources of Slovakia) was developed on the basis of the Czech information system EVIGEZ. We are contributing data on our collections to European databases.

Our genebank was planned for 50 000 accessions. The genebank holds a base seed collection for long-term conservation (–18°C) as well as an active collection used for distribution, regeneration and evaluation of plant characteristics. Each sample from the base collection is also safety-duplicated. It is packed separately and will be stored in Prague. The Gene Bank in Prague also has safety-duplicates in our genebank. Each collection (basic or active) has 2 chambers.

We previously focused our activity on the study of procedures prior to storage, i.e. how to carry them out in the safest and most reliable way. If the material received is of interest for inclusion into our genebank, it is first documented on a temporary number-receipt number. Seeds are accepted only with protocol and passport data (Fig. 1). After checking these data, samples are stored in paper bags in the drying room, at 20°C and 15% RH.

Table 1. Survey of evaluation and utilization of grain legume genetic resources (GLGR) in 1997 and survey of total GLGR as of 31.12.1997

	No. of accessions						Collections holder	
		Evaluated						
Crops	Obtained	Prelim-inary	Basic	Multiplied	Distributed to users	Main-tained 31/12/1997	Inst./ Breed-ing stn. †	Curators / holders
Pisum sativum	27	41	60	140	14	1105	PBS	Slamena, Z.–Štefanka, J
Phaseolus	521	292	91	723	229	1151	RIPP	Hornáková, O.
Phaseolus spp.	–	–	–	–	–	240	SAU	Brindza, J.
Lens culinaris	10	28	52	–	52	243	RIPP	Cicová, I.–Benková, M.
Glycine max	45	47	186	365	386	557	RIPP	Debre, F.
Faba vulgaris	11	–	27	14	7	120	PBS	Vavák, M.
Vicia sativa	–	15	20	35	7	135	PBS	Lazarcíková, M.–Vavák, M.
Lathyrus	7	6	–	–	7	34	RIPP	Cicová, I.–Benková, M.
Cicer	4	54	–	–	5	118	RIPP	Cicová, I.–Benková, M.
Lupinus	9	21	–	–	9	38	RIPP	Cicová, I.–Benková, M.
Total	**634**	**504**	**436**	**1277**	**716**	**3741**		

† Institute / Breeding station: RIPP = Research Institute of Plant Production, Piešťany; PBS = Plant Breeding Station, Horná Streda; SAU = Slovak Agricultural University, Nitra.

Survey of grain legume genetic resources maintained in the Slovak Agricultural University (SAU) in Nitra by 31.08.1998 (data are not computerized)

	No. of accessions						Collections holder	
		Evaluated						
Crops	Obtained	Prelim-inary	Basic	Multiplied	Distributed to users	Main-tained	Inst./ Breed-ing stn. †	Curators / holders
Pisum sativum	–	–	200	–	–	200	SAU + PBS	Brindza, J.
Phaseolus spp. ‡	–	–	–	–	–	680	SAU	Mišak, Brindza, J.
Lathyrus	–	–	–	–	–	30	SAU	Brindza, J.
Cicer	–	–	–	–	–	20	SAU	Brindza, J.
Total	**0**	**0**	**200**	**0**	**0**	**930**		

† Institute / Breeding station: PBS = Plant Breeding Station, Horná Streda; SAU = Slovak Agricultural University, Nitra.

‡ Including 240 GR from previous table

The seeds are left in the drying room until moisture content is 5-6%. We make a germination test for each sample: 2 replicates, 100 seeds per replicate. Our samples are packed in twist-cap glass containers (720 ml, 360 ml and 210 ml).

There are several data processing tables, one for temporary storage of the numbers of the populations to be accessed and the purpose, the next for those that are to be rejected. The structure of these two tables is given in Table 3.

Table 2. Number of observed characters

Collections	Number of observed characters
Pisum	15
Phaseolus	42
Lens	42
Lupinus	29
Cicer	29
Vicia faba	12
Glycine max	45

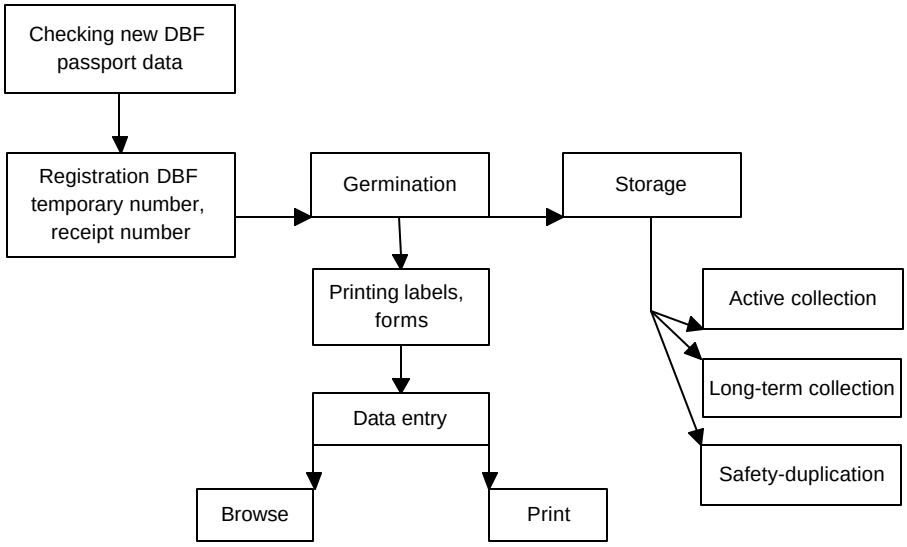


Fig. 1. Seed management information in Piešťany Genebank.

Table 3. Structure of data processing tables

Field name	Type	Width	
Receipt number	Num.	6	
Instcode	Char.	12	
Crop code	Char.	3	
Accession number	Char.	5	
Cultname	Char.	40	
Classification	Char.	1	(S - Store, V – Return, U - Temporary)
Year of coll.	Char.	4	
Type of coll.	Char.	2	(A - active, Z – long-term)
Germination (at arrival)	Num.	5.1	
Germination critical	Num.	5.1	
Moisture (at arrival)	Num.	4.1	
Year of acquisition	Char.	4	
Safety duplication	Char.	1	
Date of test	Date	8	
Type of seed	Char.	2	
1000-seed weight	Num.	6.2	
Number of seeds	Num.	5	
Weight of seeds	Num.	6.1	
Notes	Char.	150	

Seed management information also describes the physical location of seed in the storage. The structure of the storage table is presented in Table 4 (identical for long-term and for active collections).

Monitoring of viability is planned after 10 years for the base collection and after 5 years for the active collection.

Characterization/evaluation data are not stored for all accessions. More than 30 descriptors have been developed for the most important crops. However, new proposals for the improvement of the list of descriptors are being submitted, in order to be able to also maintain quantitative data and biochemical or, as the case may be, molecular characteristics.

Table 4. Structure of the storage table

Field name	Type	Width
Store's number	Num.	6
Instcode		
Crop code		
Accession number		
Cultname		
Date	Date	8
Type of containers	Char.	1
Number of cont.	Num.	2
Amount in cont.	Num.	6.1
Minimum for reg.	Num.	6.1
Chamber	Char.	1
Location in the seed storage (shelf, place, glass container)		

Grain legume production data

Table 5. Production and growing area

	Area harvested (x 1000 ha)			Yield (t/ha)		
	1995	**1996**	**1997**	**1995**	**1996**	**1997**
Pisum sativum	42511	35477	26192	2.25	2.23	2.23
Lens culinaris	1465	1551	1239	0.67	1.01	0.60
Phaseolus vulgaris	1419	1481	1366	1.59	1.56	1.65
Fodder legumes	4207	4020	4174	2.04	1.51	1.36
Glycine max	755	871	818	1.41	1.70	1.51

Table 6. Crop and area cultivated in 1998

Crop	Area (x 1000 ha)
Pisum sativum	27.80
Pisum sativum (fodder)	0.79
Lens culinaris	1.29
Phaseolus	1.38
Faba vulgaris	1.03
Vicia sativa	0.26
Glycine max	0.80

Source: Matošková, D. 1998. Legumes. Research Institute of Agricultural and Food Economics, Bratislava. 17pp.

Registered varieties

Table 7. Number of registered grain legume varieties in the Slovak Republic

Crop	Number
Pisum sativun	22
Pisum sativum L. convar. *medulare*	43
Pisum sativum L. subsp. *sativum* convar. *speciosum* (Dierb.)	9
Faba vulgaris Moench	12
Phaseolus vulgaris L.	8
Phaseolus vulgaris L. convar. *nanus*	43
Glycine max (L.) Merr.	13
Lens esculenta Moench	4
Total	**154**

Main activities of the National Programme for PGR

- Collection
- Study
- Multiplication
- Conservation
- Development of computerized databases
- Publication of a *Pisum* catalogue
- Maintenance of the information system genotypdata for *Phaseolus* and *Pisum*.

We are currently preparing a new proposal for a PGR project in accordance with the Global Plan of Action. We have no experience concerning on-farm conservation, but we plan to develop this kind of activity in the future. There is currently no *in situ* conservation of grain legume genetic resources in our region.

Status of the grain legume collection in Slovenia

Vladimir Meglič

Agricultural Institute of Slovenia, Ljubljana, Slovenia

Introduction

Slovenia belongs to the Mediterranean and to the European centres of diversity. Slovenia could be considered as a gene centre for some Brassicaceae (cabbage, turnip), Alliaceae (onion, garlic), Asteraceae (lettuce, chicory), Valerianaceae (corn lettuce) and some fruit and grapevine species, grasses, clovers, medicinal and aromatic plants. Crop relatives such as *Mycelis muralis, Lactuca serriola* and *Cichorium intybus* of the Asteraceae can be found in the wild. Owing to the presence of extensive grassland area in Slovenia, many different ecotypes of grasses and clovers can be found. Many landraces also appear in crops which were introduced more than a century ago from other parts of the world. From America, maize, beans and potato were spread at the time of the Austro-Hungarian Monarchy. In the different ecological conditions of Slovenia, farmers selected a lot of different populations adapted to the less favourable growing conditions.

Early projects to collect Slovenian autochthonous populations, ecotypes and landraces of agricultural species with the goal of breeding new and improved cultivars were initiated about 35 years ago. In the former Yugoslavia, during the late 1980s, a programme started with the task to collect plant genetic resources for the Yugoslav Genebank. After the independence of Slovenia, the Slovenian Ministry of Science and Technology supported the genebank of vegetables, potato, fodder plants, grasses, clovers, small fruits and grapevine from 1992 to 1994. In 1996 the Ministry of Agriculture, Forestry and Food started financing the Slovene Genebank programme with the aim of maintenance, evaluation, regeneration and preservation of Slovenian autochthonous species, ecotypes, populations and landraces of agricultural plants.

Grain legume collection

The germplasm collection at the **Agricultural Institute of Slovenia** is one of the three working collections within the Slovene genebank system. This is a fairly large *ex situ* collection of lettuce, onions, cabbage, winter wheat, grasses and clovers, small fruit, grapevine and grain legumes. The grain legume collection consists of 1051 accessions of *Phaseolus* and *Vicia faba* (Table 1).

Table 1. Grain legume collection maintained at the Agricultural Institute of Slovenia

Species	No. of accessions
Phaseolus vulgaris	964
Phaseolus coccineus	53
Vicia faba	34
Total	**1051**

Seed samples and passport data were obtained with the assistance of local elementary and agricultural schools, Agricultural Advisory Service, newspaper ads and farmers. Most of the people who sent us samples filled out a questionnaire which gave us, besides the passport data, some additional information on local names and growing practices. All accessions were inspected, sorted and numbered. Through that action we received 852 accessions by the end of 1995. However, because of the inappropriate storage facilities, some of the samples were destroyed by insects and some completely lost their germinative ability. In 1996 about 100 additional samples were obtained in a repeated action. At present we are continuing the effort of broadening the grain legume collection with other species.

Documentation

All grain legume accessions are well documented for IPGRI minimum passport descriptors, although some minor gaps exist. Recently an initiative was taken to establish an information and database management system for the Slovenian Genebank. Because most information is available for these species, bean and faba bean collections will serve as pilot databases.

Evaluation

To maximize the useful genetic diversity, new accessions are assayed according to morphological, agronomic and ecological characteristics and molecular data are also efficiently used for this purpose. A subsample of the Slovenian *Phaseolus* germplasm collection was compared with a group of tester accessions representing the Andean and Mesoamerican genepools. A group of Slovenian accessions revealed a fair amount of distinctness from both, representing a possible set of unique germplasm.

Evaluation of the faba bean collection showed that most accessions appeared to be of *equina* type, one of *minor* and the rest of *major* type.

Activities involving grain legumes conducted in F.R. Yugoslavia

Dragan Jovićević

Institute of Field and Vegetable Crops, Novi Sad, F.R. Yugoslavia

Introduction

In F.R. Yugoslavia, three species of grain legumes share a total acreage of 106 000 ha: soyabeans are grown on 70 000 ha, beans on 24 000 ha and peas on 12 000 ha. The area under grain legumes represents only 2.2% of the total agricultural land of 4 867 000 ha. Although they are valuable sources of relatively inexpensive nutrients, grain legumes take an undeservedly small portion of the total agricultural production in Yugoslavia when compared with other countries. In addition, the Yugoslav production of grain legumes is limited to a small number of species.

A short history of collecting, studying and conserving grain legume genetic resources

Work on the collection, classification, partial evaluation and conservation of some species of grain legumes started within the framework of a project initiated by the Yugoslav Bank of Plant Genes (BBGJ). In the period 1989-92, the programme included the following grain legumes: *Glycine, Phaseolus, Pisum, Vicia faba, Lupinus, Cicer* and *Lens*. The material under study originated from active collections of research institutes and seed companies of the former Yugoslavia.

Within the framework of the National Programme, 20 regional expeditions were organized with the aim of collecting and conserving the existing genetic variability. Collecting and partial characterization in accordance with (IBPGR) IPGRI descriptors were carried out by breeders and botanists from research institutes.

In its final form, the information system of the Yugoslav Bank of Plant Genes (YUGB) included data on 542 samples of grain legumes (Table 1).

After the break-up of the former Yugoslavia, portions of grain legume samples were either preserved in former Republics or were destroyed if they happened to be passing the regeneration phase in war-infested zones.

Table 1. Summary of accessions in the Yugoslav Bank of Plant Genes (YUGB)

YUGB designation	Plant species code	Genotype from-to	Genus	DB code	Species
YUGB	012	1-60	*Glycine*	GMAX	*Glycine max*
YUGB	013	1-79	*Cicer*	CARI	*Cicer arietinum*
YUGB	038	1-290	*Phaseolus*	PVUL	*Phaseolus vulgaris*
YUGB	044	1-60	*Pisum*	PSAT	*Pisum sativum*
YUGB	045	1-22	*Vicia faba*	VFAB	*Vicia faba*
YUGB	047	1-23	*Lupinus*	LUPI	*Lupinus albus*
YUGB	048	1-8	*Lens*	LENS	*Lens esculenta*

Current status of the grain legume samples in F.R. Yugoslavia

From the number of samples given above, the national collection of the Yugoslav Bank of Plant Genes presently includes only samples of *Glycine* (60) and *Phaseolus* (290). The samples are stored in chambers for mid-term storage at +4ºC, rented from the Maize Research Institute in Zemun Polje. In the period 1996-97, 20 *Glycine* samples and 68 *Phaseolus* samples were regenerated.

The overall activity of the Gene Bank is considerably reduced owing to financial difficulties at national level. It had been planned for the Yugoslav Bank of Plant Genes to cover 5500 m^2 and to have a storage capacity for 100 000 samples. These storehouses were planned to be equipped for long-term storage at –20ºC, for additional safety of the stored samples. However, the construction of the Gene Bank, which started in 1990, is not yet completed.

Work on the characterization of samples has not been completed and data are not available to potential users. A possibility of duplication cannot be ruled out in spite of the small size of the national collection of grain legumes.

No funding can be provided to organize regional expeditions for collecting populations and old varieties. This is an unfortunate situation, considering the biodiversity and genetic variability of the flora of Yugoslavia. The flora of F.R. Yugoslavia makes 1.7% of the total world flora while the area of the country takes only 0.035% of the total dry land. The territory of Yugoslavia is floristically rich, with a high diversity of species (e.g. Fabaceae: 313).

The situation is much better in the active collection of research institutes. There are six institutes in Yugoslavia engaged in the study, maintenance and breeding of grain legumes (Table 2).

Table 2. Yugoslav research institutes with collections of grain legumes

Name of institute	Location
Institut za ratarstvo i povrtarstvo	Novi Sad
Institut za istrazivanja u poljoprivredi "Srbija" – Centar za povrtarstvo	Smederevska Palanka
Institut za istrazivanja u poljoprivredi "Srbija" – Centar za poljoprivredna i tehnološka istrazivanja	Zajecar
Institut za poljoprivredu	Podgorica
INI Agroekonomik, PK Beograd	Belgrade
INR Uljarice	Belgrade

In most institutes, active collections are kept in chambers for mid-term storage (+4ºC). Each sample has, or should have, complete passport data. Before being stored, seed viability and moisture content are measured. Viability is periodically monitored and when it drops below 70% the sample is regenerated by sowing in the field. As a rule, sample size is not in agreement with the IPGRI requirement. It varies depending on how frequently a sample is used by breeders. Furthermore, the characterization of samples in most cases has not been done according to the IPGRI descriptors.

The current situation and the number of samples in the active collections (Table 3) indicate the necessity of another round of collecting for the needs of the national collection (BBGJ). Before embarking on that project, however, it is necessary to check the existing documentation of the active collections, in order to avoid duplication of samples in the national collection.

Table 3. Number of genotypes in the active collection in F.R. Yugoslavia

Species	No. of accessions
Glycine max	1223
Phaseolus vulgaris	276
Pisum sativum	424
Vicia faba	5
Lupinus albus	4
Cicer arietinum	5
Lens esculenta	6

Utilization

Screening and evaluation of confectionery peanut germplasm

Andreas Hadjichristodoulou
Agricultural Research Institute, Nicosia, Cyprus

Introduction

This short report refers to special conditions for which peanut germplasm is very limited. In the Mediterranean countries (West Asia, North Africa, islands) as well as in other parts of the world, soils are generally calcareous. In Cyprus most peanut soils have up to 20-25% $CaCO_3$ and 10% active lime (Papastylianou 1990). In such areas peanut varieties express lime-induced iron chlorosis, give low yields and require expensive treatment with iron chelates. Furthermore, in these areas confectionery peanuts are grown and consumed roasted as snacks. Varieties for such uses must be large-seeded and have long shelf-life (high ratio of oleic/linoleic acid). High oil content is not required.

Availability of genetic resources for such conditions is very limited. 'Cyprus Local' and 'Shulamit' (Israel) are relatively tolerant to lime-induced iron chlorosis. In order to improve the existing confectionery varieties in the calcareous soils, special confectionery germplasm developed by ICRISAT was first screened for tolerance to lime-induced iron chlorosis and finally on agronomic performance.

Results and discussion

The variation in lime-induced iron chlorosis was very significant (Hadjichristodoulou 1993). Iron chlorosis ranged from 3.0% to 67.1%. 'Cyprus Local' (6.5% chlorosis) and the Israeli line 'Hazera' 234/73 (10.9%) were among the most tolerant. Considering that ICRISAT material was developed and selected at Hyderabad, India, where there is no problem of lime-induced iron chlorosis, and parents have not been selected for tolerance, it is interesting that many lines appeared by chance to be tolerant. ICRISAT staff are now using these tolerant lines in crossing programmes. The advantage of growing varieties tolerant to chlorosis in calcareous soils is that it is not necessary to spray with Fe chelates in order to correct lime-induced iron chlorosis.

Following this screening for tolerance to chlorosis, the best germplasm was evaluated for agronomic and quality performance. The main criteria for selection were kernel yield, 1000-kernel weight and shelf-life (high oleic/linoleic ratio). As a result, three such lines were registered by Crop Science as improved germplasm: ICGV 88438 ('Nikokleia'), ICGV 89214 ('Kouklia') and ICGV 91098 ('Gigas') (Hadjichristodoulou *et al.* 1997). Seed may be obtained from the National Seed Storage Laboratory, Fort Collins, USA, from ARI, Nicosia, Cyprus or from ICRISAT, India. Further evaluation resulted in identifying agronomically superior and chlorosis-tolerant varieties for calcareous soils, such as 'Timi', 'Koloni', 'Yeroskipou' and 'Mondria' (Hadjichristodoulou 1998). The above selected germplasm has a long shelf-life. 'Timi' and other selected lines outyielded the 'Cyprus Local' by 23% in pod yield, 27% in kernel yield and their kernel mass was 1.2 g compared with 0.8 of 'Cyprus Local'.

By crossing the selected germplasm it is possible to develop agronomically superior varieties of confectionery peanuts, tolerant to lime-induced iron chlorosis.

References

Hadjichristodoulou, A. 1993. Groundnut genotypes tolerant to lime-induced iron chlorosis. International *Arachis* Newsl. 13:12-13.

Hadjichristodoulou, A., S.L. Dwivedi, J.C. Wynne, S.N. Nigam, G. Alexandrou, Chr. Theodorides and M. Mouzouris. 1997. Registration of germplasm. Crop Sci. 37(6):1985.

Hadjichristodoulou, A. 1998. New peanut varieties for calcareous Mediterranean soils. Technical Bulletin No. 191. Cyprus Agricultural Research Institute. 9pp.

Papastylianou, I. 1990. Effectiveness of iron chelates and $FeSO_4$ for correcting iron chlorosis of peanut on calcareous soils. J. Plant Nutrition 13(5):555-566.

Pea composite crosses

Simo Hovinen
Nordic Gene Bank (NGB), Alnarp, Sweden

Purpose

Pea breeding in Finland is directed to obtaining productive, semi-high-stemmed varieties. Adaptability to low temperatures and long-day conditions is also necessary. The normal practice in handling breeding material is that after the last single plant is selected, the rest of the material is destroyed. A very small part of the population is usually selected for the following generation. In the end, the genetic resources remaining for conservation are limited to market varieties, which are released at a frequency of 2-3 in 10 years. The purpose of this conservation is to save, for potential future use, genetic material which is adapted to the northern cultivation areas.

Development of composite populations

Populations are grown in single rows according to the pedigree breeding method. Only populations showing an average earliness are the object of composite crosses. Every separate cross-combination forms one composite cross-population. Selection starts with still segregating F_4 or F_5 populations and continues for 2-3 years in order to obtain a population carrying easily explainable characteristics. Populations can be of conventional leaf type or semi-leafless. About 10 final populations are developed every year. In this way, the parents of every composite population are known all the time. Typical characteristics of each composite are observed and registered in databases. In the last stage of selection, about 1000 plants are chosen for conservation in bulk.

Usage of composite cross populations

Throughout the years a breeder can gather experience about the parental value of cross parents because lines from the same crosses as composites will be evaluated in normal plot trials. If any specific cross or single parent shows extraordinary high breeding value, it can be used again as a cross parent. If some of the crosses behind composites have produced several exceptionally valuable pure lines or varieties, a breeder can once again grow the composite for further single plant selection. The breeding institute will keep the composite cross seeds in cold storage for a period of 10 years or more.

After rejuvenation of the composites the breeder can deliver them to the Nordic Gene Bank. A decision about which composites it is useful to accept in collections should be made by the NGB working group on pulses. Databases of composites will be combined with NGB's registration system.

Winter varieties of grain legumes in Italy

P. Ranalli and C. Paoletti

Istituto Sperimentale Colture Industriali, Bologna, Italy

The cultivation of winter grain legumes – faba bean, chickpea, lupin and lentil – has dramatically decreased in Italy during the last 40 years. At the beginning of the 1950s approximately 817 000 ha of grain legumes were cultivated, 82% of which were in the southern and insular parts of Italy. Later, the cultivation of these crops showed a progressive and continuous decrease, until it reached 94 000 ha, 84% of which were only faba bean cultures.

There are multiple causes for this decrease of interest in legume cultivation: unstable yields, lack of mechanization of the main cultural practices (sowing, weeding and harvesting), lack of interest in the consumption of such simple food in our society and, particularly for faba bean, the decline in the number of horses which were the main consumers of this legume in our country. Moreover, until the mid-1970s, everywhere in the world and especially in Italy, there was a generalized lack of interest in agronomic and genetic research for legumes that had a strong negative impact on the cultivation of these crops.

Surprisingly, while agronomic research slowed down worldwide, the demand for legumes on the Italian market increased, presumably because of a renewed interest in the Mediterranean diet and because of the use of legumes as sources of proteins, especially for the animal feed industry.

To match the new demand and successfully reintroduce these grain legumes in Italy, in the mid-1970s the need of developing research activities aimed at obtaining high and stable yields and at making legume cultivation economically competitive with respect to other crops became evident. The agronomic advantages in increasing legume cultivation are multiple. These crops play an irreplaceable role as renewal crops because of their suitability for less favourable conditions and they are capable of improving soil fertility, especially in southern Italy, which is characterized by an arid or semi-arid climate and clay soils with no irrigation. Arable lands in these areas often undergo rotations of just a few crops, primarily durum wheat. As a matter of fact, between 1989 and 1991, wheat covered about 40% of the total arable land in the south. Moreover, legumes are capable of fixing nitrogen. This is particularly important nowadays when the cost of industrially produced nitrogen has increased, and public opinion is particularly sensitive to environmental pollution issues.

On the basis of different projects supported by the Italian National Research Council, by the Agriculture Ministry and the Foreign Ministry, by the European Union and by the ENEA (Ente Nazionale Energie Alternative), several projects evaluating legume germplasm, designing more efficient harvesting techniques and innovative agronomic practices have been carried out.

Owing to the breeding work carried out in the last 20 years, new varieties were added to the few ones previously registered in the National Variety list of the Italian Ministry of Agriculture (faba bean and pea for animal feeding). At the moment the National Variety list includes 8 varieties of faba bean, 13 varieties of pea, 6 new varieties of chickpea, 1 new variety of lupin, but none of lentil.

Research

*Molecular differentiation of common bean (*Phaseolus vulgaris *L.) landraces*

J. Kraic, M. Závodná, O. Hornáková, E. Gregová and F. Debre

Research Institute of Plant Production (RIPP), Genebank of Slovak Republic, Piešťany, Slovak Republic

Introduction

Common bean is a traditional grain legume grown in Slovakia. During the last collecting missions in Slovakia, several tens of bean landraces were collected. They were studied for their morphological and agronomical characteristics and introduced into the bean collection. Nevertheless there is no or very limited information about their origin or pedigree, and moreover some of them possess similar or identical morphological traits. There is also a high probability that this set of landraces contains duplicates of commercial genotypes released or imported and grown in Slovakia in the last years.

For differentiation and identification of bean genotypes, seed storage proteins and isozymes have been used as molecular markers (Gepts *et al.* 1986; Driedger *et al.* 1994). Nevertheless their polymorphism to differentiate individual genotypes is limited. Therefore different types of DNA markers have been used, more frequently RFLP (Stockton and Gepts 1994) and RAPD (Skroch and Nienhuis 1995; Fofana *et al.* 1997) markers. Their differentiation potential is higher. Analysis of satellite sequences have been used in population dynamic studies in humans, animals, and plants. Microsatellite-derived DNA probes for the study of variability in the genus *Phaseolus* were applied by Hamann *et al.* (1995). Stockton and Gepts (1994) tested minisatellite-derived and other hypervariable DNA probes to reveal polymorphism within the *Phaseolus vulgaris* genome. They concluded that not all hypervariable probes are equally useful for fingerprinting in *Phaseolus vulgaris* but specifically the M13 bacteriophage and 33.15 human probes were able to generate polymorphic hybridization patterns. To accelerate, improve and minimize time of analysis, a technique based on DNA amplification using simple sequence repeats-derived single primers was presented in studies of evolutionarily diverse genomes (Gupta *et al.* 1994).

The present research had the following objectives: to differentiate 85 bean landraces and detect possible duplicates, and to determine the potential of satellite polymorphism to estimate genetic diversity in common bean.

Material and methods

Eighty-five bean (*Phaseolus vulgaris* L.) landraces were obtained during collecting missions in different localities of Slovakia. The seeds of collected landraces were introduced into the bean collection and maintained in the Genebank of Slovak Republic, Piešťany.

The genomic DNA of the analyzed genotypes was isolated by the method of Dellaporta *et al.* (1993) from leaves of young seedlings. The sample of each genotype represented a DNA collected from 10-15 individual plants. Seven primers derived from core sequences of microsatellites – $(ACTG)_4$, $(GACA)_4$, $(ACAG)_4$, 5'-$(GACAGATA)_2$-3' – and core sequences of minisatellites – M13 bacteriophage (5'-GAGGGTGGXGGXTCT-3'), 33.6 (5'-AGGGCTGGAGGAGGGC-3') and 33.15 (5'-AGAGGTGGGCAGGTGG-3') – were used for amplification. The PCR reactions were performed in 20-µl volumes. The programmes were as follows: 1 min at 94°C followed by 35 cycles each of 1 min at 94°C, 1 min at annealing temperature (each G / C = 4°C, each A / T = 2°C), 5 min at 72°C. Extension step in the last cycle was 8 min at 72°C. Amplification reactions contained 1x Taq-DNA polymerase buffer, 0.25 mM each of dNTP, 1 mM primer, 0.8 U Taq-DNA polymerase, and 25 ng DNA.

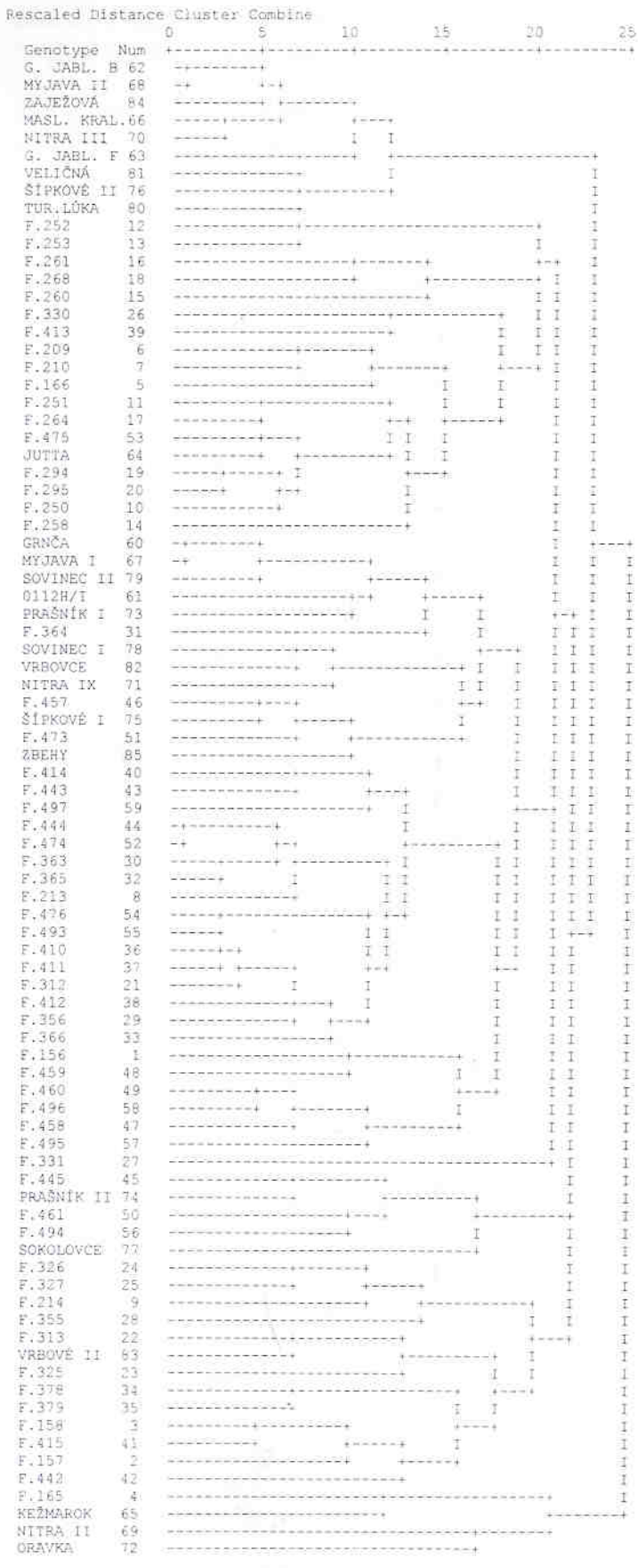


Fig. 1. Dendrogram obtained with UPGMA method showing genetic variability in bean landraces.

The PCR reactions were performed in PTC-200 Peltier Thermal Cycler (MJ Research). Amplified PCR products were separated in 1.5% agarose gels and stained with ethidium bromide.

Only unambiguous and intense bands were used for evaluation of generated DNA markers. The statistical analyses were performed using the statistics package software SPSS 8.0.1 (SPSS, Inc.).

Results and discussion

The analyzed landraces included variability in morphological characteristics of seed (shape, colour, coat pattern), plant (bush or climbing), colour of immature pods, and others. Nevertheless this is not sufficient to differentiate all landraces from each other and to determine their identity. Therefore a molecular approach was used to identify and distinguish a set of bean landraces. All four microsatellite-based primers and three primers derived from core sequences of human and M13 bacteriophage minisatellites were able to amplify reproducible, high polymorphic banding patterns. Microsatellite primers generated 2-4 polymorphic markers in the range of 600-1200 bp, minisatellite-based primers generated 5-9 polymorphic markers in the range of 260-1700 bp. The highest number of polymorphic markers (9) was generated by the minisatellite primer derived from M13 bacteriophage. As a result, it was possible to discriminate one from the other 85 landraces under analysis (Fig. 1).

We conclude that microsatellite and minisatellite DNA markers could be very effective tools for the identification and differentiation of common bean genotypes. Moreover the PCR-based approach is very convenient to analyze genetic diversity and differentiate common bean genotypes.

References

Dellaporta, S.L., J. Wood and J.B. Hicks. 1993. A plant DNA minipreparation: Version II. Plant Mol. Biol Rep. 4:19-21.

Driedger, D.R., B.M. Watts, A. Hussain and L.G. Elias. 1994. Isoenzyme and cotyledon protein variation for identification of black beans (*Phaseolus vulgaris* L.) with similar seed morphology. Euphytica 74:27-34.

Fofana, B., X. Vekemans, P. du Jardin and J.P. Baudoin. 1997. Genetic diversity in Lima bean (*Phaseolus lunatus* L.) as revealed by RAPD markers. Euphytica 95:157-165.

Gepts, P., T.C. Osborn, K. Rashka and F.A. Bliss. 1986. Phaseolin protein variability in wild forms and landraces of the common bean (*Phaseolus vulgaris* L.): evidence for multiple centers of domestication. Econ. Bot. 40:451-468.

Gupta, M., Y.S. Chyi, J. Romero-Severson, and J.L. Owen. 1994. Amplification of DNA markers from evolutionarily diverse genomes using single primers of simple-sequence repeats. Theor. Appl. Genet. 89:998-1006.

Hamann, A., D. Zink and W. Nagl. 1995. Microsatellite fingerprinting in the genus *Phaseolus*. Genome 38: 507-515.

Skroch, P.W. and J. Nienhuis. 1995. Qualitative and quantitative characterization of RAPD variation among snap bean (*Phaseolus vulgaris* L.) genotypes. Theor. Appl. Genet. 91:1078-1085.

Stockton, T. and P. Gepts. 1994. Identification of DNA probes that reveal polymorphism among closely related *Phaseolus vulgaris* lines. Euphytica 76:177-183.

Morphological and physiological studies on some faba bean (Vicia faba *L.) genotypes under the conditions of Bucovina zone, Romania*

***G. Saghin*[1], *Silvia Strajeru*[2] *and Mirela Nimigean*[2]**

[1] *Agricultural Research Station Suceava, Romania*
[2] *Suceava Genebank, Romania*

Legumes are cultivated on about 10.5% of the arable land over the world. Among these, *Vicia* and *Phaseolus* are the most important crops. Their seeds have both higher protein and lysine content than cereal seeds and are used as food and silage for animal feeding.

The main objectives of the Romanian breeding programmes are directed at increasing both the production capacity and pest resistance of these species.

Material and methods

Since 1984, a *Vicia faba* L. breeding programme has been carried out at the Agricultural Research Centre of Pojorata (Suceava district), starting with the collection and study of the raw material.

By now, 220 foreign genotypes and 50 local populations have been studied in the ecological conditions of the mountainous zone in Bucovina, for their morphology, production capacity, pest resistance and earliness.

This paper presents the results of these studies for 58 genotypes of *Vicia faba* L., during 1992-94. The climatic conditions during the study period were as follows:

yearly average rainfall	1991-92	559.2 mm
	1992-93	662.0 mm
	1993-94	451.4 mm
yearly average temperature	6.9 – 7.9°C	

Results and discussion

Earliness

"Days to flowering" and "days to harvest" were scored and the results were compared with the variety 'Cluj-84', as control sample. For the number of "days to flowering", only seven genotypes had a flowering period 1–3 days longer than the control (Fig. 1). Figure 1 shows that, for days to harvest, all analyzed genotypes were earlier than the control sample, the greatest difference being 29 days in the case of 'ARF 00122', 'ARF 00139', 'ARF 00138' and 'ARF 00210'.

Morphological evaluation data

The measurement of some morpho-productive traits was taken for all 58 genotypes. The behaviour of 14 representative genotypes is represented graphically (Fig. 2).

The number of fertile offshoots ranged between 1.8 for 'Iugoslavia 4475' and 2.3 for 'Maroc 25033' genotypes. Small differences in the number of seeds per pod were observed, a mean of 2.3 grains being registered for the control ('Cluj-84'). The majority of analyzed genotypes had a smaller number of pods per plant than the control, but the 'Minor' genotype should be pointed out for its greater number of pods per plant (14.2) (Fig. 2). Grain weight per plant varied depending on the number of pods per plant, number of seeds per pod, 1000-grain weight and the genotype. Concerning plant height, the highest value was registered for the control 'Cluj-84' (105.7 cm) and the smallest for 'ARF 00122' (50.3 cm). This trait is depending on genotype, variety and origin. A positive correlation was obtained between plant height and insertion height of the first pod, which ranged between 17.6 and 37.2 cm.

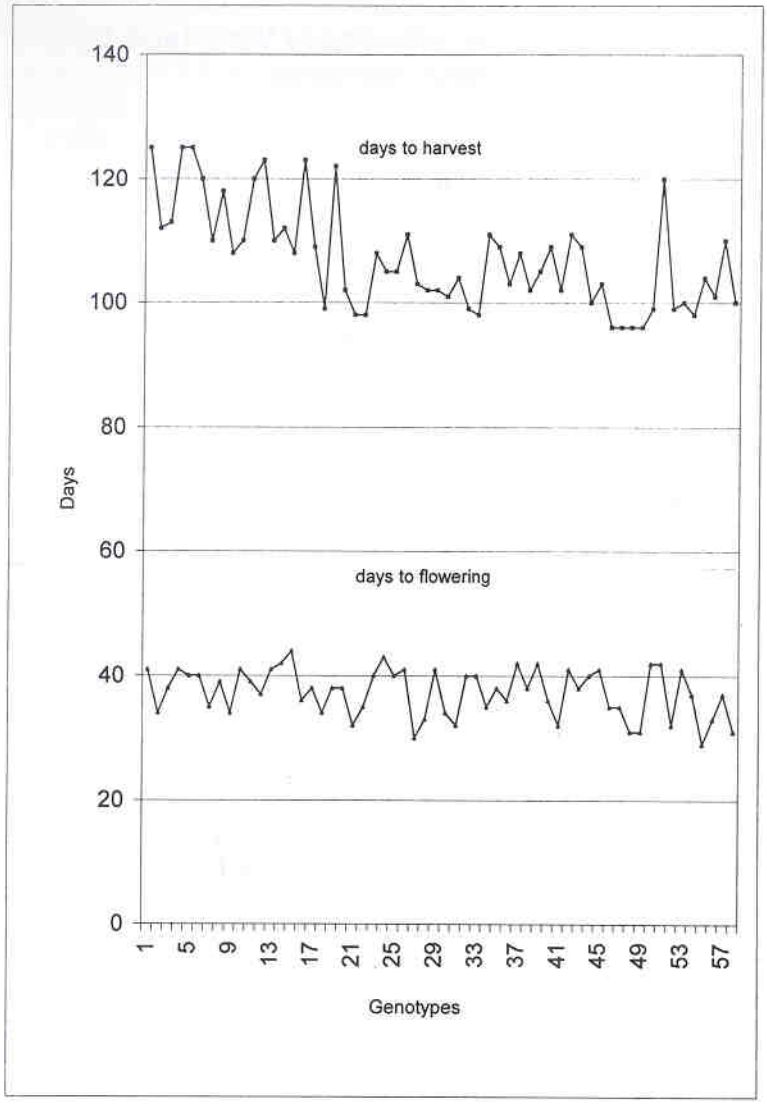


Fig. 1. Phenological data of the faba bean genotypes.

Legend of the studied genotypes

1	Cluj-84	21	Con amore	41	Olga
2	Pojorata-24	22	Sito	42	Bordeaux
3	Vama-48	23	Ciabanskie	43	Ascott
4	Iasny 2	24	Ucraine	44	Pilote
5	Gret	25	Arrigliano	45	Siria 4495
6	Debec	26	Larissa	46	ARF 00122
7	Klatovsky svinsky	27	Grecia 107628	47	ARF 00139
8	Chlumetcky	28	Grecia 107622	48	ARF 00138
9	Hedosa	29	Iugoslavia 4475	49	ARF 00210
10	Inovec	30	Spania 4475	50	Yemen 25134
11	Milion	31	Spania 106155	51	Afganistan 4454
12	Uran	32	Cargo	52	Japonia 11916
13	Kisvardai-22	33	Triple White	53	Egipt 27705
14	Ovari	34	Maxime	54	Maroc 25017
15	Karna	35	Minor	55	Maroc 25033
16	Kornbeiger-Kleinkornige	36	Ricardo	56	Tunisia 4508
17	Topas	37	Fine Pack	57	Mexic 15531
18	Canner	38	Climax	58	Peru 4459
19	Hedin	39	Bianka		
20	Troy	40	Alfred		

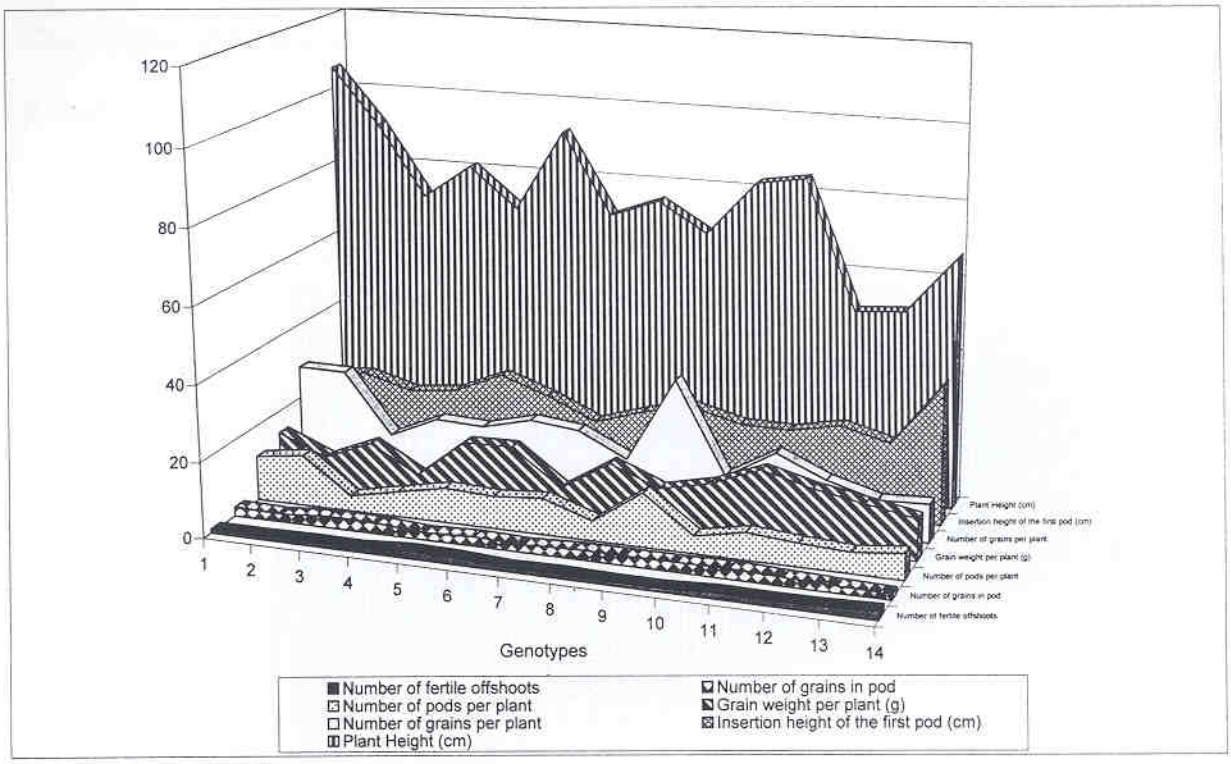


Fig. 2. Main morpho-productive traits of some *Vicia faba* L. genotypes.

Legend of the analyzed genotypes

1	Cluj-84	8	Triple White
2	Hedin	9	Minor
3	Con amore	10	Climax
4	Larissa	11	Olga
5	Grecia 107622	12	ARF 00122
6	Iugoslavia 4475	13	ARF 00138
7	Cargo	14	Maroc 25033

Pest resistance evaluation data

The production capacity of the *Vicia faba* genotypes depends mostly on their resistance to major diseases, especially those due to the fungi *Uromyces fabae, Botrytis fabae* and *Ascochyta fabae*.

The studied genotypes had different reactions to the attack of these diseases (Fig. 3). The attack of *Uromyces fabae* had a higher intensity at plant maturity, and it was the fungus which had the strongest effect in this ecological zone. Figure 3 shows that none of the studied genotypes had a very good resistance against this fungus. 'Maroc 25017', 'Maroc 25033' and 'ARF 00138' were very sensitive (rating 9), the disease being present in all vegetation stages on leaves and stalks.

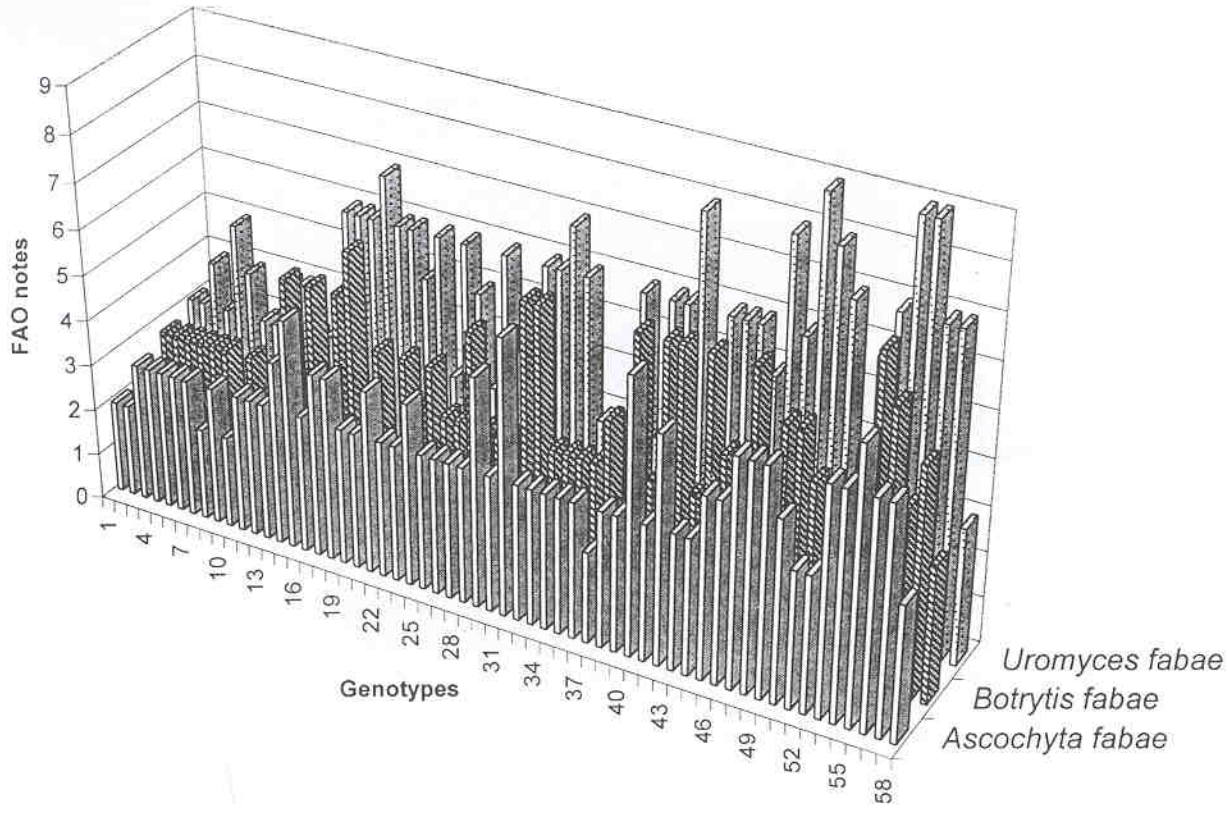


Fig. 3. Response of the studied *Vicia faba* L. genotypes to *Uromyces fabae*, *Botrytis fabae* and *Ascochyta fabae*.

Botrytis fabae had a lower intensity on all genotypes and increased after the formation of seeds in pods. 'Cluj 84', 'Milion', 'Inover', 'Chlumetcky', 'Kisvardai-22', 'Troy' and 'Fine Pack' were very resistant genotypes (rating 2), while 'Maroc 25017' had the lowest resistance (rating 7) for this disease.

The majority of analyzed genotypes manifested a very high or high levels of resistance (ratings 2-4) to the attack of *Ascochyta fabae*, with the exception of 'Iugoslavia 4475', 'Spania 106155', 'ARF 00210', 'Egipt 27705', 'Maroc 25017', 'Maroc 25033', 'Tunisia 4508', 'Mexic 15531', 'Karna' and 'Bordeaux' which had medium resistance.

Conclusions

- 'Iasny II', 'Cluj 84', 'Chlumetcky', 'Milion', 'Kisvardai-22', 'Sito', 'Triple White', 'Maxime', 'Minor' and 'Pojorata 24' represent sources of valuable genes for pest resistance.
- With the present study it was possible to identify valuable genotypes as sources of pest resistance, earliness and other desirable traits to be used for breeding purposes.

Bibliography

Bond, A.D. 1993. Motor of *Vicia faba* evolution and Breeding. Grain Legumes 1:15-16.

Carrouee, B. 1993. Pea and faba bean: new step in ECC production. Grain Legumes 1:18-19.

Huber, W. and P. Vuilliound. 1979. Rezultatele experimentale varietale la bobul de primavara (in French). Rev. Suisse Agric. II(6):263-268.

Iannelli, P. 1970. Ameliorarea genetica la *Vicia* sp. L'Agricoltura italiana 3:163–203.

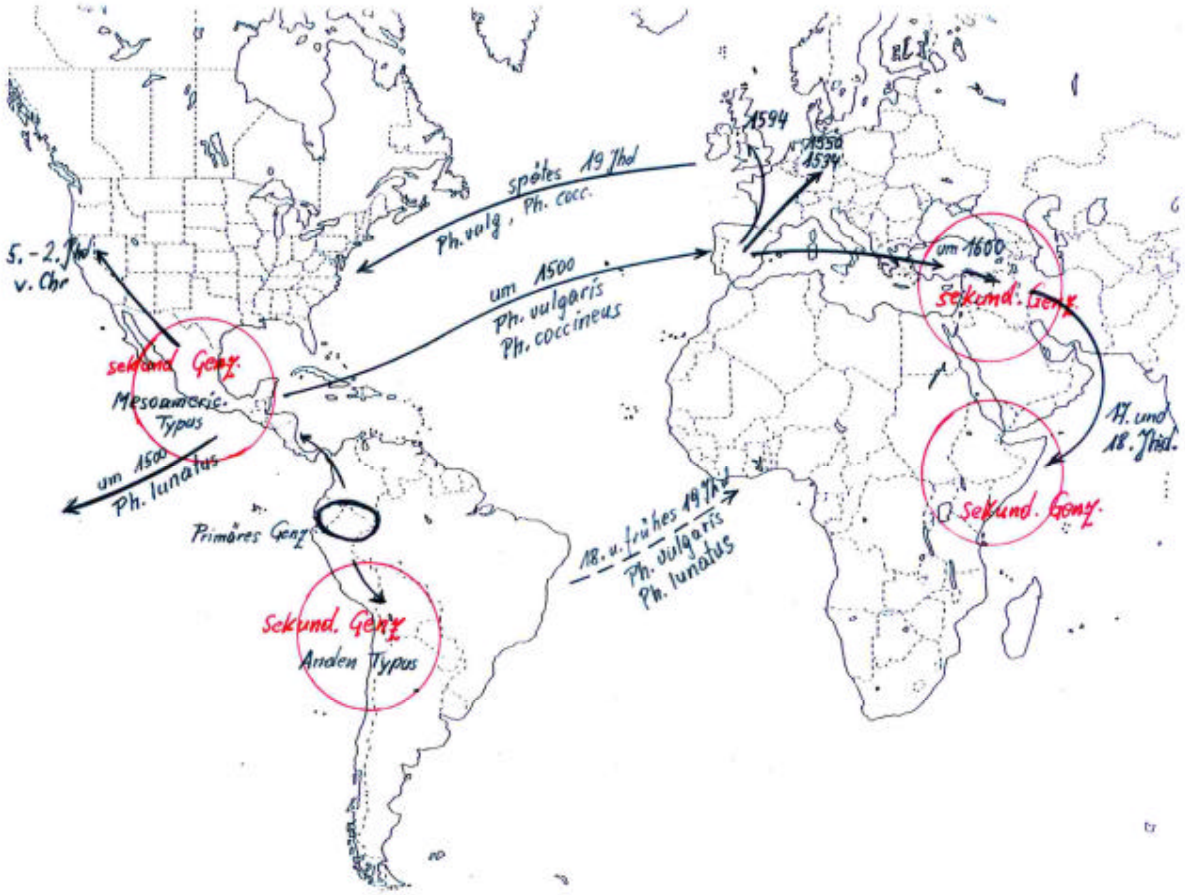
Tivoli, B. 1993. Role of the pathologist in a breeding programme. Grain Legumes 1:13-14.

The origin of Phaseolus

Rudolf Schachl
Federal Office of Agro-Biology, Linz, Austria

During the last EUCARPIA Symposium on breeding of protein and oil crops, held in April 1998 in Pontevedra (Spain), P. Gepts from the University of California showed that the domestic genepool of *Phaseolus* consists of two main geographic genepools, the Andean and the Mesoamerican, corresponding to the main domestication centres. In addition, an intermediate genepool was identified, distributed on the Pacific slope of the Andes in Ecuador and Northern Peru. Unlike the two major genepools, the latter contains only wild populations and was never introduced into cultivation. The intermediate nature of the third genepool could theoretically be the result of hybridizations of the two domesticated ones, or be attributed to common ancestry. The PCR-based survey of the distribution of tandem direct repeats in phaseolin genes shows that the only bean genotype lacking any of the surveyed repeats is the population of the intermediate group. This observation suggests that the intermediate population is the presumed ancestor of *P. vulgaris*.

Starting from the Mesoamerican gene centre, *P. vulgaris* and *P. coccineus* were brought to Spain in the 16th century, in 1534 and 1550 respectively. *Phaseolus* bean was reported in Germany in 1594. It reached England and from there was brought back to North America. After 1500, *Phaseolus* spread over the Mediterranean part of Europe and arrived in the Turkish-Iranian gene centre around 1600. In the 17th and 18th centuries the bean reached the East African gene centres, through Arab traders. Assuming that, in a gene centre, environmental conditions prevail that lead to enrichment of the genepool, these areas might be of special interest. Regarding the genetic variability to be expected, we must keep in mind that mostly beans from the Mesoamerican gene centre came to Europe. Gepts also noted that from a large-scale scrutiny, the genetic variation within the two domesticated genepools, the Mesoamerican and the Andean, is rather narrow although the variation of beans grain regarding colour, shape, size, etc. would anticipate a large genetic variation. The wide variation in the feature of the grain is easy to explain as such mutations can be immediately noticed by man and therefore selected.


1594
1550
1534
spätes 19 Jhd
Ph. volg, Ph. cocc.
5.-2. Jhd v. Chr
um 1500
Ph. vulgaris
Ph. coccineus
um 1600
sekund. Genz.
sekund. Genz.
Mesoamerik. Typus
um 1500
Ph. lunatus
17. und 18. Jhd.
Primäres Genz
sekund. Genz.
18. u. früher 19 Jhd
Ph. vulgaris
Ph. lunatus
Sekund. Genz.
Anden Typus

Appendix I. Grain Legume Passport Descriptors

(based on the FAO/IPGRI Multi-Crop Passport Descriptors)

GRAIN LEGUME PASSPORT DESCRIPTORS
1. Institute code (INSTCODE) Code of the institute where the accession is maintained. The codes consist of the 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym.
2. Accession number (ACCENUMB) This number serves as a unique identifier for accessions and is assigned when an accession is entered into the collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number should never be reused. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).
3. Collecting number (COLLNUMB) Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.
4. Genus (GENUS) Genus name for taxon. Initial Uppercase letter required.
5. Species (SPECIES) Specific epithet portion of the scientific name in lowercase letters with authority[8]. Following abbreviation is allowed: “sp.”
6. Subtaxa (SUBTAXA) Subtaxa can be used to store any additional taxonomic identifier plus authority[1]. Following abbreviations are allowed: “ssp.” (for subspecies); “var.” (for variety); “convar.” (for convariety); “f.” (for form).
7. Accession name (ACCNAME) Either a registered or other formal designation given to the accession. First letter uppercase. Multiple names separated with semicolon.
8. Country of origin (ORIGCTY) Name of the country in which the sample was originally collected or derived. Use the ISO3166 extended codes (i.e. current and old 3-letter ISO 3166 country codes).
9. Location of collecting site (COLLSITE) Location information below the country level that describes where the accession was collected starting with the most detailed information. Might include the distance in kilometres and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S, PARANA means 7 km south of Curitiba in the state of Parana).
10. Latitude of collecting site (LATITUDE) Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).
11. Longitude of collecting site (LONGITUDE) Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data (minutes) should be indicated with hyphen (e.g. 076-W).
12. Elevation of collecting site [m asl] **(ELEVATION)** Elevation of collecting site expressed in meters above sea level. Negative values allowed.

[8] Authority is only provided at the most detailed taxonomic level

13. Collecting date of original sample [YYYYMMDD] **(COLLDATE)**
Collecting date of the original sample where YYYY is the year, MM is the month and DD is the day[9].

14. Status of sample **(SAMPSTAT)**

1 Wild
2 Weedy
3 Traditional cultivar / Landrace
4 Breeders line
5 Advanced cultivar
6 Genetic stock
99 Other (Elaborate in REMARKS field)

15. Collecting source **(COLLSRC)**
The coding scheme proposed can be used at 2 different levels of detail: either by using the global codes such as 1, 2, 3, 4 or by using the more detailed coding such as 1.1, 1.2, 1.3 etc.

1 Wild habitat
- 1.1 Forest / woodland
- 1.2 Shrubland
- 1.3 Grassland
- 1.4 Desert / tundra

2 Farm
- 2.1 Field
- 2.2 Orchard
- 2.3 Garden
- 2.4 Fallow
- 2.5 Pasture
- 2.6 Store

3 Market
- 3.1 Town
- 3.2 Village
- 3.3 Urban
- 3.4 Other exchange system

4 Institute / Research organization
99 Other (Elaborate in REMARKS field)

16. Donor institute code **(DONORCODE)**
Code for the donor institute. The codes consist of the 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym.

17. Donor number **(DONORNUMB)**
Number assigned to an accession by the donor. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).

18. Other number(s) associated with the accession **(OTHERNUMB)**
Any other identification number known to exist in other collections for this accession. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system). Multiple numbers can be added and should be separated with a semicolon.

A. Safety-duplication **(SAFEDUP)**

0 Sample is not safety-duplicated elsewhere
1 Sample is safety-duplicated elsewhere

19. Remarks **(REMARKS)**
The remarks field is used to add notes or to elaborate on descriptors with value "99"(=Other). Prefix remarks with the field name they refer to and a colon. Separate remarks referring to different fields by semicolons (e.g. COLLSRC:roadside).

[9] Missing data should be omitted, e.g., 197703 or 1953

FAO WIEWS DESCRIPTORS[10]

1. Location of safety-duplicates (DUPLSITE)

Code of the institute where a safety-duplicate of the accession is maintained. The codes consist of 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym. Multiple numbers can be added and should be separated with a semicolon.

2. Availability of passport data (PASSAVAIL)

(i.e. in addition to what has been provided)

0 Not available
1 Available

3. Availability of characterization data (CHARAVAIL)

0 Not available
1 Available

4. Availability of evaluation data (EVALAVAIL)

0 Not available
1 Available

5. Acquisition type of the accession (ACQTYPE)

1 Collected / bred originally by the institute
2 Collected / bred originally by joint mission / institution
3 Received as a secondary repository

6. Type of storage (STORTYPE)

Maintenance type of germplasm. If germplasm is maintained under different types of storage, multiple choices are allowed, separated by a semicolon (e.g. 2;3). (Refer to FAO / IPGRI Genebank Standards 1994 for details on storage type).

1 Short-term
2 Medium-term
3 Long-term
4 *In vitro* collection
5 Field genebank collection
6 Cryopreserved
99 Other (elaborate in REMARKS field)

[10] FAO WIEWS Descriptors are used in the FAO World Inventory and Early Warning System. They are optional descriptors for the Grain Legume Central Databases

Appendix II. Abbreviations and acronyms

AARI	Aegean Agricultural Research Institute, Turkey
AIS	Agricultural Institute of Slovenia
ARI	Agricultural Research Institute, Cyprus
BAZ	Federal Centre for Breeding Research on Cultivated Plants, Germany
BBGJ	Yugoslav Bank of Plant Genes
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economical Cooperation and Development), Germany
BGRC	Braunschweig Genetic Resources Collection, Germany
BRG	Bureau des ressources génétiques, France
CABINET	Carbohydrate Biotechnology Network for grain legumes
CBD	Convention on Biological Diversity
CIFA	Centro de Investigación y Formación Agraria, Spain
CGN	Centre for Genetic Resources, The Netherlands
CLIMA	Centre for Legumes in Mediterranean Agriculture
CMS	cytoplasmic male sterile
COMECON	Council for Mutual Economic Assistance
CPRO-DLO	Centre for Plant Breeding and Reproduction Research, The Netherlands
CRF	Centro de Conservación de Recursos Fitogenéticos, Spain
CWANA	Central and West Asia and North Africa
EAN	Estação Agronómica Nacional, Portugal
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks
ENMP	Estação Nacional de Melhoramento de Plantas, Portugal
ESA	Escola Superior Agraria, Portugal
ESCORENA	European System of Cooperative Research Networks in Agriculture – FAO
EUCARPIA	European Association for Research on Plant Breeding
FAO	Food and Agriculture Organization of the United Nations
FOA	Federal Office of Agro-Biology, Austria
GTZ	German Agency for Technical Cooperation
GEVES	Groupe d'étude et de contrôle des variétés et des semences, France
HDRA	Henry Doubleday Research Association, UK
HRI	Horticulture Research International, UK
IAR	Institute for Agricultural Research, Yugoslavia
ICARDA	International Centre for Agricultural Research in the Dry Areas, Syria – CGIAR
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics, India – CGIAR
IGR	Information Centre for Genetic Resources (ZADI), Germany
INIA	Instituto de Investigación Agraria, Spain
INRA	Institut National de la Recherche Agronomique, France
IPK	Institut für Pflanzengenetik und Kulturpflanzenforschung, Germany
JIC	John Innes Center, UK
LGRN	*Lathyrus* Genetic Resources Network

LINK	Legume Interactive Network
MAPA	Ministerio de Agricultura Pesca y Alimentación, Spain
NGB	Nordic Gene Bank, Sweden
NGO	non-governmental organization
NIAB	National Institute of Agricultural Botany, UK
PSR	Pro Specie Rara, Switzerland
PCR	polymerase chain reaction
PGR	plant genetic resources
PGRFA	plant genetic resources for food and agriculture
RAPD	random amplified polymorphic DNA
RIPP	Research Institute of Plant Production, Slovakia
SAVE	Saveguard for Agricultural Varieties in Europe, Germany
SIA	Servicio de Investigación Agraria, Spain
UTAD	Universidade de Tras-os-Montes e Alto Douro, Portugal
UPOV	Union internationale pour la protection des obtentions végétales (International Union for the Protection of New Varieties of Plants)
VIR	Vavilov Institute of Plant Industry, Russian Federation
WANANET	West Asia and North Africa Network for Genetic Resources
WIEWS	World Inventory and Early Warning System – FAO
ZADI	Central Agency for Agricultural Documentation and Information, Germany

Appendix III. List of Participants

Working Group Members

Chairperson
Mike Ambrose
Department of Applied Genetics
John Innes Institute
Norwich Research Park, Colney Lane
Norwich NR4 7UH, **United Kingdom**
Tel: (44-1603) 452571
Fax: (44-1603) 456844
Email: mike.ambrose@bbsrc.ac.uk

Members

Rudolf Schachl
Federal Office of Agro-Biology
Wieningerstrasse 8 – Postfach 17
4020 Linz, **Austria**
Tel: (43-732) 381261 / 259
Fax: (43-732) 385482
Email: schachl@agrobio.bmlf.gv.at

Zlatko Šatović
Dept. Plant Breeding, Genetics and Biometrics, University of Zagreb
Svetošimunska 25
10 000 Zagreb, **Croatia**
Tel: (385-1) 2393935
Fax: (385-1) 239 3930
Email: zsatovic@agr.hr
satovic@hotmail.com

Andreas Hadjichristodoulou
Agricultural Research Institute
Nicosia, **Cyprus**
Tel: (357-2) 305101
Fax: (357-2) 316770
Email: hjchris@arinet.ari.gov.cy

Simo Hovinen
Boreal Plant Breeding
Myllytie 10
31600 Jokioinen, **Finland**
Tel: (358-3) 4187721
Fax: (358-3) 4187715
Email: simo.hovinen@mtt.fi

Gérard Duc
Laboratoire des Légumineuses
URGAP-INRA
BP 1540
21034 Dijon cedex, **France**
Tel: (33) 380633148 / 3000(switch)
Fax: (33) 380633263
Email:gerard.duc@epoisses.inra.fr

Thomas Gladis
ZADI / IGR
(German Centre on Documentation & Information in Agriculture, Information Centre for Genetic Resources)
Villichgasse 17
53177 Bonn, **Germany**
Tel: (49-228) 9548210
Fax: (49-228) 9548220
Email: gladis@zadi.de

André Mendes Dordio
Estação Agronómica Nacional
Quinta do Marquês
2780 Oeiras, **Portugal**
Tel: (351-1) 4416855
Fax: (351-1) 44 16011
Email: ean@mail.telepac.pt

František Debre
Research Institute of Plant Production (RIPP)
Bratislavská cesta 122
921 68 Piešt'any, **Slovak Republic**
Tel: (421-838) 7722311 / 312 / 326 / 327
Fax: (421-838) 7726306
Email: debre@vurv.sk

Vladimir Meglič
Crop and Seed Production Dept.
Agricultural Institute of Slovenia
Hacquetova 17
1000 Ljubljana, **Slovenia**
Tel: (386-61) 1375375
Fax: (386-61) 1375413
Email: vladimir.meglic@kis-h2.si

Alvaro Ramos Monreal
Servicio de Investigación Agraria
Carretera de Burgos km. 118 - Apdo 172
47080 Valladolid, **Spain**
Tel: (34-983) 414431
Fax: (34-983) 414780
Email:
alvaro.ramos@svidta.dgiadr.cag.jcyl.es

Gert B. Poulsen
Nordic Gene Bank
PO Box 41
230 53 Alnarp, Sweden
Tel: (46-40) 461790
Fax: (46-40) 462188
Email: gert@ngb.se

Loek J.M. van Soest
Centre for Genetic Resources, The Netherlands (CGN)
Centre for Plant Breeding & Reproduction Research (CPRO-DLO)
PO Box 16
6700 AA Wageningen, **The Netherlands**
Tel: (31-317) 477011
Fax: (31-317) 418094
Email: L.J.M.vansoest@plant.wag-ur.nl

Nevin Açikgöz
Aegean Agricultural Research Institute
PO Box 9, Menemen
35661 Izmir, **Turkey**
Tel: (90-232) 8461331
Fax: (90-232) 8461107
Email: aari@service.raksnet.com.tr

Dragan Jovićević
Inst. of Field and Vegetable Crops
Maksima Gorkog 30
21000 Novi Sad, **F.R. Yugoslavia**
Tel: (381-21) 614933
Fax: (381-21) 621212

FAO

Thomas Bachmann
Crop and Grassland Service
Via delle Terme di Caracalla
00100 Rome, Italy
Tel: (39) 0657051
Fax: (39) 0657053152

Henry Doubleday Research Association (HDRA)

Alan Gear
Henry Doubleday Research Association
Ryton Organic Gardens
Coventry CV8 3LG, United Kingdom
Tel: (44-1203) 303517
Fax: (44-1203) 639229
Email:
agear@hdra.org.ukagear@hdra.org.uk

IPGRI

Lorenzo Maggioni
ECP / GR Coordinator
IPGRI
Via delle Sette Chiese 142
00145 Rome, Italy
Tel: (39) 0651892231
Fax: (39) 065750309
Email: l.maggioni@cgiar.org

Observers

Margarita Vishnyakova
N.I. Vavilov Institute of Plant Industry (VIR)
Bolshaya Morskaya Str. 42
190000 St. Petersburg, **Russian Federation**
Tel: (7-812) 3144732
Fax: (7-812) 318762
Email: vir@mail.dux.ru

Attending Members - Unable to Attend

Shahal Abbo
Dept. of Field Crops, Vegetables and Genetics
Faculty of Agriculture, Food & Environmental Quality Sciences
The Hebrew University of Jerusalem
PO Box 12
Rehovot 76100, **Israel**
Tel: (972-8) 9481943
Fax: (972-8) 9468265
Email: abbo@agri.huji.ac.il

Claudia Paoletti
(representing Paolo Ranalli)
Istituto Sperimentale per le Colture Industriali
Via di Corticella 133
40129 Bologna, **Italy**
Tel: (39) 0516316847 / 6316811
Fax: (39) 051374857

Wojciech Swiecicki
Institute of Plant Genetics
Polish Academy of Sciences
ul. Strzeszynska 34
60479 Poznan, **Poland**
Tel: (48-61) 8233511
Fax: (48-61) 8233671
Email: wswi@igr.poznan.pl

Corresponding Members - Unable to Attend

Siyka Angelova
Institute of Introduction and Plant Genetic Resources "K. Malkov"
4122 Sadovo, Plovdiv District, **Bulgaria**
Tel: (359-32) 267625
Fax: (359-32) 629026 / 270270

Miroslav Hýbl
AGRITEC Ltd. Sumperk
Zemedelska 16
787 01 Sumperk, **Czech Republic**
Tel: (420-649) 382111
Fax: (420-649) 382999
Email: Hybl@agritec.cz

László Holly
Institute for Agrobotany
Kulso mezo 15
2766 Tápiószele, **Hungary**
Tel: (36-53) 380016 / 70 / 71
Fax: (36-53) 380072
Email: lholly@agrobot.rcat.hu

Michael O'Farrell
Dept. of Agriculture, Food & Forestry
Backweston Farm
Leixlip, Co. Kildare, **Ireland**
Tel: (353-1) 6280608
Fax: (353-1) 6280634

Godfrey Camilleri
Agricultural Research and Development Centre
Government Farm
Ghammieri, **Malta**
Fax: (356) 442587 / 440251

Marcel Avramiuc
(now replaced by Ion Scurtu, see below)
Suceava Genebank
Bulevardul 1 Decembrie 1918 nr. 17
5800 Suceava, **Romania**
Tel: (40-30) 227087
Fax: (40-30) 227087

Romas Bogusas
Lithuanian Institute of Agriculture
Akademija
5051 Kedainiai distr., **Lithuania**
Tel: (370-57) 37173
Fax: (370-57) 60975
Email: romas@lzi.lt

New members (nominated after the meeting)

Alain Maquet
Phytotechnie des Régions tropicales et intertropicales
Faculté Universitaire des Sciences Agronomiques de Gembloux, FUSAGx
2, passage des Déportés
5030 Gembloux, **Belgium**
Tel: (32-81) 622145
Fax: (32-81) 614544
Email: phytotrop@fsagx.ac.be

Konstantinos Iliadis
Institute for Forage Crops and Pastures
Theofrastou 1
41335 Larissa, **Greece**
Tel: (30-41) 533811
Fax: (30-41) 533809

Dr Ion Scurtu
Vegetable and Flower Gardening Research Institute
8268 Vidra-Ilfov, **Romania**
Tel: (40-1) 3139282
Fax: (40-1) 3139282
Email: inclf@rnc.ro