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

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
IPGRI

ECP/GR Report of a Working Group on Grain Legumes

Errata Corrigendum

We would ask you to note a correction regarding authorship of the article mentioned on p.iv and p.66.

The correct authorship is as follows:

"Status of Grain Legume Collections in Portugal"

E. Bettencourt and A. M. Dordio
Estação Agronómica Nacional, Quinta do Marquês, 2780 Oeiras, Portugal

The International Plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization operating under the aegis of the Consultative Group on International Agricultural Research (CGIAR). The international status of IPGRI is conferred under an Establishment Agreement which, by December 1995, had been signed by the Governments of Australia, Belgium, Benin, Bolivia, Burkina Faso, Cameroon, China, Chile, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Iran, Israel, Italy, Jordan, Kenya, Mauritania, Morocco, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovak Republic, Sudan, Switzerland, Syria, Tunisia, Turkey, Ukraine and Uganda. IPGRI's mandate is to advance the conservation and use of plant genetic resources for the benefit of present and future generations. IPGRI works in partnership with other organizations, undertaking research, training and the provision of scientific and technical advice and information, and has a particularly strong programme link with the Food and Agriculture Organization of the United Nations. Financial support for the agreed research agenda of IPGRI is provided by the Governments of Australia, Austria, Belgium, Canada, China, Denmark, France, Germany, India, Italy, Japan, the Republic of Korea, Mexico, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK and the USA, and by the Asian Development Bank, IDRC, UNDP and the World Bank.

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

The geographical designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of IPGRI or the CGIAR concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Citation:
Gass, T., M. Ambrose, J. Le Guen, A. Hadjichristodoulou and S. Blixt, compilers. 1996. Report of a Working Group on Grain Legumes. First meeting, 14-16 July 1995, Copenhagen, Denmark. International Plant Genetic Resources Institute, Rome, Italy.

ISBN 92-9043-289-6

IPGRI
Via delle Sette Chiese 142
00145 Rome
Italy

Contents

Discussion and Recommendations

Introduction

Opening remarks

T. Gass welcomed the participants on behalf of ECP/GR. He expressed his satisfaction that the repeated recommendation by the Programme's Technical Consultative Committee to establish a working group on *Pisum* and initiate activities on other grain legumes has finally been implemented. He reminded the participants that they had been nominated by their respective National Coordinators to represent the interests of the grain legume genetic resources community in their country. T. Gass suggested that M. Ambrose, who had been instrumental in bringing this first meeting about, be asked to chair the meeting. The group agreed to this.

Dr Sigfús Bjarnason, Director of the Nordic Genebank (NGB), then welcomed the group on behalf of the Danish ECP/GR Coordinator Dr Arent Josefsen and on behalf of the Nordic Countries. He gave a short historic overview of the collaboration regarding *Pisum* in Europe and expressed his satisfaction that the Nordic Countries were hosting the first meeting of this group.

After briefly presenting the structure and conservation strategy of the Nordic Genebank, Dr Bjarnason emphasized the importance of collaboration to advance the cause of genetic resources in Europe. He mentioned the key role played by the Nordic Genebank in initiating ECP/GR grain legume activities.

An ECP/GR working group for *Pisum* had been functional during the first phase of ECP/GR and one of the subjects for discussion was the long-term commitment of the Nordic Genebank to the conservation of the pea collection, which had been gathered at the Weibullsholm Plant Breeding Institute since 1930. The multiplication of the material and transfer to NGB was initiated in 1982 and continued through 1986.

This first *Pisum* working group was discontinued because of lack of funding but the issue was raised again in 1987. Again, the lack of funding stopped the formation of a working group, but a small group of scientists, including Peter Matthews (John Innes Centre), Peter Winfield and Niall Green (DAFS, Edinburgh), and NGB staff members, met at NGB in November that year to discuss the documentation and access to *Pisum* genetic resources. The tasks of gene symbol coordination, and the working collection of genetic stock for peas, have now been transferred from the NGB to the John Innes Centre under the responsibility of Mike Ambrose. The base collection is still maintained in the deep freezers at NGB.

The Technical Consultative Committee of ECP/GR recommended the re-establishment of the *Pisum* Working Group at both the Phase III meeting in Hungary 1989 and the Phase IV meeting in Bulgaria 1993. As a result of the increased budget of ECP/GR in the current Phase V, the initiation of this group with a mandate to also include other small grain legumes, is now possible.

In closing, Dr Bjarnason reminded the group that the success of ECP/GR is based on the commitment of national plant genetic resources institutions and the actions undertaken by them as in-kind contribution to the programme.

Objectives and scope of the group

T. Gass presented the objectives set for Phase V of ECP/GR by the Technical Consultative Committee (Bulgaria, 1993) and the present *modus operandi* of the Programme. This was followed by a discussion on the objectives and scope of the Grain Legumes Group.

S. Abbo mentioned that priorities for conservation at the national level should be strongly influenced by the question of whether the material is original to that country. He reminded the group that this was in harmony with the specification of the Convention on Biodiversity which committed signatory countries to the conservation of their genetic resources. S. Blixt suggested that one way of promoting the awareness of this commitment within the national collection was to assign different status to the accessions, as this is being done at NGB (e.g. accessions for which long-term commitment was accepted, accessions maintained for specific scientific studies, accessions maintained solely as working material, etc.). S. Bjarnason added that NGB continued storing its germplasm not originating from the Nordic Countries until it is sure that another country has accepted responsibility to conserve it. The Group acknowledged the commitment of many genebanks to preserve the material collected outside their borders.

The Group also discussed the potential effect of intellectual property rights on the availability of genetic resources and the consequences this could have regarding the collaboration within Europe. While full understanding was expressed for the fact that breeders restricted access to their breeding lines, the group strongly recommended that material declared as genetic resources within member countries of ECP/GR should remain available to all *bona fide* users.

Concerning the scope of crops to be dealt with by the group, it was agreed that the Group would focus its attention on *Cicer*, *Lens*, *Lupinus*, *Phaseolus*, *Pisum*, soyabean, *Vicia faba* and *Vigna*. A number of legumes which belong to the mandate of ECP/GR's Forages Working Group are of interest to the Group (e.g. *Vicia sativa*, *Lathyrus* spp. and other *Vicia* spp.). It was agreed that coordination with the Forages Working Group would be sought through the Chair concerning work on these species.

Review of national grain legume collections

(This section briefly highlights the presentation made by participants. Full details on size of collections are given in Part B.)

Austria

R. Schachl presented the collections maintained in Austria. Grain legume collections are maintained by the Federal Office and Research Centre in Vienna (137 accessions of *V. faba* as working collection), the genebank Wies / Stria (37 accessions of *Phaseolus* spp.) and the Federal Office of Agrobiology in Linz (38 accessions of *Pisum* and 604 accessions of *Phaseolus* spp.). Much of the *Phaseolus* material was collected in the early 1980s and consists exclusively of landraces. The collection is characterized to a large extent and fully documented including photographic archives. No research is presently being undertaken with the material, but great interest exists for comparing this material with collections held in neighbouring Slovenia, Croatia and Hungary.

At present, half of the *Phaseolus* collection still requires regeneration and 10% has yet to be safety-duplicated. R. Schachl undertook to increase the proportion of regenerated material to 70% by the end of 1997 and to safety duplicate the remaining 10% of the collection at IPK, Gatersleben by the end of 1997.

R. Schachl further informed the group that the Federal Office of Agrobiology, Linz was already hosting large numbers of accessions from ICARDA as safety duplicates and that it was prepared to extend this service to the countries of ECP / GR.

Bulgaria

A report received from S. Angelova was read to the group. Currently 4455 accessions of grain legumes are maintained in the Bulgarian genebank at IPGR-Sadovo. These consist essentially of *Pisum* spp. (1970 accessions) and *Phaseolus* spp. (1390 accessions). Collections of *Lupinus*, *Cicer* and *Lens* spp. are also maintained. Besides newly bred cultivars and foreign accessions, the largest part of the collections consists of old cultivars and populations.

Of the 4455 accessions mentioned above, 1853 are maintained under long-term storage conditions. None of the collections have yet been safety-duplicated within the country or abroad.

With the exception of the *Lupinus* collections the crops mentioned above are all used by breeding programmes within the framework of collaborative projects with the Fodder Research Institute, Pleven, the Institute of Wheat and Sunflower, Gen. Toshevo and the High Institute of Agriculture, Plovdiv.

In situ conservation activities are undertaken for rare *Cicer* and *Lens* species.

The group expressed its thanks to S. Angelova for sending the report and stated that it looked forward to an intensive collaboration with Bulgaria. It recommended that safety-duplication of the above-mentioned germplasm be given high priority. It was recognized that this could be done advantageously within the Swiss-Bulgarian collaboration. Alternatively, the Federal Office of Agrobiology offered to act as depository.

Croatia

Z. Šatovic presented the situation regarding grain legumes in Croatia. With the exception of soyabean, most grain legumes are still cultivated as landraces and primitive forms. Farmers are rapidly abandoning these forms owing to the introduction of modern high-yielding varieties.

The collection is maintained at the Croatian Bank of Plant Genes and includes mainly *Phaseolus*, *Cicer*, *Pisum* and lupin accessions. Storage facilities are not yet adequate and the construction of a cold store is planned at the department of Plant Breeding, Genetics and Biometry at the Faculty of Agriculture in Zagreb. Given the availability of funding, this long-term store could be realized within 2 years. In the mean time regeneration needs to be carried out every 2 years to maintain the collection.

The group welcomed the commitment of the Croatian Government towards conserving genetic resources as shown by the establishment of a coordinated national programme and Croatia's recent joining of ECP/GR. The group expressed concern for the safety of the collections in Zagreb and the potential loss of the landraces still being used by farmers. It recommended that international funding be mobilized to address this situation. The Federal Office of Agrobiology, Linz offered to act as base collection for the Croatian material until the new store is built and will offer technical assistance if required.

Cyprus

A. Haddjichristodoulou presented the situation concerning grain legumes in Cyprus. Although production trends have fallen steadily during the past 10 years, he expressed confidence that the recent rise in awareness of the nutritional values of grain legumes would revive this branch of the national agriculture. National coordination and conservation responsibility lies with the CYPARI Genebank at the Agricultural Research Institute, Nicosia (National PGR Coordinator: A. Della). The national collections are made up of indigenous material of *V. faba* (101 accessions), *Cicer* (28 accessions), *Lens* (19 accessions), *Phaseolus* (6 accessions) and *Vigna* (8 accessions). The material is stored under medium-term storage conditions and a large portion is not safety-duplicated. Characterization and documentation of the accessions is only partially realized. A staff member of ARI's Genetic Resources Programme has recently been trained to use database software.

The group noted that the present activities on grain legume breeding are being phased out. The limited resources of breeders will be concentrated on crops of higher economic importance. It was recommended that the safety duplication of the above-mentioned material be given high priority and it was noted that documentation of the collections will soon be realized. The group suggested that the characterization of the collections be carried out in collaboration with the breeders prior to the phasing out of the breeding programme.

Czech Republic

In the absence of M. Hýbl, M. Hochman of AGRITEC, Šumperk presented the status of the grain legume collections in the Czech Republic. While the National Programme for Conservation and Utilization of Plant Genetic Resources is coordinated by the Genebank of the Research Institute of Plant Production (RICP) Prague, the crop-specific responsibility for grain legumes lies with AGRITEC, Šumperk. AGRITEC became a privatized breeding company in 1994. This institution currently holds a collection of *Pisum* spp. (1048 accesions), *Vicia* spp. (618 accessions), *Phaseolus* spp. (321 accessions),

Glycine spp. (208 accessions) and *Lupinus* spp. (60 accessions). Of this material, 13.5% is made up of Czech landraces, breeder's lines and cultivars. The material is maintained in medium-term storage conditions and gradually duplicated into the long-term base collection at RICP (Prague) under a government-funded agreement. The material is freely available for breeding and research. Most of the accessions are characterized and all data are electronically documented on the Czech EVIGEZ system. In addition to the above collections a small collection of garden peas is maintained at RICP, Olomouc. Good collaboration exists between AGRITEC and this institution. AGRITEC regenerates its grain legume collection at a rate of 200 accessions per year.

France

J. Le Guen presented the status of French grain legume collections and the activities related to these accessions. He informed the group that in France grain legume genetic resources were maintained by three different types of institutions in accordance with their respective objectives. The Institut National de Recherche Agronomique (INRA) focuses on fundamental research and specialized breeding and maintains collections of pea, faba bean, lupin, bean and lentil. Work with soyabean will gradually be phased out over the following 3 years. INRA is strongly involved in grain legume research through six plant breeding stations: Dijon for pea and faba bean; Versailles and Rennes for pea and beans; Mons for pea; Lusignan for lupin and Montpellier for soyabean. The Groupe d'Etude et de control des Variétés et des Semences (GEVES) maintains new registered varieties, old varieties and landraces of pea, lentil, bean, faba bean and lupin. The Groupement des Sélectionneurs de pois (GSP) is a scientific and economic interest association of eight private breeding companies holding a working collection mainly focusing on prebreeding of pea.

Under the national coordination of the Bureau des Resources Génétiques (BRG) a French grain legume working group is currently being formed, incorporating private and public partners. The first meeting of this group will take place in September 1995. As a priority, this group will address the centralized documentation and rationalization of the collections. It is expected that the database will be available over the Internet by the end of 1997.

Germany

A. Diederichsen presented the German grain legume collections and the related conservation and research activities. Currently the conservation responsibilities lie with Federal Research Centre for Agriculture, FAL, Braunschweig and the Institute for Plant Genetics and Crop Plant Research, IPK, Gatersleben whereby IPK has recently been given the national coordination responsibility for crop genetic resources. The collections at FAL are closely integrated into the agronomic research context of the Institute and have been completed with extensive evaluation data for *Pisum*, *Lupinus* and *Vicia faba*. Prebreeding activities have also been undertaken for these collections. IPK holds large collections of all grain legume crops of European importance. Particularly large collections exist for *Phaseolus* (7688 accessions), *Pisum* (3092 accessions) and *Vicia* (3099 accessions). A large *Glycine* collection (2957 accessions) has been established in relation to past research programmes. Generally, the collections at IPK are regenerated at a frequency of 10% per year and stored under long-term conditions. Careful regeneration and detailed characterization have been given high priority at IPK. This level of activity is threatened by prevailing economic pressure to reduce the staff at the Institute. At FAL, passport, primary and secondary evaluation data is documented electronically. At IPK only passport data is currently available in computerized form, this information

includes an intra-specific classification based on characterization. An Internet connection is expected in the near future.

A certain amount of duplication between the collections at FAL and at IPK is expected to exist but has not as yet been assessed. As a first step, valuable passport and characterization data need to be compared. A final decision on the duplication status of accessions will require confirmation through comparison under field conditions. These could be complemented using molecular techniques, although the funds for this extensive work are not currently available.

Israel

S. Abbo presented the status of Israeli grain legume collections. Particular emphasis is placed on the conservation of local landraces and indigenous wild forms. Currently, the collections include *Cicer* (468 accessions), *Lens* (523 accessions), *Pisum* (324 accessions) *Lupinus* (186 accessions) and *Phaseolus* (600 accessions). This material is maintained at the Israeli Gene bank for Agricultural Crops at Bet-Dagan. In addition a *Cicer* breeding programme at the Volcani Center maintains a working collection of ca. 200 cultivars and numerous hybrid combinations with no specific commitment for long term conservation of the material.

While passport data for the national collections is fully computerized, the level of characterization and evaluation activities is low due to lack of staff at the genebank. The *Phaseolus*, *Vigna*, *Cicer* and *Lupinus* material has been regenerated during the last 3 years. At that time general observations were recorded and computerized.

The Israeli Gene Bank will complete the regeneration of its *Lens* and *Lupinus* landraces by the end of 1997.

Italy

F. Saccardo, presented the work done in Italy with grain legume genetic resources. Working collections are maintained at numerous institutions focusing mainly on research and breeding. Two Italian genebanks have long-term responsibilities for grain legume germplasm. The Germplasm Institute in Bari maintains large collections of bean, chickpea, faba bean, lentil and lupin. The University of Torino maintains an important bean collection (224 accessions). Both of these institutions have computerized databases including passport data and some characterization data. In the context of increasing interest in Italy in soyabean production, the University in Udine has established an important soyabean collection.

Collaboration with other countries and institutions participating in ECP/GR is a high priority by Italian institutions working with grain legumes.

The Netherlands

A report sent by L. van Soest was read to the group. The grain legume collections maintained at the Centre for Genetic Resources, The Netherlands (CGN), currently consists of 1382 accessions including *Pisum* (734 accessions), *Vicia faba* (607 accessions) and *Lupinus* (41 accessions). In addition to this material, 249 accessions, including pea, faba bean and lupin, need to be regenerated, characterized and stored. The grain legume collections are not given a high piority and no efforts are undertaken to sample the overall genetic diversity available in the particular crops. All the material regenerated and stored under long-term conditions is documented for passport data in CGN's database information system GENIS.

The group thanked L. van Soest for submitting a written report and looks forward to collaborating with The Netherlands. Notice was taken of CGN's intention to regenerate, document and store the mentioned 249 accessions mentioned above. It is hoped that a report on this activity can be presented at the group's next meeting.

The Nordic Countries (Denmark, Finland, Iceland, Norway, Sweden)

Data and information was presented by S. Blixt, in regard to the situation at the Nordic Genebank, NGB, and by S. Hovinen, in regard to the activities within NGB's Working Group VI, the Working Group for Rootcrops, Oil Plants and Grain Legumes. The database work at NGB is performed using dBASE4, dBASE5 or FoxPro. Registering of data from hard copy is normally done by the officer in charge of the particular crop. The Nordic Seed Database holds 10 passport descriptors and no biological descriptors; individual crop databases hold from 13 to 19 passport descriptors and from 6 to 64 biological descriptors.

Working Group VI is presently chaired by S. Hovinen, and the secretary is S. Blixt. In total, 267 accessions of grain legumes are presently held in the NGB collection, 155 soyabeans, 2 lentils, 21 common beans, 42 peas, 39 faba beans and 8 vetches. The soyabean material is composed of three registered varieties and dormant breeding material, all resulting from an abandoned Swedish breeding programme. Most of the material is safety duplicated in the permafrost store at Svalbard. An assessment of the extent of the coverage of the collections is difficult to make, since most landraces and older material disappeared during the Second World War. An inventory of released varieties in Sweden and Denmark indicates that only 10% of common beans, 30% of the peas and around 75% of the faba beans and vetches have been collected. It is probably no longer possible to regain this missing material.

The objectives of Working Group VI are to conserve commercial and local varieties, landraces and important wild populations of relevant crops and search for new genetic resources; the mandate concerns only material originating from the Nordic region. The Working Group also provides guidance in the creation of databases, publication of catalogues and enquiries about specific aspects of the crop species concerned.

Germination tests are run on random samples from the active collection, so that each accession will be tested around every 5-10 years. During 1996, three accessions of beans, two of peas, two of faba beans, and three vetches will be multiplied or rejuvenated.

Poland

W. Swieciki presented the status of Polish grain legume collections and the activities related to these collections. Currently 2887 *Pisum* and 868 *Lupinus* accessions are conserved in Wiatrowo, of which less than 50% have been included in long-term storage at IHAR Radzikow. At Radzikow collections of field bean (802 accessions), soyabean (329 accessions), common bean. *Vicia* (279 accessions), *Lathyrus sativa* (88 accessions), and *Lens* (50 accessions) are maintained in long-term storage. In addition 300 common bean accessions are maintained at the Agricultural University in Poznan. Of these 30% have already been included in long-term storage. The long-term storage collections at IHAR Radzikow are regularly monitored and regenerated according to international standards. Computerized passport data exists for all the collections.

The group commended the intensive activity carried out by curators in Poland and recommended that continued national support be given to these efforts. This could be acheived through the renewing of the Ministerial agreement concerning the

conservation of crop genetic resources. W. Swiecki agreed to complete the long-term conservation of the collections at Wiatrowo and Poznan by the end of 1998.

Portugal

A. Mendes Dordio presented the Portuguese grain legume collections. In Portugal grain legumes are considered an important alternative in the context of the decline in cereals production. Genetic resources are maintained in two germplasm collections and eight breeding collections. The National Institute of Agricultural Research (INIA) is committed to institutionalize an effective mechanism that allows for coordination of the national activities in this field. Most of the material was collected after 1989. Sixty-seven percent of the accessions are maintained under long- or medium-term conditions and 33% are kept under short-term conditions at room temperature. The level of characterization is relatively low and much attention needs to be given to the evaluation and regeneration of the collections. Current shortage in funding is an obstacle to the adequate solving of these problems.

The group took note of the difficulties faced by the Portuguese grain legume collections and hopes that national support for genetic resources conservation will increase. The establishment of a national coordination structure under INIA would be welcomed and the group looks forward to the addressing of safety duplication of the collections in this new context.

Russia

B. Kurlovich reported on grain legume activities and collections in Russia and specifically those of N.I Vavilov Institute (VIR). VIR is responsible for more than 43 000 accessions including wild relatives, local populations, landraces and breeding varieties of pea, soyabean, vetch, lupin, faba bean, lens, chickpea and others. *Pisum* is by far the most important legume crop in Russia. Great emphasis is placed on developing taxonomic and ecogeographic classifications. Results are summarized in "Theoretical Basis of Plant Breeding", a series dedicated to different legumes. Introduced material is evaluated and characterized 3 years before being included in the basic catalogue, if it is original and valuable. Material is regenerated depending on species (2-3 years for soya, 5 years for peas and 8-10 years for *Phaseolus*). Evaluation is done through eight experimental stations using the same methods. As some of the southernmost stations of the former VIR now belong to other independent states, there is a need to find a foreign institute to take responsibility for some collections including soyabean, *Phaseolus*, *Vigna*, *Dolychus* and *Cajanus*; total material represents about 3000-4000 accessions. IPGRI will contact ICARDA and IITA to see whether these centres would be prepared to include these in their collections. Responding to a question from S. Abbo related to lentil status in Russia, B. Kurlovich indicated that the culture is in regression due to poor yield and difficulties in mechanizing the culture.

Priorities for the future are related to possibilities of long-term storage, documentation and research valorization.

VIR has also started a genetic stocks collection of *Pisum*. M. Ambrose offered to send a duplicate set of the International *Pisum* Genetic Stocks Collection to VIR and hoped that a reciprocal exchange could be arranged. A tripartite collaboration between Institute of Plant Genetics, IPG (Poland), John Innes Centre, JIC (UK) and N.I. Vavilov All-Russian Research Institute of Plant Industry VIR was initiated.

Slovakia

F. Debre presented the status of grain legume collections in Slovakia. The national conservation responsibility lies with the Research Institute of Plant Production (RIPP), Piestany. At this institute plant genetic resources activities have been ongoing since 1951. Since the independence of Slovakia, a National Plant Genetic Resources Programme has been established involving 18 institutes throughout the country. A genebank is under construction in Piestany and expected to become operational in 1996. Grain legumes are maintained at four institutes (total 1900 accessions). At Piestany (1376 accessions), at Hornà Streda (476 accessions), Nove Zamky (3 accessions) and in Nitra (45 accessions). The accessions are documented using a Slovak version of the EVIGEZ programme.

F. Debre informed the group that passport data are expected to be fully computerized by the end of 1997. At the same time 70% of the grain legumes collection in Piestany is expected to have undergone minimum characterization.

Spain

In Spain there is only one central bank for long-term storage, the Centro de Conservación de Recursos Fitogenéticos del Instituto Nacional de Investigaciones Agrartias, CRF-INIA. Besides this genebank, which is the Spanish official centre for genetic resources, breeders' collections exist in which seed is conserved under short-term conditions. Collections are also maintained at different institutions in Spain located at Valladolid, Salamanca, Castilla la Mancha, Badajoz, Asturias, Ponteverda and Cordoba. Stored material is essentially of Spanish origin (mainly chickpea, faba bean, lupin and pea). Passport data are recorded for all the samples. Management data exist on all the stored samples following a specific CRF INIA format. Some of the samples possess characterization and evaluation data in various formats (specific to breeders when IPGRI descriptors are not available). To enter the CRF INIA bank, samples should have at least 1000 seeds and 85% germinating ability. At the other banks, many samples are represented in very low quantitites.

Among the main objectives for grain legume genetic resources in Spain is the development of capacities for long-term storage. In the coming 2 years, efforts will also be made by the different local genebanks to regenerate their collections, to increase documentation and characterization of the material and to duplicate existing stocks. Breeders are also trying to collaborate to establish a national core collection for each species.

Turkey

N. Acikgoz presented the plant genetic activities for Turkey. These started in 1964 with the development of an *ex situ* programme which was implemented within the framework of National Plant Genetic Resources Research Project, NPGRRP. Aegean Agricultural Research Institute, AARI, took over this responsibility at the national level. Main activities in this area are devoted to survey/collection, multiplication/regeneration, evaluation/characterization and documentation of the material. The work is undertaken by crop-specific groups.

Turkey has a particularly rich flora and constitutes an important centre in the world for origin and diversity. Turkey is also an important centre of diversity for legumes. *Ex situ* conservation is provided at the Genebank, AARI, through short-term, medium-term and long-term storage. Herbarium specimens are taken to facilitate identification. Facilities are available at Ankara for safety duplication. Regeneration, multiplication

and characterization are carried out according to international standards. Material is freely available for breeders and for research of which feedback information is requested. Collections are well documented including passport and management data. An important *in situ* conservation programme has been undertaken. (See specific description of this programme in *In situ* conservation.)

United Kingdom

M. Ambrose presented the background to plant genetic resources and the status and activities of grain legume collections in the UK. The *Pisum* collection (3000 accessions) is held at the John Innes Centre, JIC. This collection includes material from around the world and is especially focused on wild material, landraces and genetic stocks. The collection is maintained in medium-term storage. Close collaboration in relation to genetic stocks exists with the Nordic Genebank which acts as the base collection for this material. JIC also maintains a collection of *V. faba* (300 accessions). A second large *Pisum* collection, the UK *Pisum* cultivar collection, serves as a statutory reference collection. This collection includes reference lines associated with the UPOV guidelines for peas. Other important collections include ca. 800 accessions of *V. faba* and *Vicia*. spp., maintained at the Scottish Crops Research Institute and a *Lupinus* collection maintained at the University of Reading. A collection of over 3000 *Phaseolus* accessions maintained by the University of Cambridge has been moved to HRI, Wellesbourne. The collection has been recently regenerated and is well documented. If any other institution is interested in taking over responsibility for this material it is invited to contact M. Ambrose.

M. Ambrose informed the group that the International *Pisum* genetic stocks collection held within the main JIC *Pisum* collection is being duplicated at NGB. This is expected to be complete by the end of 1997.

A number of important databases are coordinated and maintained in the UK. These include the ILDIS and Viceae databases in Southampton, the UK *Pisum* cultivar database, the *Pisum* Gene list and European *Pisum* catalogue at JIC. The last is managed jointly with the Institute of Plant Genetics, Poland.

General remarks concerning collections

The group agreed that the chairperson will coordinate the centralization of a list of the biographical reference data concerning research activities related to European grain legume genetic resources. This information will be sent to the chair in electronic format by those participants who have not already submitted it along with their report (deadline 12 December 1995).

The Group was reminded that the Nordic Genebank and the Federal Office of Agrobiology in Linz have agreed to act as safety duplication sites for grain legume collections. This responsibility includes the safe long-term storage of small samples of seed. The accessions stored as safety duplicates are not declared as accessions by the bank hosting the safety duplicate. This material will not be tested, regenerated or distributed to third parties by the latter and remains strictly under the sovereignty of the contributing institution.

Collecting activities

Several countries reported that they plan collecting missions for grain legume in the near future.

Austria
Surveys will be made to assess the necessity for further collecting in three southern provinces bordering Slovenia, Hungary and Italy. The work would focus on *Phaseolus* and *Vicia faba*. F. Saccardo offered to help by contacting institutes and universities in Torino and Udine to cooperate in the collection of *Phaseolus* in the areas of Italy close to southern Austria.

Croatia
Efforts will be made through individual scientists to collect and send local landraces of *Cicer, Pisum* and legumes to the Croatian Bank of Plant Genes. More funds will be needed to plan future collections.

Czech Republic
No collecting missions are planned.

Cyprus
Collecting missions are planned for 1995 and 1996 for wild grain legumes for feeding and pasture purposes.

France
No collecting missions are planned.

Germany
Collecting missions have been undertaken in Romania in 1994 (for *Phaseolus* and *V. faba*); in Albania from 1993 to 1995; Italy in 1995 and Central Asia 1993 to 1995. Further collecting missions are foreseen in these areas.

Italy
A collecting mission is planned in 1995 by the Germplasm Institute, Bari, in collaboration with IPK in Germany.

Israel
No collecting missions are planned.

Nordic Countries
Surveying for *V. faba, V. sativa* and *Lathyrus*, for use in breeding is planned for 1995 and 1996. A further round of advertising in public media is planned to call for old landrace material.

Poland
No collecting missions are planned.

Portugal
A collecting mission is planned for the coming year to collect *Phaseolus* germplasm in the northern Provinces (University Department of Genetics and Biotechnology, University Tras-Montes). A mission is planned by the national plant breeding station to collect *Cicer, Pisum* and *V. faba* in the central and southern provinces of the country.

Russia
Collecting missions are planned in 1995 in collaboration with scientists from the USA, to the Caucasus region for wild *Lathyrus* and *Vicia* species. Further missions are planned along the Volga river, perhaps jointly with FAL (Braunschweig, Germany). Any other country interested in joining this mission is invited to write to VIR.

Slovakia
Continuation of a programme of collecting landraces of *Phaseolus* and *Lens* is planned.

Spain
A coordinated programme exists for continued collecting of crops within the country.

Turkey
Collecting missions are being completed with the cooperation of ICARDA (Syria) and CLIMA (Australia). A total of 32 herbarium specimens and 261 seed samples of *Lens*, *Cicer*, *Pisum* and *Phaseolus* were collected in 1995. Two further collecting missions of grain legumes in West Anatolia are planned for 1996 in cooperation with ICARDA and CLIMA.

United Kingdom
No collecting missions are planned.

Further needs for collecting

Cicer
Collecting missions need to be planned to North Africa (Morocco, Algeria, Tunisia) in cooperation with the Regional Office of ICARDA in N. Africa. F. Saccardo mentioned that at Bari (Italy) there is already a collection of such material and promised to communicate this information to the Chair by the end of September 1995.

Lupinus
Priority must be given to collecting *Lupinus* spp. in the Mediterranean region. B. Kurlovich stated that there is a need to collect *Lupinus luteus* resistant to anthracnose in S. Italy and S. France and islands; this was strongly supported by W. Sweiciki, F. Saccardo, J. Le Guen. F. Saccardo and J. Le Guen will investigate the possibility of cooperating in planning a collecting mission to these areas and send official invitation letters to VIR by the end of September 1995. B. Kurlovich will look for funding for the mission.

Phaseolus
Important genetic resources in landraces of Hungary and Croatia need to be collected, since there is a potential danger of their loss. There is significant scientific interest in this material.

Vicia faba
Collecting missions need to be planned to Afghanistan, China, Erithrea and Ethiopia. Whenever possible, cooperation should be sought with the Regional Office for WANA (IPGRI). These countries are important producers and have valuable landraces of these species.

Pisum
Collecting missions should be carried out in Central Asia, Afghanistan. It was also mentioned that there is interesting material in Eritrea and Ethiopia.

Geographical areas which are considered important for collecting

Croatia: Landraces of grain legumes are threatened and should therefore be collected as soon as possible.

Cuba: There is interest in collecting *Phaseolus* and *Vigna* species in this country. VIR in Russia has, however, considerable collections of such material, and so has IPK in Gatersleben, Germany. Spain offered its continued good relations with Cuba where an intermediate was needed.

Israel expressed its interest in obtaining material collected in that geographical region before 1947, or information regarding any such collections. Since it is known that Vavilov made collections in this area, such material may still exist at VIR. The crop *Arachis* is also of interest in Israel.

Finally, it was emphasized that collecting missions outside Europe should only be undertaken when it could be shown that adequate material does not already exist in European collections.

European legume databases

The Group agreed that the principle of central crop databases is important and that it is necessary to have a coordinator for each species. Participants were asked to indicate the crop they would like to work with. T. Gass read the offers received from different countries via IPGRI.

For *Lupinus* there was a proposal from K. Swieciki, interested in coordinating a database on Old World *Lupinus* species, including *L. mutabilis.*

The Group decided that database responsibilities for *Pisum* should be continued jointly between both the Plant Experimental Station, Wiatrowo and the John Innes Centre.

For *Cicer*, a proposal to coordinate a European database was put forward by Portugal. This database will be located at the National Plant Breeding Station in Elvas. Dr Tavares de Sousa agreed to assume this task.

For *Phaseolus*, Austria expressed interest in coordinating the database. The species included would be *Phaseolus vulgaris, P. coccineus* and *P. lunatus*.

Discussion with regard to *Viceae* species: A. Ramos Monreal suggested including, in the same group, species such as: *Lathyrus* sp; *L. cicera; L. sativus; L. arvenses; L. articulatus; Vicia ervilia; V. sativa; V. narbonensis; V. monanthos; V. lutea; V. villosa; V. benglialensis* and *V. calcarata.*

It was proposed that the Chairperson of the group should contact the Forage Working Group concerning inclusion of these *Vicia* species. A. Ramos Monreal agreed to act as contact person for these species.

All above proposals were accepted by the Group and the Institutes were thanked for accepting these responsibilities.

J. Le Guen proposed France as coordinator of the European *V. faba* database which would be located at Rennes.

For *Glycine*, B. Kurlovich proposed the Vavilov Institute as database coordinator. No proposals were received for *Vigna* or *Arachis.*

For *Lens* there was no definitive proposal for coordination. Turkey was asked to consider managing a European database on this crop. V. Acikoz said that she will make contacts in her country to try to locate a coordinating centre for this species. She was asked to act as focal person for *Lens* within the Working Group and agreed to do this.

All above proposals were accepted by the Group and the Institutes were thanked.

For *Vigna*, different suggestions were examined including the possibility of locating a database at the Germplasm Institute of Bari (Italy). F. Saccardo will follow up this proposal. It was suggested that *Vigna* might be managed in the same group as *Phaseolus*.

For *Arachis* it was proposed to ask the Institute of Genetic Resources in Sadovo (Bulgaria) whether they could undertake the coordination of a database.

The Group agreed with the fact that *Vigna* and *Arachis* are interesting crops in Europe, and that any problem related to these will be addressed by the group on a case by case basis.

European *Pisum* catalogue

M. Ambrose presented the European *Pisum* Catalogue structure initiated by Dr Mattews and W. Swiecicki. This catalogue includes 32 253 entries and concerns more than 20 European Institutes. M. Ambrose explained the different steps in setting up this database and emphasized the necessity for detailed and frequent

communication between the different centres involved. The following list of passport descriptors is included in the *Pisum* database.

- Country (Country where the collection is located)
- Institute (Name of the Institute where the collection is located)
- Accession (Institute accession number)
- Name (botanical name, species, subspecies)
- Synonym
- Origin (Country from where accession comes)
- Donor (Name of the donor Institute)
- Donor number
- Country origin (Country from where accession was collected).

Priorities in the coming period are focused on:

- collecting outstanding data from Bari and VIR
- sending data back to contributing institutions for further edits and recent additions.

A. Diederichsen was asked to send the list of definitions, edited by Knupffer, to all participants of the Group. T. Gass will circulate a list of country and institute acronyms used by the FAO and IPGRI in their databases.

M. Ambrose emphasized the seriousness of the undertaking to coordinators and the need for extensive disucussions before arriving at passport field structures.

M. Ambrose offered to send the structure of the *Pisum* database used at John Innes Centre, as an example for further development, to the different managers. It was proposed that every database manager will send a draft database structure, including foreseen descriptors, to the Chairperson within a 6-month period, who will then circulate it to the group. (deadline: end of October 1995). This will then be further developed.

It was proposed that assistance from experts should be obtained. NGB, IPK and JIC offered assistance. T. Gass also suggested contacting managers of databases in other groups such as the Cereals Group and the *Malus* Group for advice.

Time schedule for legume database establishment

October 1995: T. Gass will send an output of IPGRI/FAO database sorted by crop to the database coordinators in the Legume Group.

January 1996: First draft of the field structures for passport data to be sent to the Chairperson. The possibility of a common format for the database will then be expanded.

April 1996: Call for data to be sent to the institutes holding genetic resources following discussion of the letter between Chairperson and T. Gass.

January 1997: Consolidated databases operational.

Descriptors

The inclusion of minimal characters in the databases, to aid in the searching and location of accessions, was considered. During the discussion, it was agreed that only highly heritable characters should be taken into account. In particular, characters markedly influenced by environmental conditions should not be included in the list, because they are unreliable and inconsistent from one country to another.

Pisum

The following descriptors were retained:

- Flower colour (coloured vs. white)
- Seed shape
- Seed colour (seed anthocyanin).

Phaseolus

R. Schachl presented the cxisting *Phaseolus* database. The following minimum descriptors were proposed for the European *Phaseolus* Database:

- Plant type (bush or climbing)
- Seed colour
- Seed size.

Lupinus

W. Swiecicki suggested the following descriptors:

- Seed texture
- Alkaloids content
- Branched vs. unbranched types.

Cicer

A. Mendes Dordio proposed a number of possible descriptors for *Cicer*. Of these, the following were retained:

- Growth habit
- Seed shape
- Seed weight
- Seed colour
- Flower colour.

Glycine

- Maturity type (referring to existing groups)
- Growth habit (determined vs. indeterminate)
- Seed colour.

Vicia faba

- Flower colour
- Seed type
- Sowing type
- Seed size.

It was agreed that all European Grain Legume Databases will include additional fields indicating the availability of characterization and evaluation data.

Core collections

Examples of core collection activities in other ECP/GR working groups

T. Gass introduced the subject with a brief presentation of the concept, its advantages and disadvantages. He mentioned the activities of other ECP/GR Working Groups, e.g. the more analytic approach of the Barley Group, as well as the more pragmatic approaches of the *Brassica* or the Forages Groups.

S. Blixt mentioned similar use at NGB of a small number of pea accessions to represent overall diversity, mainly for research purposes, to facilitate the distribution of material for the curator and to minimize the work for the researcher. This subset of the collection was based on the taxonomic system developed by C. Lehman at IPK, Gatersleben. Also in pea, W. Swieciki reported the use of enzyme systems in identifying suitable subsets of the collection.

In France, breeders have selected subsets based on evaluation at different sites of agronomic characters.

At JIC, a small subset has been identified to facilitate the evaluation of characters such as protein quality, disease resistance. This subset is being developed and extended.

Discussion

In the following discussion it was pointed out that the formation of a core collection is, in fact, a strategic sampling of the diversity of the entire collection. This sampling very much depends on the strategic aim. Consequently, it might be necessary to talk about core collections rather than of a single core collection. In some cases the inclusion of heterogenus landraces may not be possible. It was also mentioned that the organization of the legume genome seemed less, or at least differently, organized than the one in cereals which would make it more difficult to create a core collection.

It became clear, as a result of the discussion, that the number of accessions in grain legume collections had not reached the size of the cereal collections. The Group expressed the need to focus on the development of the European database for species listed previously. The Group noted, however, that activities relating to core collections were ongoing and would wish to return to the issue at the next meeting.

Improving and promoting the utilization of grain legume genetic resources

(Report by M. Ambrose on Workshop held on 13 July following the AEP 2nd European Grain Legume Conference).

The title of the workshop was 'Improving the use and utilization of Grain Legume Genetic Resources: Mobilizing collections for breeding and research.'

The objective of the Workshop was to take the opportunity of the large concentration of people gathered at the Conference to lead a discussion focused on communications and expectations of the breeding and research communities concerning the use of germplasm collections.

The primary aim was to identify key areas and principle priorities of the breeders and research communities, which could be included on the working agenda of the ECP/GR Grain Legume Group.

The main points emerging from the Workshop are summarized below.

Breeders

- Full passport data to be available. Material without data will not be considered.
- Characterization to be based on heritable traits. Linking characterization to what is known of the genetic basis of the character should be the long-term aim of collections. Genetics is the common language between collections and the two main client groups and will become more so in the future.
- Less emphasis on evaluation work. The most valuable evaluation is done at the place where it is needed. Most breeders will evaluate again, in any case, and it is therefore not considered the most efficient use of the scarce resources available for work on collections.
- Curators are expected to have good working knowledge of the variability within their collections.
- Further promotion of collections and material is needed.

Researchers

- Collections should be friendly and approachable to specialists and non-specialists alike.
- Curators should have good knowledge of the variability within their collections.
- There should be good links between material and the genetic data available.

Overall

- Greater flow of information in both directions.
- Closer working collaboration between genetic resources and the user community.
- Increased feedback from users is recommended so that the long-term data associated with the collections can be increased and improved.

Looking to the future

For a number of reasons it was anticipated that, in the future, there would be a move towards more specialization of collections and a move away from more centralized models. The situation in France was discussed in detail as an example of this trend.

The importance for genebanks to facilitate interaction with users, making information and seed readily available, was emphasized.

Collections are already centres where additional information and material are held together. The development of biological/plant resources centres for work on *Arabidopsis* and other species was cited where stocks, genetic data and linkage maps,

bibliography, visual reference, molecular probes, constructs and sequence data are all maintained together. The extensive cross-referencing of computer records in systems such as GRAINGENES, SOYBASE and the *Arabidopsis* database were discussed as examples of what can be achieved with serious funding. Furthermore, development along these lines is expected at many other centres.

Much more information is required on the genetic variability within collections and how this relates to ecogeographic and phylogenetic considerations. This has important implications in relation to assessing the coverage of a collection and gaps which may be present or insufficiently represented. The time is now fast approaching when molecular screening of whole collections is a realistic and economically feasible proposition.

Increasing the amount of cytological data on accessions was also considered important and the routine cytological screening of all wild material was recommended, especially in the cases of *Vicia* and *Lens.*

A presentation of the current status of genetic maps in grain legumes covered recent work on comparative mapping which suggested that, in contrast to the cereal maps, the genome organization was unstructured. The consequence of this is, if it can be substantiated, that the size of grain legume collections fully representing all genes will have to be considerably larger.

Two types of maps will be required in the future:

- High-density maps for work within species.
- Comparative maps across species are of growing significance but require a different approach.

General discussion following the presentations

S. Blixt recalled that routine cytological screening of the Weibull collection (now part of the Nordic Genebank collection) was started.

M. Ambrose added that he was not aware of any routine screening of *Pisum* accessions in any collection at this time. Currently, following a period of frequent revisions of the linkage map for *Pisum* the tester set published by Lamm in 1972 was in need of revision. Work by Folkeson, in the early 1990s, had clarified some but others were still unresolved. There was a need for further cytological work on known translocation stocks to confirm their exact designations. A list of translocation stocks has been prepared in the last year from literature searches and has formed the basis of two recent grant proposals between a series of laboratories interested in working in this area in the UK, Italy, Czech Republic and Germany.

While the recording of the basic karyotype may be possible, on a routine basis, it is still a time-consuming and expensive job as exemplified by the additional staff required for the maintenance of precise genetic stocks in cereal species. The need to revise translocation data in line with the linkage map at intervals makes it a strong candidate for specialist collections.

S. Abbo mentioned the importance of considering the compatability question in respect to wild forms and their cultivated relatives when planning collection expeditions of wild material.

It was agreed that progress in cross-referencing broader resources was of great interest to the Group and should be reviewed at the next Group Meeting.

In situ conservation of grain legume genetic resources

It was emphasized that, in addition to *ex situ* conservation, *in situ* conservation plays an important role in preserving genetic resources. However, only limited activities exist in ECP/GR countries, and these are relatively recent.

Turkey

N. Açikgoz presented the Turkish *in situ* programme. This project was initiated in 1993 in several parts of Turkey, a country known for its richness in plant genetic resources. Three major Ministries are involved in the project.

Objectives of the project include:

- to identify and establish the *in situ* conservation areas in Turkey
- to test and develop a new approach to the conservation of genetic diversity.

During the first 2 years, pilot conservation areas were identified for wild relatives of crop plants and woody species (fruit and forest trees). After survey and inventory of these sites for target species, gene management zones will be determined and managed for *in situ* conservation. A national plan for the conservation of plant diversity in Turkey will, thereafter, be prepared. Within the framework of the project for *in situ* Conservation of Genetic Diversity, research for conservation biology and genetic diversity will be conducted.

Results obtained during the first 2 years of operation of the project include:

- area identification in the west part of Turkey (Kaz Dag), the Centre (Anatolia) and the South East (government farm close to the border with Syria)
- work was initiated on gene management zones, institutional strengthening and data management.

An International Symposium will be held in 1996 for the exchange of information among scientists.

Nordic countries

There are limited possibilities for on-farm conservation of genetic resources, including wild relatives of crops, because the modern agricultural system cannot be modified. On-farm conservation activities do, however, exist in collaboration between NGB and the Botanical Museums in the identification and development of heritage collections. This is also an active point of contact between NGB and NGOs and it is seen as active and positive on both sides.

S. Abbo made the case that for many wild relations of crop species the maximum conservation effort should be in *in situ*. Where material was collected for safety purposes, the necessity for cytological data to be collected was strongly emphasized.

Links with NGOs

Austria: Less positive experiences where there was a basic mistrust on the part of some NGOs who did not want close contact. In some instances material held by NGOs was not available to collections.

Germany: A number of collaborations involving two expeditions with Austrian groups. The collaboration was perceived to be constructive and working well with a clear understanding of the roles of both sides.

Sweden: A number of positive experiences exist in which contacts are leading to areas of common collaborative work.

UK: More positive relationships are developing. One representative NGO currently has a place on the UK Plant Genetic Resources Group. NGOs are often well placed to play an educative role for genetic resources and conservation as well as acting as a bridge between their members and the public sector collections.

Conclusions

The Group accepted the revised version of the draft chapters 1 to 4 and 7.

The Group elected M. Ambrose as Chairperson until the next formal meeting.

M. Ambrose expressed his appreciation, on behalf of the group, that a Grain Legume Working Group had now formally met and developed a common workplan.

He added that this meeting was the start of many future collaborative projects between the genetic resource collections represented by the group. The agreed workplan adopted by the group is ambitious and represents important developments for grain legume genetic resources in Europe.

He stated that the group now acts as an important focus for grain legume genetic resources in Europe and members were encouraged to share information concerning these resources in their countries through the chair and keep in touch in regard to progress on the workplan

Finally, S. Blixt was thanked for his involvement in the very earliest discussions of a pea group under the ECP/GR programme. The timing of the meeting came 6 weeks before his retirement, after a long and distinguished career in genetics, genetic reources and some 40 years of valuable work on peas. M. Ambrose spoke for the whole group in extending warmest wishes to S. Blixt in his retirement.

Review of National Collections

Information on grain legume collections in Austria

R. Schachl
Federal Office of Agrobiology, 4020 Linz, Austria

The Austrian grain legumes collection is comprised of three genera

Vicia faba	137 accessions
Pisum sativum	38 accessions
Phaseolus spp.	642 accessions.

The *Vicia faba* collection, which was mainly created for breeding purposes, is held at the Federal Office and Research Centre in Vienna. The basis of the collection was obtained from the genebank in Bari/Italy, and is combined with mainly breeding material derived from the Italian accessions.

The *Pisum* collection, maintained by the Federal Office of Agrobiology in Linz, consists of recently bred cultivars.

Phaseolus is maintained by the two genebanks: Wies/Styria with 37 accessions and the Federal Office of Agrobiology, Linz, with 604 accessions. Approximately 150 types have clearly distinguishable botanical characters. The material was collected over the years 1983 to 1986 in the southern part of the province of Styria, and consists entirely of landraces. This collection is important because it is the most valuable collection of grain legumes in Austria

Status of collection

As mentioned above, the accessions were collected 10 years ago and since then have been multiplied and regenerated. Presently, about half of the material has been regenerated. The total collection will be multiplied and renewed within the next 5-7 years.

Nearly 90% of the material has already been duplicated in the genebank at Gatersleben/Germany. After multiplication, the remainder of the accessions will be stored at Gatersleben for safety-duplication.

All accessions, including *Pisum* and *Vicia*, have been characterized for passport data. With regard to *Phaseolus*, of the accessions already regenerated, approximately 50% have also been characterized. Characterization is based on 28 descriptors prepared by the Federal Office of Agrobiology, and are assumed to be the minimum requirement for identification. In addition, provision has been made to document the accessions with photographs using Picture-publisher software. (The required software is sold together with the scanner.) Pictures in postcard format or photo-CDs can be used for documentation. Photo-CDs are, to some extent, of better quality, but costs of scanning are much higher, so that we prefer to use photographs scanned on a flat-bed scanner. The advantage of this system is that data can be shown together with a picture on the screen.

The data are managed by the holder of the material. In Vienna and Linz, the documentation is fully computerized, using similar programmes. The data for *Phaseolus* are managed by the curator of the genebank at Linz, Mr W. Kainz.

The Austrian *Phaseolus* collection includes two species: *Phaseolus vulgaris* (*P. vulgaris* var. *vulgaris* and *P. vulgaris* var. *nanus*) and *Phaseolus coccineus.*

Except for the 37 accessions maintained by the genebank Wies, all the material has been documented. Since these accessions do not differ from those kept at the Federal Office of Agrobiology, all Austrian material may be considered correctly registered.

The data are managed on PCs, IBM 468 and stored on Novell-Netware with a storage capacity of four gigabytes. The software used is dBASE IV, a change to dBASE for Windows is intended in the near future. Transfer of data, from dBASE to ASCII and vice versa will be possible as long as standard data formatting is observed. CompuServe is used to transmit data to Internet. Data transmission from diskettes will also be possible using 'packed data' with ZIP.EXE and UNZIP.EXE respectively.

No research is being done or planned on *Phaseolus*. However, studies in Austria are needed and will be carried out on the history and cultivation of *Phaseolus*. *Phaseolus* beans are traditionally cultivated together with maize, using the maize plants instead of sticks for climbing. This is the traditional method employed by Indians, the use of which can be traced back to the Austro-Hungarian Monarchy. This explains why landrace material found in Styria and in the neighbouring areas of Hungary and Slovenia is almost identical. Furthermore, during the first half of the last century Erzherzog Johann, who was at that time archduke of Styria, ordered the collection of the most important agricutural and horticultural crops. Among the crops collected were *Phaseolus* beans. It can be said that none of these basic types has been lost when compared with recently discovered material. Furthermore, more variety can be found today.

Apart from periodic surveys of existing material, no further collecting activities are intended as, it is assumed that in principle, all basic forms are presently held in the collections. Finally, in the years immediately following collection, further collecting missions of most landraces were halted after heavy infestation by *Bruchidius obtectus.*

Example of data maintained with the germplasm

Bundesamt für Agrarbiologie, Wieningerstr. 8 , A-4020 Linz

Passport data

1.	Accession data	
1.1	Accession number	BVAL 610189
1.2	Donor name	H. Kahr
1.3	Donor identification no.	
1.4	Scientific name	*Phaseolus vulgaris* L. *vulgaris*
1.5	Pedigree / cultivar name	Wachtelbohne (188 B)
1.6	Year of release	0
1.7	Year of cancelling	0
1.8	Acquisition date	1983
2.	Collection data	
2.1	Collectors number	16j
2.2	Collecting institute / breeder	
2.3	Date of collect. of orig. sample	10 / 83
2.4	Country of coll. / cultivar bred	AUT
2.5	Province / state / location	Klausen 45
2.6	Collection source	3
2.7	Status of sample	4
2.8	Local / vernacular name	

Management data

1.	Accession management data	
1.1	Distribution status	1
1.2	Duplication	
1.3	Principal attribute	beige-braun protein: 27.9%
2.	Sample data	
2.1	Year of harvest / temperature	93(+10°C), 94(–20°C)
2.2	First testing result	0
2.3	Most recent test (germ / year)	
2.4	Next test (year)	0
2.5	Quantity of seed	
2.6	Times accession regenerated	1

Characterization data

Accession number	BVAL 610189
Type	SB
Height	4
Species	*Phaseolus vulgaris* var. *vulgaris*
Leaf size	7
Leaf colour	1
Leaf surface	1
Flower colour wings	1
Flower colour standard	2
Pod size	5
Pod separation	1
Pod length	4
Pod width	4
Pod constriction	5
Pod colour	3
Pod pattern	6
Seed number	7
Strings	9
Seed length	5
Seed width	5
Seed shape	2
Seed square size	3
Hilum colour	1
Hilum ring	3
Seed basic colour	2
Seed pattern colour	6
Seed pattern kind	9
Protein content	27.9%

Grain legume collections in Bulgaria

S. Angelova and T. Stoilova
Institute of Plant Introduction and Genetic Resources "K. Malkov", 4122 Sadovo, District Plovdiv, Bulgaria

A total of 4455 accessions covering the grain legume group are maintained in Bulgaria. Of these, 1853 accessions are in long-term storage and the rest are either in working collections or in short-term storage.

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*; *Phaseolus vulgaris*, *Ph. multiflorus*, *Ph. lunatus*, *Ph. angularis*, *Ph. aureus*.

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.

Lupinus angustifolius, *Lupinus graecus*, *Cirer monbretii*, *Lens evroides* and *Lens nigricans* all belonging to rare and endangered species in Bulgaria are conserved *in situ*. In-depth studies are being made of their habitats. Seeds are also being collected and a herbarium established.

Besides evaluation, according to descriptor lists, accessions of this group are characterized according to main breeding trends important to Bulgaria. The specific climate, mainly the wide ranges in temperature occuring in various areas of the country, calls for the creation of early maturing varieties of all grain legume crops. The stress related to period of drought and high temperatures, coinciding with the formation of the reproductive organs, results in extremely low yields of the mid-, early and late cultivars. Only early cultivars can reveal their yield potential. Peas mature in the first half of June and other grain legumes in the first half of July.

Selection for winter resistance is being made for pea and lens and low temperature resistance for beans. Ecological trials made it possible to select about 250 pea acccessions with high winter resistance.

Lupinus is not being bred in Bulgaria, which explains why accessions in the collection are mainly of foreign origin. Interest in this crop is limited. Enriched and preserved collections have been kept since 1966 and serve mainly educational and theoretical investigation purposes related to biochemical composition and changes in alcaloid content.

IIPGR collaborates in the breeding programmes for pea and beans with the Fodder Research Institute (Pleven), Institute of Wheat and Sunflower (General Toshevo), High Agriculture Institute (Plovdiv).

A network of experimental stations has been created for testing the ecological plasticity of some of the more valuable pea, *Cicer* and *Lens* accessions.

Safety duplication

As a whole, grain legume collections have not been duplicated at other genebanks in the country or abroad, excluding samples collected in collaboration with other breeding institutes.

Standard varieties

Standard varieties cultivated in Bulgaria are collected and stored at the genebank of Sadovo. These are mainly cultivars bred in Bulgaria.

Table 1. Type and location of grain legume collections in Bulgaria.

Crop and cultivar	Location of collection
Pisum	
Pleven 10	Pleven
Pleven 4	Pleven
Mir	Sadovo
N ± 11	Sadovo
Yubiley	Plovdiv
Vesela	Sadovo
Yunak	Czech Republic
Neosipayushtchii	Russia
Lens	
Stanka 1	Gen. Toshevo
Stanka 2	Gen. Toshevo
Mizia	Gen. Toshevo
Nadejda	Gen. Toshevo
N ± 1	Sadovo
N ± 440	Sadovo
Phaseolus	
Abritus	Gen. Toshevo
Prelom	Gen. Toshevo
Dobrudjanski 4	Gen. Toshevo
Dobrudjanski 7	Gen. Toshevo
Desislava	Gen. Toshevo
Cicer	
Ressource 1	Sadovo

Table 2. Status of grain legume collections in Bulgaria.

		Long -term	Bulgarian			
Genus	Total	storage	Cultivars	Land-races	Wild forms	Priority species
Pisum	1970	580	30	60	2	*sativum, arvense*
Lupinus	280	68			5	*albus, luteus angustifolius**, *graecus**
Cicer	285	285	4	2	1	*arietinum, monbretii**
Lens	500	360	6	8	4	*culinaris, evroides**, *nigricans**
Phaseolus	1390	560	12	85		*vulgaris, multiflorus*

* Wild flora in *in situ* conservation.

Table 3. Collaborative work with IIPGR, Sadovo..

Pisum	Fodder Research Institute, Pleven
Pisum, Lens, Phaseolus	Institute of Wheat and Sunflower, General Toshevo
Pisum, Phaseolus	High Institute of Agriculture, Plovdiv
Lupinus	Department of Biochemistry, Bas, Sofia

Status of the national grain legume collections in Croatia

Zlatko Šatovic
Croatian Bank of Plant Genes, Department for Plant Breeding, Genetics and Biometrics, Faculty of Agriculture, University of Zagreb, 11 000 Zagreb, Croatia

Introduction

Grain legume species occur in Croatia in field production as modern cultivars and primitive varieties and in nature as a large number of wild (escaped) populations.

Within the framework of the Croatian Bank of Plant Genes, scientists from the Departments of Botany at the Faculty of Agriculture and the Faculty of Forestry in Zagreb are in the process of designing a map of floristic areas in order to plan collecting missions for wild populations of grain legume crop species and their wild relatives.

Because under the previous regime land ownership was limited to 10 ha, many small farmers did not have access to modern agricultural technology. Thus, some primitive varieties are still maintained in production. However, there is a danger of genetic erosion of these resources caused by gradual introduction of modern high-yielding cultivars and/or by reorganization of agricultural production. In the case of soyabean (*Glycine max* (L.) Merr.) and peas (*Pisum arvense* L. and *Pisum sativum* L.) mostly modern cultivars are sown, whereas for other crops mostly primitive varieties are used in production.

The national grain legume collection

The collection

The grain legume collection is maintained at the Department of Plant Breeding, Genetics and Biometrics at the Faculty of Agriculture, University of Zagreb, within the project "Croatian Bank of Plant Genes", financed by the Ministry of Science and Technology and the Ministry of Agriculture and Forestry. The Project was initiated in 1991 with the aim of national coordination of activities concerning conservation and utilization of national plant genetic resources.

Grain legume accessions held at the Croatian Bank of Plant Genes are listed in Table 1. The collection consists of 641 accessions. Except in the case of chickpea (*Cicer arietinum* L.), material obtained from ICARDA, Syria, has not been safety-duplicated at other genebanks.

Table 1. Grain legume accessions held at the Croatian Bank of Plant Genes.

Species	No. of accessions	Status of accessions
Bean (*Phaseolus vulgaris*)	158	primitive varieties, modern cultivars
Chickpea (*Cicer arietinum*)	156	primitive varieties, breeding material form ICARDA
Faba bean (*Vicia faba*)	16	primitive varieties
Grasspea (*Lathyrus sativus*)	10	primitive varieties
Lentil (*Lens esculenta*)	7	primitive varieties
Lupin (*Lupinus albus*)	111	primitive varieties, breeding material, modern cultivars
Pea (*Pisum sativum*)	112	primitive varieties, breeding material, modern cultivars
Vetch (*Vicia sativa*)	71	primitive varieties, breeding material, modern cultivars

Storage facilities

Storage conditions do not comply with internationally recommended standards. Seed samples are kept in paper bags at room temperature. Seed quantity for each accession varies between 500 and 5000 seeds. The establishment of a long-term storage (–20ºC) facility for maintenance of the base collection is planned. The active collections (+4ºC) will be held at a range of cooperating institutions situated in different agroecological regions of Croatia.

Regeneration of accessions

Owing to inadequate storage, the collection needs to be regenerated every 2 years. A part of the material collected in Istria, Dalmatia and Herzegovina, especially lentil and chickpea accessions, has been lost over the past 4 years during regeneration, due to inability to adapt to agroecological conditions in northern Croatia (Zagreb).

Characterization/evaluation and documentation of accessions

Parts of the collection have been characterized and/or evaluated according to slightly modified IPGRI descriptor lists. A computerized grain legume database is not yet operational.

Research activities

All research activities concerning genetic resources will be coordinated in the framework of the project "Croatian Bank of Plant Genes". The project cooperates with all breeding institutes and there is an agreement concerning maintenance of the entire material at the Faculty of Agriculture in Zagreb. There is close collaboration with the project "Estimation and application of genetic parameters in field crops" which is also carried out at the Department of Plant Breeding, Genetics and Biometrics. One of the aims of the project is to undertake breeding activities in peas, vetches and lupins. Over the last 10 years two pea cultivars (Maksimirski bijeli and Šampion), one vetch cultivar (Ratarka) and two white lupin cultivars (Zrinka and Maksimirka) have been released. Additionally, two pea cultivars (Favourite and Ratar) have been submitted to official trials. All the cultivars are based mainly on Croatian primitive varieties.

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The status of legume collections in Cyprus

A. Hadjichristodoulou
Agricultural Research Institute, Nicosia, Cyprus

In the past, grain legumes, mainly faba bean, *Phaseolus* bean, cowpea and chickpea were the major source of protein in the human diet in Cyprus (Table 1). The proportion of grain legumes has declined since the 1960s and that of livestock products has increased. However, recent medical studies have pointed out the positive effects of maintaining a significant part of the human diet as grain legumes. As a result of an increase in the level of public awareness, consumption of grain legumes is slowly increasing.

In most countries, peanuts are mainly an oilseed crop, but in Cyprus they are exclusively consumed roasted as snacks and consequently considered a grain legume.

Except for faba beans, Cyprus is not self sufficient in grain legumes (Table 1). The most commonly consumed grain legumes are *Phaseolus* beans and cowpeas, which are dual-purpose crops, consumed green or dry. Recent research shows that dry peas is a potential grain crop for the production of high-protein livestock feed. Dry peas can be grown in rotation with grain barley, thus breaking the continuous barley cropping system.

New varieties were selected for almost all grain legumes in order to avoid complete elimination from the farming systems. The main reason for reducing the production of grain legumes is the difficulty of mechanical harvesting. The cultivation of most of the new varieties released can be partially or completely mechanized (Table 2).

Table 1. Area, production and consumption of the main grain legumes in Cyprus (1980-91).

		Production (t)		Dry seed
Legume	**Area (ha)**	**Green**	**Dry**	**consumption (t)**
Field beans	938	2300	969	1639
Faba beans	1186	938	1449	802
Cowpeas	347	1508	178	457
Chickpeas	877	–	222	486
Lentils	73	–	58	504
Lathyrus	72	–	59	60
Peanuts (kernels)	530	–	1015	1157

Status of the grain legume collections

The number of accessions for six grain legumes collected in Cyprus are given in Table 3. The germplasm is stored at the CYPARI Genebank and regeneration takes place when viability of seed is below international standards. No other activities are done on safety duplications, documentation, etc.

Grain legume databases

There is no operational grain legume database system at the Genetic Resources Programme of Cyprus. Seed stock data are kept manually. A detailed report on the status of grain legume collections and grain legume databases was submitted by Mrs A. Della.

Table 2. Landraces and new varieties of grain legumes in Cyprus.

Legume	Landrace/variety	Properties	New varieties, year of release	Properties
Phaseolus	Local	Cooking quality	Myrtou (WAF 132) (1993)	–
	Macrothylaco	Grain size	Karavas (Alubia cerillos) (1994)	
Cowpea	Orounda, Alambra, Peristerona, Local	Grain size, continuous flowering, cooking quality, beige eye	Tricomo (IT-81D-1137) (1991) Yerolakkos (IT-85D-3577) (1991) California (CB5) (1995)	mechanical harvesting
Chickpea	Local, Orounda	Grain size, cooking quality	Yialousa (ILC 3279) (1984) Kyrenia (ILC 464) (1987)	mechanical harvesting, ascochyta resistance grain size
Faba bean	Local	Grain size	Improved Local (1990)	uniformity, grain size
Peanut	Local	Tolerant to iron chlorosis, kernel size	Kouklia (ICGV 89214) (1995) Nikoklia (ICGV 88438) (1995) Gigas (ICGV 91098) (1995)	grain yield, kernel size
Lathyrus	Local	–	–	–
Phaseolus coccineous		–	Gigantes, Elefantes (1980)	–
Pea	Local	Used as green vegetable	Kontemenos (PS 210713) (dry seed)	grain yield, mechanical harvesting

Table 3. Food legumes collected in Cyprus.

Scientific name	No of accessions	Year of collecting	Collecting organization	Institutions holding collections
Vicia faba L. var. *major*	101	1980	ARI / IBPGR	ARI, GL. Bari, ICARDA IHAR (Radzikow, Poland)
Cicer arietinum L.	28	1984	ARI / IBPGR / ICARDA	ARI, GL Bari, ICARDA
Lathyrus ochrus (L.) DC.	12	1984	ARI / IBPGR / ICARDA	ARI, GL Bari, ICARDA
Lens culinaris Medik.	19	1984	ARI / IBPGR / ICARDA	ARI, GL Bari, ICARDA
Phaseolus vulgaris L.	6	1990	ARI	ARI
Vigna unguiculata L.	8	1990	ARI	ARI

Research on grain legume landraces

Evaluation of landraces of cowpeas

Evaluation of four cowpea populations of the local landrace, collected in different locations in Cyprus, showed variation in agronomic traits, such as grain yield, pod yield, volume weight and 1000-grain weight (Table 4) (Hadjichristodoulou 1991a, 1991b).

Table 4. Evaluation of landraces (LR) of cowpeas with California Black Eye CB5.

	Grain yield (t/ha)	Flowering date (1=1 June)	Volume weight (kg/hl)	1000-grain weight (g)
Elenma (LR)	3.7	40	76	225
Orouka (LR)	3.0	42	73	265
Peristerona (LR)	3.7	42	75	204
Alambra (LR)	3.7	42	74	232
CB5	3.9	40	70	229
SE	0.27	-	1.0	3.4
CV	10.6	-	2.0	2.1

Chlorosis in peanuts

Lines were introduced from Israel, and hundreds of breeding lines obtained from ICRISAT and the Cyprus Local landrace were evaluated for, among other traits, calcium-induced iron chlorosis. The Cyprus landrace was among the most tolerant lines and is now being used in the crossing programme of ICRISAT aimed at developing peanut cultivars for areas around the world having problems with peanut chlorosis.

Evaluation of two chickpea landraces

Local and Orounda (landrace grown in a small area) were evaluated along with other germplasm lines. Orounda was earlier by 4 days, taller by 4 cm, produced larger grains by 20 g per 1000 grains and had 7 pods per plant more than Local.

Phaseolus beans

Four local landraces of *Phaseolus* beans were evaluated over several seasons and showed some variation in traits. The range in flowering and maturity dates was 7 days, in 1000-grain weight 136 g, in volume weight 2 kg / hl and grain nitrogen content 0.6% units.

Broad beans

Selected germplasm was evaluated from 1981 to 1987 and significant differences were found in grain yield, 1000-grain weight, flowering data plant height and protein content. The best population was released (Della 1990). The local landrace is being used in the crossing programme to develop broad beans for the canning industry.

Valuable properties of some landraces of grain legumes in Cyprus

Modern agricultural practices are based on new characteristics of varieties, which are necessary for low-cost production. Modern varieties are in general less labour-intensive and, to a great extent or completely, mechanized.

On the other hand, landraces selected by subsistence farmers who have, at their disposal, all the family labour they need, have different characteristics from modern varieties. With the rapid replacement of landraces these valuable traits are in danger of disappearing.

There is wisdom in the minds of scientists developing modern varieties. However, similar wisdom was employed by men and women centuries ago, in the selection of landraces. This was done in the absence of modern scientific techniques.

A logic has been employed in the past for all field crops and farming systems in the selection of varieties and cultural practices. For example, in Cyprus, a dryland country, durum wheat landraces are late in maturity. Late varieties tend to suffer from late drought. However, the logic behind this situation was to expand the period of hand harvesting of cereals. Also, landraces were tall to compete with weeds (herbicides were not available). The case of two grain legumes will be described in more detail below.

Cowpeas. Until the early 1960s, and for the past hundreds or thousands of years, agriculture has been practised by subsistence farmers. This was characterized by the availability of family labour (many children and absence of employment in industries, services or other sectors of the economy) and low purchasing power. Human nutrition was based on non-processed crop products. Only recently, over the last 40 years, have livestock products became an important part of human nutrition. This increased consumption has also brought about a significant increase in diseases of the heart and circulatory systems.

The cowpea landraces were selected by these subsistence farmers to provide food from fresh pods or seeds, which were rich in protein over the long periods in the summer. Thus, landraces were selected for continuous flowering and pod formation from June until November. The surplus pods were harvested when mature, then were thrashed for the production of dry seeds which were cooked in winter, December to May, when cowpeas could not be grown in the field. These landraces could be grown rain-fed (in deep soils, which store winter rainfall) or under irrigation. They flowered continuously, having at the same time flowers, fresh pods and mature pods. They were labour-intensive, as the farmer visited the field every 2-3 days to collect pods at the desired stage of maturity. The cooking quality of local cowpeas is excellent. Although cowpeas are locally called Mavromattica (black-eye), the eye of the dry seed of the landrace is beige. This is desired so that the water when boiling does not become dark. Also, landraces produce relatively large seeds, which are pleasing to the eye.

Modern varieties have few of the above properties; they flower and mature simultaneously so that they can be harvested mechanically, and most of them are only used for dry seed production. They have upright growth and are not spreading types, as are the landraces.

As the major traits of landraces are considered negative to the modern farming systems, there is an urgent need to collect, evaluate and store cowpea genetic resources, and also to try to incorporate some of these genes (quality traits) into modern varieties.

More information on cowpea evaluation and description of its uses was published by Hadjichristodoulou (1991a, 1991b).

Peanuts. The peanut landrace produces large kernels (confectionery types) and it is used roasted as a snack. All soils in Cyprus are alkaline, with pH 7.5 to 8.5. Breeding material introduced from the International Center ICRISAT (India) was screened in Cyprus for performance, but especially for calcium-induced iron chlorosis, common in alkaline soils. The result was that the Cyprus landrace, and a few lines from Israel, were the most tolerant material. By chance, some of the ICRISAT lines did not show chlorosis. ICRISAT is now using the Cyprus landrace in its crosses, in order to develop new high-yielding lines adapted to the alkaline soils. (Details on this work are published by Hadjichristodoulou 1993.)

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Report on grain legume germplasm in Cyprus

Athena Della
PGR Curator, National Coordinator, Agricultural Research Institute, Nicosia, Cyprus

Status of the grain legumes collections in Cyprus

The local variety of faba beans (*Vicia faba* L. var. *major*), which is the main variety grown (Della 1982; 1985), was collected in 1980 from different areas of Cyprus (Della 1980). The local varieties of chickpea (*Cicer arietinum* L.), ochrus vetch (*Lathyrus ochrus* (L.) DC.) and lentil (*Lens culinaris* Medik.) were collected during a multi-crop collecting mission in 1984 (Della 1984). Haricot bean (*Phaseolus vulgaris* L.) and cowpea (*Vigna unguiculata* L.) were collected during 1990. The number of accessions, the year of collecting, the collecting organizations and the Institutions holding collections are shown in Table 1 (Della 1995; in press).

Germplasm is stored at the CYPARI Genebank at (0-4ºC, 50% RH) in laminated foil bags. Germination tests are carried out during October, before the next growing season, and regeneration of the material is carried out when viability of seed is below the International standards (<85%).

Documentation

As yet there is no operational grain legumes database with the Genetic Resources programme of Cyprus. Seed stock data are kept manually. However since 1982 and for a few years an Apple II microcomputer has been used to store passport, characterization and preliminary evaluation data using the visifile, visicalc visitrend/visiplot software. A vax minicomputer was later on acquired by the ARI and passport and evaluation data of a few crops are in SAS. The Genebank Management System Software, prepared by IPGRI, was installed but it was not used, mainly because it cannot accept or produce ASCII files. Recently a staff member of the Genetic Resources Programme of the ARI was trained by the IPGRI/WANA and GRU ICARDA Documentation Officers on dBASE IV as well as on MF Software (produced by the GRU-ICARDA).

Research conducted on grain legumes

Broad beans. The collection of broad beans (101 accessions, Table 1) 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 variation was presented by Della (1986, 1988).

Selected Cyprus germplasm was tested in yield trials, 1981 to 1987, 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 the farmers (Della 1990).

A programme for breeding faba beans for the canning and freezing industry was initiated in 1987, in cooperation with Dr G.P. Chapman of Wye College, UK, using the adaptive genes of the Cyprus local variety. Selected Cyprus germplasm, crossed and backcrossed at Wye during the summers of 1987 and 1988 with white-flowering, white-seeded varieties, was grown in Cyprus for selfing, selection and intercrossing from 1987 to 1991. An adapted white-flowering, white-seeded composite 1 was promoted and is

being tested in yield trials, while selected plants were grown in isolation for further selection.

The other grain legumes germplasm, as well as germplasm of miscellaneous other crops conserved in the CYPARI Genebank, will be evaluated in the future.

Table 3. Food legumes collected in Cyprus.

Scientific name	No of accessions	Year of collecting	Collecting organization	Institutions holding collections
Vicia faba L. var. *major*	101	1980	ARI / IBPGR	ARI, GL. Bari, ICARDA IHAR (Radzikow, Poland)
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Lathyrus ochrus (L.) DC.	12	1984	ARI / IBPGR / ICARDA	ARI, GL Bari, ICARDA
Lens culinaris Medik.	19	1984	ARI / IBPGR / ICARDA	ARI, GL Bari, ICARDA
Phaseolus vulgaris L.	6	1990	ARI	ARI
Vigna unguiculata L.	8	1990	ARI	ARI

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Status of grain legumes in the Czech Republic

M. Hybl
Agritec, Research, Breeding and Services, Ltd., 787 01, Šumperk, Czech Republic

The grain legume collection in Sumperk

Since 1961, the germplasm at AGRITEC has been assembled from crop collections held by breeders and State institutions and includes 13.5% Czech origin landraces, breeders lines and cultivars. Recently a large number of accessions have been introduced from overseas institutes and international research centres.

Curator / Person in Charge
Eng. Miroslav Hybl

Table 1. Detail of collections.

Cultivars	Accessions
Pisum spp.: *P. elatius, P. abyssinicum, P. jomardi, P. melanocarpum, P. acacium*	1048
Vicia spp.: *V. pannonica, V. villosa, V. faba, V. narbonensis*	618
Phaseolus spp.	321
Glycine spp.	208
Lupinus spp. *L. albus, L. luteus, L. angustifolius*	60

Maintenance of collection
As seeds, medium-term storage at 2°C.

Duplication of collection
As seeds, long-term seed storage at –18°C. Seed at 5% m.c. in glass jars.

Geographical representation
Europe, Asia, America, Australia.

Availability
Free, 50 seeds per accession for research and breeding purposes.

Characterization
Passport data for all accessions.

Quarantine
Imported material must pass through quarantine.

Evaluation
Most accessions have been characterized.

Documentation
All species have been computerized.

Description of the grain legumes genetic resources database

The database is held on a 486 personal computer running MS-DOS and using dBASE II software. Data can easily be transferred to and from other systems. The database includes passport characterization and description data files. Passport and description data (scale 1-9) on genetic resources are gathered in the Czech information system EVIGEZ. Passport and description data are freely available on request. Data for accessions can be made on floppy disc or selected lists in hard copy.

Passport data

accession number
genus and species
genotype or cultivar name
country of origin
type of accession
donor
origin
pedigree
collection date of original sample

Description data

accession number
genus and species
date of start testing
name of control variety
morphological data (in code form) on the base of the Czech national descriptor.

National programme for conservation and utilization of plant genetic resources

Collections of plant genetic resources are studied at eleven institutes in the Czech Republic. The total number of accessions has reached more than 40 000.

The National Programme For Conservation And Utilization Of Plant Genetic Resources in the Czech Republic has been running under the sponsorship of the Ministry of Agriculture of the Czech Republic since 1994. The genebank of the Research Institute of Plant Production, Prague, Ruzyne, is the coordination centre of this programme and Dr Ladislav Dotlacil its coordinator. The Council of Genetic Resources is the consultation authority of the National Programme for Conservation and Utilzation of Plant Genetic Resources.

The objectives of the National Programme are to:

- contribute to global activities in the conservation of germplasm in cooperation with the International Plant Genetic Resources Institute
- improve accessibility and use of genetic variation
- contribute to the understanding of genetic variation and its conservation
- promote long-term conservation of collections important to plant breeding in the Czech Republic and elsewhere.

Current status of genetic resources in annual large-seeded legume crops in France

J. Le Guen
INRA, Station d'Amélioration des Plantes, 35650 Le Rheu, France

Introduction

The main characteristic of genetic resources for legumes in France is that there is no central germplasm institute, as in some other countries, or unique collections related to the various species of this group. The main collections are working collections and are generally maintained by breeders.

Basically, three types of organizations are involved in the management and development of genetic resources for legumes:

- INRA (Institut National de la Recherche Agronomique), mainly in genetics and plant breeding stations
- GEVES (Groupe d'etude et de Controle des Variétés et des Semences)
- Private breeders, among them eight French breeders collaborating as a specific group for pea (*Pisum sativum*) research, namely GSP (Groupement des Selectionneurs de Pois). Other organizations include the GIE (Groupement d'Intérèt Economique).

Pea breeding in France is an established and important activity incorporating numerous private businesses, the main ones being grouped under GSP. Similarly, for legumes, INRA has a network of four plant breeding research stations connected to pea breeding and genetic resources maintenance (Rennes, Mons, Dijon and Versailles). On the other hand, faba bean and lupin are very poorly represented, other than through INRA (only one private breeder for faba bean and for lupin).

Moreover, the whole profession is well coordinated through UNIP (Union Nationale des Plantes Riches en Proteines) which brings together all operators interested in legumes from producers through to users and businesses.

As a result of this dispersion, genetic resources in France are currently scattered over various locations and, until last year, no important operation was undertaken to consolidate the different collections. This situation is currently evolving: under BRG (Bureau des Ressources Génétiques) recommendations, INRA proposals and Ministry submissions. France is presently in the process of improving genetic resources management and focusing the efforts of the partners.

Methodology

Databases are well managed for the different species and data are available, at least for every INRA research station. PCs are used with Paradox® software on UNIX, presently in use at every INRA station and GEVES but not yet at private firms. Oracle® software is generally available. A Web display is under preparation.

Generally, the different stations, INRA, GEVES and private businesses, are well equipped for seed multiplication and storage. However, no refrigerated chambers (-20°C) are presently available except at GEVES and INRA Versailles plant breeding station. Seeds are generally stored for medium-term conservation (10 years at maximum) in specially controlled chambers maintained at 4°C, in which RH is always less than 35%.

Regeneration of the seed stock is generally made at the rate of one-tenth per year, so that at the end of each 10-year period, theoretically, the whole collection has been renewed. In general genotypes, instead of genes, are conserved so that individual

progenies of each genotype, grown under controlled conditions of isolation to avoid insect cross-pollination, are collected. In some cases, particularly in faba bean, bulks or mixed populations are grown in inter-crossing, each of them being isolated, to provide and maintain a more complex genetic mix. The remaining progenies of such multiplications correspond to the mixture of a single seed or a single pod descendant per plant of the bulk. INRA as well as GEVES and private breeders retain acreage in sufficient quantity and have the technical capacity to achieve this operation under good conditions.

Perspectives

It appears that all the organizations have large quantities of similar genotypes in their collections. For this reason why it has been decided to create a general agreement so that core collections can be place in common, centralized projects. This was first initiated by BRG (Bureau des Ressources Génétiques) and the legume group for genetic improvement at INRA. The Ministry of Agriculture also offered to help by first nationalizing an integrated approach of pea genetic resources, and following up with other legume crops. It was proposed to focus storage and seed multiplication of the core collections at the INRA plant breeding station at Versailles. This includes the management of a common database for these core collections, in which lists of each participant can be compared, thus avoiding maintenance of duplicated genotypes.

A meeting of INRA, BRG, UNIP, GEVES and representatives of private breeders will be held in September in Paris to determine a way to organize this task. This work will result both in the establishment of a 'general agreement for protein crops' for National and European purposes, and in the practical involvement of the different partners in this initiative. Restructuring of the scattered collections is planned over a period of 2-3 years. Presently a group is working on the design of a computerized central database at Versailles.

The INRA group has also arranged a network between all INRA stations and agronomic domains concerned with legume breeding and experimentation. This network, besides being used for experimentation of pre-registered varieties, will be used for dynamic management of genetic resources due to the various environ-mental conditions existing at the different sites concerned: north, west, east, south and central regions of France. We can, in this way, expect to have identical genetic populations grown in these locations, under various environmental stress condit-ions, which might allow these populations to express their best characteristics.

It is also intended to include information on genetic markers in the database, at least for pea as an initial step. As soon as these markers are available this will provide a complementary method for distinguishing between genotypes included in the pool of genetic resources.

Collecting missions

Collecting in countries of origin, or diversification of the different legumes should be undertaken to expand genetic variability, which is restricted for certain characters, and also to prevent genetic erosion which might occur under some conditions. Some collecting was done a few years ago by INRA for lupin in various Mediterranean countries (Turkey, Greece, Italy, Spain and the Azores).

Interesting surveys for certain species, especially peas, may nowadays be difficult in Eritrea and Ethiopia.

With regard to faba bean, collaborative work is being done between France and the Maghreb countries, in particular Morocco and Tunisia. Collecting missions are

commonly done both for plant genetic resources and for a survey of associated pathogens strains. A multilocal agronomic evaluation of some cultivars is presently being undertaken by a Moroccan PhD student.

It is of utmost importance that prospecting for faba bean is done in other countries, for example in China, before current traditional farming changes lead to an erosion of genetic diversity as has been observed in some instances. The reasons for this interest in China is that it is the most important faba bean producing country and because faba bean production in China is spread over a wide area involving a large quantity of landraces or local populations. Each farmer grows his personal faba landrace and, owing to the absence of wide distribution of local seed production, there obviously exists great diversity among these local populations. Our expectation is to find an opportunity to participate in such a collecting mission.

Also of interest would be collecting for faba in the northern part of the Indian continent (Afghanistan, Pakistan and the north of India), but this would probably be difficult nowadays.

Table 1. Main legume species in French germplasm collections.

Species	Latin name	Organization
Pea	*Pisum sativum*	INRA-GEVES-GSP Private breeders
Faba bean	*Vicia faba*	INRA - GEVES
Lupine	*Lupinus albus* *Lupinus mutabilis* *Lupinus luteus* *Lupinus angustifolius*	INRA - GEVES
Bean	*Phaseolus vulgaris*	INRA - GEVES
Lentil	*Lens esculenta*	INRA - GEVES
Chickpea	*Cicer arietinum*	–

Main germplasm locations and people responsible

INRA

General collections, working collections

Pea (Versailles, Rennes, Dijon, Mons):	J. Le Guen, R. Cousin, G. Eteve, G. Duc
Faba bean (Rennes, Dijon):	J. Le Guen, G. Duc
Lupin (Lusignan):	C. Huyghe, J. Papineau
Bean (Versailles):	G. Fouilloux
Lentil (Clermont Ferrand):	J.P. Bonnard

GEVES

Collections of genotypes, registered varieties, old varieties.

Pea, lentil, bean (Brion):	F. Boulineau
Faba bean, lupine (le Magneraud):	V. Gensollen

GSP - Private firms

Core collection, working collections

Pea (GSP = eight private breeders):	Ms M. Duparque
Faba bean (Company Blondeau):	J. Thomas

Table 2. Grain legume collection at GEVES.

	La miniere	Brion	Total
Pea	12	1728	1740
Faba	130	–	130
Lupin	38	–	38
Lentil	–	12	12
Phaseolus	–	1409	1409
Total	180	3149	3329

Working collections are not included.

Table 3. Collections at INRA and GSP.

	Rennes	Dijon	Mons	Clermont	Versailles	Lusignan	Total
Pea	398	142	1135 960 *	–	1600	–	4235
Faba	1608	1148	–	–	–	–	2756
Lupine	–	–	–	–	–	2244	2244
Lentil	–	–	–	397	–	–	397
Bean	–	–	–	–		–	
Total	2006	1290	2037	397		2244	

*GSP pea collection (located at Mons). Working collections are not included.

Table 4. Total collections of legumes in France (working collections not included).

Species	
Pea	5975
Faba	2886
Lupine	2382
Lentil	409
Phaseolus	1409
Total	13 061

Main people responsible for collections

B.R.G
Marianne Lefort, Paris

INRA

General coordinator for legumes:	J. Le Guen
Pea:	J. Le Guen, R. Cousin, A. Burghoffer, G. Eteve, G. Duc
Faba bean:	J. Le Guen, G. Duc
Lupine:	C. Huyghe, J. Papineau
Phaseolus:	G. Fouilloux
Lentil:	J.P. Bonnaud

GEVES

Pea:	F. Boulineau
Faba bean:	V. Gensollen
Lupine:	V. Gensollen
Phaseolus:	F. Boulineau
Lentil:	F. Boulineau

GSP

Pea:	M. Duparque

Table 5. Main descriptors for legumes in French collections.

	Lupin	**Pea**	**Faba**
Origin of material			
· Geographic	✓	✓	✓
· Genetic	✓	✓	✓
Phenology	✓		✓
Morphology			
· Quantitative	✓	✓	✓
· Qualitative	✓	✓	✓
Productivity	✓		✓
Quality	✓		✓
Diseases		✓	✓
Physiology		✓	
Markers			
· Enzymes			✓
· Infra red	✓		
· RFLP		✓	

Status of plant genetic resources and research on grain legumes in Germany, 1995

A. Diederichsen and K. Hammer
IPK-Genebank, 06466 Gatersleben, Germany

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

Table 1. Grain legumes in the German genebank collections.

Species	Braunschweig	Gatersleben
Cajanus *cajan* (L.) Huth	32	7
Cicer	142	236
Cicer arietinum L.	142	227
Cicer species	–	9
Glycine	103	2957
Glycine mutants	–	1530
Glycine strains	–	65
Glycine max (L.) Merr.	103	1360
Glycine soja Sieb. et Zucc.	–	2
Lablab *purpureus* (L.) Sweet.	1	26
Lathyrus	15	427
Lathyrus sativus L.	1	196
Lathyrus species	14	231
Lens	92	311
Lens culinaris Medik.	69	300
Lens species	23	11
Lupinus	1983	811
Lupinus albus L.	137	208
Lupinus angustifolius L.	400	269
Lupinus luteus L.	252	128
Lupinus mutabilis (L.) Sweet	998	25
Lupinus species	196	181
Phaseolus	890	7688
Phaseolus acutifolius A. Gray	2	15
Phaseolus coccineus L.	26	343
Phaseolus lunatus L.	2	34
Phaseolus vulgaris L.	822	7284
Phaseolus species	25	12
Pisum	2268	3092
Pisum fulvum Sibth. et Sm.	10	3
Pisum sativum L. subsp. *abyssinicum* (A. Braun) Berger	9	61
Pisum sativum L. subsp. *elatius* (Stev.) Schmalh.	1	22
Pisum sativum L. subsp. *sativum*	2000	2989
Pisum species	246	17
Vicia	1228	3099
Vicia faba L.	1006	1503
Vicia ervilia (L.) Willd.	21	135
Vicia narbonensis L.	13	76
Vicia species	188	1385
Vigna	44	490
Vigna angularis (Willd.) Ohwi et Ohashi	–	78
Vigna mungo (L.) Hepper	–	4
Vigna radiata (L.) Wilcz.	–	61
Vigna umbellata (Thunb.) Ohwi et Ohashi	–	11
Vigna unguiculata (L.) Walp.	35	197
Vigna species	9	139
Total	6798	19 144

State and management of the genebank collections

Origin of the genebank accessions

FAL Braunschweig
The largest part of the collection comes from world-wide exchange with other institutions. Table 2 gives an overview of the relative breeding varieties for grain legume genera.

IPK Gatersleben
About two-thirds of the accessions come from collecting missions. The rest is made up by breeding varieties or comes from other institutions. Landraces and primitive varieties characterize the collections (Table 2).

Table 2. Breeding varieties of grain legumes in the German genebanks.

	Relative part of breeding varieties and strains (% of the collection)	
Group	**FAL Braunschweig**	**IPK Gatersleben**
Cicer	18	9
Glycine	–	39
Lathyrus	40	7
Lupinus	14	15
Phaseolus	55	ca. 50
Pisum	47	50
Vicia	31	13
Cajanus, Lablab, Lens and *Vigna*	9	9

Storage, reproduction and evaluation strategies of the genebanks

FAL Braunschweig
The seeds are dried to a moisture content lower than 8% and stored in tins at a temperature of –10°C. The reproduction of the genera *Pisum*, *Vicia* and *Phaseolus* is done in the field, the other genera are grown in greenhouses. Every year one accession of each genus is reproduced. Characterization and secondary evaluation have been done in special research programmes. The results are published. Prebreeding, especially for use as industrial crops, has been done in Braunschweig for several years (see list of publications).

IPK Gatersleben
The dried seeds are stored in jars together with silica gel for further drying at a temperature of –15°C. Reproduction is done, if (1) the accession enters the genebank, (2) the germinability of the stored seeds is lower than 85%, (3) the request of the accession is high or (4) the primary evaluation has to be completed. Table 3 shows the figures for field reproduction in 1995. The rate of reproduction will be the same in future. Primary evaluation data are documented for every reproduction cycle. Management data of the accessions are computerized and used for internal management.

Databases describing the genebank accessions

FAL Braunschweig

Passport information, primary and secondary evaluation data are computerized. This information is also available as booklets for parts of the genera *Lupinus, Vicia* and *Pisum*.

IPK Gatersleben

Passport information is computerized and will be directly accessible for users after the establishment of the Internet connection of the institute in 1996. Primary evaluation data are documented and available on request. Secondary evaluation data exist for parts of the collection.

Table 3. Reproduction of grain legume groups at Gatersleben in 1995.

Group	No. access. in reproduction	% of collection in reproduction	Place of reproduction
Cicer	44	19	field
Glycine	237	8	field
Lathyrus	62	15	field
Lupinus	53	7	isolation sites
Phaseolus vulgaris	745	10	322 in field, 433 in greenhouses
Phaseolus coccineus	43	13	isolation sites
Other *Phaseolus* spp.	–	0	
Pisum	217	7	field
Vicia faba	214	14	isolation sites
Other *Vicia* spp.	129	8	isolation sites
Cajanus, Lablab, Lens and *Vigna*	99	12	greenhouses
Total	1843	9.6	

Planned collecting missions

FAL Braunschweig

The collecting strategy is always to concentrate on one species. Up to now there are no plans to do special collecting missions on legumes.

IPK Gatersleben

Collecting missions, covering the whole range of cultivated plants, are planned to Albania, Italy and Central Asia. These areas are of relevance for genetic resources of grain legumes.

Further activities in grain legumes of the German genebanks

There have been no investigations into duplications existing between the two genebanks in Germany. This needs to be clarified by comparing available passport and characterization data. For a final decision comparison must be under the same environmental conditions. Molecular characterization techniques should also be used. Presently, no funds exist to do this work on a large scale.

German institutions and plant breeders keeping collections of grain legumes (names of the genera in brackets)

- Botanischer Garten der Universität Potsdam, Postfach 601553, D-14415 Potsdam (*Glycine, Cajanus, Phaseolus*)
- Bundesforschungsanstalt für Landwirtschaft Braunschweig-Völkenrode (FAL) - Institut für Pflanzenbau-, Bundesallee 50, D-38116 Braunschweig (see Table 1)
- Institut für Landwirtschaftliche Forschung und Untersuchung e.V., Merseburger Str. 41, D-06112 Halle (*Lathyrus, Vicia*)
- Institut für Nutzpflanzenkunde gemäßigter, subtropischer und tropischer Regionen, Fachbereich 11, Universität Gesamthochschule Kassel, Steinstraße 19, D-37213 Witzenhausen, (*Cajanus, Glycine, Lupinus, Vigna)*
- Institut für Pflanzenzüchtung der Universität Hohenheim (350), D-70593 Stuttgart (*Vicia*)
- Institut für Planzengenetik und Kulturpflanzenforschung (IPK) -Genbank-, Corrensstr. 3, D-06466 Gatersleben (see Table 1)
- Pflanzenzucht Oberlimpburg, Dr. P. Franck, D-74523 Schwäbisch-Hall (*Vicia*)
- Universität Hohenheim Landessaatzuchtanstalt (720), D-70593 Stuttgart (*Lupinus, Vicia*)

Research with relevance to grain legumes germplasm conducted in Germany

Fundamental taxonomical research

Hanelt, P. 1972. The infraspecific variability of *Vicia faba* L. and its classification (Die infraspezifische Variabilität von *Vicia faba* L. und ihre Gliederung). Kulturpflanze 20:75-128.

Lehmann, Chr. O. and S. Blixt. 1984. Artificial infraspecific classification in relation to phenotypic manifestation of certain genes in *Pisum*. Agri Hortique Genetica 42:49-74.

Lehmann, Chr.O. 1962. Ein Beitrag zur Systematik der Sojabohnen (*Glycine max* (L.) Merr.). Der Züchter 32 (5):229-249.

Schäfer, H.I. 1973. The taxonomy of the *Vicia narbonensis*-group (Zur Taxonomie der *Vicia narbonensis* Gruppe). Kulturpflanze 21:211-273.

Recent research on grain legumes germplasm

Grain legumes research in general

Bundesamt für Ernährung und Forstwirtschaft, Außenstelle Bonn (Projektträger Agrarforschung). 1989. Schriftenreihe des Bundesministers für Ernährung, Landwirtschaft und Forsten, Reihe A: Angewandte Wissenschaft, Heft 367, Körnerleguminosen, Tagungsband zum Expertenkolloquium am 7.-8. 11. 1988 in Königswinter und Dokumentation der Forschungsvorhaben. Landwirtschaftsverlag GmbH Münster-Hiltrup, 412 p.

Dambroth, M. and G. Schröder. 1990. Sammlung, Erhaltung, Evaluierung und Nutzbarmachung pflanzengenetischer Ressourcen am Institut für Pflanzenbau und Pflanzenzüchtung der FAL - dargestellt am Beispiel der großsamigen Körnerleguminosen. Landbauforschung Völkenrode 40 (4):261-278.

Schmidt, H.E. and Chr. O. Lehmann. 1990. Untersuchungen zur Virusresistenz in den Gaterslebener Kollektionen von Ackerbohnen (Vicia faba L.), Erbsen (Pisum sativum L.) und Buschbohnen (Phaseolus vulgaris L.). In: Institut für Pflanzenbau und Pflanzenzüchtung der Bundesforschungsanstalt für Landwirtschaft (FAL) Braunschweig-Völkenrode; Zentralinstitut für Genetik und Kulturpflanzenforschung der Akademie der Wissenschaften in Gatersleben (eds.):

Gemeinsames Kolloquium Sicherung und Nutzbarmachung pflanzengenetischer Ressourcen 3. - 5. Juli 1990:109-125.

Recent research concerning single genera of grain legumes

Lupinus

Kasten, W. and R. Kunert. 1991. A culture method for isolated immature embryos of different Lupinus species. Biologisches Zentralblatt 110 (4).

Kasten, W., T. Paradies, R. Kunert and P. Straka. 1991. Progress in realization of interspecific hybrids in the genus Lupinus by means of an embryo rescue technique. Biologisches Zentralblatt 110 (4).

Phaseolus

Castineiras, L., M. Esquivel, L. Lioi and K. Hammer. 1991. Origin, diversity and utilization of the Cuban germplasm of common bean (*Phaseolus vulgaris* L.). Euphytica 57 (1):1-8.

Esquivel, M., L. Castineiras and K. Hammer. 1990. Origin, classification, variation and distribution of lima bean (*Phaseolus lunatus* L.) in the light of Cuban material. Eyphytica 49 (2):89-97.

Esquivel, M., L. Castineiras, L. Lioi and K. Hammer. 1992. The domestication of lima bean (*Phaseolus lunatus* L.) in Cuba: morphological and biochemical studies. Plant Genetic Resour. Newsl. 91/92:21-22.

Hammer, K. 1992. Neu- und altweltliche Bohnen. Vorträge für Pflanzenzüchtung 22:162-166.

Lioi, L., M. Esquivel, L. Castineiras and K. Hammer. 1991. Lima bean (*Phaseolus lunatus* L.) landraces from Cuba: Electrophoretic analysis of seed storage proteins. Biologisches Zentralblatt 110 (1):76-79.

Lioi, L. and K. Hammer. 1990. A wild race of *Phaseolus vulgaris* L. as a new source of phaseolin variation. Kulturpflanze 37:129-132.

Zink, D., K. Schumann and W. Nagl. 1994. Restricion fragment length polymorphisms of the phytohemagglutinin genes in *Phaseolus* and *Vigna* (Leguminosae). Plant Systematics and Evolution 191 (3-4), 131-146.

Pisum

Gottschalk, W. 1988. Genetic diversity of flowering in a collection of *Pisum* mutants and recombinants. Angewandte Botanik 62 (1/2):1-8.

Sneyd, J. 1993. Langjährige Züchtungsarbeit mit Landsorten; erste Teilerfolge bei Winter-Grünfuttererbsen, 3-blütigem Roggen und extrem frühem Weizen. Vorträge für Pflanzenzüchtung 25:206-209.

Vicia

Hanelt, P., A. Rudolph, K. Hammer, A. Meister, K. Müntz and F. Scholz. 1978. Eiweißuntersuchungen am Getreide- und Leguminosen-Sortiment Gatersleben. Teil 3: Gehalt an Rohprotein und schwefelhaltigen Amonisäuren der Ackerbohne (*Vicia faba* L.). (Protein screening of the Gatersleben collection of cereals and pulses three. Protein and SH-amino contents of field beans (*Vicia faba* L.)). Kulturpflanze 26:183-212.

Herzog, H. and A. Olszewski. Project 1990-1994. Frost resistance of Faba beans (*Vicia faba* L.). Institut für Nutzpflanzenforschung der Technischen Universität Berlin, Fachgebiet Acker- und Pflanzenbau.

Kittlitz, E. von, K. I.M. Ibrahim, P. Ruckenbauer and I.D. Robertson. 1993. Analysis and use of interpool-crosses (Mediterranean x Central European) in faba beans (*Vicia faba* L.) 1. Performance of Mediterranean and Central European faba beans in Syria and Germany. Plant Breeding 110 (4):307-314.

(*Vicia faba* L.) 1. Performance of Mediterranean and Central European faba beans in Syria and Germany. Plant Breeding 110 (4):307-314.

Lötsch, A. 1990. Investigations in the distribution of the resistance to BYMV in *Vicia faba* L. in a collection of European provenience. Mitteilungen der Gesellschaft für Pflanzenbauwissenschaften 3:167-170.

Stelling, D., C. Balko and E. von Kittlitz. 1985. Genotypische Variabilität in der Trockenheitstoleranz der Ackerbohne (*Vicia faba* L.). Vorträge für Pflanzenzüchtung 8:125-136.

Ongoing research projects

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Nagl, W. and M. Nenno. Current project 1994-1988. Establishment of a molecular karyotype of the *Phaseolus* polytene chromosomes by multicolor *in situ* hybridization. Abteilung Zellbiologie im Fachbereich Biologie der Universität Kaiserslautern.

Nagl, W. and K. Schumann. Current project 1989-2000. Molecular characterization of the storage protein, phaseolin, and of its genes. Abteilung Zellbiologie im Fachbereich Biologie der Universität Kaiserslautern; Department of Agriculture and Range Science, University of California, Davis, USA.

Nagl, W. and D. Zink. Current project 1994-1998. DNA fingerprinting in the genus Phaseolus with digoxigenized oligonucleotides and the PCR technique. Abteilung Zellbiologie im Fachbereich Biologie der Universität Kaiserslautern; Abteilung Molekulare Pflanzenbiologie Biozentrum der Universität Frankfurt/Main.

Peterka, H. and H. Budahn. Current project 1993-1996. Marker assisted selection for resistance against fungal diseases in pea (*Pisum sativum* L.). Institut für Züchtungsmethodik bei Gemüse der Bundesanstalt für Züchtungsforschung an Kulturpflanzen (BAZ) Quedlinburg; Institut für Gemüse-, Heil- und Gewürzpflanzenforschung der BAZ (Scholze, P.).

Peterka, H. and H. Budahn. Current project 1993-1996. Marker assisted selection for virus resistance in pea (*Pisum sativum* L.): Institut für Züchtungsmethodik bei Gemüse der Bundesanstalt für Züchtungsforschung an Kulturpflanzen (BAZ), Quedlinburg; Institut für Resistenzforschung/Aschersleben der Bundesanstalt für Züchtungsforschung.

Status of grain legume collections in Israel

S. Abbo
Plant Genetics Weizmann Institute, Rehovot 76100, Israel

The Israel Gene Bank for Agricultural Crops has placed and is continuing to place emphasis on the regeneration of local landraces. Within the last 3 years, accessions of *Phaseolus*, *Vigna*, *Lens*, *Cicer* and *Lupinus* have been regenerated; general observations have been collected and stored on the database.

All passport data received, including accessions from abroad, are automatically entered into the computer together with an individual code number. Within the next 2 years we shall complete the regeneration of landraces of *Lens* and *Lupinus*. We also expect to include the regeneration of introduced lines of *Phaseolus*, *Cicer* and *Lupinus*.

It is also planned to regenerate local landraces of *Triticum*, *Hordeum* and *Vicia*. We expect to include the regeneration of introduced lines of *Phaseolus*, *Cicer* and *Lupinus*.

The Israel Gene Bank manages part of the grain legumes database.

Dr B. Retig holds a working collection of several thousand lines of *Cicer arietinum*. Samples of some introduced lines are held at the IGB.

The majority of introduced lines of *Lens* have been regenerated at Bet Dagan.

Super Vision Pentium PCI/ISA computer using Microsoft Access/Windows is used and managed by the Israel Gene Bank.

Israeli Gene Bank activities regarding grain legume accessions

A. Regeneration of local landraces which include *Cicer* and *Lens* accessions.

B. Regeneration of imported stored material; including *Cicer*, *Pisum*, *Lens, Lupinus,* and *Phaseolus* species.

C. Computerized data management of all stored accessions; including all data information received with the original material and field observations made while propagating the material.

A working chickpea collection, which includes ca. 200 cultivars and a large number of hybrid combinations, is held by Dr B. Retig of the ARO, Volcani Center, at Bet-Dagan.

Table 1. Accessions held at the Israel Gene Bank.

Species	No. of accessions	Origin
Cicer arietinum	468	
landraces	38	Israel
C. arietinum	417	worldwide
other *Cicer* spp.	13	
Lupinus	186	
landraces and wild	22	Israel
L. albus	31	worldwide
L. angustifolius	43	worldwide
L. luteus	58	worldwide
Others	32	worldwide
Lens	523	
landraces	108	Israel
Lens spp.: wild	7	Israel
L. culinaris	400	worldwide
others	8	
Phaseolus	596	
P. vulgaris: landraces	21	Israel
P. aureus: landraces	5	Israel
others	3	Israel
P. vulgaris	368	worldwide
P. acutifolius	6	worldwide
P. aureus	42	worldwide
P. coccineus	107	worldwide
P. limensis	4	worldwide
P. lunatus	36	worldwide
others	4	worldwide
Pisum	324	
Pisum sativum	304	worldwide
others	17	worldwide
Pisum spp.: landraces and wild	3	Israel

Status of grain legume collections in Italy

F. Saccardo
Universitá della Tuscia, Dipartimento produzione Vegetale, 01100 Viterbo, Italy

Table 1. Food legumes in Italy (average for 1990-93).

Species	Cultivated area (x 1000 ha)	Production t/ha	Production (x 1000 t)	Utilization	Import (x 1000 t)
Faba bean	104	1.1	114	D,G	199
Bean	24	1.5	36	D,G,C,F	46
Pea	13	2.9	38	F,C,G	-
Chickpea	10	1	10	D,C	43
Lupin	3	1.3	4	D	-
Lentil	1	0.7	1	D,C	19

Main constraints to pulses in Italy

General

- Lack of high and stable yielding cultivars of legumes competitive with cereal varieties
- Expansion of cereal cultivation (mainly wheat) due to high yield stability and intensive mechanization
- Conversion of dry lands to irrigated areas favourable to vegetable crops
- Change of human diet, over the last 50 years, to high consumption of animal proteins
- Well-organized marketing for cereals and not for legumes.

Specific

- Abiotic stresses: cold for winter sowing of chickpea and pea; drought for spring sowing of chickpea, faba bean, bean, lentil and lupin
- Biotic stresses: fungal pathogens such as *Ascochyta rabiei* in chickpea, *Fusarium oxysporum* f.sp. *lentis* in lentil, *Botrytis fabae*, *Uromyces fabae* and *Heterodera goettingiana* in faba bean, *Colletotrichum lindermuthianum* in bean, *Fusarium oxysporum* f.sp. *pisi* and *Erysiphe pisi* f.sp *pisi* in pea; viruses such as BCMV, BYMV and CMV in bean, PMV and AMV in pea; bacterial pathogens such as *Pseudomonas syringae* pv. *phaseolicola* in bean; insects
- Presence of antinutritional factors in faba bean and lupin.

Table 2. Main Italian institutions involved in germplasm collecting and breeding programmes for grain legumes.

Species	Institution	Programme
Bean (*Phaseolus* spp.)	Istito del Germoplasma CNR, Bari (1318 accessions)	Regeneration of accessions, safety duplication and documentation. Analysis of proteins
	Università di Torino, Dip. DI.VA. P.R.A. (224 accessions)	Regeneration of accessions, safety duplication and documentation
	Università della Tuscia, Dip. DABAC, Viterbo	Breeding for disease resistance
	Istituto del Germoplasma CNR, Bari (348 accessions)	Regeneration of accessions, safety duplication and documentation
	Università della Basilicata, 1st Biologia Agraria, Potenz (120 accessions)	Regeneration of accessions, safety duplication and documentation
	Università della Tuscia. Dip. Produzione Vegetale, Viterbo and Università di Napoli, Dip. Scienze Agronomiche e Genetica Vegetale, Portici	Breeding for high yield and resistance to stresses (cold and Ascochyta blight). Agronomical practices and *in vitro* culture
Chickpea (*Cicer* spp.)	ENEA, Settore Biotecnologie e Agricoltura, Roma	Breeding for high yield and resistance to biotic stress and *in vitro* culture
	Stazione Sperimentale di Granicoltura per la Sicilia, Caltagirone	Agronomic practices and breeding for resistance to drought
	Università di Catania (1st Agronomia Gen. e Coltivazioni Erbacee Università di Palermo (1st Agronomia Generale e Coltivazioni Erbacee), Università di Bari (1st Miglioramento Genetico)	Collection of local ecotypes. Breeding for high yield and drought resistance
	Istituto del Germoplasma CNR, Bari (2249 accessions)	Regeneration of accessions, safety duplication and documentation. Characterization by isozymes
	Università della Tuscia, Dip. DABAC, Viterbo	Breeding by constitution of self-fertile inbred lines and high yielding synthetic populations
Faba bean	ENEA, Settore Biotecnologie e Agricoltura, Roma (250 accessions)	Breeding for high yield by use of self-fertile and determinate inbred lines
	Università di Catania (1st Agronomia Gen. e Coltivazioni Erbacee; Università di Palermo (1st Agronomia Generale e Coltivazioni Erbacee), Università di Bari (1st Miglioramento Genetico	Collection of local ecotypes. Breeding for high yield and drought resistance. Mutagenesis for reduced plant height
	Istituto del Germoplasma CNR, Bari (330 accessions)	Regeneration of accessions, safety duplication and documentation

Species	Institution	Programme
Lentil (*Lens* spp.) - cont.	Università della Basilicata, 1st Biologia Agraria, Potenz (150 accessions)	Regeneration of accessions, safety duplication and documentation
	Università della Tuscia, Dip. DABAC, Viterbo	Breeding for high yield
	ENEA, Settore Biotecnologie e Agricoltura, Roma (250 accessions)	Breeding for high yield, erect types, lack of antinutritional factors
Lupin (*Lupinus* spp.)	Istituto del Germoplasma CNR, Bari (188 accessions)	Regeneration of accessions, safety duplication and documentation
	Università della Basilicata, 1st Biologia Agraria, Potenz (150 accessions)	Regeneration of accessions, safety duplication and documentation
	ENEA, Settore Biotecnologie e Agricoltura, Roma (250 accessions)	Breeding for determinate and sweet types for animal feeding
	Università di Napoli, Dip. Scienze Agronomiche e Genetic Vegetale, Portici	Agronomical practices, breeding for high yield and seed quality
Pea (*Pisum* spp.)	Istituto del Germoplasma CNR, Bari (188 accessions)	Regeneration of accessions, safety duplication and documentation
	Istituto per le Colture Industriali, Bologna	Breeding for high yield and grain quality
	Università di Napoli, Dip. Scienze Agronomiche e Genetic Vegetale, Portici	Breeding for grain quality, canning and stress resistance

[Italy – pp. 54-55]

Italian Research programmes on grain legumes

- CNR (IPRA), project on the research of new protein sources, 1982-86.
- Italian Agriculture and Forestry Ministry, Project on the quantitative and qualitative improvement of food legumes, 1987-93.
- ICARDA and Italian institutions, collaborative project on the development of chickpea germplasm with combined resistance to Ascochyta blight and Fusarium wilt using wild and cultivated species, 1988-94.
- EEC, Eclair Project on the development of chickpea germplasm resistant to Ascochyta blight and Fusarium wilt as a winter planting alternative to cereal grains in southern Europe, 1992-95. Countries involved: Spain, Italy, England.

In general, the research activities developed by these projects involve all the main grain legumes and different aspects such as:

- development of new agronomic practices
- resistance to biotic and abiotic stresses
- evaluation of local and foreign germplasm under different environmental conditions
- creation of new genetic variability, using intra and interspecific hybridizations, as well as by mutagenesis
- release of new cultivars
- cytogenetic studies
- approaches to *in vitro* culture.

Current status of the CGN grain legume collection

Loek J.M. van Soest and H. Dijkstra
Centre for Plant Breeding and Reproduction Research (CPRO-DLO), Centre for Genetic Resources The Netherlands (CGN), 6700 AA Wageningen, The Netherlands

The collection

The CGN grain legumes collection consists of 1382 accessions of the legumes *Pisum*, *Vicia faba* and *Lupinus* (Table 1). Furthermore, an additional 249 accessions of pea (170), faba bean (150) and lupine (29) are available, which have been conserved, along with the material already in storage. This material needs to be regenerated, characterized and stored. In total, CGN maintains some 1630 accessions of grain legumes.

The grain legumes collection is considered a working collection and therefore has not been emphasized.

Table 1. Grain legumes collection at CGN.

Species	No. of accessions	Total
Pisum sativum	730	
Pisum arvense	1	
Pisum elatius	3	
Pisum (total)		734
Vicia faba	607	607
Lupinus albus	13	
Lupinus luteus	28	
Lupinus (total)		41
Total		1382

Pisum

The collection includes mainly material of *P. sativum*; only a few accessions of *P. arvense* and *P. elatius* are available (Table 1). The origin of the *P. sativum* material is listed according to population type in Table 2. Only 22 landraces from Europe are maintained in the collection; however, there is a larger quantity of landraces from Asia (154) and Africa (82). The material from Ethiopia and Pakistan has been collected with Dutch participation (Hashmi *et al.* 1981). The cultivars form the greater part of the collection and consist both of dry peas for animal feed and peas for human consumption. The latter group includes some 120 cultivars. There are a limited number of accessions (35) which have been classified as research material. There is also a relatively large group of accessions (79) of which the population type is not known, and the country of origin is not known for 149 accessions.

Vicia faba

The collection includes 607 accessions of *V. faba*. Table 3 presents the origin of the material according to population type. Nearly 60% of the collection consists of landraces, including 48 accessions from Europe. A substantial number of landraces are from the centres of origin. Nearly all cultivars, and limited research material, are of European origin. The country of origin and population type of, respectively, 44 and 89 accessions are not known.

Table 2. Origin of *Pisum sativum* collection according to population type.

Origin*)	Landraces	Cultivars	Research material	Unknown	Total
Europe					
The Netherlands	3	146	8	21	180
France	1	7	1	21	30
United Kingdom		19	2	14	35
EU (DEU, GRC, AUT, ESP, ITA, SWE)	7	10		5	22
Rest (SUN, CSK, POL, ALB)	11				11
Total	22	182	13	61	278
North America					
(USA, MEX, CAN)	3	11		7	21
South America					
(BRA, PER, ARG, VEN, PRY)	5		7		12
Africa					
Ethiopia	80				80
Rest (CIV, GIN)	2				2
Total	82				82
Australia					
(AUS + NZL)	1	22	7		30
Asia					
Pakistan	63				63
India	47				47
Turkey	37				41
Rest (NPL, SYR, CHN, IRQ, LBN)	7				7
Total	154		4		158
Unknown	5	129	11	4	149
Total	272	344	35	79	730

* country codes according to FAO.

Lupinus

This small collection includes only 41 accessions of the species *L. albus* and *L. luteus* (Table 1). Only a few landraces and cultivars are maintained in the collection. These come from The Netherlands, Germany and Hungary. Other material consists of research material produced by the former Foundation for Plant Breeding-SVP (van Soest en Boukema 1995).

Regeneration and characterization

Faba beans and lupines are regenerated in plots isolated spatially in winter rye fields at a distance of approximately 50 m between the plots. The size of the plots is 8 m², and normally 200 seeds are sown directly in the field. Peas are sown directly in the field

without isolation. A hundred seeds are sown per accession against a fence. During the growing season the accessions are monitored both visually and by means of serological tests for Pea Seedborne Mosaic Virus (PSMV). Plants detected with PSMV infections are removed.

Table 3. Origin of *Vicia faba* collection according to population type.

Origin*	Landraces	Cultivars	Research material	Unknown	Total
Europe					
The Netherlands	1	25	1	8	35
Germany		47		2	49
United Kingdom		13		14	27
EU (ITA, GRC, ESP, FRA, SWE, AUT, FIN)	38	16	3	5	62
Rest (SUN, ROM, POL, YUG, CSK, BRG)	9	25		13	47
Total	48	126	4	42	220
North America and South America					
Canada	34	1			35
Rest (PER, USA)	3			1	4
Total	37	1		1	39
Africa					
Ethiopia	74			4	78
Egypt	19	1		8	28
Rest (SDN, DZA, MAR, TUN)	16			1	17
Total	109	1		13	123
Australia	1			1	2
Asia					
Syria	57				57
Afghanistan	53			2	55
Pakistan	25				25
Middle East (IRQ, TUR, JOR, LBN, YEM, IRN)	33				33
Rest	6	3			9
Total	174	3		2	179
Unknown		9	5	30	44
Total	369	140	9	89	607

During regeneration the accessions of *P. sativum* and *V. faba* are characterized for, respectively, 14 and 13 different agromorphological traits, using CGN descriptor lists (Dijkstra and van Soest 1986). The lists, partly derived from the IPGRI and UPOV descriptor lists, were established after consultation with several breeders of grain legumes. Presently, there are 7700 characterizations of *Pisum* and 7350 data of *V. faba*

included in the information system GENIS (van Soest and Boukema 1995). The lupins have only been characterized for two traits: plant type and flower colour.

Documentation

The 1382 accessions of the different grain legumes are all documented for passport data in GENIS, which is an information system based on the database management system ORACLE (van Hintum 1989). The passport data are incomplete for some accessions. There are insufficient data on landraces, *P. sativum* and *V. faba*, collected in the centres of origin in Asia and Africa (Ethiopia).

More than 15 000 characters are documented in GENIS, but so far no evaluation data are available.

Storage

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

Utilization

Since 1988 some 550 accessions of *Pisum* have been distributed to users in The Netherlands and abroad. During the same period 81 accessions of *V. faba* and only 10 of *Lupinus* have been sent to users. Normally, users are supplied with 50 seeds and provided with information on the requested material.

Future activities

The grain legumes collections at CGN have the status of a working collection (van Hintum en van Soest 1995). This means that no attempts are made to sample the overall genetic diversity available in the particular crop and its related wild species. Planned activities for the next 5 years can be summarized as follows:

- regeneration and characterization of the 249 accessions not yet included in the collection
- limited broadening of the grain legumes collection with original Dutch material
- updating the passport data of the collections
- further monitoring of pea accessions for Pea Seedborne Mosaic Virus (PSMV)
- emphasis will be given to securing evaluation data from third parties including this information in GENIS.

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Status of legume collections in the Nordic countries

S. Blixt
Nordic Gene Bank, 23053 Alnarp, Sweden

The Nordic Gene Bank (NGB) covers the countries Denmark, Finland, Iceland, Norway and Sweden. Database work at the Nordic Genebank is organized and overseen by Morten Hulden, using dBASE4, dBASE5 or FoxPro for Windows, whichever is convenient. Data registration from hard copy is normally done by the officer in charge of the particular crop.

Pulses and grain legumes are under Working Group VI of NGB; the chairman is currently Simo Hovinen and the secretary is Stig Blixt.

The seed collection, as a whole, includes grain legumes and is managed by Claus Holten.

The functions of Working Group VI (Root crops, oil plants and pulses) are:

- to preserve Nordic commercial varieties, local varieties, landraces and important wild populations
- to actively search for new genetic resources of the crops in question; these resources must be characteristic of Nordic countries
- to create databases to manage the material and document the characters of the preserved material
- to distribute material for scientific and breeding purposes.

Table 1. Databases held by the Nordic Gene Bank.

	No. of descriptors	
Database and *species*	**passport**	**biological**
Soyabeans, *Glycine max*, Soyabean	13	6
SDB, *Lens culinaris*, Lentils	10	0
SH01, *Pisum sativum*, peas	18	32
SH02, *Vicia faba*, faba beans	19	38
JMS3, *Pisum sativum*, peas	18	28
N601, *Pisum sativum*, peas	19	64
SDB, *Vicia sativa*, vetches	10	0

Table 2. Originating country of species and number of accessions held.

Species	**DAK**	**FIN**	**NOR**	**SWE**	**Total**
Glycine max, soyabean	0	0	0	155	155
Lens culinaris, lentils	0	0	0	2	2
Phaseolus vulgaris, beans	3	0	7	11	21
Pisum sativum, peas	14	6	1	21	42
Vicia faba, faba beans	0	30	0	9	39
Vicia sativa, vetches	1	0	0	7	8
Total	18	36	8	205	267

Table 3. Number of accessions with germination data, approximate average germinability, number in safety storage at Svalbard, number in need of multiplication / rejuvenation.

Species	Germ.	Germinability (%)	Safety duplic.	No. needing mult./rejuven.
Glycine max, soyabean	16	95	147	0
Lens culinaris, lentils	2	86	2	0
Phaseolus vulgaris, beans	13	81	7	3
Pisum sativum, peas	36	95	38	2
Vicia faba, faba beans	33	95	28	2
V. sativa, vetches	6	73	5	3
Total	106		227	10

Table 4. Extent of collection, modern varieties in Sweden and Denmark.

Species	Total access.	No. registered varieties	%
Phaseolus vulgaris, bean	8	1	12
Pisum sativum, pea	103	32	31
Vicia faba, faba bean	11	8	73
V. sativa, vetch	8	6	75

The status of grain legume collections in Poland

W.K. Swieciki
Institute of Plant Genetics, 60-479 Poznan, Poland

Table 1. Status of grain legume collections in Poland.

Crop type	Location	Accessions
Pea	Plant Exp. Sta., Wiatrowo	2887
Lupin	Plant Exp. Sta., Wiatrowo	868
Field bean	PBAI*, Radzików	802
Soyabean	PBAI, Radzików	929
Common bean	PBAI, Radzików (seeds)	626
	Agri Univ. Poznan (pods)	300
Vicia (other)	PBAI	279
Lathyrus sativus	PBAI	88
Lens	PBAI	50

* Plant Breeding and Acclimatization Institute.

Table 2. *Pisum.*

No. of accessions	2887 (50% cvs.)
Content	Wild lines/ecotypes, cultivars, mutants, cross-derivatives
Storage	Standard seed store + long-term storage, 968 (33.5%) LTS* (11 glass, 0°C, 10% RH) + 4 years control of germination (10% of accessions)
Regeneration	Standard seed store: 4-5 years; regeneration below 80% germination
Characterization	Passport, plant development phases, 50 monogenic characters, taxonomy, core collection (morphologic and isozymic markers)
Use	300-500 seed samples/year (breeding, research, collections)
Database	Passport (+ seed store) and genotype description (line no., name, origin, donor, author, line classif., taxonomy, mutation group and types)
Research	• Genetic analyses for monohybrid variation and gene mapping • Variation analyses using biochemical and molecular (RAPD) methods • Seed yield trials in progress

* Long-term storage.

Table 3. *Lupinus.*

Number of accessions	845 (*L. albus* – 214; *L. angustifolius* – 214; *L. luteus* - 377; Wild, Old World, New World – 23; Wild, New World – 17
Content	Wild species/lines, populations, mutants, cross-derivatives
Storage	Standard seed store + long-term storage, 414 (49%)
Regeneration	Standard seed store: 4-5 years
Characterization	Passport + 22 descriptors (including protein, alkaloids), taxonomy
Use	140 seed samples/year (breeding, research, collection)
Database	Passport (+seed store) (line no., name, origin, donor, author, line classif., taxonomy)
Research	• Thermoneutrality in cultivated lupins • Variation and evolution of alkaloid complex during domestication • Identification of new lupin species (*L. anatolicus* L. (x) *eurohyridus*) • Variation analyses using biochemical and molecular (RAPD) methods

Table 4. *Vicia faba.*

Number of accessions	802 (minor and major)
Content	Cultivars (95%)
Storage	Long-term storage (100%)
Regeneration	Below 80% germination.
Characterization	Devel. phases, metrical characters (stem length, yield structure, protein, self-completing, etc.)
Use	30-80 seed samples/year
Database	Passport (line no., name, spp., multipl. year, storage year, donor, country of origin , origin - pedigree/ place), valorization
Research	• Germination of stored seeds • Yield estimation in different environmental conditions • Relation between plant architecture and yield structure • Estimation of wild ancestors of cultivated field bean using electrophoretic analyses of seed proteins and isoenzymes

Table 5. *Glycine.*

Number of accessions	929
Content	cvs.
Storage	Standard seed store + long-term storage (100%)
Regeneration	Standard seed store
Characterization	Devel. phases + yield structure + protein and fat + lodging + resistance (*Pseudomonas, Septoria, Peronospora*, viruses)
Use	± 80 / year
Database	Passport. (Name, species, origin, donor and donor country). + valorization
Research	Resistance of gene resources to *Pseudomonas, Septoria* and *Peronospora*

Table 6. *Phaseolus.*

	Seeds	**Pods**
No. of accessions	626	300
Content	cvs + local populations	cvs + local populations + ecotypes
Storage	standard + long-term (100%)	standard + long-term (30%)
Regeneration	standard seed storage 4-5 years	standard seed storage 4-5 years
Characterization	dev. phases + yield structure + resistance to anthracnose / bacteria	dev. phases, yield structure + acter. Resistance to anthracnose / bacteria
Use	30 / year	10 / year
Database	Passport (name, donor, country, origin, plant habitat).+ valorization.	-
Research	Variation in gene resources for resitance to anthracnose, bacteria and tolerance to low temperatures during germination. Character of gene resistance using electrophoretic analyses of seed proteins.	Influence of climatic conditions on fiber content in pods.

Status of grain legume collections in Portugal

Mendes Dordio
Esaçãco Agronómica Nacional, Quinta do Marquês, 2780 Oeras, Portugal

Introduction

Over the last 30 years grain legume production in Portugal has decreased from 570 000 to 52 000 ha (Table 1). The main reasons for this decrease have been low yields from local cultivated varieties and ecotypes (300 to 600 kg / ha for chickpea, 150 to 550 kg / ha for beans and 520 to 880 kg / ha for faba beans) and the poor technology used: a high degree of manual labour, the cost of which has risen recently. Another reason for the reduction in demand for chickpea, beans and faba beans, although there is still high importation of these grains (Table 1), has been a change in the diet of the Portuguese population.

Feed legumes, faba beans, peas, vetches and lupins can not compete with mixed feeds for livestock in price or quality, nor can they compete with oilseed meals. Almost all these feed types, protein-rich meals, are imported and have a negative impact on the national economy. The mixed-feed industry annually uses 147 462 t (23.8%) of oilseed meals and 58 944 t (1.6%) of feed legumes, both of which are imported (IACA 1994).

Up to now, agricultural policy has placed an emphasis on cereal production, mainly through the addition of subsidies, which have caused expansion of cereal farming over unsuitable soils, resulting in very low yields. In 1980 a total area of 2 330 365 ha (39.9% of arable land on Continental Portugal) was devoted to cereal production. In 1993 only 30.6% of total arable land area on the mainland produced cereals (INE 1994).

The adoption of EU (unsubsidized) cereal prices in Portugal will cause a reduction in the areas of low-fertility soils where cereal crops can no longer be grown. As such, grain legumes could be a good replacement for cereals in rotation.

Table 1. Production and consumption of grain legumes in Portugal.

	Area	Total production		Import	Export	Total consumption	
Year	(1000 ha)	1000 t	kg/ha	(1000 t)	(1000 t)	1000 t	Per capita (kg)
Fababean							
1962	71.3	37.6	528	0.3	2.2	25.9	–
1972	45.4	28.8	633	1.0	5.9	22.1	–
1982	30.0	18.2	600	0.6	1.2	13.7	–
1992	9.0	8.0	888	1.3	0.8	8.5	–
1993	–	–	–	1.3	0.4	–	–
Chickpea							
1962	67.5	20.8	309	–	7.4	9.4	1.2
1972	38.1	14.4	379	1.0	1.5	11.4	1.5
1982	30.0	9.7	323	3.6	0.1	11.4	1.1
1992	3.8	2.2	580	8.3	0.6	9.7	1.0
1993	3.7	2.3	625	7.8	0.4	9.7	1.0
Beans							
1962	432.0	58.3	134	0.3	0.9	39.5	5.1
1972	322.0	50.7	157	9.9	4.8	47.8	6.1
1982	245.0	35.3	144	14.4	0.1	43.7	4.4
1992	39.2	21.7	554	31.4	2.0	43.3	4.3
1993	35.1	19.0	543	30.2	1.5	47.7	4.8

Legumes contribute to, maintain and even increase soil fertility and maintain the income of farmers benefiting from the EU subsidy. Even with mixed feeds, the percentage could be increased if these feeds were produced in Portugal. However, foreign varieties of grain legumes which have been tested in Portugal were bred for different edaphoclimatic conditions, and, although they show reasonable yields, are not very well adapted.

During the last few years important breeding work, based on national germplasm and a few varieties of sweet white and yellow lupin, chickpeas and faba beans, has been done and the results have already been registered in the National Varieties Catalogue. It is necessary, however, to continue research into good varieties of the most important species that grow well under different conditions in the country, which, while giving high yields, are resistant to pests and diseases and allow complete mechanization of the crop.

Portugal has an abundance of genetic resources for grain legumes, which are important to collect, characterize and preserve for utilization in breeding projects. The National Institute of Agricultural Research (INRA) is committed to establishing a coordinating mechanism allowing the rationalization of all efforts in taking advantage of our biodiversity.

The main source of information for the preparation of the present work was the National Information System on Plant Genetic Resources (SNIRGV), used with INIA / SNIRGV, building on a set of related databases which hold data on the holdings in the national collection relating to conditions of maintenance and activities for each crop among other related data. Ten grain legume germplasm collections have been identified in Portugal. The collections hold a total of 8583 accessions belonging to seven genera, representing 29.2% of the total national germplasm holdings. Table 2 illustrates the contribution of each genus to the total grain legumes holdings. The number of accessions, by species, held in each collection is shown in Table 3.

Table 2. Grain legume holdings in Portugal.

Genus	Number of accessions	% of total
Cicer	1854	21.6
Lens	569	6.6
Lupinus	1987	23.1
Phaseolus	2186	25.5
Pisum	453	5.3
Vicia	1240	14.4
Vigna	304	3.5
Total	8593	100

Conservation

The collections are generally maintained under good storage conditions (Table 4). Table 5 represents a summarized analysis of the situation.

It is worth noting the number of accessions kept under long-term, a combination of long-term and medium-term, and under medium-term seed-storage conditions. The total represents 66.4% of the total grain legume holdings kept in good or excellent seed storage conditions. Notwithstanding the general good picture, urgent action is required concerning the remaining 33.3% accessions which are kept under short-term seed storage conditions. Safety-duplication of accessions at risk needs to be encouraged or maintenance conditions should be upgraded or, preferably, both.

Table 3. Grain legume germplasm collections in Portugal.

Institution	Species	No. of samples
Portuguese Plant Germplasm Bank (BPGV)	*Cicer arietinum*	234
Director / Curator: Rena M. Farias Quinta dos Peões,	*Lens culinaris*	40
Gualtar, 4700 Braga	*Lens* spp.	3
	Lupinus albus	69
	L. luteus	12
	Phaseolus coccineus	46
	P. lunatus	3
	P. vulgaris	1129
	Pisum sativum	167
	Vicia faba	290
	V. sativa	14
	Vigna unguiculata	184
	Total	**2191**
Plant Biology Laboratory	*Vigna unguiculata*	70
Curator: Carlos Reis, School of Agriculture, Quinta da Sra. de Mércules, 6000 Castelo Branco	**Total**	**70**
Section of Grain Legumes	*Cicer arietinum*	1500
Curator: Graça Pereira, Section of Pastures and Forages,	*Lens culinaris*	500
Department of Forages, Pastures and Grain Legumes,	*Pisum sativum*	180
Estação Nacional de Melhoramento de Plantas,	*Vicia faba*	500
Apartado 6, 7351 Elvas Codex	**Total**	**2680**
Section of Pastures and Forages	*Lens* spp.	11
Curator: João Paulo Carneiro, Department of Forages,	*Lupinus* spp.	27
Pastures and Grain Legumes, Estação Nacional de	*Vicia* spp.	146
Melhoramento de Plantas, Apartado 6, 7351 Elvas Codex	**Total**	**184**
Department of Botany and Biological Engineering	*Lupinus albus*	377
Curator: J.M. Neves Martins, Instituto Superior de	*L. angustifolius*	37
Agronomia, Tapada da Ajuda, 1399 Lisboa Codex	*L. cosentinii*	5
	L. hartwegii	2
	L. hispanicus	15
	L. luteus	78
	L. micranthus	2
	L. mutabilis	149
	L. pilosus	10
	L. polyphilus	3
	Phaseolus spp.	20
	Vicia spp.	30
	Total	**728**
Regional Directorate of Agriculture for Trás-os-Montes	*Lupinus albus*	–
	L. angustifolius	–
Curator: A.M. Monteiro, Rua da República, 137, 5370	*L. luteus*	–
Mirandela	*Vicia monantha*	–
	V. sativa	–
	Total	–
Forages Breeding Section	*Cicer arietinum*	8
Curators: A. Dordio and D. Coelho Rebelo, Department	*L. albus*	20
of Genetics and Breeding, Estação Agronómica	*L. angustifolius*	12
Nacional, 2780 Oeiras	*L. luteus*	26
	Vicia ervilia	4
	V. faba	12
	V. lutea	4

Institution	Species	No. of samples
	V. narbonensis	10
	V. sativa	100
	Total	**196**
Genebank – Genetics Section	*Cicer arietinum*	112
Curator: E. Bettencourt, Department of Genetics and Plant Breeding, Estação Agronómica Nacional, 2780 Oeiras	*Lens culinaris*	15
	Lupinus albus	270
	L. angustifolius	240
	L. cosentinii	11
	L. hispanicus	108
	L. luteus	210
	L. micranthus	6
	Lupinus spp.	10
	Phaseolus coccineus	28
	Phaseolus spp.	190
	Phaseolus vulgaris	748
	Pisum sativum	104
	Pisum spp.	2
	Vicia calcarata	29
	V. ervilia	9
	V. faba	69
	V. sativa	13
	Vicia spp.	10
	Vigna unguiculata	50
	Total	**2234**
Genetics Section	*Lupinus luteus*	288
Curator: Maria da Paz Campos–Andrada, Department of Genetics and Plant Breeding, Estação Agronómica Nacional, 2780 Oeiras	**Total**	**288**
Department of Genetics and Biotechnology	*Phaseolus vulgaris*	22
Curator: Valdemar P. Carnide, Universidade de Trás–os–Montes e Alto Douro (UTAD), Apartado 202, 5001 Vila Real Codex	**Total**	**22**

Characterization, evaluation, regeneration and documentation

The general situation of characterization, evaluation, regeneration and documentation of the Portuguese grain legume germplasm collections is represented in Table 6. At the national level not many data are available on these activities and more attention needs to be given them. According to available data, only 738 accessions have been characterized and 495 evaluated. The human and financial resources allocated to the pursuit of these activities are extremely scarce and the situation has to improve if maximization of the collections' value is to be achieved. This can only be met through the promotion of their use.

Regeneration is only referred to in three cases, comprising only 94 accessions. One interpretation of the situation can be that most of the collections were recently established and regeneration is not considered urgent. Only 6 years ago, total Portuguese grain legume holdings were 3085 accessions for the same seven genera mentioned in Table 2 (Bettencourt *et al.* 1989).

Table 4. Genus and number of accessions kept under different conservation methods and sample type.

Genus	Conservation method	No. of accessions	Sample type	No. of accessions
Cicer	L	112	LR	346
	L;M	234	BL;GS	8
	M	8	–	1500
	S	1500		
Lens	L	15	LR	58
	L;M	43	–	511
	S	511		
Lupinus	L	1821	LR	728
	L;M	81	WS	434
	M	58	LR;WS	440
	S	27	IF;GS	20
			AC	37
			BL	1
			MT	20
			CU	149
			WS;GS	26
			AC;GS	12
			–	120
Phaseolus	L	986	LR	1954
	L;M	1178	CU	42
	M;I	22	–	190
Pisum	L	106	LR	271
	L;M	167	–	182
	S	180		
Vicia	L	160	LR	424
	L;M	304	GS	18
	M	130	WS;GS	100
	S	646	AC	12
			CU	30
			–	656
Vigna	L	50	LR	184
	L;M	184	LR;OL	70
	M	70	–	50
	Total	**8593**	**Total**	**8593**

L– Long–term seed storage (0ºC to –18ºC or below); **M**– Medium–term seed storage (0ºC to 10ºC); **S**– Short–term seed storage (>10ºC); **I**– *in vitro* maintenance.
WS– Wild / Weedy; **LR**– Landraces; **OL**– Old cultivars; **AC**– Advanced cultivars; **CU**–Cultivated; **GS**– Genetic stocks; **MT**– Mutants; **IF**– Introgressed forms; **BL**– Breeding lines.

Table 5. Percent of samples maintained under different conservation methods.

Conservation method	Number of accessions	% of total
Long term	3 250	37.8
Long term; medium term	2 191	25.5
Medium term	266	3.1
Medium term; *in vitro*	22	0.3
Short term	2 864	33.3

Table 6. Germplasm characterization, evaluation, regeneration and documentation.

	Characterization				Evaluation			Regeneration	
Institution*	**Species**	**No. of samples**	**No. of characters**	**Descriptor list**	**No. of samples**	**No. of characters**	**Descriptor list**	**No. of samples**	**Documentation**
Portuguese Plant Germplasm Bank (BPGV)	*Phaseolus vulgaris*	49	*ca.* 40	IPGRI					Computerized
Plant Biology Laboratory	*Vigna unguiculata*	24	15	IPGRI (morphological) PRX / ACP** (isozymes)	–		–	30	Manual
Section of Grain Legumes	*Cicer arietinum*	160	15	IPGRI	160		IPGRI		Manual
	Pisum sativum	80	15	IPGRI	80		IPGRI		Manual
	Vicia faba	100	15	IPGRI	100		IPGRI		Manual
Section of Pastures and Forages									Manual
Department of Botany and Biological Engineering	*Lupinus albus*	163							Manual
Regional Directorate of Agriculture									Computerized
Forages Breeding Section	*Cicer arietinum*	4		Nat Var Cat	4		Nat Var Cat	4	Manual
	Lupinus albus	2		Nat Var Cat	2		Nat Var Cat	2	Manual
	L. luteus	1		Nat Var Cat	1		Nat Var Cat	1	Manual
	Vicia faba	4		Nat Var Cat	4		Nat Var Cat	4	Manual
	Vicia spp.	3		Nat Var Cat	3		Nat Var Cat	3	Manual
Genebank – Genetics Section									Computerized
Genetics Section, Dept. of Genetics and Plant Breeding.	*Lupinus luteus*	140	90	IPGRI	140		IPGRI	50	Computerized
Department of Genetics and Biotechnology	*Phaseolus vulgaris*	8	12	IPGRI					Manual

* See Table 3 for address of institution indicated by letter code.

** PRX – Peroxidase; ACP – Acid phosphatase.

The situation of documentation is acceptable. The status of documentation is referred to for all collections, five are computerized and five are manually documented. Type of accession maintained in the *ex situ* collections should be known, especially if they are wild or cultivated, and, for the latter if they are landraces, old cultivars or advanced cultivars. The sample type is known and documented for 5384 of the 8593 accessions of the national grain legumes germplasm collections. This figure represents 62.7% of the total. It is interesting to note that landraces, across all the seven genera, amount to 46.1% of the Portuguese grain legume holdings. The genus, sample type and number of accessions of each type are presented in more detail in Table 6: Composition of the grain legumes germplasm collections kept under different conservation methods and their sample type.

Safety duplication

The absence of an appropriate coordinating system for plant genetic resources has resulted in the absence of a national policy regulating all aspects of plant genetic resources activities. The National Institute of Agricultural Research (INIA) is committed to institutionalizing an effective mechanism that will allow for the coordination of national activities in an effective manner in this field. To date, duplication of the national collections has not been done systematically, thus material maintained in the individual collections can be considered mainly as unique material.

It is hoped that, in the near future, the Portuguese Plant Germplasm Bank will hold duplications of all accessions maintained in all collections existing in the country.

Germplasm utilization

The collecting, study and maintenance of plant germplasm collections have two main objectives: the preservation of biodiversity occurring in nature, and its sustainable utilization.

There are 12 varieties of the genera *Cicer*, *Lupinus* and *Vicia* , of which 10 are listed in the National Varieties Catalogue; hence, they are commercial. These varieties are the result of the direct use of the germplasm kept in national collections. Further information on this topic is given in Table 7.

Table 7. Germplasm utilization.

Institution*	Species	Cultivar name
Section of Grain Legumes Department of Forages, Pastures and Grain Legumes	*Cicer arietinum*	Elvar, Elmo, Elite
	Vicia faba	Favel
Section of Pastures and Forages Department of Forages, Pastures and Grain Legumes	*V. sativa*	Ervilhaca Gil Vaz, Ervilhaca da Piedade
Department of Botany and Biological Engineering	*Lupinus albus*	Misak
Forages Breeding Section Department of Genetics and Breeding	*Lupinus albus*	Estoril, Murtal
	L. luteus	Cardiga
	V. sativa	Barril
Genetics Section Department of Genetics and Plant Breeding	*Lupinus luteus*	Acos

* See Table 6 for address of institution indicated by letter code.

Conclusions

The relevance of genetic resources to the grain legumes crops in the rain-fed Mediterranean agricultural systems, and the foreseeable increment in their cultivation, is clear from the importance given these crops. In Portugal, special attention has been given to the collecting, study, conservation and utilization in breeding programmes of the rich biodiversity already represented in the national germplasm collections. For instance, since 1989 until the present, to give two examples, the national holdings of *Cicer* increased more than five-fold and that of *Phaseolus* has almost doubled.

A detailed analysis of the passport data of accessions maintained in the different national collections should be done, upon which a national strategy could be based for further collecting in order to capture the full range of genetic diversity still present in nature. The existing germplasm collections are generally maintained in good condition. Nevertheless, a worrying percentage of accessions are still conserved under short-term seed storage conditions and require urgent attention.

A germplasm collection which has not been characterized and documented has a reduced value compared with one that is fully characterized and documented. Generally, although already in progress, characterization, evaluation, regeneration and documentation of existing germplasm collections has to be improved if the goal of sustainable utilization is to be achieved. To meet the goal of sustainable utilization of this rich and valuable biodiversity presently available in the Portuguese collections, it is of paramount importance that the collections be thoroughly studied and documented.

Though regeneration does not seem to be an urgent task, probably owing to the recent establishment of most of the collections, the matter should be investigated to identify situations where regeneration might be required. There may be cases where management of collections may be inadequate, due to human or financial constraints, and where a solution could be sought. Nonetheless, the recent establishment of several grain legume germplasm collections indicates the interest and importance given to this crop. It is a fact that only 6 years ago the national grain legume germplasm holdings were a mere 35% of the actual holdings.

Table 8. Institutions, teams and research projects conducted in Portugal, relevant to grain legumes genetic resources.

Institution*	Project Leader	Research
Portuguese Plant Germplasm Bank (BPGV)	Rena M. Farias	• Evaluation of several agronomic ecotypes of *Phaseolus vulgaris* from the northern area of Portugal • Characterization and preliminary evaluation of *Phaseolus coccineus* and *Phaseolus vulgaris* maintained in BPGV • Occurrence and characterization of Bean Common Mosaic Virus in Portugal
Plant Biology Laboratory **School of Agriculture**	Carlos Reis	• Morphological and isoenzymatic characterization and evaluation of *Vigna*
Estação Nacional de Melhoramento de Plantas Department of Forages and Grain Legumes Apartado 6, 7351 Elvas Codex Tel: (351–68) 622 844 Fax: (351–68) 629295	M.M. Tavares de Sousa	• Evaluation of the performance of new accessions of peas • Mutagen induction for disease resistance and modification of the plant architecture in chickpea and pea species • Evaluation of the performance of genotypes of lentils and selection of new varieties as food legumes • Selection of new varieties of chickpea, faba bean and pea by manipulation of national and introduced germplasm
	João Paulo Carneiro	• Selection of new varieties of vetch and vetchlings for hay and grain
Estação Florestal Nacional Rua do Borja, 2 Tapada das Necessidades 1350 LISBON Codex Tel: (351–1)601661 Fax: (351–1)3973163	Eugénio Ferreira	• Effects of seed inoculation of chickpea lines using selected *Bradyrhizobium* strains, supplied by ICARDA
Instituto Superior de Agronomia Dept. of Botany and Biological Engineering Tapada da Ajuda 1399 LISBON Codex Tel: (351–1)3637824 Fax: (351–1)3635031	J.M. Neves Martins	• Adaptation of *Lupinus mutabilis* to European soil and climatic conditions • Studies of physiologic parameters of lupin for drought stress related with breeding strategies of selection • Intervarietal studies of the adaptation of lupin to the marginal soils of Alentejo, regarding the selection of new varieties. Study of chemical and technological parameters

Institution*	Project Leader	Research
Regional Directorate of Agriculture for Trás–os–Montes	António Manuel Monteiro	• Adaptation studies of different accessions of *Lupinus angustifolius* and *L. luteus* • Influence of some agronomic factors on the performance of several varieties of *Lupinus angustifolius* and *L. luteus*
Estação Agronómica Nacional **Dept. of Genetics and Plant Breeding** Forages Section 2780 OEIRAS Tel: (351–1)4416855 Fax: (351–1)4420867	A.M. Dordio	• Evaluation of several accessions of national and introduced germplasm of *Cicer* in winter growing conditions • Study of some agronomic factors of different bred lines of *Cicer* adapted for autumn sowing
	D. Coelho Rebelo	• Improvement of different species of *Lupinus* with low alkaloid content, adapted to several regions
Estação Agronómica Nacional **Dept. of Genetics and Plant Breeding** Genetics Section 2780 OEIRAS Tel: (351–1)4416855 Fax: (351–1)4420867	Maria da Paz Andrada	• Characterization and evaluation of *Lupinus luteus* accessions for agronomic and technological aspects

* See Table 6 for address of institution indicated by letter code.

Special attention should be devoted to the safe duplication of the collections. As a result of the absence of an effective coordinating mechanism for the plant genetic resources activities, the duplication of the national holdings was never systematized. The Portuguese Plant Germplasm Bank should serve as back-up to the national holdings.

In spite of some deficiencies in conservation, thorough study and documentation of the national grain legumes holdings have been exhaustively utilized. Ten varieties, directly derived from the germplasm utilization, are already in the National Varieties Catalogue and two more are awaiting inclusion.

As part of its mandate, the Portuguese Plant Germplasm Bank has a policy of continuing collecting. This happens whenever a possibility arises for collecting or there is notice of an interesting population. Besides the BPGV, the Department of Genetics and Biotechnology of UTAD plans to collect *Phaseolus* germplasm during the following years and the Department of Forages, Pastures and Grain Legumes of ENMP, depending on the approval of already submitted research projects, plans to collect *Cicer*, *Pisum* and *Vicia faba*. As far as we know, no other collecting missions for grain legumes are planned by other institutions.

A short summary of the research conducted in Portugal, directly relevant to grain legumes genetic resources, is given in Table 8.

References

Bettencourt, E., J. Konopka and A.B. Damania. 1989. Directory of Crop Germplasm Collections. 1.I. Food Legumes, *Arachis, Cajanus, Cicer, Lens, Lupinus, Phaseolus, Pisum, Psophocarpus, Vicia* and *Vigna*. International Board for Plant Genetic Resources, Rome. 190 p. ISBN 92-9043-133-4.

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Genetic resources of grain legume crops in N.I. Vavilov All-Russian Research Institute of Plant Industry

B.S. Kurlovich
N.I. Vavilov Institute of Plant Industry, 190000, St. Petersburg, Russia

In 1994 the N.I. Vavilov Institute of Plant Industry (VIR) celebrated its 100th anniversary. The history of the Institute and its activities are closely associated with the name of Nikolai Vavilov, for whom the problem of plant genetic resources was always of the highest importance.

In order to prevent the erosion of natural genetic diversity, and preserve it for future generations, major efforts are being made to collect, evaluate, characterize and store cultivated plants and their wild relatives in the Institute's genebank.

Plant collecting expeditions in Iran and the Pamirs mountains, carried out by N. Vavilov in 1916, served as the basis of the grain legume crops collection: pea, chickpea, lentil and faba beans.

The Department of legume crops at VIR was organized in 1924. Currently the collection of 43 222 accessions (Table 1), belonging to 15 genera and 16 species of the family of legumes (Table 2), includes pea, soyabean, vetch, lupin, faba bean, lentil, everlasting pea, chickpea, cowpea, mung bean, kidney bean and other legumes that are maintained and studied.

The Genebank contains genetic resources from all five continents, but most of the accessions were collected on the territory of the former USSR and in Europe (Table 3).

There is frequent exchange between genetic resources collections at other genebanks. An average of 40% material is duplicated at other genebanks. The remainder, 60%, is kept at the Institute, but is ready to be shared with colleagues.

Some accessions have a long vegetative period; there is no resistance to cold and there is great difficulty in regenerating them in Russia.

Accessions kept in VIR collections depend upon the type of crop (Table 4). Peas are basically represented as gene resources, plant breeding resources and breeding varieties. The lupin collection contains both wild and local forms. Gene resources for haricot bean are represented by 80% local and unknown forms.

The staff of the department selects new, valuable sources and donors for plant breeding, studies inheritance of plant characters, works out advanced methods for breeding practice and performs theoretical research on taxonomy and evolution. The staff also maintains accessions under viable conditions and reproduces them for long-term storage. The Department supplies breeders with initial plant material and prepares catalogues and recommendations on methodology. Summaries of results of scientific work appear in volumes of: "Theoretical basis of plant breeding", a series dedicated to the different legumes.

Fundamental methodology laboratories of the Institute assist legume crop experts and examine chemical composition, drought and cold tolerance, resistance to disease, pests, unfavourable environment and soil acidity.

Collections are studied and regenerated at experiment stations situated within the country's different ecogeographical zones. There are eight experiment stations where staff study and regenerate grain legume crops collections using the same unified method of investigation.

Accessions for regeneration are sown on an average of every 4-5 years. The main purpose is to have enough seeds to send to the different institutes and farms around the world, to maintain accessions of the world collection under viable conditions and to provide long-term storage. Presently, about 8000 to 10 000 accessions are sent to different organizations around the world every year.

There are differences between the crops. Soyabean accessions are sown for regeneration every 2-3 years; peas every 5 years, lentils and beans every 7-8 years. These high regeneration frequencies are due to lack of modern equipment for long-term storage of seeds at low temperature. The basic working collections of legume crops are stored in St Petersburg in laminated plastic bags at room temperature.

Table 1. Composition of the VIR collection of grain legumes, 1 January 1995.

Genera	Total accessions	Number of accessions	
		basic catalogue	Introduction (temporary) catalogue
Pisum L.	7983	6805	1178
Glycine Willd.	7536	6182	1354
Vicia L.	3138	3108	30
Lupinus L.	2970	2427	543
Phaseolus L.	10500	7319	3181
Cicer L.	2631	2263	368
Faba Mill	1707	1261	446
Lathyrus L	1195	857	338
Lens Mill.	3288	2900	388
Vigna Savi	1951	1352	599
Dolichos L. etc.	323	155	168
Total	43222	34629	8593

Table 2. Specific composition of the VIR collection of leguminous crops.

Genera	Number of species	
	in the VIR collection	total described (in the world)
Lupinus L.	60	250
Vicia L.	54	150
Lathyrus L.	19	150
Glycine Willd.	5	8
Phaseolus L.	5	70
Faba Mill.	1	1
Cicer L.	2	23
Pisum L.	2	2
Vavilovia (Stev.) Fed.	1	1
Lens Mill.	4	5
Vigna Savi	3	50
Dolichos L.	2	30
Cajanus DC.	1	1
Cyamopsis DC.	1	1
Ervilia Link.	1	1
Total: 15	161	743

Table 3. Composition of the VIR collection of leguminous crops in basic catalogue.

Genera	Total no. accessions	Accessions from:					
		Former USSR	Europe	Asia	Africa	America	Australia
Pisum L.	6805	2908	2461	646	264	479	47
Phaseolus L.	7319	2239	2600	1178	202	1000	100
Lupinus L.	2427	690	940	20	60	677	40
Cicer L.	2263	823	277	767	264	129	3

Lens Mill.	2900	1114	588	860	200	110	28

During 1995 IPGRI helped the Genebank acquire modern refrigerators and equipment for drying and packing of seeds. Thanks to IPGRI, long-term storage can now be organized for seed accessions at low temperatures (–15 to –20ºC).

Apart from the above, about 25 000 accessions (60%) have been deposited in the old National Seed Storage Facility of the Kuban Experiment Station, where they are preserved at +4°C.

Table 4. Type of accessions in the VIR collection of legume crops.

	***Pisum* L.**	***Phaseolus* L.**	***Lupinus* L.**	***Cicer* L.**	***Lens* Mill.**
No. of accessions	6805	7319	2427	2263	2900
Wild forms					
No.	15	-	490	2	-
%	0.2	0	21	0.1	0
Local and unknown					
No.	–	5913	350	1669	2088
%	0	80	16	73.9	72
Breeding varieties					
No.	1805	181	120	122	812
%	26.8	3	4	5	28
Plant breeding resources					
No.	2000	1225	1347	342	–
%	29	17	56	15	0
Gene resources					
No.	3000	–	90	128	–
%	44	0	3	6	0

Five experiment stations have been lost as a result of the disintegration of the former USSR and there has been difficulty regenerating accessions of soyabeans, haricot, mung bean, etc., as all have a long vegetative period. We would like to give these accessions to other genebanks for preservation. We are in favour of such sharing of tasks between genebanks in order to raise efficiency and reduce costs.

Passport information on all accessions has been listed in the Basic Catalogue and Introduction, or Temporary, Catalogue. Ten years ago the descriptors list was worked out for every genus of the legume crops. Presently we use international descriptors, which are better.

Two years ago, the Department of Leguminous Crops received a computer IBM-486/SX, which is used for documentation of the legume collections. Currently, computerization of passport data, according to information presented in Table 5, is in process. This information includes all accessions belonging to all generas and species and will be computerized by the end of this year. The Institute has an Information Department (Head of Dept. Dr Razorionov) which organizes methodological assistance.

Development of a software system is planned, within the next 2 years, in support of the establishment, maintenance and analysis of a computerized databases of plant germplasm collections. The goal is to make data on the collections immediately available to breeding centres, and to facilite data exchange with other genebanks.

Pisum

Among grain legumes, pea is the main crop cultivated in Russia. A pea collection of over 7000 accessions from all the countries where this crop is cultivated is stored in the Department.

The *Pisum* collection is studied in VIR's experimental network in the different geographical zones of Russia: at Pushkin Laboratories and Pavlovsk Experiment Station, near St Petersburg, Moscow Division, Yekaterinino Experiment Station, Tambov Province, and Krymsk Experiment Breeding Station, Krasnodar Territory.

During the last few years, experiments were conducted to determine resistance in pea to *Aphanomyces* root rot, *Bruchus pisorum* L. and to damage by lima bean pod borer. Resistance in pea to spring drought was also examined.

The phenotypic variation, in main commercially valuable characters in peas, has also been investigated. Experiments have been carried out to determine biochemical seed properties in vegetable pea and amino acid protein composition in pea varieties of different origins. Great emphasis is placed on searching for initial material for breeding peas with indehiscent pods with tendrils and for breeding peas for fodder.

A genetic collection of *Pisum* is being established, within the framework of the Institute's programme, as one of the projects of the Russian Academy of Agricultural Sciences. Accessions, where the genetic structure is known, are included in the collection. Most accessions were previously received from major genebanks: The Nordic Gene Bank, John Innes Centre, Wiatrowo and from some institutions of the former USSR.

The creation of a database related to this collection is now in progress on an IBM computer using dBASE4 format with 10 fields.

Currently, interest is focused on the research programme on genetic studies of symbiotic nitrogen fixation. Particular attention is devoted to the breeding of multi-marker lines with the sym-locus from a non-nodulating gene.

Table 5. Description of the grain legume passports databases (in VIR).

No.	Full name	Field type its size	Abbreviations
1.	Introduction number	C 8	INTNUM
2.	Catalogue number		CATNUM
3	Introduction prefix	C 2	INPREF
Codes: 0 - domestic introduction, 3 - foreign introduction			
4.	Crop name		
5.	Botanical name	C 40	BOTNAM
6.	Accession name		COMNAM
7.	Country the accession came from (for domestic introduction the region is indicated)		NATREG
8.	Research organization through which the accession was sent		ORGANI
9.	Name of the person in charge of sending the plant material		PERSON
10.	Country of origin		ORIGIN
11.	Date of the registration of the plant material		REGDAT
12.	Methods of involvement of plant material		method
Codes: 1 - requests, 2 - expeditions, 3 - cooperations (exchange), 4 -embassy advisers, 5 - others			
13.	Type of accession		status
Codes: 1 - wild, 2 - local, 3 - breeding material, 4 - plant breeding resources, 5 - gene resource			
14.	Habitat		LIFORM
Codes: 1 - spring, 2 - winter, 3 - intermediate, 4 - perennial, 5 - annual			

Lupinus

The germplasm collection of lupin includes about 2500 accessions belonging to 60 species of *Lupinus* L. The collection is constantly being enriched with new accessions, which are characterized and utilized in breeding programmes.

The study of the intraspecific diversity of blue, yellow and white lupins and the generalization of data obtained by other researchers resulted in the new taxonomic structure of the species mentioned.

Particular emphasis has been placed on the development of ecogeographical classification of *Lupinus albus*, *L. luteus* and *L. angustifolius*. A method for creating resistant lupin forms is proposed on the basis of the ecogeographical approach.

For the first time in the world, a method was developed for the breeding of fodder forms in perennial lupin having low alkaloid levels in grain. Alkaloid-free perennial lupin forms can be grown as fodder and seed in Northern countries with limited agricultural resources.

The following research priorities have been addressed:

- selection of cross-pollinated lupin species with stable low alkaloids (not higher than 0.09%)
- study of determined branching character in lupin
- breeding for high horizontal resistance to *Fusarium* wilt, using a wide genetic basis
- identification of promising materials with high efficiency of nitrogen fixation.

The above illustrates that the major portion of the species stored in the collection are potentially promising for breeding purposes in different countries.

The genebank of VIR serves as a source of initial materials for over 75% of new grain legume cultivars created in Russia and other countries of the former USSR.

In conclusion, we would like to express our interest in joint research programmes within the European Cooperative Programme for Crop Genetic Resources Networks (ECP / GR).

Summary

N.I. Vavilov Institute of Plant Industry (VIR) is responsible for the collection of 43 222 accessions belonging to 15 genera of the legumes family. More then 160 species, including pea, soyabean, vetch, lupin, faba bean, lentil, everlasting pea, chickpea, cowpea, mung bean, kidney bean and other legumes are maintained and studied. The staff in the Department of Legume Crops, VIR, selects new valuable sources and donors for plant breeding, studies inheritance of plant characters, works out advanced methods for breeding practice and performs theoretic research on taxonomy and evolution. The staff also maintain the accessions in viable conditions and reproduces them for long-term storage. The Institute supplies breeders with initial plant materials and prepares catalogues and methodological recommendations.

Status of grain legume collections in the Slovak Republic

F. Debre
Research Institute of Plant Production, 921 01 Pieštany, Slovak Republic

The Research Institute of Plant Production (RIPP) at Piestany has been systematically working with Plant Genetic Resources (PGR) and organizing them since 1951. Until recently, work related to plant genetic resources was part of the Czecho-Slovakian programme and is of a standard European level. Preparation and implementation of the PGR programme is financed and supported by the Ministry of Agriculture. The mandate for coordination was given to the leading institute in plant production in Slovakia, Research Institute of Plant Production at Piestany.

Simultaneously, with the formation of the Republic of Slovakia as an independent state in 1993, conditions were created for the realization of a National programme for the Slovak Republic oriented to the study, conservation and use of PGR.

The programme is spread over 18 specialized research and breeding institutes and stations, situated in regions suitable for the respective crop.

Despite the fact that Slovakia is not very large, its geography includes intensively farmed fertile lowlands and high mountain areas of low productivity which allowed the development of highly diverse vegetation, especially for Poaceae and Fabaceae families and others.

These differences in economic systems have allowed for the collection of many landraces, especially species of the genera *Phaseolus*, *Lens* and *Prunus*. At present we have more than 16 000 samples in our collections including duplicates. The largest collections are for wheat, triticale, maize, pea, alfalfa, red clover, grape vine, tobacco and others.

The National Genebank in RIPP Piestany will begin operations in 1996.

Piestany

Research Institute of Plant Production, Bratislavska 122, 921 01 Piestany
Vyskumny Ustav Rastlinnej Vyroby
Tel: 42-838 22311-2
Fax: 42-838 26306

Staff/Position
Dr Timotej Mistina, Director
Dr Alzbeta Zofajova, PGR Coordinator
Dr F. Debre, Curator, Legumes
Dr Pavol Hauptvogel, Head, Genebank Dept.

Maintenance of collection
In glass jars or bottles. Long-term seed-storage at –18°C, 60 - 70% RH, 6 -8% moisture content. Medium-term seed storage at 2°C, 60 - 70% RH, 6 - 8% moisture content.

Duplication sites
Phaseolus vulgaris 16% at RICP Praha. Czech Republic.

Availability of germplasm
Available in limited quantities with the exception of elite lines and on exchange basis.

Quarantine regulations
Phytosanitary certificate requested for import / export of seed.

Details of holdings at Piestany

Species	Type of accession	Location and number of accessions
Glycine max	landrace	China
Total 450 (Debre 1995)		
	advanced cultivars	Bulgaria (1), Canada (22), Switzerland (1), China (2), Czech Republic (4), Germany (11), Romania (3), France (14), Croatia (4), Hungary (8), Italy (10), Japan (7), Poland (4),former USSR (27), Sweden (1), USA (63), former Yugoslavia (1), South Africa (6)
	genetic stock	USA
	breeding or inbred lines	Austria (5), Canada (4), Czech Republic (3), Germany (2), former USSR (3), Slovak Republic (48), USA (8), former Yugoslavia (1)
	mutants	Slovak Republic
	old cultivars	Canada (3), China (1), Czech Republic (8), Germany (2), former USSR (1), Slovak Republic (1)
Lens culinaris	6 landraces	Czech Republic (3), Syria (1), Italy (2)
Total 308 (Benkova 1995)		
	73 advanced cultivars	Bulgaria (20), Greece (5), former USSR (9), USA (4), Czech Republic (6), Jordan (1), New Zealand (2), Argentina (1), Hungary (3), Germany (4), France (11), Peru (1), Canada (1), Turkey (3),Lebanon (1), Netherlands (1)
	225 breeding or inbred lines	Syria (146), Czech Republic (3), USA (3), Germany (8), France (5), Jordan (9), Lebanon (1), Greece (1), Hungary (1), Mexico (3), Bulgaria (19), former Yugoslavia (1), Chile (2), former USSR (10), Turkey (1), Iran (1), India (9), Pakistan (2)
Lens ervoides	2 wild / weedy species	Syria
Lens orientalis	2 wild / weedy species	Syria
Phaseolus vulgaris	45 landraces	Czech Republic (9), Slovak Republic (27), Italy (1), Russian Federation (6), USA (1), Poland (1)
Total 413 (Mihalikova and Hornakova 1995)		
	322 advanced cultivars	Czech Republic (15), France (39), Germany (72), Netherlands (41), Greece (6), Russian Federation (12), Bulgaria (12), Poland (6), Romania (9), USA (36), former Yugoslavia (3), Austria (3), Slovak Republic (10), Sweden (2), Hungary (2), Canada (14), Brazil (2), Chile (1), Colombia (12), Australia (7)
	26 genetic stock	Russian Federation (5), USA (18), Australia (3)
	10 breeding or inbred lines	France (3), Czech Republic (5), Bulgaria (1)
	10 old cultivars	Slovak Republic (4), Czech Republic (6)
Cicer arietinnum	21 landraces	India
Total: 143 (Mihalikova and Labaj 1995)	122 breeding or inbred lines	Syria (115), former USSR (1), India (2), Spain (4)

Species	Type of accession	Location and number of accessions
Lupinus albus Total: 20 (Mihalikova and Labaj 1995)	9 advanced cultivars	former USSR (3), Hungaria (2), Spain (1), United Kingdom (2), Italy (1)
	1 mutant	former USSR
Lupinus luteus	5	former USSR
Lupinus angustifolius	5	former USSR
Lathyrus spp. Total 42 (Mihalikova and Labaj 1995	27 landraces	Slovakia
	15 breeding lines	Syria (1) and Ethiopia (14)

Details of holdings at Horna Streda

Species	Type of accession	Location and number of accession
Faba vulgaris Total 70 (Ondro 1995)	8 landraces	Afghanistan (1), Ethiopia (2), Russian Federation (5)
	45 advanced cultivars	Denmark (1), Netherlands (2), Israel (1), Canada (2), Hungary (6), Mexico (11), Germany (5), Colombia (1), Czech Republic (5), Poland (1), Austria (2), Russian Federation (5), Slovak Republic (4), Somalia (1), Sweden (2), Italy (1), UK (5)
	4 genetic stock	Afghanistan (2), Chile (1), Lebanon (1)
	3 breeding or inbred lines	Lebanon (1), Syria (2)
	Forty-nine *Faba vulgaris* spp. major Harz. 21.	
Pisum sativum Total 305 (Slamena 1995)	218 advanced cultivars	Czech Republic (16), Slovak Republic (7), Germany (32), UK (14), Netherlands (30), France (10), Denmark (7), Poland (3), Russian Federation (10), Sweden (7), USA (5), Hungary (9), Bulgaria (1), Romania (1), Australia (1), Finland (1), Portugal (1), Others (63)
	8 genetic stock	Germany (3), UK (2), USA (2), Czech Republic (1)
	16 cultivated	Germany (5), Sudan (1), India (1), Austria (1), Sweden (1), Afghanistan (1), China (1)
	57 breeding or inbred lines	Slovak Republic (18), Czech Republic (16), Russian Federation (4), Netherlands (4), Germany (4), Poland (2), France (1), UK (1), Hungary (1)
	6 old cultivars	Czech Republic (1), Denmark (1), Poland (1), Germany (2), UK (1)

Species	Type of accession	Location and number of accession
Pisum sativum L. subsp. *sativum* conv. *speciosum* (Dierb.) Alef	252 53	
Vicia sativa Total 101	5 landraces	Czech Republic (5)
	72 advanced cultivars	Slovak Republic (3), Czech Republic (1), Poland (4), Netherlands (4), Hungary (4), UK (3), Germany (6), Russian Federation (11), Lithuania (2), France (11), Algeria (1), Italy (6), USA (1), Bulgaria (5), Greece (6), Morocco (4)
	3 genetic stock	Slovak Republic (3)
	4 breeding or inbred lines	Slovak Republic (1), Czech Republic (3)
	2 mutants	Poland (2)
	9 old cultivars	Slovak Republic (4), Czech Republic (5)
Vicia sativa 95, *Vicia villosa* 2, *Vicia pannonica* 4		

[Slovak Republic – pp. 83-85]

Evaluation status
Characterization and evaluation according to the national descriptor lists.

Documentation status
Passport and some descriptive data in EVIGEZ under FOX PRO.

Horna Streda
Plant Breeding Station
916 24 Horna Streda, Slachtitelska Stanica Horna Streda, Statny Podnik
Tel: 42-834 97221
Fax: 42-834 97167

Staff/Position
Dr Marta Lazarcikova, Curator, *Vicia sativa*
Dr Peter Markech, Director
Dr Slavko Ondro, Curator, *Faba vulgaris*
Dr Zdenek Slamena, Curator, *Pisum sativum*

Maintenance of collection
Short-term storage at ambient temperatures.

Duplication sites
Not duplicated.

Availability of germplasm
Available in limited quantity with the exception of elite lines.

Quarantine regulations
Phytosanitary certificate requested for import/export of seed.

Evaluation status
Ongoing for breeding.

Documentation status
Manual passport and some descriptive data.

Nove Zamky
Research and Breeding Institute for Vegetables and Special Plants
Andovska 6
940 01 Nove Zamky
Tel: 42-817 21265
Fax: 42-817 21265

Staff/Position
Dr Magda Valsikova, Director, Curator

Details of holdings
Phaseolus vulgaris, 3 advanced cultivars from Slovak Republic (1), Germany (1), China (1).

Maintenance of collection
In glass jars or bottles. Short-term seed storage at 2°C, 60-70% RH, 5-8% moisture content.

Duplication sites

Not duplicated.

Availability of germplasm
Available in limited quantity with exception of elite lines.

Quarantine regulations
Phytosanitary certificate requested for import/export of seed.

Evaluation status
Yield, quality, contents of chemical substances, for Slovak conditions.

Documentation status
Manual descriptive data only.

Nitra

Botanical Garden of the University of Agriculture
Trieda A. Hlinku 2
949 67 Nitra
Tel: 42-87 601
Fax: 42-87 511560

Staff/Position
Dr Vladimir Rehorek, Director, Curator

Details of holdings
Leguminosae, 15 landraces from Slovak Republic (15).

Phaseolus vulgaris, 45 landraces from Slovak Republic (45).

Maintenanceof collection
Short-term seed storage at ambient temperatures and field collection.

Duplication sites
Not duplicated.

Availability of germplasm
Available in limited quantity.

Quarantine regulations
Phytosanitary certificate requested for import/of seed.

Evaluation status
Ongoing work.

Documentation status
Manual passport data only.

Priorities in Slovak plant genetic resources programmes for next year

Priorities of PGR programme are as follows:

1. enhancement of PGR activities in Slovakia with the aim of higher working standards.
2. full and effective participation in ECP / GR.
3. creation of neccessery technical facilities, especially Slovak genebank.

1. Collection
2. Regeneration
3. Evaluation
4. Enhancement

Grain legumes databases

The Slovak Information System for plant genetic resources, ISGZS (Informacny System Genetickych Zdrojov Slovenska) has been developed on the basis of the Czech information system EVIGEZ.

A new user-programme for all breeding institutes is presently being prepared, as not all documentation of passport data are computerized. The programme will be specifically adapted for each breeding institute. As the programme is user-friendly, a manual is unnecessary.

Our breeders or researchers will prepare their own data and register each new sample as a working collection. The documentation system will be completely computerized. The structure of all files will be identical; it is supposed that there will be no problem moving files to the central genebank in Piestany.

The programme was developed on FoxPro, using a computer mouse. Windows is used with mutual interlinkage of files. The programme consists of four basic and other complementary databases. All of them are mutually linked on the basis of national accession numbers (ECN), used for unique identification of accessions.

Research activities relevant to grain legume genetic resources

Resources on conservation (selected publications)

Brindza, J., R. Bencik and Z. Slamena. 1991. Variability in the formation of aboveground organs and root system in pea. (Plant Genetic Resources), [Annual report], p. 21-26.

Ceresnakova, Z., S. Nitranyova, M. Szalayova and Z. Slamena. 1992. Nutritive value of choice varieties of pea (*Pisum sativum* spp. *sativum*). Agriculture 1-2:101-109.

Chrenkova, M., Z. Ceresnakova, Z. Slamena and A. Sommer. 1994. Factors influencing biological value and digestibility of crude protein in new bred varieties of Pea (*Pisum sativum* L.). J. Farm Animal Science:143-251.

Debre, F., M. Benkova, J. Bolebruch, O. Hornakova, J. Mihalikova, S. Ondro and Z. Slamena. 1993. Plant Genetic Resources and creation starting breeding material of legumes. [Synteticka zaverecna sprava za ciastkovu ulohu]. VURV Piestany, pp.54.

Debre, F. 1993. Collection, study and protection of PGR - soybean. [Zaverecna sprava]. Vyskumny ustav rastlinnej vyroby, Piestany, pp. 39.

Farago, J. 1995. Somatic embryogenesis from seedling-derived explants of lentil (Lens culinaris MEDIK.). Inst. Plant Genet., Nitra Slovakia, pp. 1.

Farago, J.B. Induced high-frequency shoot regeration form in vitro germinated lentil and pea seedlings. Research Institute for Plant Production, Piestany, pp.1.

Farago, J. and M. Benkova. 1993. Embryocultures and their potential application in improving lentil varieties. [Konferencia "Biotechnologie a biotechniky v podohospodarstve a ochrane zivotneho prostredia"], Kosice, pp. 5.

Hornakova, O., L. Pastucha, M. Benkova, J. Sehnalova and I. Bares. 1991. Descriptor list genus *Lens* Mill., Genove zdroje, VURV Praha, 53, pp.29.

Hornakova, O., P. Hofirek, D. Hajek, J. Bolebruch, L. Gablechova, M. Teclova, E. Pippalova, L. Pasucha, M.Mrskos, I. Bares and J. Sehnalova. 1991. Descriptor list genus *Phaseolus* L., Genove zdroje, VURV Praha, 54, pp. 34.

Kraic, J., E. Gregova, M. Benkova and I. Zak. 1995. Evaluation of protein and DNA polymorphism in lentil (*Lens culinaris* L.) for genotypes and cultivars distinguishing, Rostlinna vyroba 41:181-184.

Kraic, J., E. Gregova and I. Zak. 1995. Identification and clasification of plant genetic resources by genetic merkers, VURV Piestany, (in press) pp. 2.

Pastucha, L., T. Sinsky, P. Hofirek, I. Bares and J. Sehnalova. 1987. Descriptor list genus *Glycine* Willd., Genove zdroje, VURV Praha, 36, pp. 43.

Pavelkova,A., J. Moravec, D. Hajek, I. Bares and J. Sehnalova. 1986. Descriptor list genus *Pisum* L., Genove zdroje, VURV Praha, 32, pp. 45

Plesnik, S., F. Debre and I. Matejovic. 1993. Amino acid composition analysis in selected mutants of soybean. Soybean Genetics Newsletter, USDA ARS, Iowa State University, Iowa (May) 20:87-91.

Slamena, Z. 1992. Evaluation of selected peas cultivar assortment according to content and variability of crude protein in seeds. (Plant Genetic Resources),[Annual report], p. 40 - 44.

Table 1. Production and growing area.

	Area harvested (x 1000 ha)			**Yield (t/ha)**		
	1992	**1993**	**1994**	**1992**	**1993**	**1994**
Pisum sativum	51	57	46	2.68	1.98	2.98
Lens culinaris	3	1.3	1.3	0.99	0.91	0.90
Phaseolus vulgaris	3.6	1.9	1.8	1.17	1.21	1.74
Fodder legumes	7.5	5.0	6.0	1.75	1.88	2.18
Soja max.	4.4	1.0	0.9	0.93	1.22	1.42

Table 2. Crop and area cultivated.

Crop	**Area (x 1000 ha), 16 June 1995**
Pisum sativum	45
Pisum sativum (fodder)	0.9
Lens culinaris	1.6
Phaseolus vulgaris	1.5
Faba vulgaris	0.7
Vicia sativa	0.3
Glycine max	0.9

Genetic resources collections of grain legumes in Spain

A.R. Monreal
Servicio de Investigación Agraria, 47080 Valladolid, Spain

There is only one central germplasm bank in Spain dedicated to keeping phytogenetic resources in long-term storage, although there are some exceptions at small specific banks.

In the case of grain legumes, there is only one germplasm bank capable of keeping collections in long-term storage, CRF-INIA. Several others, directly connected with breeding programmes, are only for short-term conservation.

Databases

CRF-INIA (Centro de Conservación de Recursos Fitogenéticos del Instituto Nacional de Investigaciones Agrarias) (Center for Genetic Resources Conservation of the INIA). Under the law of 23 April 1993 (Art. 8.2), the CRF-INIA was made the centre for documentation of Spain's network of collections in the Programme for Conservation and Utilization of Genetic Resources at the Ministry for Agriculture Fisheries and Food. Under the law of 27 December 1993 (Art. 8.d) a 4-year plan was passed in which any organization financed by the Ministry of Agriculture is obliged to send all documentation to the Central Database of the CRF-INIA.

Documentation of CRF-INIA collections

CRF-INIA, Finca "la Canaleja", Apartado 1045, 28800 Madrid, España
Tel: (34) 18819286/(34) 18819286; Fax: (34) 18819287
Manager: Federico Varela Nieto
Software: dBASE
All the samples have passport data (Format: European Cooperative programme (IPGRI 1984)) and management data (Format: CRF-INIA system). Characterization and evaluation data exist for some samples (Format: IPGRI descriptors in some species and descriptors elaborated by the breeders when IPGRI descriptors are not available).

Species	No. of accessions	Species	No. of accessions
Pisum sativum	191	*Lupinus luteus*	255
Phaseolus vulgaris	1664	*Lupinus micranthus*	12
Phaseolus coccineus	53	*Lupinus mutabilis*	20
Phaseolus spp.	13	*Cicer arietinum*	450
Lupinus albus	569	*Lens culinaris*	457
Lupinus cosentinii	14	*Lens nigricans*	16
Lupinus hispanicus	196	*Vicia faba*	967

Table 1. Characterization of the situation of CRF-INIA collections.

Crop	No. samples	No. characters
Chickpea	321	15
Lentil	155	15
Beans	619	24
Lupins	422	20
Faba bean	427	11
Peas	123	28

Table 2. CRF-INIA passport data in other locations.

Species	No. samples
Pisum	800
Lupinus	441
Lens	91
Phaseolus	261
Cicer	699
Faba	286

Servicio de Investigacion Agraria de Castilla y Leon (Valladolid and Salamanca)
Servicio de Investigación Agraria, Apartado 172, 47080 Valladolid, Spain.
Tel: (34) 83414431; Fax: (34) 83414780
Documentation of collections: Alvaro Ramos Monreal
Software: dBASE
All the samples have passport data (Format: Descriptors list elaborated by the breeder (*Pisum*) and IBPGR). Management data for all the samples (Format: CRF-INIA System). Characterization and evaluation data for 800 samples. All accessions have been characterized for passport data.

Species	Accessions	Location
Pisum sativum	1300	Valladolid
Lathyrus cicera	181	Valladolid
Vicia ervilia	145	Valladolid
Phaseolus vulgaris	700	Valladolid
Lupinus hispanicus	203*	Salamanca

* The samples are stored under laboratory conditions.

All *Pisum* accessions have been characterized for passport data; 800 accessions have been evaluated. Of the total collection of *Pisum*, 300 accessions are of Spanish and Portuguese origin, 191 are already conserved at the CRF-INIA bank, 300 accessions are old cultivars, 200 are modern cultivars, and the rest is breeding material.

The *Phaseolus* collection contains 700 accessions; 509 have been evaluated.

Centro de Investigacion Agraria de Castilla la Mancha
Centro de Investigación Agraria, Albaladejito, Carretera Toledo-Cuenca km 174, 16194 Cuenca, Spain
Tel: (34) 69231868
Documentation of collections: José Antonio Lopez
Software: dBASE
All the samples have passport data. Management data for all the samples (Format: CRF-INIA System). All the samples are characterized and duplicated and kept at CRF-INIA (Madrid)
Lens culinaris, 112; *Vicia monanthos*, 40; *Lathyrus cicera*, a few; *Vicia narbonensis*, a few.

Servicio de Investigacion Agraria de la Junta de Eextremadura (Badajoz)
Servicio de Investigación Agraria, Finca "La Orden", Apartado 22, Badajoz
Tel: (34) 24440161; Fax: (34) 24440448
Documentation of collections: Jose María Carrasco Lopez
Software: dBASE
All accessions have been characterized for passport data. Management data for all accessions (Format: CRF-INIA System). All accessions have been characterized.

Species	Accessions	Comments
Lupinus albus	682	42 are sweet
Lupinus angustifolius	573	31 are sweet
Lupinus hispanicus	179	
Lupinus mutabilis	500	

Instituto de Experimentacion y Promocion Agraria del Principado de Asturias
I.E.P.A., Apartado 13, 3330 Villaviciosa, Asturias
Tel: (34) 85890066; Fax: (34) 85891854
Documentation of collections: Juan Jose Ferreira Fernandez
The software and everything is the same as in other collections. All accessions have passport data and 95 samples are characterized.
Phaseolus vulgaris, 201 accessions

Mision Biologica de Galicia (MBG) del Consejo Superior de Investigaciones Cientificas
Misión Biológica de Galicia, C.S.I.C., Apartado 28, 36080 Pontevedra
Tel: (34) 86854800; Fax: (34) 86841362
Documentation of collections: Antonio de Ron
The software is the same as in the above collections. All the collections have passport data. Of the total collection 340 accessions of *Phaseolus* have been characterized. The *Pisum* collection includes 88 landraces from Galicia and the rest from CRF-INIA (79 samples), from S.I.A. de Castilla y León (18) and 19 cultivars; of this total 125 have been characterized and multiplied.
Pisum sativum, 204 accessions
Phaseolus vulgaris, 660 accessions

Servicio de Investigacion Agraria de la Junta de Andalucia (Cordoba)
Servicio de Investigación Agraria, Finca "Alameda del obispo", Apartado 240, Cordoba
Tel: (34) 57293733; Fax: (34) 57202721
Documentation of collections: Mª Teresa Moreno Yangüela
Software: dBASE
The passport data are not always complete and accessions are partially characterized and evaluated. There are no data on the amount of seed available in each case. The collections contain landraces, cultivars and breeding material. The majority of accessions are from Spain.
Vicia faba, 1000 accessions; *Cicer arietinum*, 1500 accessions

Present status of Spain's grain legume collections

In Spain, only CRF-INIA has the base collection of the country's network of germplasm banks. The rest of the collections of grain legumes are located at research centres in which there are breeding programmes. This is the case at Cordoba (chickpea and faba bean), Misión Biológica de Galicia (*Pisum* and beans), Valladolid (*Pisum* and *Phaseolus*), Badajoz (*Lupinus*), etc.

Most of these places have short-term conservation. Most species are not represented in the collections of the research centres or CRF-INIA's base collection (Table 3). Many accessions are represented by a very low number of seeds.

Table 3. Status of accessions in the Spanish collections of grain legumes.

	CRF-INIA		SIAVA		MBG		IEPA		SIABA	
	No.*	Ch.**	Total	Ch.	Total	Ch.	Total	Ch.	Total	Ch.
Pisum sativum	191	123	1300	800	204	125				
Phaseolus	13									
P. vulgaris	1664	619	700	509	660	340	201	95		
P. coccineus	53									
Lupinus albus	569	422							682	682
L. angustifolius									573	573
L. hispanicus	196		203						179	179
L. luteus	255									
L. micranthus	12									
L. mutabilis	20								500	500
L. cosentinii	14									
Cicer arietinum	450	321					1500	Partial		
Lens culinaris	457	155			112	112				
L. nigricans	16									
Lathyrus cicera			181		A few					
Vicia faba	967	427					1000	Partial		
V. ervilia			145							
V. monanthos					40	40				
V. narbonensis					A few					

* Number of accessions.

** Accessions for which characterization is complete.

CRF-INIA: Centro de Conservación de Recursos Fitogenéticos (Madrid); SIAVA: Servicio de Investigación Agraria de la Junta de Castilla y León (Valladolid y Salamanca); MBG: Misión Biológica de Galicia del Consejo Superior Investigaciones Científicas (Pontevedra); IEPA: Instituto de Experimentación y Promoción Agraria del Principado de Asturias; SIABA: Servicio de Investigación Agraria de la Junta de Extremadura (Badajoz).

The conservation conditions of the base collections of CRF-INIA are as follows:

- seeds are desiccated to a value of <6% RH, then stored in metal and hermetic, reusable containers and placed in storage rooms at a temperature of –18°C.
- each introduction should have a minimum of 1000 seeds but it is desirable to get at least 1500 with 85% germination.
- the germination tests are carried out following ISTA regulations except that the number of seeds used is reduced.

The objectives for the base collections of grain legumes are:

- long-term conservation of all the introductions of each species
- each introduction should have between 1000 and 1500 seeds with 80% viability (at the first stage in order to extend regeneration needs over time)
- every introduction should be checked 10 years after initiation of conservation to validate method used and provide every accession with management data. From results obtained, this period could be extended in the future.

The situation for *Lens culinaris* is as follows:

Number of introductions:	457	
Introductions with >1500 seeds:	406	(Mean value 1624)
Introductions with >1000 seeds:	13	(Mean value 1275)
Introductions with <1000 seeds:	38	(Mean value 416)
Introductions with viability ≥80%:	412	(Mean value 92%)
Introductions with viability <80%:	11	(Mean value 62%)
Introductions without data:	34	
Regeneration needs:	2.4% of the collection.	

Conservation control

Once every 10 years every introduction is checked. Containers are opened within the desiccation chamber and a sample is taken for a germination test in order to determine its viability. The results are good as we can see from the next examples:

Lens culinaris	1982	Germination: 89.3%
	1992	Germination: 92.1%
Phaseolus vulgaris	1983	Germination: 93.0%
	1993	Germination: 94.8%
Vicia faba	1981	Germination: 89.8%
	1991	Germination: 94.4%

Activities for the next two years

All the banks keeping grain legume collections will be involved in regeneration of accessions, duplication for the base bank and in documentation of introductions. The above will be done together with attempts to identify existing duplications within the collections. In most cases there is good collaboration between existing banks and there is an attempt to create a core collection for each species.

At the base bank, CRF-INIA, 779 grain legumes accessions will be checked after 10 years of conservation.

Research work

The base bank of CRF-INIA work is centered on the conservation of all material and studies are carried out on the improvement and control of conservation techniques.

A post-doctoral fellowship exists for the study of seed pathology, sanitary analysis and fungi inventory.

Some work is being done on seed physiology, to study conservation conditions and pre-treatments needed to maintain viability in species not included in ISTA regulations (for example, *Lupinus hispanicus*).

For the above research, a cooperative agreement exists with Gatersleben. There is also collaboration on an IPGRI project to study hermetically sealed containers. The other genebanks use their collections for their own breeding purposes.

Collecting trips

Spanish legumes have already been collected, but there may be some exceptions. Some research centres still make collecting trips for cultivated material (landraces), mainly *Phaseolus*. Higinio Pascual collects legumes all over Spain.

Plant genetic resources activities in Turkey

Nevin Açýkgöz [*] ***and Ayfer Tan*** [**]
Aegean Agricultural Research Institute, Menemen-Izmir, Turkey

Introduction

In Turkey, work on plant genetic resource activities was begun in 1964 and, because of the importance to the country, plant genetic resources study was implemented within the framework of the National Plant Genetic Resources Research Project (NPGRRP) of 1976. The Aegean Agricultural Research Institute (AARI) has now taken over all responsibility, at the national level, for being the project centre. Cooperation with various institutions is arranged according to the principles set out in the National Code of Conduct on Collection, Conservation and Utilization in 1992. All joint programmes are conducted on a project basis within agreements.

The objectives of the NPGRRP are the exploration, collecting, conservation (both *ex situ* and *in situ*), documentation and evaluation of existing plant genetic resources and plant diversity in Turkey. Survey/collection, multiplication/ regeneration and utilization activities are organized by plant group: cereals, food legumes, forages, industrial crops, vegetables, fruit trees and grapes, ornamental plants, medicinal and aromatic plants, and endemic plants.

Turkey, being one of the world's important centres for plant genetic resources, is very rich in flora having remarkable diversity. The reasons for this richness are:

- a meeting place of three phytogeographical regions, namely the Euro-Siberian, Mediterranean and Irano-Turanian regions
- a bridge between southern Europe and southwest Asia, which has apparently served as a migration route
- centre of diversity for many genera and sections, a centre of origin for many cultivated plants and weeds in Europe
- species endemism in Turkey is high.

On the other hand, Turkey is either a centre of origin and/or a centre of diversity for lentil, chickpea, *Pisum* spp., faba bean, *Phaseolus* and *Vigna* spp.

Turkey is a member of several international programmes working on plant genetic resources, such as the Global Plant Genetic Resources Commission of the Food and Agriculture Organization of the United Nations (FAO). Turkey has adhered to the undertaking of Plant Genetic Resources; the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR); West Asia-North Africa Plant Genetic Resources Network (WANANET) of the International Plant Genetic Resources Institute (IPGRI), and the World Wheat Genetic Resources Networks.

Ex situ conservation

Survey/collecting

Systematic collecting and surveys are conducted by taking various priorities into account such as existing erosion factors, construction of dams and irrigation canals, grazing, land opening to industry. Herbarium specimens are also taken to facilitate identification and illustrate the phenotypic variation existing in the population.

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[*] Food Legumes Program Curator of NPGRRP.
[**] National Coordinator of NPGRRP.

Collections of seed material are preserved in cold storage at the genebank at AARI, where the needs of long- and medium-term storage for base and active collections, as well as short-term storage for working samples, have been thoroughly met (Table 1).

Table 1. Conservation facilities in cold stores of the genebank at AARI.

	Storage		
	Short term	**Medium term**	**Long term**
Temperature, ºC	+4	0	- 20
Moisture content ,%	6 - 8	6-8	6
Storage volume, m^3	80	240	80
Space availability	YES	YES	YES
Container type	LAP	SCN	SCN
Viability monitoring		5-year intervals	10-year intervals

Additionally, in Ankara there is storage of base collections at the Field Crops Improvement Center for safety duplication. Food legume accessions, including wild relatives collected since 1964, have exceeded 3800 (Table 2).

Table 2. AARI food legume collections (1964-94).

Species	**No. of accessions**
Cicer	1175
Lens	538
Pisum	137
Phaseolus vulgaris	1671
Vigna unguiculata	62
Vicia faba	265
Dolichos spp.	5
Total	3853

Almost all accessions have herbarium specimens maintained at the AARI herbarium (Table 3). In 1995, priority was given to the western part of the country, a total of 32 herbarium specimens and 261 seed samples were collected through the cooperative programmes with ICARDA and CLIMA. The first programme was for wild lentils which was planned in two phases. In the first phase there was a survey and herbarium collecting. In the second phase seed collecting was done in the Aegean, west Transitional zone and west Anatolia.

The other collecting programmes were conducted in west Anatolia, including Thrace and southwest Transitional regions, for legumes.

Two collecting programmes have been planned for 1996, complementary to those in 1995, covering the wild *Lens* from the south Anatolia region and all landraces of food legumes from west Anatolia including the southwest Transitional region. Future programmes will be considered in order to fill the gaps. Collecting from *in situ* conservation sites will also be performed.

Multiplication/regeneration

Stored accessions, with low germination rate or decreased amounts of active collections and insufficient amounts of collection material, are subject to multiplication and regeneration programmes. Over 3000 accessions have been multiplied since 1994. Regeneration / multiplication is usually programmed to take place in the ecological zones under conditions similar to those where the material was originally collected. For instance, *Lens* material has been multiplied in central Anatolia or southeastern Anatolia. Regeneration / multiplication programmes will be conducted whenever needed.

Evaluation and characterization

The IBPGRI (IPGRI) Descriptor lists are used for characterization and evaluation programmes. Evaluation and characterization are done with the collaboration of breeding programmes, as well as for the introduction of the collection to breeders. Some data are also recorded from material when multiplied, but material is usually evaluated for a particular characteristic. For instance, most of the chickpea accessions were evaluated for ascochyta blight, and a few were found moderately resistant and tolerant.

Primary studies on the characterization of chickpeas were carried out on 30 accessions in 1992. In 1993, systematic characterization of chickpea accessions was started on the material collected from the Aegean region at AARI. Variation was observed, mostly in pod number, seed number, seed weight per plant and 100-seed weight. The rest of the accessions will also be characterized in the following years.

Some of the faba bean material was also characterized and some characters were found to be the most variable ones.

The characterization activities will be conducted continuously in the future.

Utilization

Material is freely available for breeding programmes and for plant scientists, both in the country and abroad. Exchange of plant genetic resources depends on the availability of accessions for distribution. Feedback information is requested for the accessions, either dispatched from the Turkish genebank, or collected jointly.

Food legume genetic resources material is used extensively by the breeding programmes at AARI. Registered varieties – Eresen-87 (faba bean); Fýrat-87, Sultan-1, Emre-1, Kýþlýk pul-11 (lentil); Canýtez-87 (chickpea) – originate from local populations.

Table 3. Food legumes collected by AARI in 1995.

Species	Herbarium	Seed
Lens nigricans	17	18
Lens ervoides	7	9
Lens orientalis	7	14
Lens odemensis	1	1
Lens culinaris		16
Cicer arietinum		62
Vicia faba		63
Pisum sativum		32
Phaseolus vulgaris		46
Total	32	261

In situ conservation

In situ Conservation of Plant Genetic Diversity Project is an important part of the National Plant Genetic Resources Research Project. It was started in 1993 with collaborative work done between the Ministry of Agriculture and Rural Affairs (MARA), the Ministry of Forestry (MOF), and the Ministry of Environment (MOE). MARA and MOF are the project implementing Ministries.

The objectives of the project are as follows:

- to identify and establish the *in situ* conservation areas in Turkey for the protection of wild genetic resources originated from Turkey
- to test and develop a new approach for conservation of genetic diversity
- to provide sustainable *in situ* conservation of wild genetic resources of field and horticultural plants and forest trees.

The project components have been determined as:

- site surveys and inventories
- gene management zones (GMZs)
- data management
- national plan for *in situ* conservation
- institutional strengthening.

Site survey and inventory activities include: ecosystem-based survey to determine suitable habitats; species-specific inventory to describe species abundance and distributions; and some collections for *ex situ*, since the *in situ* conservation of genetic diversity project is complementary to existing *ex situ* conservation programmes.

The first 2 years of activities involved the identification of pilot conservation areas for wild relatives of crop plants and woody species of fruit and forest trees in the following areas:

- Kazdag in the northwest represents Euro-Siberian, Mediterranean, and Irano-Turanian regions
- Ceylanpinar State Farm in the southeast represents Mediterranean and Irano-Turanian regions
- Anatolian Diagonal in south and central Turkey represents Mediterranean, Irano-Turanian and Euro-Siberian regions.

The Aegean Agricultural Research Institute has the responsibility of coordinating the MARA studies and undertaking the project in Kazdag and Anatolian Diagonal, whereas the Field Crop Research Institute is mainly responsible for the studies in Ceylanpýnar State Farm.

In Kazdag, indigenous chestnut and plum species have been determined as target species, and nine potential sites have been selected as candidate gene management zones. In each site, inventory studies were begun to determine ecogeographic ranges and environmental heterogeneity for target species.

The Anatolian Diagonal and Ceylanpinar have been selected for wild relatives of cereals and legumes that originated in those particular areas.

Initial surveys have already started in Anatolian Diagonal, and have been completed in Ceylanpinar, where there is continuous implementation of inventory activities at the site.

After survey and inventory, gene management zones will be determined and managed for *in situ* conservation. A national plan for the conservation of crop diversity in Turkey will be prepared. Within the framework of *In situ* Conservation of Genetic Diversity Project, research will be conducted for conservation biology and genetic diversity. For security reasons, and immediate availability, small subsamples of some selected wild populations in gene management zones will be maintained at *ex situ* genebanks which will be complementary to *in situ* conservation.

In addition to this project, Turkey is one of the partner countries for IPGRI's *in situ* on-farm conservation programmes, which will support basic and applied research on *in situ* (on-farm) conservation of agricultural biodiversity in selected countries, and will develop generalized methods in support of *in situ* conservation. If Turkey takes part in this project, chickpea and hulled wheat (einkorn, emmer) will possibly be the target crop species.

Status of central food legumes databases

The NPGRRP activity data are maintained in the databases created by dBASE3+ and dBASE4. Passport/collecting and storage information have already been computerized. The evaluation information is analyzed using multivariate analysis and statistical package programmes. The mapmaker package is also used for map production if the locations of collection sites are recorded with Global positioning System (GPS). The Documentation Unit is responsible for the centralized database of NPGRRP.

Grain legume collections and activities in the UK

M. Ambrose
John Innes Centre, Norwich Research Park, Norwich NR4 7UH, UK

Organization of plant genetic resources

Plant genetic resources collections in the UK are maintained in a variety of institutions and with a diverse range of funding sources. The decentralized system is coordinated through the UK Plant Genetic Resources Group (UKPGR Group) which acts as a technical forum on issues related in particular to *ex situ* plant genetic resources and an advisory group to interested Governmental departments. All collections are working collections and are based on sites where there is active work on the utilization of plant genetic resource material which ranges from basic research to applied development.

Grain legume collections in the UK

The following is a breakdown of the principal collections which are documented and available and are included in the EU and FAO inventories of plant genetic resources collections of food legumes.

1. John Innes Centre, Norwich

Mr M. Ambrose
Medium-term storage
Working collection underpinning research and commercial users.

Pisum collection (3000 accessions)

International Centre for *Pisum* genetic stocks
Host differentials
Rogue and type collection.

The collection is broad-based with wide representation of wild and primitive populations from primary and secondary centres of diversity as well as a wide range of cultivars. Increasing significance is now being given to the development of the genetic stocks and associated resources such as bibliography and gene descriptions and visual records that are being drawn together and which are associated with the stocks. The most recent inclusion of some 300 accessions has been of three sets of recombinant inbred lines used for the detailed mapping work on *Pisum* at the centre. The future provision of the probes along with the lines is a clear pointer as to how genetic resources may be developed in the future.

Documentation: Passport data complete

Characterization data: Basic characterization data complete. Detailed phenotypic recording on over 40 characters. Descriptor states based on known underlying genetics of the character.

Availability: Freely available.

Duplication: Extensive but degree unknown.

Formal agreement with the Nordic Gene Bank for the past 3 years with respect to the International collection of genetic stocks. JIC act as working collection; NGB is the base collection. Programme of ensuring all genetic stocks are duplicated in the base collection has been started. Should be complete with a period of 4 years.

There is close cooperation between the two pea collections within the UK to work to complement each other and keep overlap to a minimum. Discussions to work to integrate data in the area of character descriptors are currently taking place.

Vicia faba **collection (300 accessions)**
Small collection which covers the breeding material tested and bred in the UK together with accessions from other centres in Europe.

Documentation: Passport data complete.
Characterization data: Minimal
Duplication: Level with other collections is high.

2. SASA, East Craigs, Edinburgh

Mr F.N.Green
Long-term storage
Working collection. Statutory reference collection for DUS testing and certification.
UK *Pisum* cultivar collection (3022 accessions)
UPOV reference collection
Availability: Dependent on accession.
Documentation: Passport data complete.
Characterization: Wide range of quantitative and qualitative data recorded.
Phenotypic observations related to the known underlying genetics of the species.
Data accumulated over many years are used to give measures of the range and plasticity of characters.

3. Scottish Crops Research Institute

Dr G. Ramsey
Medium-term storage

Vicia faba, Vicia **species and landraces (800 accessions)**

Documentation: Passport data complete
Characterisation: Basic descriptors complete
Duplication: Not presently known.

4. University of Southampton

Dr. F. Bisby
Vicieae collection.
Predominantly forage but some grain legumes.
Vicia spp., *Lathyrus* spp.

5. Dept. of Agricultural Botany, University of Reading

Prof. P. Caligari
Medium-term storage
Lupinus albus (500 accessions)
Lupinus angustifolius (100 accessions)
Lupinus mutabilis (300 accessions)
Lupinus luteus (100 accessions)

6. Horticultural Research Institute

Dr D. Astley

Long-term storage

Phaseolus vulgaris ex University of Cambridge (3077 accessions)

This collection has been relocated as from April 1995. The previous owners no longer wish to maintain it as the department where is was originally housed has closed and the last of the work has now been wound down. No Governmental support for the collection was forthcoming on at least two attempts. Support from a private breeding company ensured regeneration of the whole collection in very recent years and all accessions together with the databases of passport data and evaluation data as to performance under UK conditions has been moved to Wellesbourne. All stocks are in long-term storage. No provision for servicing the material or in dealing with requests has been made.

Grain legume databases operational in the UK

Key databases coordinated or developed within the UK.

1. International legume Database and Information Service -ILDIS (Univ. of Southampton)
2. Vicieae Database Project (University of Southampton)
3. *Pisum* European Common Catalogue (John Innes Centre- in collaboration with Poland)
4. UK *Pisum* cultivar database (SASA Edinburgh)
5. *Pisum* Gene list (John Innes Centre)

Seed storage conservation in grain legumes

Two groups are currently active in the UK. The principal group is that of the department of Agricultural Botany at the University of Reading. This group has been responsible for much important work in the area of conservation and seed storage for a wide range of species, both orthodox and recalcitrant. Their work has helped elucidate many of the models that are now widely accepted and used in the design of germplasm storage facilities and the international guidelines for their construction.

A second group has now been formed at the Royal Agricultural College, Cirencester, which is also working in the area of the effects of storage on the rate of chromosomal aberrations.

Recent literature of seed storage conservation work in the UK

Dourado A.M. and Roberts E.H. 1984. Chromosome aberrations induced during storage in barley and pea seeds. Ann. Bot. 54, 767-779.

Sivritepe, H.O. and Dourado A.M. 1994a. The effect of storage environment on seed survival and the accumulation of chromosomal aberrations in pea (*Pisum sativum* L.) Ann. Bot. in press.

Sivritepe, H.O. and Dourado A.M. 1994b. The effect of priming treatments on the viability and accumulation of chromosomal damage in aged pea seeds. Ann. Bot. in press.

Appendix I. List of Participants

* Unable to attend.

Chair

Mr Mike J. Ambrose
John Innes Centre
Norwich Research Park
Colney Lane
Norwich NR4 7UH, UK
Tel: +44-1603 452571
Fax: +44-1603 456844
Email: ambrose@bbsrc.ac.uk

Members

Dr Rudolf Schachl
Federal Office of Agrobiology
G. Wieningerstr. 8
4025 Linz, Austria
Tel: +43- 732 812 62-259
Fax: +43- 732 3854 82
Email: 100444.3502@compuserve.com

Ms. Siyka Angelova*
Institute of Plant Introduction and
Genetic Resources “K. Malkov”
4122 Sadovo
District Plovdiv, Bulgaria
Tel: +(359-32)393118 / 2221
Fax: +(359-32)270270 (centra1
Plovdiv)

Mr Zlatko Satovic
Faculty of Agriculture
University of Zagreb
Department for Plant Breeding,
Genetics and Biometrics
Svetosimunska 25
11000 Zagreb, Croatia
Tel: +385-1 23 35 777
Fax: +385-1 21 53 00
Email: satovic@magr.agr.hr

Mr Andreas Hadjichristodoulou
Agricultural Research Institute
PO Box 2016
Nicosia, Cyprus
Tel: +357-2 305 101
Fax: +357-2 316 770
Email: ari@athena.cc.ucy.ac.cy

Mr Miroslav Hýbl
AGRITEC Ltd.
Šumperk, Zemedelská 16
787 01 Šumperk, Czech Republic
Tel: +42-649 4511
Fax: +42-649 5975

Mr Simo Hovinen
Boreal Plant Breeding
Myllytie 8
31600 Jokioinen, Finland
Tel: +358-16 4187721
Fax: +358-16 4187715--
Email: simo.hovinen@mtt.fi

Mr Joël Le Guen
INRA, Station d'Amélioration des
Plantes,
BP 29
35650 Le Rheu, France
Tel: +33-99 28 51 27
Fax: +33-99 28 51 20
Email: leguen@rennes.inra.fr

Mr Axel Diederichsen
Institut für Pflanzengenetik und
Kulturpflanzenforshung (IPK)
Corrensstr. 3
06466 Gatersleben, Germany
Tel: +49-39482 5117
Fax: +49-39482 5155

Mr Shahal Abbo
Plant Genetics
Weizmann Institute
Rehovot 76100, Israel
Tel: +972-8 344341
Fax: +972-8 344 160
Email: lp.abbo@weizmann.
weizmann.ac.il

Mr Francesco Saccardo
Università della Tuscia
Dipartimento Produzione Vegetale
Via Camillo de Lellis 1
01100 Viterbo, Italy
Tel: +39-761 357 369
Fax: +39-761 357 531

Mr Loek J. M. van Soest*
Centre for Plant Breeding and
Reproduction Research (CPRO-DLO)
Centre for Genetic Resources The
Netherlands (CGN)
PO Box 16
6700 AA Wageningen, The Netherlands
Tel: +31-8370 77011
Fax: +31-8370 18094
Email: cgn@cpro.agro.nl

Mr Wojciech. K. Swiecicki
Institute of Plant Genetics
Strzeszynska 34
60-479 Poznan, Poland
Tel: +48-61 233 511
Fax: +48-61 221 122

Mr André Mendes Dordio
Estação Agronómica Nacional
Quinta do Marquês
2780 Oeiras, Portugal
Tel: +351-1 441 6856
Fax: +351-1 442 0867

Mr Boguslav S. Kurlovich
N.I. Vavilov All-Russian Research
Institute of Plant Industry
42, B. Morskaya Str.
190 000 St. Petersburg, Russia
Tel: +7-821 314 4732
Fax: +7-812 311 8762
Email: vir@glas.apc.org

Mr František Debre
Institute of Plant Production
Bratislavská cesta 122
921 01 Pieštany, Slovakia
Tel: +42-838 223 11
Fax: +42-838 263 06
Email: scurka@vurv.bb.sanet.sk

Mr Alvaro Ramos Monreal
Servicio de Investigacion Agraria
Carretera de Burgos Km. 118
Apartado 172
47080 Valladolid, Spain
Tel: +34-83 41 44 31
Fax: +34-83 41 47 80

Mr Stig Blixt
Nordic Gene Bank
Box 41
23053 Alnarp, Sweden
Tel: +46-40 461790
Fax: +46-40 462188
Email: nordgen@gemini.ldc.lu.se

Ms Nevin Açikgoz
Aegean Agricultural Research Institute
PO Box 9
Menemen, Izmir 35661, Turkey
Tel: +90-232 8461331
Fax: +90-232 8461107

IPGRI
Mr Thomas Gass
ECP/GR Coordinator
Via delle Sette Chiese 142
00145 Rome, Italy
Tel: +39-6 5189 2221
Fax: +39-6 575 0309
Email: t.gass@cgnet.com