European Cooperative Programme for Crop Genetic Resources Networks

ECP//GR

Arachis genetic resources in Europe

IPGRI

***Ad hoc* Meeting, 15–16 November 2002, Plovdiv, Bulgaria**

L. Maggioni, S. Georgiev and E. Lipman, *compilers*

FUTURE HARVEST
<www.futureharvest.org>

IPGRI is a Future Harvest Centre supported by the Consultative Group on International Agricultural Research (CGIAR)

European Cooperative Programme for Crop Genetic Resources Networks

ECP//GR

Arachis genetic resources in Europe

***Ad hoc* Meeting, 15–16 November 2002, Plovdiv, Bulgaria**

L. Maggioni, S. Georgiev and E. Lipman, *compilers*

The International Plant Genetic Resources Institute (IPGRI) is an independent international scientific organization that seeks to advance the conservation and use of plant genetic diversity for the well-being of present and future generations. It is one of 15 Future Harvest Centres supported by the Consultative Group on International Agricultural Research (CGIAR), an association of public and private members who support efforts to mobilize cutting-edge science to reduce hunger and poverty, improve human nutrition and health, and protect the environment. IPGRI has its headquarters in Maccarese, near Rome, Italy, with offices in more than 20 other countries worldwide. The Institute operates through three programmes: (1) the Plant Genetic Resources Programme, (2) the CGIAR Genetic Resources Support Programme and (3) the International Network for the Improvement of Banana and Plantain (INIBAP).

The international status of IPGRI is conferred under an Establishment Agreement which, by January 2003, had been signed by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

Financial support for IPGRI's research is provided by more than 150 donors, including governments, private foundations and international organizations. For details of donors and research activities please see IPGRI's Annual Reports, which are available in printed form on request from ipgri-publications@cgiar.org or from IPGRI's Web site (www.ipgri.cgiar.org).

The European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) is a collaborative programme including most European countries aimed at facilitating the long-term conservation and the increased utilization of plant genetic resources in Europe. The Programme, which is entirely financed by the member countries and coordinated by IPGRI, is overseen by a Steering Committee composed of National Coordinators nominated by the participating countries and a number of relevant international bodies. The Programme operates through ten 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, inter-regional 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. Similarly, the texts and taxonomic definitions in these proceedings reflect the views of the respective authors and not necessarily those of the compilers or their institutions.

Mention of a proprietary name does not constitute endorsement of the product and is given only for information.

Citation:
Maggioni, L., S. Georgiev and E. Lipman, compilers. 2004. *Arachis* genetic resources in Europe. *Ad hoc* meeting, 15-16 November 2002, Plovdiv, Bulgaria. International Plant Genetic Resources Institute, Rome, Italy.

ISBN 92-9043-647-6

IPGRI
Via dei Tre Denari 472/a
00057 Maccarese, Rome, Italy

© International Plant Genetic Resources Institute, 2004

CONTENTS

PART I. DISCUSSION AND RECOMMENDATIONS

Introduction

Opening of the meeting

Rada Koeva, Director of the Institute for Plant Genetic Resources "K. Malkov" (IPGR), Sadovo, opened the meeting by welcoming all the participants to Bulgaria and to Plovdiv. She thanked IPGRI for its help in organizing the *ad hoc* meeting on *Arachis* genetic resources and for generally facilitating collaboration between countries. She said that groundnut had been grown in Bulgaria since ancient times, giving power to the ill and spirit to the healthy. In Sadovo, collecting and selection of the *Arachis* crop started for the first time in the 19th century. The crop is grown in the Trakia lowlands, where agriculture and science develop side by side. Currently, a programme for the improvement of the sustainable use of *Arachis* genetic diversity is ongoing at IPGR-Sadovo, with focus on the promotion of the utilization and the enlargement of the market. Collaboration is also ongoing with the USA for scientific research on groundnut. R. Koeva wished participants successful work and a fruitful start for collaboration on groundnut genetic resources in Europe. She said she was convinced that this meeting would help in the identification of *Arachis* genetic diversity in Europe and in promoting its use in sustaining agricultural production and feeding people. Finally she expressed the hope that the meeting would open the first page of a better collaboration between countries interested in the *Arachis* crop.

Siyka Angelova, Bulgarian member of the ECP/GR Grain Legumes Working Group, also welcomed the participants and thanked the members of the Grain Legumes Network Coordinating Group for their support in organizing this meeting.

General briefing on ECP/GR

Lorenzo Maggioni, ECP/GR Coordinator, welcomed all the participants on behalf of IPGRI. He explained that the proposal to hold this meeting was the result of the initiative of the Bulgarian member of the Grain Legumes Working Group, which had been supported by the Grain Legumes Network Coordinating Group. The objectives agreed for this meeting were the establishment of an ECP/GR *Arachis* database at IPGR-Sadovo and the improvement of cooperation on documentation, conservation and use of *Arachis* genetic resources in Europe. Experts from the European and Mediterranean countries holding the main collections of groundnut were invited to attend. Although delegates from Greece, Israel, Morocco and Romania were unable to attend, they were able to provide information on their collections in advance of the meeting and this is included in the present report. L. Maggioni then asked the participants to briefly introduce themselves and proposed that Stanko Georgiev, Vice-director of IPGR-Sadovo, should chair the meeting. S. Georgiev accepted, with the consent of the group.

National Collections

The following reports were presented at the meeting: Bulgaria (S. Georgiev and S. Stoyanova), Hungary (L. Horváth), Russian Federation (O. Dzyuba) and Turkey (N. Açikgöz). Other information was received from Greece (S. Koztamanidis), Israel (A. Ashri), Morocco (M. Sadiki), Portugal (I. Duarte) and Romania (S. Strajeru and M. Dima).

All contributions are included in Part II (see pages 8-30).

Discussion

S. Stoyanova stressed the importance of including in a European *Arachis* database data related to plant breeders' material and asked the group about the best way to encourage collection of these data.

N. Açikgöz explained that the Turkish genebank only maintains landraces and registered varieties, but no breeders' material or related data. This type of sample or data should therefore be sought directly from the plant breeders.

L. Horváth mentioned that plant breeders and other partners in Hungary could apply for specific funds allocated annually to the conservation of genetic stocks. In order to fulfil the main conditions to access these funds, the applicants should possess unique germplasm; the material should be made freely available; and the activities should be conducted in accordance with international genebank standards. At the same time a basic set of passport information should be supplied to the National Genetic Resources Database (NGRD), and a safety-duplication of seed-propagated accessions should also be supplied for the National Base Collection (NBC) (beside its other national and international genebank duties, the Institute for Agrobotany in Tápiószele (ABI) is responsible for the operation of the NGRD and NBC).

A question was raised as to whether it is preferable to conserve groundnut germplasm as pods or as seed. It was noted that the Hungarian and Russian genebanks conserve pods, since this method has been shown to maintain seed viability better. On the other hand, the Bulgarian genebank stores seed, since this system gives a better indication of the number of viable seeds and it considerably reduces the volume of the samples.

Briefing on EPGRIS and EURISCO

L. Maggioni gave a brief account of the progress of the EU-funded project EPGRIS for the Establishment of a Plant Genetic Resources Infra-Structure (Fifth Framework Programme for Research). The objective is to establish a European Internet Search Catalogue (EURISCO) with passport information of plant genetic resources maintained *ex situ* in Europe. Before the end of 2003, the first version of EURISCO is expected to be launched on-line and to contain a combination of data available from the existing national inventories and from the existing Central Crop Databases.[1] EURISCO is expected to gradually develop and become the most complete and reliable source of passport data in Europe. The catalogue will carry an important minimum set of passport data, frequently and automatically updated from the national inventories. These data will be based on the revised version of the FAO/IPGRI *Multi-crop Passport Descriptor List* (MCPDv2), which was finalized in December 2001 (http://www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=124), with an addition of six specific descriptors for EURISCO. The EURISCO catalogue is expected to become a reliable source of passport data for all crops in European collections. The EPGRIS project partners, however, recommended that existing and new Central Crop Databases (CCDBs) should not refrain from gathering data in the traditional way (i.e. requesting data from the individual curators) until EURISCO has collected enough data to become the preferred source of passport data. It is on the other hand recommended that the CCDBs harmonize their standards with the EURISCO list of descriptors. In the medium term, it is expected that the CCDBs and their managers would eventually be able to fully assume the function that has repeatedly been attributed to them, i.e. gathering characterization and evaluation data,

[1] Update at time of publication: EURISCO was launched officially at the Final Conference of the EPGRIS Project, 11-13 September 2003, Prague, Czech Republic. A demo version of the catalogue is available at http://eurisco.ecpgr.org/

analyzing information in the databases and promoting the coordination of activities, such as helping to define European collections, core collections, safety-duplication and collecting needs.

The European *Arachis* Database: adoption of FAO/IPGRI – EURISCO Multi-crop passport descriptors

Stanko Georgiev confirmed the intention of IPGR-Sadovo to establish a European *Arachis* database and recommended that the meeting should reach an agreement on the list of passport, characterization and evaluation descriptors to be adopted.

He presented the list of passport descriptors, based on the FAO/IPGRI *Multi-crop passport descriptors* (MCPDv1), which were originally adopted by the Grain Legumes Working Group during its second meeting in Norwich, United Kingdom, in October 1998.

It was remarked that this list had been superseded by the new version (December 2001) of the FAO/IPGRI *Multi-crop passport descriptors* (MCPDv2)[2] and the EURISCO extended list.[3] It was also noted that specific modifications to MCPDv1 had been adopted by the Grain Legumes Working Group in 1998 for use in the grain legumes databases (i.e. the introduction of a sixth state "Genetic stock" to the descriptor "Status of sample" and the addition of a new descriptor "Safety-duplication"). These modifications had all been taken into account and included in MCPDv2. The adoption of the EURISCO descriptors was proposed for use in the European *Arachis* Database.

Arachis characterization descriptors for the European database

S. Georgiev also presented a list of 42 proposed characterization and evaluation descriptors among which to select a number of priority descriptors to be included in the European *Arachis* database. It was noted that in most cases European genebanks were not carrying out evaluation of *Arachis* accessions and therefore it would be realistic only to provide a small number of characterization descriptors for the first version of the *Arachis* database, while data on disease resistance or agronomic performance evaluation would not be available.

Methodology for testing and describing accessions for the establishment of the European *Arachis* database

S. Georgiev presented the methodology used at IPGR-Sadovo for characterization and evaluation of the groundnut accessions (Appendix I) and recommended its use. The preparation and provision of a detailed description of the standards adopted by IPGR-Sadovo was greatly appreciated by the participants. L. Horváth remarked that genebank practice in Tápiószele, Hungary would not allow splitting accessions containing seeds with variable morphological characters, since this would alter the genetic integrity of the specific accession. S. Stoyanova replied that splitting accessions would on the contrary allow to reduce genetic drift and the likely loss of genetic diversity contained in a variable accession.

Regarding the methodology used to record resistance to diseases, N. Açikgöz remarked that, in contrast to the methodology proposed by S. Georgiev, international standards record

---

[2] FAO/IPGRI's *Multi-crop passport descriptors* (version 2, December 2001) are available on-line (http://www.ipgri.cgiar.org/system/page.asp?frame=catalogue/select.asp).

[3] The document *EURISCO Descriptors for uploading information from National Inventories to EURISCO* is available on-line (http://www.ecpgr.cgiar.org/epgris/Tech_papers/EURISCO_Descriptors.doc).

susceptibility to diseases on a 1-9 scale, with the least susceptible accessions being scored "1" and the most susceptible "9".

Recommendations and workplan

As a result of extensive discussion on all the various subjects covered by the meeting, participants agreed on the following recommendations and actions:

- The Institute for Plant Genetic Resources (IPGR), Sadovo, was advised to proceed with the establishment of the European *Arachis* Database. Participants from Hungary, Russian Federation and Turkey thanked IPGR-Sadovo for its commitment and agreed to collaborate in the development of the database by sending their respective country's available data to the database manager. It was also noted that, in advance of the meeting, representatives from Greece, Israel and Morocco expressed appreciation of this initiative and the intention to contribute data to the database.

- The database is aiming to include data of all accessions maintained for medium- and long-term storage in genebanks and other collections in Europe and the Mediterranean area. These include varieties and breeding lines.

- It was agreed to adopt the use of EURISCO passport descriptors for the European *Arachis* Database and that national passport data should be converted into the agreed format before being delivered to Sadovo for inclusion in the central database. A document containing the list of EURISCO descriptors was distributed to all the participants and is available from the database manager and the ECP/GR Secretariat.[4]

- Initially, 8 characterization descriptors were selected by the participants as a priority for inclusion in the European *Arachis* Database. After the meeting, following consultation with other world *Arachis* experts and IPGRI, the Group agreed to provide data to the European *Arachis* Database according to 10 characterization descriptors (see Appendix II, pages 38-39).

- It was agreed that the available passport (in EURISCO standard format) and 10 selected characterization descriptors data should be sent to IPGR-Sadovo as soon as possible. In the case of Hungary, it was noted that passport data had been delivered during the meeting and that characterization data would possibly be sent not later than 30 May 2003, conditional upon national approval. In the case of Russia, the data would possibly be sent not later than 30 May 2004. In the case of Turkey, only passport data would be delivered, since there is no characterization programme planned for *Arachis* at AARI, Izmir, in the near future. Curators of collections from other countries not represented at the meeting were also invited to send their *Arachis* data to IPGR-Sadovo, in the format agreed by the meeting.

- The methodology developed by S. Georgiev for groundnut characterization and evaluation at IPGR-Sadovo was recommended by the author for general use.

[4] http://www.ecpgr.cgiar.org/epgris/Tech_papers/EURISCO_Descriptors.doc

Closing remarks

Participants visited IPGR in Sadovo, including the genebank and the new botanic garden. An excursion was also organized to the old city of Plovdiv and to the Monastery of Batckovo in the Rhodope Mountains. While appreciating the art, folklore and typical food of the Plovdiv area, including local groundnut seed and butter, the participants had the opportunity to continue their exchange of information and reinforce their commitment for future collaboration. All the participants approved the recommendations and workplan and, to the sound of Balkan music for a wedding celebration, the meeting was officially closed in the Trimontium Hotel in Plovdiv.

PART II. PRESENTED PAPERS

The groundnut collection in Bulgaria – status 2002

Stanko Georgiev
Institute for Plant Genetic Resources "K. Malkov" (IPGR), Sadovo, Bulgaria

The Bulgarian groundnut collection is maintained at the Institute for Plant Genetic Resources in Sadovo, which also carries out breeding activities. All varieties grown in Bulgaria were bred at Sadovo, and the original seed materials can be found only there.

The history of groundnut in Bulgaria dates back to over 100 years. The first experiments (1902-1907) were carried out by the former Agricultural Experimental Station in Sadovo, currently IPGR. The crop seemed promising in the Plovdiv region. In the beginning (1907), the area cultivated under groundnut was 0.7 ha. It then steadily increased, reaching 57 ha in 1926, 10 000 ha in 1992, and 15 000 ha in 1999. Six phases can be distinguished as regards experiments conducted on *Arachis*:

- 1902-1907: introduction and evaluation of varieties;
- 1912-1929: introduction and evaluation of varieties;
- 1934-1945: creation of a small working collection;
- 1977-1984: enrichment of the collection (199 accessions);
- 1984-1998: enrichment of the collection (317 accessions); and
- 2000-2002: establishment of the database.

In 2001, the collection contained a total of 685 accessions, including 317 under long-term conservation and 368 as part of the working collection. In 2002 the total number of accessions had increased to 729, including 363 under long-term conservation and 366 under short-term conservation as part of the working collection (Table 1). The collection consists of varieties (54%) and breeders' lines (46%) (Table 2). Varieties and breeders' lines of local origin represent 41% of the collection, compared with 59% of foreign origin. Most of the groundnut working collection (80%) consists of breeders' lines developed through hybridization and selection of the progeny.

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

Subspecies	Type	No. of accessions		
		Long-term conservation	Working collection	Total
fastigiata	Valencia	124	310	434
	Spanish	135		135
hypogaea	Virginia	104	56	160
Total		**363**	**366**	**729**

Table 2. Structure of groundnut collections

Subspecies	Type	No. of accessions			
		Cultivars		Breeders' lines	
		Foreign	Local	Foreign	Local
fastigiata	Valencia	135	9	-	290
	Spanish	133	2	-	-
hypogaea	Virginia	116	-	44	-
Total		**384**	**11**	**44**	**290**

Due to the considerable diversity of the parent genetic material, breeders' lines incorporate an enormous potential of complex valuable characters. This type of germplasm is of great importance for the creation of highly productive, improved new varieties. The remaining part of the working collection is represented by foreign varieties.

The large increase of the number of accessions in the groundnut collection is the result of the national breeding system, which has produced 290 breeding lines. Additionally, 44 lines from North Carolina State University are included, bringing the total to 334. Foreign lines were received as part of a free exchange programme, based on international agreements and projects for cooperative scientific research on groundnut breeding.

IPGR-Sadovo collaborates with the "Programme for cooperation and support of scientific research on groundnut" coordinated and funded by Georgia Agricultural University, in collaboration with North Carolina State University during 1997-2001 and with New Mexico State University during 2001-2006. The distribution of accessions according to their country of origin is shown in Table 3.

Table 3. Origin of the groundnut accessions

Country	Number	Country	Number	Country	Number
Algeria	1	Guinea	1	Morocco	17
Argentina	4	Hungary	43	The Netherlands	1
Australia	3	India	28	Portugal	35
Brazil	1	Indonesia	1	Senegal	1
Bulgaria	301	Iraq	1	Somalia	1
China	8	Israel	8	Syria	2
Congo	3	Italy	20	Turkey	3
Cuba	5	Japan	7	USA	169
Egypt	8	Laos	2	Vietnam	7
Former Soviet Union	29	Libya	1	Yugoslavia	7
Greece	6	Mexico	1	Unknown	4
Total = 729					

Varieties and breeders' lines from the working collection (Table 4) have been studied for 1-3 years. Bulgarian breeders' lines are being studied for a second year, whereas the evaluation of breeders' lines from the USA ceased in 2000. The data from the latter are being processed and will be computerized. In 2001 and 2002 the American breeders' lines have been multiplied in order to obtain the required number of seeds for long-term conservation.

Table 4. Structure of the working collection

Subspecies	Type	Cultivars	Breeders' lines		Total
		Foreign	Foreign	Local	
fastigiata	Valencia	20	-	290	310
	Spanish	-	-	-	-
hypogaea	Virginia	12	44	-	56
Total		**32**	**44**	**290**	**366**

All accessions are evaluated for a set of 39 characters, including taxonomic identification, length of the growing period, productivity, resistance to diseases, agronomic quality of the seed and fruit, chemical content of the seed, potential for mechanization.

During the experiments, all varieties are compared with the Bulgarian standard variety 'Kalina'. Comparison of the American breeders' lines of Virginia type and 'Kalina' lead to the following conclusions:

- Regarding fruit and seed yield, no accession is more productive than 'Kalina'. The high yield potential of foreign varieties cannot be achieved under Bulgarian climatic conditions as they cannot complete their long growing period (over 150 days). They ripen 15-30 days later than 'Kalina'.
- Most of the American varieties are sensitive to *Fusarium* sp. and *Botrytis cinerea*.

- Fat content of the seed varies from 47% to 53%. Five breeders' lines show better results than 'Kalina' (which has 50.4%) and may prove useful for the creation of new varieties with a higher fat content.
- The protein content of the seed of breeders' lines varies from 26.0% to 30.4%. There are no samples that exceed the Kalina control, which has 29.8% protein in the seeds.
- The size of the seed of all the breeders' lines exceeds that of 'Kalina' and the most promising can be used as breeding material.

It should be emphasized that the results from the latest experiments confirm that in the period 1930-2000, as indicated by Georgiev (1988, 1994, 2000, 2002), no foreign varieties performed better than the Bulgarian varieties. Varieties developed during the period 1969-2001 ('Sadovo 2609', 'Kalina', 'Rossitza', 'Orpheus' and the newest variety 'Kremena' released in 2004) currently occupy all the arable land under groundnut in Bulgaria.

References

Georgiev, S. 1988. Agrobiologitchno i technologitchno prouchvane na taksonomichnite raznovidnosti na fastatsi ot vida *A. hypogaea* L. pri usloviyata na Tsentralna Yujna Bulgaria [Agrobiological and technological studies on groundnut taxonomical variability of the species *Arachis hypogaea* L. under conditions of Central Southern Bulgaria]. Doctor of Science Thesis, Sofia.

Georgiev, S. 1994. Izpolzuvane na rastitelnite resursi v selektsiyata na fastatsite [Utilization of plant genetic resources in groundnut breeding]. Rastenievadni nauki 31(3-4):145-149.

Georgiev, S. 2000. The groundnut collection in Bulgaria. Pp. 44-47 *in* Report of a Working Group on Grain Legumes. Second meeting, 1-3 October 1998, Norwich, United Kingdom. (L. Maggioni, M. Ambrose, R. Schachl and E. Lipman, compilers). International Plant Genetic Resources Institute, Rome, Italy.

Georgiev, S. 2002. Sadarjanie na maznini i beltachini v semenata na amerikanski linii fastatsi ot tip Virginia pri usloviyata na Tsentralna Yujna Bulgaria [Content of fats and protein in the seeds of American groundnut lines from Virginia type under conditions of Central Southern Bulgaria]. Rastenievadni nauki 38(7-10):355-358.

Conservation of peanut germplasm in the Bulgarian Genebank

Siyka Stoyanova
Institute for Plant Genetic Resources "K. Malkov" (IPGR), Sadovo, Bulgaria

Introduction

The need for conservation of genetic variation in plants is widely recognized. Considering the high cost of establishing and evaluating a collection, and the incalculable value of its genetic potential, it seems indefensible to provide anything less than optimal storage conditions for seeds. The *Genebank Standards* (FAO/IPGRI 1994) described the preferred storage conditions according to FAO and IPGRI. However under storage conditions in the genebank, although seeds survive for a long time, it was shown that different rates of change can be expected (Roos 1986, 1989; Roos and Davidson 1992; Grzelak *et al*. 1994; Specht *et al*. 1997, 1998; Stoyanova 2001).

Conservation of genetic diversity in Bulgaria was the main concept behind the establishment of a conservation strategy in the framework of the National Programme for Plant Genetic Resources. Seed conservation of cultivated plant species under controlled conditions started in 1980 at the Institute for Plant Genetic Resources (IPGR) in Sadovo (Stoyanova 1985). Currently, nearly 51 000 seed accessions are maintained, including cereals, grain legumes, industrial crops, forage crops and grasses, vegetables, flowers and medicinal plants (including rare and threatened plants). Over 37 000 samples are conserved in the base collection under long-term storage conditions.

The aim of this report is to present our results on peanut seed conservation under real genebank conditions and to discuss the opportunity for more appropriate monitoring.

Organization and maintenance of seed storage

The genebank facilities are designed for both long-term and medium-term storage. Three collections are maintained: base collection, working collection and collection for free exchange. The base collection is under long-term storage conditions, meaning that seeds with low moisture content are kept in hermetically closed containers at -18°C. Two types of seed container are used: screw-top glass jars and vacuum three-layered foil bags (PP/AL/PE).

Seed germination tests are carried out both at the start of storage and after 10 years or more. Germination conditions are set according to the preferred *Genebank Standards* (FAO/IPGRI 1994) and according to the *International Rules for Seed Testing* (ISTA 1985). Control tests are carried out after pre-conditioning of seeds.

Seed desiccation is carried out in a drying chamber equipped with an air dehumidifier. Seed moisture before and after storage is determined using oven methods of ISTA for small working samples (about 1 to 3 g per seed accession).

Storage data files are maintained as Access for Windows (earlier DBASE III+) files.

Monitoring of seed longevity

Effect of storage

The seed collection of *Arachis hypogaea* L. in the genebank consists of 428 accessions, where 364 are preserved under long-term storage conditions. After more than 12 years of storage, control tests of 133 accessions were carried out. These were used to predict storability and the regeneration cycle of peanut seeds.

To avoid the negative effect of odd results and to ensure that the observed variation was statistically sound, we used conditions for data compatibility (Table 1). This means that all results are classified in a suitable category for compatibility of data, according to the amount of change occurring in storage. In a group of accessions with equal values for Initial Seed Germination (SGI), different categories of accessions could be identified after 12 years in storage: "no change", "minimal change" and "significant change". As presented earlier, the difference in germination ability before and after storage influences the mean values, but has a stronger effect on the standard deviations (Stoyanova 2001). In the case of minimal changes, the control tests after storage most frequently confirm the rate of initial seed germination. In this case, the mean values of seed germination before and after storage are identical. On the other hand, the standard deviation after storage is slightly higher, but in the same range. When slightly reduced viability is observed, mean values for seed germination are close, but the standard deviation after storage increases because of larger variation between minimum and maximum values. This tendency is better illustrated when mean values before and after storage differ more. In this case, the standard deviations in both statistical rows (SGI and SGL) differ more significantly. According to the theoretical predictions, the largest variation should be expected when the mean values of viability decrease to 50%. When more significant reduction in seed viability exists, this could affect the evaluation (Stoyanova 2001). One reason to keep the standard deviations within theoretical limits is to eliminate rare odd results. The described approach allows determination of the frequency of successful storage as well as illustrating the level of damage.

On the basis of the above discussion, different categories are defined using two statistical parameters, i.e. seed germination before storage (SGI) and seed germination after storage (SGL). The conditions for compatibility of data within the accession categories are based on the level of seed viability decline: "no change", "minimal change" and "significant decline" of seed viability.

Accessions maintaining the same germination rate or a slightly higher level are classified in the category "conserved with no change". This refers to accession groups where SGI=SGL or SGI<SGL. This category, like the other two, includes data sets with different tolerance for compatibility, because SGI-values vary from 100 to 85%, but SGL-values vary more. However, all of these cases are classified as stored with "no change". Accessions with seed viability reduction of about 10% are described as showing "minimal change". These two categories are considered as "successfully stored accessions". Situations strongly differing from the main results are included in the category "odd results". This approach allows the frequency of successful storage to be determined and the extent of damaged samples to be quantified. As described above, frequencies rather than mean values are used.

In several cases, the control test exceeded the initial seed germination. The relationship between seed dormancy and viability should be considered carefully, since prolonging longevity by immediate harvest of mature seeds and storage under low temperature is known to occur (Roberts 1965, 1984). However, experience at IPGR shows that if seeds are kept under genebank conditions directly after harvesting, this results in a higher proportion of dormant seeds than could otherwise be the case.

The frequency of seed accessions conserved without change in germination rate after 12 years is 0.77. The best results are observed when seed germination at the beginning is above 95%. In this case, no loss of accessions due to reduced germination rate is occurring.

Table 1. Data matrixes used for evaluation of peanut seeds (*Arachis hypogaea* L.) stored for 12 years in the Bulgarian genebank

Germination classes		No. of accessions	Frequency	Initial seed germination (SGI) (%)	Control test after storage (SGL) (%)
SGI*	**SGL****				
Total number of accessions		133	1.000	98.43±4.05	95.98±8.53
>97	>97	**86**	**0.64**	**100**	**99.69±0.72**
	95-97	**7**	**0.05**	**100**	**96**
	90-94	5	0.04	100	93.40±0.89
	85-89	2	0.015	100	86.00±1.00
	80-84	3	0.02	100	81.66±1.15
	<80	3***	0.02	100	68.33±7.57
95-97	>97	**7**	**0.05**	**96**	**99.42±0.97**
	95-97	**1**	**0.01**	**96**	**96**
	90-94	2	0.015	96	93.00±1.00
	85-89	1	0.01	96	86
	80-84	1	0.01	96	84
	<80	2***	0.015***	96	75.00±2.82
90-94	>94	**3‡**	**0.03**	**92**	**98.66±2.31**
	90-94	**1‡**	**0.01**	**92**	**94**
	85-89	-	-	-	-
	80-84	-	-	-	-
	<80	2***	0.015***	92	57.50±17.67
85-89	>89	**1‡**	**0.01**	**88.00±0.50**	**100**
	85-89	-	-	-	-
	80-84	1	0.01	88	84
	<80	-	-	-	-
80-84	>85	**3‡**	**0.02**	**80**	**89.66±4.04**
	80-84	**1**	**0.01**	**80**	**80**
	<80	-	-	-	-

The cases presented in bold (shaded cells) are evaluated as stored without change in the genebank.
The symbol (‡) indicated the cases when the result after 12 years of storage is better than germination at the beginning of storage.
* SGI = initial seed germination
** SGL = last seed germination (test after storage)
*** = odd results, when seed viability decline is significant

Viability monitoring

From a practical point of view, it is important to be able to predict the appropriate frequency of control tests in the genebank. The measure of seed longevity in this study is based on the sigma-value defining the period during which the percentage viability is reduced by one probit: e.g., from 84.1% to 50% viability as described by Hong *et al.* (1998). The sigma-value presented here was determined using statistically tested results (Table 2). Namely, only successfully stored seed accessions were considered, representing 95% of the tested accessions, while rare odd results were discarded. On the basis of this analysis, the predicted storability of peanut seeds in the genebank is calculated at 42.74 years. This is less than for other plant species. However, for leguminous seeds sigma-values lower than 100 years could be expected (Stoyanova 2001).

The prediction gives an indication for an easy and safe monitoring. For safety, the second control test for peanut seeds may be carried out one or two years earlier than the predicted storability time. To avoid reduced germination levels, predictions of the storability time should be analyzed by groups of accessions according to the conditions for data compatibility, as described above. All accessions preserved without change and with minimal changes are considered as "successfully stored".

Table 2. Germplasm storability of peanut seeds under real genebank conditions

A. Summary of experimental results			
		Seed accessions	**Frequency of the cases**
1	Number of evaluated accessions	133	1.00
2	Number of accessions stored without changes	103	0.78
3	Number of all successfully stored accessions	126	0.95
5	Rare occasions (odd results)	7	0.05
4	Reduced number of evaluated accessions	126	0.95
B. Effective results and prediction of storability			
1	Seed germination before storage (mean value ± standard deviation)	98.51± 4.03%	2.17 probits
2	Control test of seed viability after storage (mean value ± standard deviation)	97.07± 5.68%	1.89 probits
3	Storage time to the control test	4471.25 days	12.25 years
4	Viability equation based on practical data set: $v = K_{I-}(1/x).p$	*v = 2.172 – 0.0234.p*	*(r=0.999)*
5	Predicted $P_{84.10}$	18279.20 days	50.08 years
6	Predicted P_{50}	33879.30 days	92.82 years
7	Predicted storability – sigma σ	15600 days	42.74 years
8	Seed viability equation for monitoring of peanut storage life	*V = 1.027 – 0.00003.p*	*(r=0.992)*
9	Safe storage time - p_{10}	15158 days	41.52 years

p = time in storage, days or years
v = percentage seed viability, expressed as a probit
1/x = regression slope in the relationship between seed viability and storage time
sigma σ = seed viability constant
p_{10} = predicted time for reduction of seed viability by 10%
$P_{84.10}$ and P_{50} represent predicted time for reduction of viability to respectively 84.10% and 50%

Genetic integrity

Preservation of genetic integrity is important. A decrease in seed viability of 10% could induce genetic shifts in heterogeneous seed accessions (Stoyanova 1991, 1992, 1996). The safe storage time (P_{10}) as predicted for that change can be calculated using the viability equation proposed by Ellis and Roberts (1980). Using the equation for monitoring viability, the predicted safe storage time of peanut in the Sadovo genebank was calculated at 41.52 years, which allows an accurate definition of regeneration needs.

The next important item is the sample size for regeneration. The random loss of rare alleles directly relates to the effective population size. If a genotype is represented on average by less than one seed in a heterogeneous seed accession, it is practically eliminated from the sample (Stoyanova 1996, 1998). The effective size of a sample for regeneration can be described by a relation between predicted sample size (Ne) and the critical level (kcr) of the rare genotype composition:

$$Ne > 1/kcr$$

From a practical point of view this means more than 100 viable seeds, if the frequency of rare genotype in the sample is reduced to 0.01.

Seed storage protocols for Arachis hypogaea *L.*

The above-mentioned considerations allow suggesting a complete protocol for peanut germplasm storage, including standards for germination tests, seed drying, moisture control, storage and regeneration. The suggested protocol is indicated in Table 3.

Table 3. Suggested protocol for peanut germplasm storage

• How many seeds for genebank storage?	• 3000 to 5000 seeds per accession
• Seed germination rate before storage?	• At least 80%, preferred >90%
• Germination conditions?	• According to *Genebank Standards* (FAO/IPGRI) and ISTA rules
• How to dry seeds?	• In a drying chamber with 10-15% relative humidity, as seed moisture in dried seeds about 3 to 4.2% w.b.
• Seed moisture control?	• Oven methods of ISTA for reduced working samples (1 to 3 g per accession)
• Seed containers for genebank storage?	• Hermetically top-screw closed glass jars or vacuum PE/AL/PP-foil bags
• Frequency of control tests?	• First test after 10-15 years, next one according to the prediction
• How to limit seed damages in dry seeds?	• By pre-conditioning: 24 hours equilibration of seed containers at room temperature and re-humidification in a chamber (48 hours at relative humidity 90%) before the seeds are set to germinate
• When regeneration needs are suggested?	• If seed germination during storage is reduced by more than 10% or seed number per accession is lower than 1000 seeds
• How many seeds for regeneration?	• At least 100 viable seeds
• How to avoid genetic shifts?	• Using good genebank practice • Limiting regeneration needs • If multiplication is needed then use the rule of “effective sample size” • Keeping control of genetic integrity in regenerated seed accessions

Conclusions

Seeds of *Arachis hypogaea* L. survived at -18°C with low moisture content for more than 12 years but there is a difference in longevity between accessions. The frequency of seed accessions preserved without change is 0.77. The rate of change depends on the initial seed viability. Odd results can influence the mean viability values and their standard deviations in proportion to the number of accessions and the rate of change.

The predicted time of safe storage for peanut seeds is 42.51 years. The calculated storability coefficient (sigma-value) is 42.74 years. These values confirm a close relationship with seed life span described for other leguminous seeds.

The prediction gives an easy and safe way for monitoring genebank storage of *Arachis hypogaea* L. It allows preserving the germplasm integrity at the level of minimal change. On the basis of the results presented here, a seed storage protocol for *Arachis hypogaea* L. germplasm can be suggested.

References

Ellis, R.H. and E.H. Roberts. 1980. Improved equations for the prediction of seed longevity. Annals of Botany 45:13-30.

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

Grzelak, K., M. Czuba, J. Belotti, M. Tulo and M. Gorski. 1994. Viability of cereal seeds stored as germplasm in the Polish genebank. Plant Genetic Resources Newsletter 97:21-29.

Hong, T.D., S. Linington and R.H. Ellis. 1998. Compendium of information on seed storage behaviour. International Plant Genetic Resources Institute, Rome.

International Seed Testing Association (ISTA). 1985. International rules for seed testing. Seed Science and Technology 13:356–513.

Roberts, E.H. 1965. Dormancy in rice seeds. IV. Varietal responses to storage and germination temperatures. Journal of Experimental Botany 6(47):441-349.

Roberts, E.H. 1984. The meaning of viability. Pp. 146-178 *in* Seed Management Techniques for Genebanks (J.B. Dickie, S.H. Linington and J.T. Williams, eds). International Board for Plant Genetic Resources, Rome.

Roos, E.E. 1986. Precepts of successful seed storage. Pp. 1-25 *in* Physiology of seed deterioration (M.B. McDonald, Jr. and C.J. Nelson, eds). Spec. Publ. No. 11, Crop Science Society of America, Madison, WI, USA.

Roos, E.E. 1989. Long-term seed storage. Plant Breeding Reviews 7:129-158.

Roos, E.E. and Davidson, D.A. 1992. Record longevities of vegetable seeds in storage. Hort Science 27(5):393-396.

Specht, C.-E., E.R.J. Keller, U. Freytag, K. Hammer and A. Boerner. 1997. Survey of seed germinability after long-term storage in the Gatersleben genebank. Plant Genetic Resources Newsletter 111:64-68.

Specht, C.-E., U. Freytag, K. Hammer and A. Boerner. 1998. Survey of seed germinability after long-term storage in the Gatersleben geenebank (part 2). Plant Genetic Resources Newsletter 115:39-43.

Stoyanova, S.D. 1985. Technologia za dalgsrotchno sahranenie na semena v genbanka [Technology for long-term seed storage in genebank]. Rastenievadni nauki] XXII(10):6-12.

Stoyanova, S.D. 1991. Genetic shifts and variation induced by seed ageing. Seed Science and Technology 19:363-371.

Stoyanova, S.D. 1992. Effect of seed ageing and regeneration on the genetic composition of wheat. Seed Science and Technology 20:489-496.

Stoyanova, S.D. 1996. Variation of gliadins in wheat cultivars associated with seed survival and multiplication. Seed Science and Technology 24:115-126.

Stoyanova, S.D. 1998. *Ex situ* conservation and regeneration in the Bulgarian seed genebank. Pp. 10-16 *in* Regeneration of seed crops and their wild relatives (J.M.M. Engels and R. Ramanatha Rao, eds). Proceedings of a Consultation Meeting, 4-7 December 1995, ICRISAT, Hyderabad, India. International Plant Genetic Resources Institute, Rome, Italy.

Stoyanova, S.D. 2001. *Ex situ* conservation in the Bulgarian genebank: 1. Effect of storage. Plant Genetic Resources Newsletter 128:68-76.

Report on the status of *Arachis* genetic resources in Greece

Savas Kotzamanidis
Cereal Institute, Thessaloniki, Greece

Arachis hypogaea has been grown in Greece since 1915. It thrives in a limited range of low fertility sandy soils under irrigation. It enriches these soils with nitrogen and is probably the most suitable crop for such areas. Breeding of *Arachis* started in Greece in 1962 with increased yield as the main target. Initially, a breeding programme was established, consisting of 100 pedigree trials distributed over 20 promising areas for the evaluation of local and introduced germplasm and their crosses. This work lasted until 1985. From 1986, a new crossing methodology was adopted with crosses made in the greenhouse, to accelerate the breeding process and subsequent pedigree selection. As a result, a range of new improved Greek varieties was released to meet the internal production needs.

Selection in *Arachis* is cumbersome, since the breeder cannot make visual scoring and assessment for yield and quality in the trial fields, due to the fact that the relevant part of the plant, the seed, is buried in the soil. Therefore, the selection process has four stages: two in the field to select for the botanical type and for yield and other agronomic characteristics at harvest; two other steps in the laboratory for qualitative and quantitative characters of the pods and seeds. Finally, chemical analysis for oil and protein content is carried out.

The Greek *Arachis* germplasm has been characterized according to the IPGRI descriptor list.

Parallel experiments for breeding were carried out on the effect of N-fertilization and N-fixing bacteria on the yield and quality of the crop, as well as on the inoculation of the seeds with N-fixing bacteria. Another line of breeding work was targeted on the study and control of a number of important diseases.

References

Kotzamanidis, S. 1989. Research in *Arachis hypogaea*. Veltiotika Bul. 4:54-58.

Kotzamanidis, S. 1994. Description and evaluation of the Greek collection of peanuts varieties (*Arachis hypogaea* L.). Journal of Agricultural Research 18:49-58.

Kotzamanidis, S. and N. Stavropoulos. 1997. Characterization and preliminary evaluation of Greek groundnut (*Arachis hypogaea* L.) germplasm for earliness, high pod concentration and synchronized maturity. Agricoltura Mediterranea 127:1-7.

Kotzamanidis, S. and N. Stavropoulos. 1999. Characterization of Greek groundnut (*Arachis hypogaea* L.) germplasm and evaluation for tolerance to waterlogging. Agricoltura Mediterranea 129:36-44.

Status of the groundnut collection in Hungary

Lajos Horváth and Attila Simon
Institute for Agrobotany (ABI), Tápiószele, Hungary

History

The groundnut (*Arachis hypogaea* L.) is a new crop to Hungarian agriculture. Its history here began at the turn of the nineteenth-twentieth centuries. Since then – although the tonnage grown has never been large – the species is often found in arable lands and especially in the gardens of the country.

The initiative of establishing a Hungarian groundnut collection was taken at the Institute for Agrobotany (ABI) in Tápiószele at the end of the 1970s. ABI belongs to the Ministry of Agriculture and Rural Development, and beside some other national and international genebank duties, it is responsible for the development and maintenance of the Hungarian field crop and vegetable genetic resources collection.

Status

Since its establishment the ABI groundnut collection has been under continuous development but, as shown in Fig. 1, the largest increase took place in the first years. The main tools for this were postal seed exchanges, but also some collecting activity was undertaken. The ABI *Arachis* collection currently consists of 71 genebank accessions. Most of them (55 accessions) are of foreign or unknown origin (Fig. 2), and from the remaining 16 Hungarian accessions, 12 inland accessions may be regarded as not too old, but well adapted ecotypes. Hungary, with its fairly continental climate, is on the northern border of the world groundnut-growing area. Therefore the germplasm which has become acclimatized here may be of great importance for breeding. In its present state, the collection does not contain any genetic resources of the wild groundnut relatives.

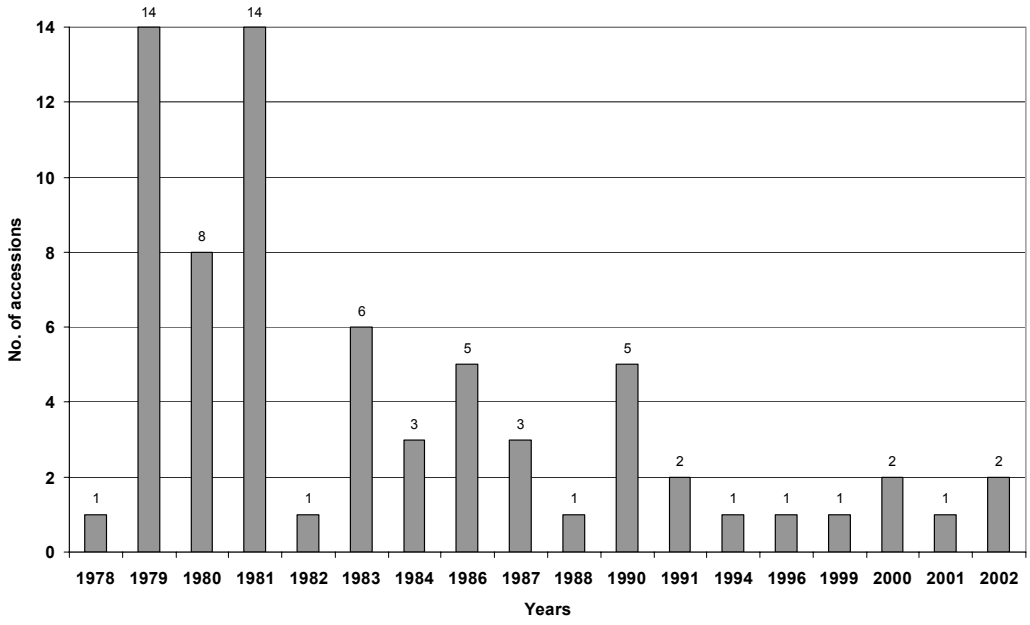

Fig. 1. The yearly increase of the ABI groundnut collection.

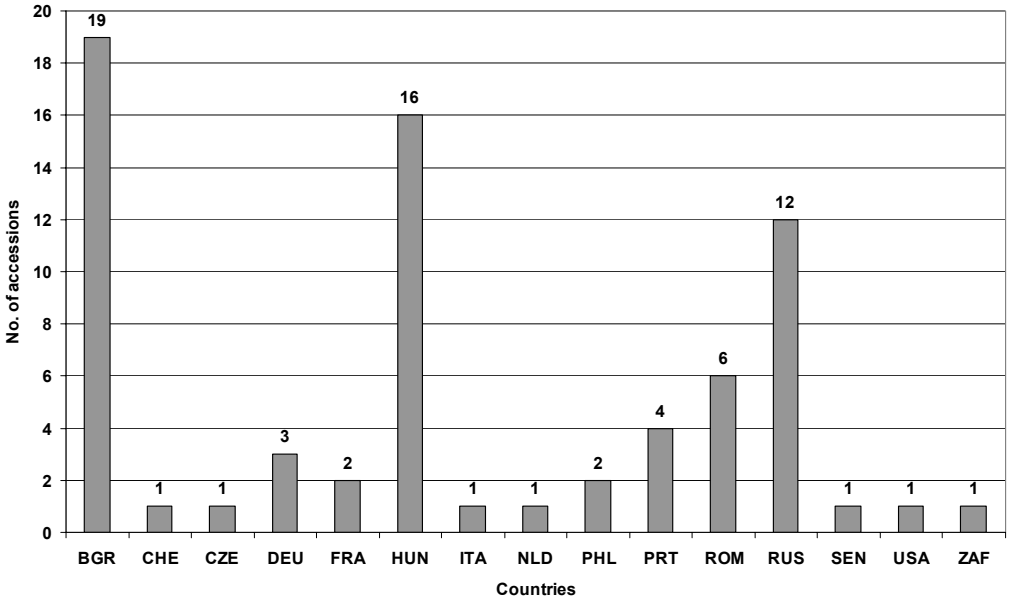

Fig. 2. The distribution of the ABI groundnut collection by donor countries.

Conservation management and standards

Since its establishment the collection has been maintained and managed in accordance with international genebank standards. After drying to 7% of moisture content, the seed samples are stored in airtight jars in the active and base collection chambers of the ABI. The storage temperature is 0°C in the active, and -20°C in the base collection chambers.

Characterization and evaluation activities

A list of 56 descriptors is used for the characterization of groundnut accessions. Most descriptors were elaborated from the IPGRI *Arachis* descriptors (IBPGR and ICRISAT 1992), and the norms used for scoring and coding descriptors are also in accordance with international standards. The characterization and evaluation are done together with the yearly multiplication activity; therefore about 10–15 accessions are characterized in a growing season. Table 1 shows some examples of the practical use of this descriptor list.

Yield data included in Table 1 are the results of a field experiment with 4 replications in medium-large plots. This type of field trial is carried out occasionally, depending on the resources of ABI.

Table 1. Evaluation of some characters on 7 *Arachis* genebank accessions following the ABI descriptor list

Accession identity number	Country of origin	Stem pigment		Growth habit		Leaflet length (mm	Leaflet tip shape		Corolla colour		Legume yield (t/ha)
		state	code	state	code		state	code	state	code	
1052/91	ROM	absent	1	erect	6	75	obtuse	5	yellow	5	1.31
5418/87	HUN	present	9	erect	6	70	acuminate	1	orange	9	1.12
0394/91	CHE	absent	1	erect	6	71	acuminate	1	yellow	5	1.19
2819/00	HUN	absent	1	erect	6	60	acuminate	1	yellow	5	1.24
3018/00	FRA	absent	1	procumbent	1	43	acuminate	1	orange	9	1.62
5488/02	HUN	present	9	erect	6	68	acuminate	1	orange	9	1.35
5489/02	HUN	present	9	procumbent	1	72	acuminate	1	orange	9	1.23

Status of documentation

The data management (passport, characterization and genebank management data) is fully computerized. ABI relies on its own passport data structure with dBase, but it is easily convertible into the FAO/IPGRI *Multi-crop Passport Descriptor* list. As shown in Fig. 3, coverage of some data-fields is low in some cases. The ABI groundnut database can also be found in the Hungarian National Inventory at the IPGRI-ECP/GR European Plant Genetic Resources Catalogue, called EURISCO (http://eurisco.ecpgr.org/).

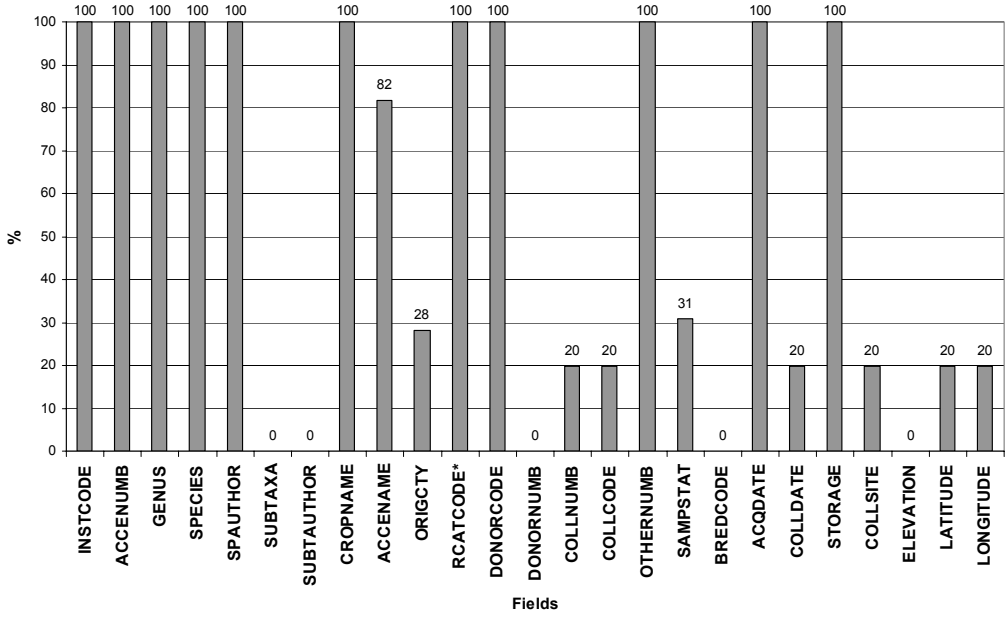

Fig. 3. Level of data coverage in the ABI groundnut database.

Reference

IBPGR and ICRISAT. 1992. Descriptors for groundnut. International Board for Plant Genetic Resources, Rome, Italy/International Crop Research Institute for the Semi-Arid Tropics, Patancheru, India.

Short note on peanut genetic resources in Israel

Amram Ashri
Hebrew University of Jerusalem, Rehovot, Israel

Peanuts are grown in Israel mainly for the local and export confectionery markets; they are consumed mainly roasted (shelled or unshelled) or in sweets. There is no oil extraction from locally produced materials. For that reason the varieties grown are large-kernel ones, of the Virginia type, and these are the main focus of interest; in the past there was some interest in varieties of the Spanish and Valencia type.

The Israel Gene Bank (located at the Volcani Center) maintains in storage 20 accessions of *Arachis hypogaea*, originating from India (4), Israel (2), South Africa (9) and USA (5).

A working collection is used in the breeding programme and this is subject to change from season to season. No wild *Arachis* species are maintained in the collection.

Short note on peanut genetic resources in Morocco

Mohammed Sadiki
Hassan II Institute of Agronomy and Veterinary Medicine, (IAV Hassan II), Rabat, Morocco

Peanut crop

The peanut crop (*Arachis hypogaea*) was introduced into Morocco during the Spanish occupation in the early 1900s. It is currently cultivated mainly in the northwest of the country as summer crop under irrigation. The sowing dates range from 15 April to 15 June. The annual area cropped to peanut totals on average 10 000 ha. It is grown on sandy soils. The yields are limited and only rarely reach 25 q/ha. The number of farmers producing peanuts is estimated at 3500. A very limited number of genotypes is used in cultivation. Seeds are non-certified and produced by the farmers themselves in the majority of the cases. Most of the peanuts produced are large-seeded and consumed as grains.

Genetic resources

The Moroccan peanut collection consists of around 700 accessions, of which 350 are characterized on-station for morphological traits. More than 100 have been evaluated for agronomic traits and adaptation to different cropping systems in the production area. 230 accessions have been screened for cercospora leaf spot. Grain analysis for oil and protein content is underway and should be completed by the end of February 2003. Most accessions are local, collected over the last 15 years from farmers' fields. Other accessions have been introduced over the last 10 years from Senegal, Sudan and India. Regeneration of the accessions is carried out every 3 years and is coupled with morphological characterization.

Short note on peanut genetic resources in Portugal

Isabel Maria Duarte
Estação Nacional de Melhoramento de Plantas (ENMP), Elvas, Portugal

Four accessions of *Arachis* are conserved at the Banco Português de Germoplasma Vegetetal, Braga. For further details, it is possible to contact the head of the genebank, Ana Maria Barata (bpgv@draedm.min-agricultura.pt).

Peanut genetic resources in Romania

Milica Dima
Central Plant Research Station (SCDCPN), Dăbuleni, Romania

Germplasm collection

The Central Plant Research Station, Dăbuleni (SCDCPN) is the only institution maintaining an *Arachis* collection in Romania and still carrying out an *Arachis* breeding programme. The collection at Dăbuleni contains varieties of foreign origin (Argentina, Bulgaria, Brazil, China, Israel and Turkey) and local breeding lines (T55, T58, T232, etc.).

The following varieties are maintained: 'Dăbuleni', 'Brazilian Begici', 'Blaco Santa Fe', 'Velican', 'Timpurii de China', 'HYY-1', 'HYY-2', 'HYY-3', 'Shulamith', 'Tâmbureşti', 'Tatu', 'Mogiana', 'Turceşti', 'Sadovo 2609', 'Olega', 'Viorica', 'Provenienţă China 1', 'Provenienţă China 2', 'Ning', 'Henen Province' and 'Provenienţă Turcia'.

The Chinese varieties, characterized by large seeds, are considered to have a great production potential and earliness (80 days). They have big seeds, compared to the reference Romanian variety 'Tâmbureşti'.

Germplasm is stored as pods, with seed moisture less than 10%. This way, loss caused by *Plodia interpunctella* is reduced. The rooms for storage of the pods are well aerated and the relative humidity is kept below 50%. Pods are kept exposed to the air or in hemp bags at room temperature.

Early experiments with peanut cultivation in Romania

The sandy soils in the south of Oltenia are favourable for peanut cultivation, which was tested in Romania for the first time at Valul lui Traian Experimental Station by the Romanian Farming Researches Institute.

The first peanut cultivation research in Romania consisted of testing foreign peanut varieties with different growing periods, obtained from warm countries, but they proved to be unsuitable for cultivation in local conditions.

Therefore, it was necessary to breed new and adapted types. Breeders started in 1974 with individual selections from a germplasm source derived from the Tâmbureşti peanut population, which was obtained by mutagenesis from 'Jelud', 'Velican' and 'Braziliene' varieties. A great number of lines were obtained at the Experiment Didactic Station (SDE) in Tâmbureşti and in particular a remarkable line, T227, which was registered in 1983 with the name 'Tâmbureşti'.

Current peanut breeding

At SCDCPN-Dăbuleni research on peanut cultivation on sandy soils started in 1986 and it was shown that the many varieties and lines under trial were giving yields higher than the world average (1000 kg pods/ha).

The breeding programme, started at Dăbuleni in 1988, and still in progress, had the main objective of obtaining more productive genotypes with a short growing period, drought and disease resistance and good potential for mechanization. All varieties and lines are compared with the Romanian standard variety 'Tâmbureşti'.

Characters evaluated were the following:

1. Growth period, based on the time to develop the first flower;
2. Number of mature pods at time of harvest;
3. Yield, based on the weight of dry pods per plant;
4. Grain quality, based on chemical analyses for protein and oil content;

5. Resistance to diseases and abiotic stresses, which is assessed during growth; and
6. Grain germination rate in the soil before harvesting, which is scored at harvest time.

Two new varieties with favourable characteristics were released in 1997: 'Dăbuleni' and 'Viorica'. They have the following characteristics:

- growth period: 130-140 days
- growth habit: erect
- number of branches/plant: 4.4 – 5.1
- grain colour: pink
- protein content: 35.1 – 34.4%
- shelling percentage: 72 - 74%
- yield: 2800-2880kg/ha
- recommended for consumption as grains.

Many more peanut lines have been obtained by selection, most of them with special characters, and these were introduced into the network of the State Institute for Variety Testing and Registration (ISTIS). A hybridization programme at SCDCPN-Dăbuleni has obtained numerous new combinations, from which new genotypes are being selected, mainly for a short growth period.

All accessions are characterized for a set of 15 traits:

1. days between sowing and emergence
2. uniformity of emergence
3. days between emergence and blossoming
4. height of main stem
5. number of branches per plant
6. number of mature pods per plant
7. number of seeds per pod
8. pod length
9. pod width
10. 1000 pod-weight
11. seed length
12. seed width
13. 1000 seed-weight
14. shelling percentage; and
15. dry pod yield.

Status of the *Arachis* collection in Russia

Oxana O. Dzyuba
N.I. Vavilov Research Institute of Plant Industry (VIR), St. Petersburg, Russian Federation

The groundnut, which was brought to Russia from Turkey, has been known in Russia since 1792. The first experience of cultivating this crop in the North Caucasus region in southern Russia dates back to the mid-19th century.

Composition of the collection

The Russian *Arachis* collection was founded by N.I. Vavilov in 1926. At present, the base collection held in the Vavilov Institute consists of 1787 accessions of *Arachis hypogaea* L. and 1 accession of *Arachis monticola* Krap. et Rig. During almost 75 years, groundnut seed samples have been obtained through exchange with breeders and collecting missions from all over the world. The collection covers the whole area of groundnut distribution (Table 1).

Table 1. Origin of *Arachis* accessions in the VIR collection

Continent	No. of accessions
Africa	778
Asia	566
America	255
Europe	187
Australia	2
Total	**1788**

A part of the collection (9%) is formed of accessions originating from Russia and from seven former Soviet Union republics. Additionally, *Arachis* genetic material from 76 foreign countries was included in the collection. The largest number of accessions was obtained from Senegal (12%), India (12%), Vietnam (9%), Uganda (6%) and the USA (5%). There are also 30 samples, which were personally collected by N.I. Vavilov. The largest number of samples was collected in the 1980s (Table 2).

Table 2. Introduction of *Arachis* into VIR collection

Collection period	No. of accessions
1926-1930	107
1931-1940	117
1941-1950	6
1951-1960	217
1961-1970	249
1971-1980	277
1981-1990	598
1991-2000	217

The collection currently holds old (29%) and advanced (9%) cultivars, landraces (40%) and breeding material (22%).

227 herbarium specimens of *Arachis* have been kept in the VIR Herbarium since 1928.

The Russian *Arachis* collection is subdivided into two parts: the main part (96%) consists of the base (permanent) collection, while a smaller portion is the temporary (introduction) collection. The base collection contains material with a sufficient quantity of seeds. The temporary collection contains accessions with a small amount of seeds. After multiplication, these accessions will also be included in the base collection.

Maintenance and conservation

The collection is regenerated in an agroecological environment which is suitable for this crop, at the VIR experimental station located in the south of Russia.

The *Arachis* seeds are sown directly in the soil without isolation of individual accessions, since it is a self-pollinating crop. The seeds are spaced at 0.15 m, with 0.7 m between the rows.

The *Arachis* working collection is maintained at VIR in aluminium boxes at room temperature and is used for the Russian breeding programme.

A large part of the base collection (976 accessions) is preserved in the National Seed Storage in Krasnodar region since 1975. The seed samples, dried to 8-9% moisture, are stored at +4°C in hermetically sealed glass jars (200 seeds per accession). 398 additional accessions of the base collection have been conserved in St. Petersburg since 1996. These samples are dried to 3-4% moisture content and stored at -10°C in air-tight aluminium foil bags (less than 50 seeds per accession). A few more accessions belonging to the base collection (342) and the temporary collection (72 accessions) are conserved at room temperature at VIR. Part of the base collection (101 accessions) has been duplicated in the All-Russian Research Institute of Oil Crops in Krasnodar, where it is stored in aluminium boxes at room temperature and is used for the Russian breeding programme and for germplasm exchanges.

Passport data (10 fields) of all accessions from the base collection are stored in dBaseIV format. The database with conservation management data is complete and contains 13 fields.

Characterization and evaluation

All material in the collection is subject to preliminary characterization in the quarantine nurseries belonging to VIR.

The collection covers a wide range of diversity. Every year a part of the *Arachis* collection is sown, characterized and evaluated. Some data are also recorded during multiplication. The experimental results are presented in annual reports.

Since 1965, 643 samples have been evaluated for 40-43 characters, including morphological traits, agronomic traits, disease resistance and biochemical characters (protein and oil content, oil fatty acid profile, etc.). Evaluation is carried out over three years, in collaboration with research laboratories of the Vavilov Institute and Russian breeding centres. Evaluation data have been partly computerized, while much of characterization data is still recorded manually.

Utilization

The accessions are sent to users (breeders, scientists) upon request. Users are supplied with 20 seeds and passport data on the requested material. Additional data are provided upon request. Every year, about 100 seed samples of the *Arachis* collection are distributed to the national breeding programme and foreign users. All *Arachis* varieties in Russia and the former Soviet Union republics have been bred from the accessions preserved in the VIR collection.

The Vavilov Institute publishes for breeders a series of "Catalogues" of evaluated accessions (in Russian).

Future activities planned

- Increasing the size of the collection under long-term conservation
- Updating passport data
- Developing the evaluation data documentation
- Continued search for sources of valuable traits for breeders.

Groundnut in Turkey

Nevin Açikgöz
Aegean Agricultural Research Institute (AARI), Menemen-İzmir, Turkey

Introduction

In contrast to most of the legumes, Turkey is not the centre of origin or diversity for *Arachis*. It is not clear how groundnut was introduced into the country, but it is assumed that the local people who went to Hicaz brought groundnuts back with them in the period 1890-1900. The other hypothesis is that it was brought to southern provinces through North Africa, Selanik and İzmir. Commercial production of groundnut started between 1930 and 1935. Since then, the cultivated area has gradually expanded.

Although groundnut is one of the major oil crops in the world, it is not used as an oil crop in Turkey due to the high cost associated with oil production. Almost the entire production is used for internal consumption as a snack.

Growing areas

During the last five years groundnut production has decreased from 82 000 tons to 72 000 tons (Table 1). Groundnut is grown in the irrigated coastal plain of the Mediterranean and Aegean regions. Osmaniye, Adana, Mersin, Hatay, Antalya and Aydın provinces provide approximately 95% of the production (Table 2).

Table 1. Groundnut area sown, production and yield (1997-2001)

Years	Growing area (ha)	Production (tons)	Yield (kg/ha)
1997	32000	82000	2563
1998	35000	90000	2571
1999	28000	75000	2679
2000	28300	78000	2756
2001	-	72000	-

Table 2. Groundnut production by province (1997)

Provinces	Growing area (ha)	Production (tons)	Yield (kg/ha)
Osmaniye	10345	27790	2686
Adana	8836	26252	2971
Mersin	6030	9997	1658
Hatay	997	4275	4288
Aydın	1432	3726	2602
Kahramanmaraş	1303	3373	2589
Muğla	1189	2946	2478
Antalya	1460	1825	2664
Isparta	294	744	2531
Karaman	51	117	2294
Çanakkale	25	66	2640
Balıkesir	22	23	1045
Manisa	9	14	1556
Burdur	7	13	1857
Total	32000	82000	

Groundnut research activities in Turkey

Up to 1981 a few research projects were conducted on groundnut. Extensive research activities started with the "Second National Crop Research and Extension Project" in 1981. Research findings revealed promising varieties and some suitable agronomic applications for the regions.

In the Aegean region planting should be done before May for satisfactory yield. The most suitable planting time was found to be 10-30 April and 20 April–10 May for snack and oil types of groundnut respectively. Neither the oil nor the snack type varieties stand a chance as a second crop in the Aegean region.

The Mediterranean Agricultural Research Institute is the main institute to carry research on groundnut at present. Certified seed multiplication is also done by this institute.

Additional research is being conducted to determine the suitable varieties and growing techniques for southeastern Anatolia under the framework of the "Southeastern Anatolia Project".

Registered groundnut varieties in Turkey

Registered groundnut varieties and their characteristics are given in Tables 3 and 4 respectively.

Table 3. Registered groundnut varieties

Varieties	Registration date	Institute
ÇOM	28.04.1986	Second Crop Research and Extension Project
Gazipaşa	28.04.1986	"
Florispan	28.04.1986	"
NC-7	30.04.1991	Mediterranean Agr. Res. Inst.
Ant 92-1	Not registered yet	"

Table 4. Characteristics of the registered groundnut varieties

Characteristics	Varieties			
	ÇOM	Gazipaşa	NC-7	Ant 92-1
Days to maturity	140-160	140-160	140-160	140-160
Number of pods /plant	33-35	33-35	35-37	35-36
1000-seed weight	700-800	700-800	900-950	750-800
Oil (%)	47-52	47-52	50-52	50-52
Yield (kg/ha)	3000-3500	3000-3500	3500-4000	3000-3500

Groundnut accessions in the AARI Genebank

There are only 4 accessions in existence in the AARI Genebank. Their passport data are given in Table 5.

Table 5. Accessions conserved at AARI genebank

Accession number	TR42674	TR48925	TR48926	TR48927
Accession name		Çom	Gazipaşa	Florispan
Scientific name	*A. hypogaea*	*A. hypogaea*	*A. hypogaea*	*A. hypogaea*
Acquisition date	1980	1988	1988	1988
Collecting province	Tekirdağ	-	-	-
Altitude	170			

Storage status at the AARI Gene Bank

As a principle the AARI Gene Bank only stored landraces and registered varieties - not breeders' working samples. There are some storage difficulties due to the oil content and the anatomy of the kernel (orthodox). Careful drying for seed moisture content and careful threshing is necessary to avoid mechanical damage (seed injury).

Since the groundnut has an innate seed dormancy, dormancy breaking treatments should be applied, such as application of ethephon ($5x10^{-4}$ M), which is successfully used to promote seed germination in field sowing during regeneration, together with ethylene.

Seeds require 100% oxygen in the germination environment.

APPENDICES

Appendix I. Methodology for testing and description of accessions for the establishment of a database

Stanko Georgiev
Institute for Plant Genetic Resources "K. Malkov" (IPGR), Sadovo, Bulgaria

In order to have comparable and useful data in the "European *Arachis* database", they need to be obtained using the same methodology by all the member countries of ECP/GR. It is therefore necessary to discuss and agree on a standardized methodology for testing and describing the accessions. On the basis of the experience and practice of IPGR-Sadovo, the following methodology is proposed for discussion and possible generalized adoption.

Observation and description of the accessions in the quarantine sector

- When no information is available on a given accession, whether it is a variety or a population, and in order to establish its taxonomic status, seed traits (colour, shape and size) should be recorded before sowing. If clear differences are present within the accession, it should be split into sub-accessions receiving the same accession number, followed by different letters (a, b, c, etc.).

- All new accessions, regardless their number of seeds, are sown in the first year in a quarantine sector for multiplication and detection of quarantine diseases and pests.

- Sowing is done under the optimum conditions for the given country, with 70 cm between rows, 20–30 cm between seeds within the row, planting 1 seed at each hill.

- Phenological observations are made on all plants to detect diseases and pests requiring quarantine control. The reproductive organs are checked to determine the taxonomic status of the accessions, whether they belong to subsp. *hypogaea* (Virginia and Runner type) or subsp. *fastigiata* (Valencia and Spanish type). Accessions where the number of deviating plants is more than 10% of the total should be discarded.

  In case the accession is a population, consisting of taxonomically different plants in approximately equal proportions, uniform groups of plants should be separately collected and stored as sub-accessions with the same accession number and named alphabetically (a, b, c...). The phenological observations to establish the starting dates of the various stages of development and the length of the growing period are made on 10 previously marked plants.

- Morphological characters and those parameters that vary slightly under the influence of the environment are recorded only once using biometric measurements on 5 plants. Such characters are: colour, shape and size of leaves (observations are made on 10 leaves taken from 4-5 nodes of the central stem); colour of flowers (by sight, using the rainbow colours); number and percentage of fruits with 1, 2, 3, 4 and 5 seeds; fruit shape and size.

Testing under field conditions – comparative field trial

- All accessions, in the second year following the quarantine control, are tested and multiplied under field conditions for 3 years in order to determine their biological and agronomic traits. The data obtained are processed and computerized and the seeds handed over to the genebank for long-term storage.

- Due to the large differences in the growing period and ripening time, all accessions in the field testing are sown in separate variety trials for each taxonomic group.

- One or two local varieties in each subspecies should be used as controls for comparison if they are commonly grown in the country. When testing small numbers of accessions, common field testing methods can be used (non-standard or standard). Large numbers of accessions can be sown in beds with control varieties between every 10 accessions.

- Each accession being multiplied is sown in a field trial in 2 rows of 10 meters, with 4 replications. Plants are spaced 70 cm x 10 cm x 1 seed, on 14 m^2 plots, requiring a total of 800 seeds for each trial (200 per replication). If there is not enough seed available for sowing, accessions are combined into groups according to the number of the seeds obtained from the multiplication and they are sown in separate groups of variety trials with various numbers of seeds and replications. The minimum number of plants for each accession to carry out significant observations should be 100. In this case, seeds are sown in one row, 10 m long or in beds of 2 m, with 4 replications needing 25 seeds each, at the same spacing, regardless their botanical type.

- All plants of the first replication are observed for diseases and pests. On 10 previously marked plants, phenological observations are carried out to determine the stages of development: 50% germination; 50% beginning of flowering; 50% beginning of fruit formation; 50% beginning of maturity; complete botanic maturity of the seeds; the intervals between developmental phases are measured in days. Leaf disease incidence is scored from 0 to 5, corresponding to different percentages of infection of the leaf surface (Table 1 and Fig. 1).

Table 1. Scale for disease infection

Score	Range of infection as % of leaf surface (*)
0	Resistant (healthy)
1	1–5
2	6–25
3	26–50
4	51–75
5	76–100

(*) see Figs. 1a to 1f

The level of attack by *Fusarium* sp. and *Verticillium* sp. is determined as % of plants affected of the total number in the plot.

- To assess the response of each accession to fungal infection under natural conditions, in the quarantine sector as well as under field conditions, fungicides are not applied during the growing period.

Fig. 1. Scale for report of leaf spot disease infection (range of infection as % of leaf surface)

1a. Score 0 = Resistant

1b. Score 1 = 1-5%

1c. Score 2 = 6-25%

1d. Score 3 = 26-50%

1e. Score 4 = 51-75%

1f. Score 5 = 76-100 %

- Lime-induced iron chlorosis is scored according to the method of Gorbanov and Georgiev (1992) (Table 2 and Fig. 2).

Table 2. Scale for report of lime-induced iron chlorosis

Symbol	**Degree of resistance**	
RR	Resistant	No visible sign of susceptibility (Fig. 2a)
RS	Semi-resistant	Light yellowing of leaves without stress during growth and plant development (Fig. 2b)
SS	Susceptible	Leaves completely yellow with necrotic spots and yield decrease up to 15% (Fig. 2c)
SSS	Highly susceptible	Highly susceptible. Leaves completely yellow with strong necrotic spots and yield decrease over 15-50% (Fig. 2d)

Fig. 2. Scale for level of attack by lime-induced iron chlorosis

2a. RR = Resistant

2b. RS = Semi-resistant

2c. SS = Susceptible

2d. SSS = Highly susceptible

- To evaluate other morphological, biological and agronomic traits, which are strongly affected by the environmental conditions, it is possible to use 20-25 plants from the first replication or 5 plants in each of 4 replications. The following traits are scored:
  - height of the bush (the height of the central stem)
  - width of the bush
  - index of uprightness of the bush (the ratio of the width to the height)
  - total number of side branches of the 1st, 2nd and 3rd order
  - number of pegs
  - total number and weight of the fruits (including fruits with mature and immature seed)
  - number and weight of fruits with mature seeds
  - number and weight of fruits with immature seeds
  - attack by diseases (number of attacked fruits with mature seeds and number of attacked fruits with immature seeds)

  All peanut plants are uprooted for biometric measurements 1-2 days before shelling. The plants need to be analyzed no more than 2-3 days after collecting, since the seeds quickly change colour from light to the darker (typical colour) of the matured seeds. If it is not possible to analyze the plants for 2-3 days, they should be stored in a greenhouse and processed after complete drying of the fruit and seeds to 12% moisture.

  The biological maturity of the seeds is established by the black colouring of the sclerenchyma layer of the fruit shell. The plants from the 2nd, 3rd and 4th replication are collected for determination of the plot yield in kg and in kg per hectare. Fruit production data from the 1st replication are considered together with data from biometric measurements of the other replications.

- The plants of Virginia and Runner types are stored and processed in a greenhouse due to their late ripening and harvesting time, which is, in Bulgarian conditions, at the end of October or the middle of November, before the first frost and winter rainfall.

- The varieties' reaction to the tuber *Rhizobium* bacteria is determined by the number and the weight of the root tubers or in the laboratory by determination of the nitrogen-fixing activity.

Laboratory investigations

- The percentage by weight of fruits with mature seeds or immature seeds is determined by manual sorting of samples averaging 5 kg. For example if the weight of the fruits with mature seeds is 4 kg, the percentage is 80 (4 x100/5 = 80).

- The yield of seeds, i.e. the weight of the kernels as a percentage of the total weight of the fruits with seeds is measured in two samples of 2 kg of pods with mature seeds.

- The weight of 1000 seeds in g is measured in two average samples of 250 seeds for each variety.

- The percentage of fat and protein in the seed is determined according to the approved laboratory methods and the available equipment, and is reported together with its error.

- The description of the accessions on the basis of the overall expression of different traits is carried out by considering the combination of a specific number of traits and parameters that needs to be agreed in advance.

- A complete complex quantitative assessment of the accessions is made through a 100-point system, developed by Georgiev (1988).

- The plants from all accessions in the quarantine sector and the field trials are grown under the same conditions and the most suitable agronomic standards for each country.

References

Georgiev, S. 1988. Agrobiologitchno i technologitchno prouchvane na taksonomichnite raznovidnosti na fastatsi ot vida *A. hypogaea* L. pri usloviyata na Tsentralna Yujna Bulgaria [Agrobiological and technological studies on groundnut taxonomical variability of the species *Arachis hypogaea* L. under conditions of Central Southern Bulgaria]. Doctor of Science Thesis, Sofia.

Gorbanov, S. and S. Georgiev. 1992. A study of the degree of resistance of groundnuts to carbonate chlorosis. Soil Agro-chemistry and Ecology 27(2):24- 30.

Appendix II. Minimum Descriptor List for *Arachis*

The list contains the characterization descriptors selected by the meeting as priority for inclusion into the European *Arachis* Database, further modified and agreed after consultation with other world *Arachis* experts and IPGRI.

(1) Plant growth habit

1 Prostrate (or procumbent)
3 Semi-erect (or decumbent)
5 Erect

(2) Main stem growth habit

(For prostrate varieties only)
1 Prostrate
2 Erect

(3) Branching pattern

1 Alternate
2 Sequential
3 Irregular with flowers on main stem
4 Irregular without flowers on main stem

(4) Days to maturity

(Recorded from the date of emergence and when more than 75% of the pods in a plant are mature)
1 < 90
2 91 - 100
3 101 - 110
4 111 - 120
5 121 - 130
6 131- 140
7 141 - 150
8 151 - 160
9 > 160

(5) Days to 50% flowering

(From emergence)
1 15 – 20
2 21 - 25
3 26 – 30
4 31 - 35
5 36 – 40
6 > 40

(6) Number of seeds per pod

1 2-1
2 2-3-1/2-1-3
3 3-2-1/3-1-2
4 2-3-4-1/2-4-3-1/2-3-1-4/2-4-1-3/2-1-3-4/2-1-4-3-5/3-2-4-1/3-2-1-4
5 3-4-2-1/3-4-1-2
6 4-3-2-1/4-2-3-1
7 4-3-1-2/4-2-1-3
8 3- or 4-seeded with occasional 5-seeded pods
99 Other (specify)

(7) Seed colour

1 Monochrome
2 Variegated

(8) Primary seed colour

(Primary or major colour of seeds recorded within one month of harvest after complete drying on mature, wrinkle-free seeds. Standard colour codes from the Royal Horticultural Society (RHS) Colour Chart are given in parentheses beside descriptor states)

1 White (white group 155B)
2 Off-white (yellow-white group 158A)
3 Yellow (yellow group 8C)
4 Very pale tan (yellow-orange group 27C)
5 Pale tan (yellow-orange group 27A)
6 Light tan (greyed-orange group 173D)
7 Tan (greyed-orange group 174D)
8 Dark tan (greyed-orange group 172D)
9 Greyed orange (greyed-orange group 176B)
10 Rose (greyed-red group 181C)
11 Salmon (greyed-red group 179D)
12 Light red (greyed-red group 180D)
13 Red (greyed-red group 181A)
14 Dark red (greyed-red group 178A)
15 Purplish red/reddish purple (greyed-purple group 187A)
16 Light purple (red-purple group 59A)
17 Purple (purple group 79B)
18 Dark purple (purple group 79A)
19 Very dark purple (blackish) (black group 202A)
99 Other (specify)

(9) Secondary seed colour

(Secondary or minor colour on variegated seeds. Variegation types should be designated using the states below singly or in combination, using the colour states as for the Primary seed colour, e.g. 7/3 = secondary colour is tan (174D) and is striped. RHS colour codes should be given in parentheses beside descriptor states by the evaluator)

1 Blotched
2 Flecks of colour
3 Striped
4 Tipped at the embryo end
5 Obscure or hazy
99 Other (specify)

(10) 100-seed weight [g]

Weight of 100 random, mature, wrinkle-free seeds

Appendix III. Abbreviations and acronyms

AARI	Aegean Agricultural Research Institute, Menemen-İzmir, Turkey
ABI	Institute for Agrobotany, Tápiószele, Hungary
CCDB	Central Crop Database
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks
EPGRIS	Establishment of a Plant Genetic Resources Infra-Structure
EURISCO	European Internet Search Catalogue
FAO	Food and Agriculture Organization of the United Nations
IPGR	Institute for Plant Genetic Resources "K. Malkov", Sadovo, Bulgaria
VIR	N.I. Vavilov Research Institute of Plant Industry, St. Petersburg, Russian Federation

Appendix IV. Agenda

ECP/GR ad hoc *meeting on* Arachis *genetic resources*
15-16 November 2002, Plovdiv, Bulgaria

Thursday 14 November

Arrival of participants at Sofia airport and transport to the Trimontium Princess Hotel at Plovdiv.

19:30 Dinner at the hotel

Friday 15 November

9:00	Opening of the meeting (*Rada Koeva, Leader of the Genetic resources programme and Director of IPGR-Sadovo*)
9:05	Welcoming speech, introduction of participants, definition of Chairman for the meeting and briefing on ECP/GR (*Lorenzo Maggioni, ECP/GR Coordinator)*
9:10	Role and place of the *Arachis* database in the Grain Legumes Working Group (*S. Angelova, member of the ECP/GR Working Group on Grain Legumes, IPGR-Sadovo*)
9:15	Presentations of national *Arachis* collections: - Bulgaria (*Stanko Georgiev and Siyka Stoyanova, IPGR, Sadovo*) - Hungary (*Lajos Horváth, Institute for Agrobotany, Tápiószele*) - Russian Federation (*Oxana Dzyba, N.I. Vavilov Research Institute of Plant Industry, St. Petersburg*) - Turkey (*Nevin Açikgöz, Aegean Agricultural Research Institute, Izmir*)
10:30	*Coffee break*
11:00	Briefing on EPGRIS and EURISCO (*Lorenzo Maggioni)*
11:15	European *Arachis* Database: adoption of FAO/IPGRI – EURISCO *Multi-crop passport descriptors* (*Stanko Georgiev*)
11:30	Discussion and recommendations
12:30	*Lunch at the hotel*
13:30	*Arachis* characterization descriptors for the European database (*Stanko Georgiev*)
13:45	Discussion and recommendations
15:10	*Coffee break*
15:30	Methodology for testing and describing accessions for the establishment of the European *Arachis* database (*introduced by Stanko Georgiev*)
15:45	Discussion and recommendations
17:00	Closing of the meeting
19:30	*Social dinner in the old city of Plovdiv*

Saturday 16 November

09:30 *Visit to the Institute for Plant Genetic Resources "K. Malkov" at Sadovo and excursion to the Batckovo Monastery in the Rhodope Mountains.*

19:30 *Dinner at the hotel*

Sunday 17 November

Departure of participants

Appendix V. List of participants

ECP/GR* ad hoc *meeting on* Arachis *genetic resources
15-16 November 2002, Plovdiv, Bulgaria

Stanko Georgiev
Institute for Plant Genetic Resources
"K. Malkov" (IPGR)
4122 Sadovo, Plovdiv district
Bulgaria
Tel: (359-32) 31182251
Fax: (359-32) 629026/270270(post)
Email1: stanko@ipgr-bg.org
Email2: stankod@netbg.com

Rada Koeva
Institute for Plant Genetic Resources
"K. Malkov" (IPGR)
4122 Sadovo, Plovdiv district
Bulgaria
Tel: (359-32) 629026
Fax: (359-32) 629026/270270(post)
Email1: rada_k@abv.bg
Email2: rada_k@ipgr-bg.org

Siyka Stoyanova
Institute for Plant Genetic Resources
"K. Malkov" (IPGR)
4122 Sadovo, Plovdiv district
Bulgaria
Tel: (359-32) 629026
Fax: (359-32) 629026/270270(post)
Email: s_stoyanova@gbg.bg

Siyka Angelova
Institute for Plant Genetic Resources
"K. Malkov" (IPGR)
4122 Sadovo, Plovdiv district
Bulgaria
Tel: (359-32) 629026
Fax: (359-32) 629026/270270(post)
Email1: angelova@ipgr-bg.org
Email2: siika_angelova@yahoo.com

Lajos Horváth
Field Crops Department
Institute for Agrobotany (ABI)
Külsömezö 15
2766 Tápiószele
Hungary
Tel: (36-53) 380070/071
Fax: (36-53) 380072
Email: lhorváth@agrobot.rcat.hu

Oxana O. Dzyuba[5]
Department of Oil and Fiber Crops
N.I. Vavilov Research Institute of Plant Industry (VIR)
42 Bolshaya Morskaya Str.
190000 St. Petersburg
Russian Federation
Tel: (7-812) 3147836
Fax: (7-812) 3118762
Email: brassica@mail.ru

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

[5] At time of publication, responsibility for *Arachis* at VIR has been taken over by:
Alexandra Dubovskaya
Email: a.dubovskaya@vir.nw.ru

ECP/GR Secretariat

Lorenzo Maggioni
ECP/GR Coordinator
Regional Office for Europe
International Plant Genetic Resources Institute (IPGRI)
Via dei Tre Denari 472/a
00057 Maccarese (Fiumicino)
Italy
Tel: (39) 06 6118231
Fax: (39) 06 61979661
Email: l.maggioni@cgiar.org

Unable to attend

Savas Kotzamanidis
Cereal Institute
PO Box 60411
570 01 Thermi, Thessaloniki
Greece
Tel: (30-2310) 471544/475432
Fax: (30-2310) 473024
Email: cerealin@otenet.gr

Amram Ashri
Faculty of Agriculture
Hebrew Univ. of Jerusalem
PO Box 12
76100 Rehovot
Israel
Tel: (972-8) 9489209
Fax: (972-8) 9468265
Email: ashri@agri.huji.ac.il

Mohammed Sadiki
Department of Agronomy and Plant Breeding
Hassan II Institute of Agronomy and Veterinary Medicine
BP 6202 Rabat-Instituts
Rabat
Morocco
Tel: (212-37) 774869
Fax: (212-37) 774869
Email: m.sadiki@iav.ac.ma

Milica Dima
Central Plant Research Station
207220 Dăbuleni
Romania
Tel: (40-251) 334402
Fax: (40-251) 334347/334308
Email: sccpndabuleni@rol.ro

INDEX OF AUTHORS

ISBN 92-9043-647-6

Cover photos: courtesy of © S. Georgiev, IPGR “K. Malkov”, Sadovo, Bulgaria and
S. Kotzamanidis, Cereal Institute, Thermi, Thessaloniki, Greece