European Cooperative Programme for Crop Genetic Resources Networks

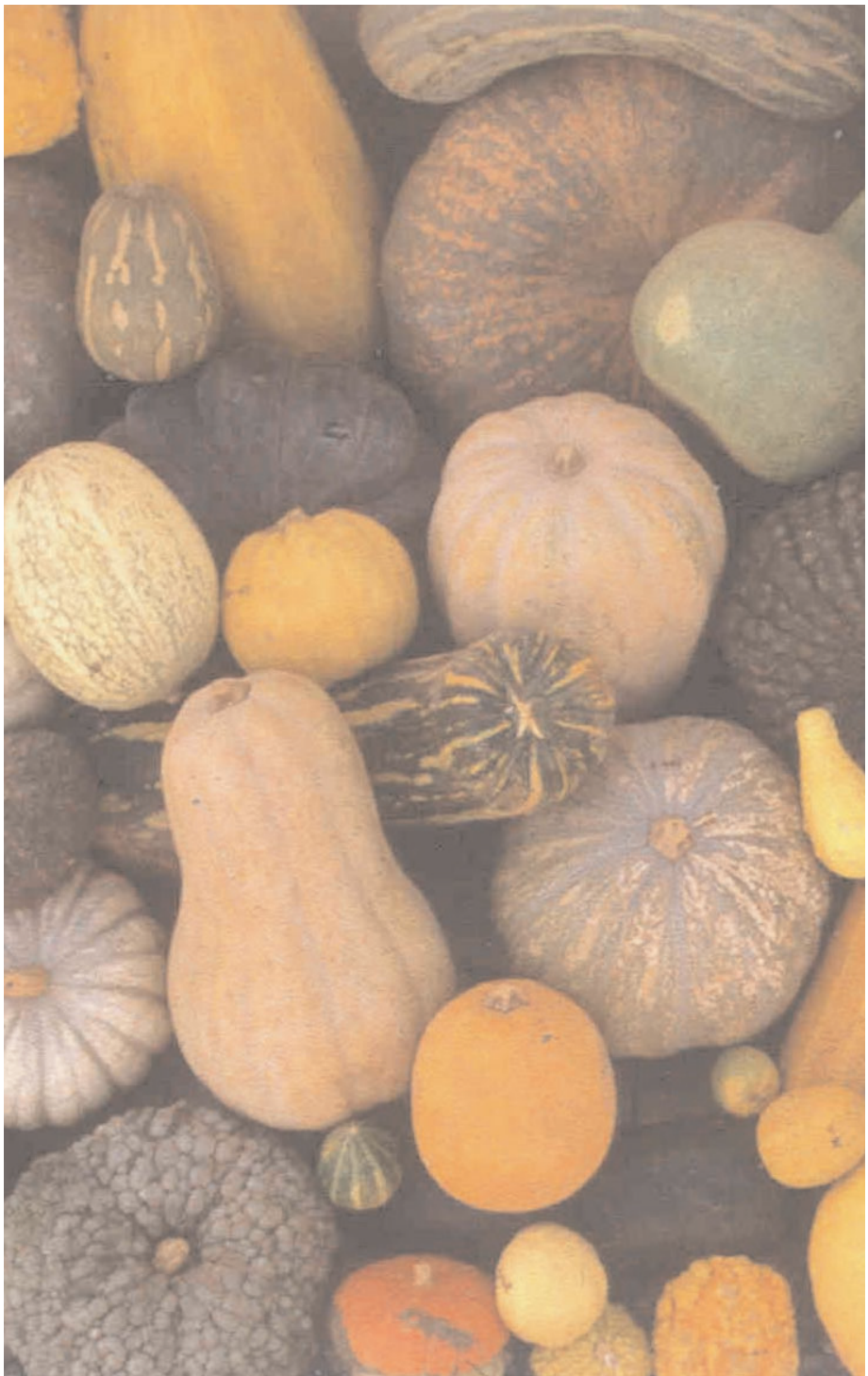
ECP/GR

Cucurbit Genetic Resources in Europe

IPGRI

***Ad hoc* meeting, 19 January 2002, Adana, Turkey**

M.J. Díez, B. Picó and F. Nuez, *compilers*



FUTURE HARVEST
<www.futureharvest.org>

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

ECP//GR

Cucurbit Genetic Resources in Europe

***Ad hoc* meeting, 19 January 2002, Adana, Turkey**

M.J. Díez, B. Picó and F. Nuez, *compilers*

The **International Plant Genetic Resources Institute (IPGRI)** is an autonomous international scientific organization, supported by the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of genetic diversity for the well-being of present and future generations. IPGRI 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 2002, had been signed and ratified by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

In 2001 financial support for the Research Agenda of IPGRI was provided by the Governments of Albania, Armenia, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Republic of Korea, Lithuania, Luxembourg, Macedonia (F.Y.R.), Malta, the Netherlands, Norway, Peru, the Philippines, Poland, Portugal, Romania, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Uganda, UK, USA and F.R. Yugoslavia (Serbia and Montenegro), and by the African Development Bank (AfDB), Asian Development Bank (ADB), Center for International Forestry Research (CIFOR), Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica (CATIE), Centro Internacional de Agricultura Tropical (CIAT), Centro Internacional de la Papa (CIP), Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Common Fund for Commodities (CFC), European Commission, European Environmental Agency, European Union, Food and Agriculture Organization of the United Nations (FAO), German Foundation for International Development (DSE), Global Forum on Agricultural Research (GFAR), Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología (COLCIENCIAS), Inter-American Drug Abuse Control Commission (CICAD), International Center for Agricultural Research in the Dry Areas (ICARDA), International Center for Living Aquatic Resources Management (ICLARM), International Centre for Research in Agroforestry (ICRAF), International Crops Research Institute for the Semi-Arid (ICRISAT), International Development Research Centre (IDRC), International Food Policy Research Institute (IFPRI), International Foundation for Science (IFS), International Fund for Agricultural Development (IFAD), International Institute of Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), International Rice Research Institute (IRRI), International Service for National Agricultural Research (ISNAR), International Water Management Institute (IWMI), Japan International Research Centre for Agricultural Science (JIRCAS), National Geographic Society, National Science Foundation (NSF), Programme on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation (PGRA), Regional Fund for Agricultural Technology (FONTAGRO), Rockefeller Foundation, Taiwan Banana Research Institute (TBRI), Technical Centre for Agricultural and Rural Cooperation (CTA), Technova, United Nations Development Programme (UNDP), UNDP Global Environmental Facility (UNDP-GEF), United Nations Environment Programme (UNEP), UNEP Global Environmental Facility (UNEP-GEF), United States Department of Agriculture (USDA), United States Agency of International Development (USAID), Vlaamse Vereiniging voor Ontwikkelingssamenwerking en Technische Bijstand (VVOB), West Africa Rice Development Association (WARDA) and the World Bank.

The **European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR)** is a collaborative programme involving most European countries aimed at facilitating the long-term conservation and increased utilization of plant genetic resources in Europe. The Programme, which is entirely financed by the member countries and is 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, forage crops, vegetables, grain legumes, fruit, minor crops, industrial crops and potatoes) 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.

Citation:
Díez, M.J., B. Picó and F. Nuez, compilers. 2002. Cucurbit genetic resources in Europe. *Ad hoc* meeting, 19 January 2002, Adana, Turkey. International Plant Genetic Resources Institute, Rome, Italy.

ISBN 92-9043-556-9

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

Contents

Part I. Discussion and Recommendations

Introduction

Partners in a new European collaboration on Cucurbitaceae genetic resources met for the first time in Adana, Turkey, for an *ad hoc* meeting organized within the framework of the ECP/GR Vegetables Network (see Agenda, Appendix II) and back-to-back with a meeting of the EU-funded project RESGEN CT99-108 on *Cucumis melo*. After an introductory welcome given by Kazim Abak on behalf of the University of Çukurova, Maria José Díez (representing Fernando Nuez, ECP/GR focal person on cucurbits) welcomed the participants to the meeting and spoke about the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR) in general and more specifically the Vegetables Network. She summarized the history of this network, reporting the conclusions reached in the *ad hoc* meeting of the Network Coordinating Group on Vegetables held in Vila Real (Portugal) in May 2000.[1] In this meeting the establishment of three new informal working groups on Solanaceae, Cucurbitaceae and Leafy Vegetables within the Vegetables Network was approved.[2] Establishment of these three informal working groups began with one small meeting per crop, in collaboration with the recently approved EU-funded projects on eggplant, melon and lettuce (extra-day meeting). M.J. Díez described the role of the ECP/GR focal persons for each crop, as specified during the Vila Real meeting, as follows:

- to establish the workplans for the respective informal groups;
- to promote the development of crop databases and the rationalization of the collections;
- to facilitate the implementation of activities by seeking people interested in getting involved with the proposed workplan;
- to chair the extra-day meeting and be responsible for the organization of this meeting in coordination with the ECP/GR Secretariat and for the preparation of a report.

After this introduction the participants introduced themselves (see list in Appendix III). Four partner institutions of the EU-funded *Cucumis melo* project RESGEN-CT99-108 attended the meeting (two from Spain, one from Portugal and one from Turkey) together with two partners from EU countries not involved in the EU *Cucumis melo* project (Spain and The Netherlands) and four experts from eastern Europe (Bulgaria, Czech Republic, Hungary and Russian Federation). The scientist responsible for the vegetable genetic resources section at the Aegean Agricultural Research Institute, Izmir (Turkey), also participated.

The European Cucurbit Collections

The participants presented the current status of the cucurbit germplasm collections in their countries (see Part II, Presented papers). The fact that the most important cucurbit collections in Europe were represented at the meeting became apparent after the presentation of the general situation of cucurbit genetic resources in Europe by M.J. Díez (Tables 1 and 2).

---

[1] Maggioni, L. and O. Spellman, compilers. 2001. Report of a Network Coordinating Group on Vegetables. *Ad hoc* meeting, 26-27 May 2000, Vila Real, Portugal. International Plant Genetic Resources Institute, Rome, Italy.

[2] In October 2001, the ECP/GR Steering Committee approved the establishment of a formal Working Group on Solanaceae. The ECP/GR formal Working Groups share a budget dedicated to meetings and publications on a more regular basis then informal groups. Each Working Group is made of country representatives nominated by the respective national coordinators.

Table 1. Number of accessions of each cucurbitaceous species, including landraces, breeding material and wild relatives maintained in European collections

Species	No. of accessions
Citrullus colocynthis	269
C. lanatus	3621
Citrullus sp.	465
Total *Citrullus*	**4355**
Cucumis anguria	33
C. dipsaceus	31
C. ficifolius	11
C. melo	7553
C. metuliferus	11
C. myriocarpus	12
C. sativus	5896
C. zeyheri	10
Cucumis sp.	776
Total *Cucumis*	**14333**
Cucurbita argyrosperma	9
C. ficifolia	121
C. maxima	1705
C. moschata	753
C. pepo	3541
Cucurbita sp.	808
Total *Cucurbita*	**6937**
Benincasa hispida	54
Cyclanthera pedata	34
Lagenaria siceraria	140
L. vulgaris	253
Luffa sp.	164
Momordica sp.	31
Other	90
Total other genera	**766**
Total Cucurbits	**26391**

Table 2. Number of accessions of cucurbitaceous species stored in the main European genebanks and breeders' collections

Collection curator (Country)	*Citrullus*	*Cucumis*	*Cucurbita*	Others	Total
Genebanks					
T. Piskunova (Russian Federation)	2602	4931	2064	554	10151*
A. Börner (Gatersleben, Germany)	254	975	857	175	2261**
F. Nuez (Valencia, Spain)	239	798	925	63	2025*
E. Křístková (Czech Republic)	5	967	753	44	1769*
L. Krasteva (Bulgaria)	294	1247	102	4	1647*
A. Küçük (Turkey)	329	632	645	10	1616*
L. Horváth (Hungary)	209	383	732	44	1368*
M. Carravedo (BGHZ, Spain)	147	777	349	-	1273*
W. Dooijeweert (The Netherlands)	-	790	-	-	790*
T. Kotlińska (Poland)	19	390	177	9	595**
N. Polignano (Italy)	73	143	141	29	386**
R. Farias (BPGV, Portugal)	36	119	158	4	317*
J. Berenji (Yugoslavia)	-	-	145	-	145**
Breeders' collections					
M. Pitrat (France)	-	605	-	-	605**
M.L. Gómez-Guillamón (CSIC Spain)	-	561	-	-	561**
S. Strajeru (Romania)	51	280	91	-	422**
K. Abak (Turkey)	45	301	24	17	387*
Total	**4303**	**13899**	**7163**	**953**	**26318**

* Data updated at the present meeting (Adana, January 2002)

** Data updated by the end of 2000

Mode of operation of the ECP/GR Informal Group on Cucurbits

A proposed workplan for the future operation of the informal group on cucurbits was introduced and the participants were asked for their willingness to get involved in the group on a voluntary basis.

The major tasks set out in the workplan were (see workplan in Appendix I):

- Development of a European Central Cucurbit Database;
- Assessment of safety-duplication status of collections and planning of the transfer of safety-duplicates to participating base stores in which long-term conservation conditions are available;
- Establishment of regeneration guidelines and primary characterization protocols for cucurbitaceous species.

Representatives of the Institute of Introduction and Plant Genetic Resources "K. Malkov" (Bulgaria), the Institute for Agrobotany (Hungary), the N.I. Vavilov Research Institute of Plant Industry (Russian Federation), the Center for the Conservation and Breeding of the Agricultural Biodiversity (COMAV) of the Polytechnic University of Valencia (Spain) and the Aegean Agricultural Research Institute (Turkey) agreed to participate in the informal working group on cucurbits (including cucumber, melon, squash, pumpkins, watermelon and minor cucurbits). The representative of the Research Institute of Crop Production Genebank (Czech Republic) agreed to participate as regards melon, cucumber, squash, pumpkin and others. The representatives of the Çukurova University (EU *Cucumis melo* project partners) agreed to participate with their melon and watermelon collections and the representative of the Centre for Genetic Resources, The Netherlands (CGN) agreed to participate for cucumber.

Enrique Moriones (Spain) remarked on the need to obtain some information about the programmes to which the group could apply in order to obtain funds for financing part of its activities.

Discussion of the plan of action

Development of a Central Cucurbit Database

The creation of a European Central Cucurbit Database (ECCUDB) was discussed. Before that, M.J. Díez spoke about the EU-funded EPGRIS project (European Plant Genetic Resources Information Infra-Structure) (http://www.ecpgr.cgiar.org/EPGRIS/Index.htm), whose objective is to promote the creation of national plant genetic resources inventories and to create a European Search Catalogue (EURISCO) that will contain passport information for all collections maintained *ex situ* in Europe. Thus, the role of all Central Crop Databases must be to offer not only passport, but also characterization and evaluation data.

M.J. Díez presented the current state of the European Central Cucurbit Database (ECCUDB), currently under construction at the COMAV of the Polytechnic University of Valencia. During the discussion Valdemar Carnide (Portugal) asked whether the data of the different collections could be introduced into the database by each institution *via* the Internet. M.J. Díez suggested that, as for other ECCDBs (ECP/GR *Brassica* database, ECP/GR *Lactuca* international database), the database manager should compile all the information sent from the different holdings to harmonize the structure of the database. All the European germplasm holdings representatives agreed to send their data to the COMAV.

W. van Dooijeweert (The Netherlands) asked if the database would be available on the Internet only after data from all the collections were entered, or if it could be searched during

data introduction. The partners agreed that the data should be available on the Internet as soon as they are entered in the database.

Planning of safety-duplication under long-term conservation conditions

Three questions were asked of every participant to find out the level of safety-duplication of their collections and their availability to host "black boxes":[3]

- Current level of safety-duplication?
- Which holding has long-term conservation facilities?
- Who would be available to host safety-duplicates as "black boxes"?

The answers are indicated in Table 3.

Table 3. Current level of safety-duplication of cucurbit collections in Europe

Holding	Safety-duplication	Long-term conservation facilities	Availability to host black boxes
Institute for Plant Genetic Resources "K. Malkov", Bulgaria	Planned	Yes	To be discussed
Institute for Agrobotany, Hungary	Planned	Yes	Yes
N.I. Vavilov Research Institute of Plant Industry, Russian Federation	80%	Yes	No
COMAV, Universidad Politécnica de Valencia, Spain	40%	No	No
Research Institute of Crop Production, Czech Republic	Planned	Yes	To be discussed
Aegean Agricultural Research Institute, Turkey	100%	Yes	Yes
Centre for Genetic Resources, The Netherlands	100%	Yes	Yes
E.E. "La Mayora" CSIC, Spain	75%	No	No
Çukurova University, Turkey	Planned	No	No

Following a suggestion from Lilia Krasteva (Bulgaria), the scientist responsible for those institutions with facilities for hosting black boxes agreed to inform the interested persons by email about the specific characteristics recommended for the samples and containers to be stored as safety-duplicate black boxes.[4]

Regeneration guidelines and primary characterization

A mode of operation was defined to improve and harmonize the regeneration guidelines and primary characterization descriptors for cucurbits. The proposed plan includes the following steps:

- Each holding will send its regeneration protocols to the focal person;
- The focal person will compile all the information and will develop an integrated regeneration protocol for each crop;
- All the protocols and the elaborated document will be sent to each participant for critical review;
- The participants will send back to the focal person their opinions and a final version of the protocol will be developed and sent to all partners.

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

[4] An example of Memorandum of Understanding for a safety-duplication bilateral agreement can be obtained from the ECP/GR Secretariat.

The same plan of action will be followed for the establishment of a minimum descriptor list for each crop. This workplan was agreed by all the participants.

Conclusions

The group thanked K. Abak and his co-workers for their excellent organization of the meeting resulting in a smoothly running event.

The main conclusion of this first *ad hoc* meeting was the confirmation of common interest in the establishment of a new informal working group on cucurbits and the agreement to apply to the ECP/GR Steering Committee for the establishment of a Working Group on Cucurbits.

From this moment the group can start carrying out practical activities, such as the development of a European Cucurbit Database that will facilitate the use of genetic resources of cucurbits to breeders. It will also try to establish minimum descriptors for primary characterization and standard regeneration protocols. This is necessary for developing common projects in the near future. The accomplishment of these initial objectives was thought to be feasible at this moment. The group agreed to keep in contact by email from now on and until the possible establishment of a formal Working Group.

Commitments made:

- To establish contact with cucurbit holders unable to attend the meeting;
- To obtain further information about the programmes to which the group can apply for funds.

Further contacts

According to the commitments made, the following contacts were established after the meeting:

A. Börner (IPK, Germany) was unable to attend the meeting. He was contacted by the COMAV after the meeting. He was very interested in the new informal working group on cucurbits but he decided not to participate. He argued that cucurbits are a rather small part of the IPK Genebank collections, which consist mainly of cereal crops. However, he kindly decided to contribute data of the IPK cucurbit collection to the European Central Cucurbit Database.

V. Carnide (EU *Cucumis melo* project partner and representative of the Universidade Trás-os Montes e Alto Douro, Portugal) was designated as representative of Portugal in the ECP/GR informal working group on cucurbits. After the meeting, V. Carnide indicated that the Portuguese genebank (Banco Português de Germoplasma Vegetal, BPGV) has long-term facilities which are available to host safety-duplicates as black boxes for Cucurbitaceae genetic resources.

G. Barendse (Botanical and Experimental Garden, University of Nijmegen, The Netherlands) mentioned the possibility of obtaining funds by non-EU members in collaborative projects with EU-members. The INTAS and ISCONIS programmes (http://www.intas.be/mainfs.htm; http://www.cordis.lu/isconis/home.html) seem to be the most appropriate. The group must now analyze the possibilities of obtaining funds from these programmes.

T. Kotlińska (Research Institute of Vegetable Crops, Skierniewice, Poland) was also contacted by the COMAV after the meeting. She was very interested in joining the informal working group on cucurbits and contributing with her cucurbit germplasm collection and her experience in cucurbit regeneration and evaluation.

Part II. Presented Papers: National Collections

Cucurbitaceae genetic resources in Bulgaria

Lilia Krasteva, Ivan Lozanov, Stefan Neykov and Totka Todorova
Institute for Plant Genetic Resources (IPGR), Sadovo, Bulgaria

One of the major tasks of IPGR-Sadovo is to preserve, study and utilize the biodiversity in plant collections. From experiences in various countries, it has been realized that at a certain stage of agricultural development, the collection and conservation of local germplasm is the only way to protect local genetic resources from extinction (Krasteva *et al.* 1986, 1989). Cucurbits have been the subject of investigations by many researchers in the world including Bulgaria (Vavilov 1926; Daskalov and Popov 1936; Mihov and Lozanov 1979; Ivanov 1994).

Status of the Cucurbitaceae *collection*

The status of the *ex situ* collection of Cucurbitaceae in IPGR-Sadovo is given in Table 1.

Table 1. Status of the *ex situ* collection of Cucurbitaceae in Bulgaria

	Type of cultivars			Long-term	Short-term
Botanical type	**Foreign**	**Local**	**Total number**	**conservation**	**conservation**
Citrullus vulgaris	94	205	294	86	294
Cucumis spp.	3	0	3	0	3
Cucumis melo	159	258	444	111	444
Cucumis sativus	1014	18	1032	400	800
Cucurbita spp.	3	1	4	0	4
Cucurbita maxima	45	26	71	28	71
Cucurbita moschata	4	2	6	0	6
Cucurbita pepo	33	8	41	20	21
Lagenaria spp.	0	0	4	0	4
Total	**1355**	**518**	**1899**	**645**	**1647**

The National collection comprises 294 accessions of *Citrullus vulgaris*, 444 of *Cucumis melo*, 1032 of *Cucumis sativus*, 71 of *Cucurbita maxima* and 41 of *Cucurbita pepo*. Other species are represented by single accessions. The largest share of the collection is represented by introduced accessions (total number 1355). The total number of local forms is 518, of which the best represented are melons (258 accessions), followed by watermelons (205) and *Cucurbita* species (37) (Krasteva 1984a, 1984b, 2000; Stefanova *et al.* 1994).

The collection contains 645 accessions in long-term conservation and 1647 accessions in short-term conservation.

The National Cucurbitaceae Collection is stored at the Institute for Plant Genetic Resources in Sadovo. Small collections used for research purposes are also held at the Institute for Horticulture and Canning Industry in Plovdiv and at the Vegetable Experiment Station in Gorna Oryahovitsa.

Citrullus vulgaris

This collection was created in two ways: collecting expeditions in Bulgaria (Table 2) and introduction of cultivars and hybrids from various geographic areas (Table 3).

Table 2. Accessions of *C. vulgaris* collected in Bulgaria

Location	No. of accessions collected
Pleven	38
Haskovo	23
Vidin	22
Lom	22
Shumen	18
Dobrich	15
Lovech	13
Pazardzik	11
Razgrad	10
Montana	10
Vratsa	10
Plovdiv	8
Blagoevgrad	6
Total	**206**

Table 3. Accessions of *C. vulgaris* introduced from abroad

Country	No. of accessions introduced
Germany	30
USA	29
Israel	10
Taiwan	8
Turkey	7
The Netherlands	3
Romania	2
Yugoslavia	2
Korea	2
Libya	1
Total	**94**

Cucumis melo

The collection was created in several ways. Most attention was given to the local accessions. A total of 285 accessions were collected from different parts of Bulgaria, mostly from the northern part of the country (Table 4) and a collection of 159 accessions was accumulated from 1978 to 1998 through non-monetary exchange with related institutions from various countries (Table 5). Single accessions were also obtained from Romania, Italy, Afghanistan, Cyprus, and other countries.

Table 4. Accessions of *C. melo* collected in Bulgaria

Location	No. of accessions collected
Northern part	
Pleven	50
Lom	32
Lovech	30
Dobrich	23
Vidin	18
Montana	15
Shumen	14
Razgrad	12
Vratsa	5
Total	**199**

Location	No. of accessions collected
Southern part	
Haskovo	27
Stara Zagora	18
Blagoevgrad	16
Pazardzik	13
Plovdiv	12
Total	**86**

Table 5. Accessions of *C. melo* obtained through exchange

Country	No. of accessions
Germany	43
USA	30
Russia	22
Japan	13
Israel	7
Denmark	7
Taiwan	6
France	5
The Netherlands	5
Turkey	5
Total	**159**

Cucumis sativus

This collection involves mainly accessions introduced from 20 countries, most of the representatives being from Asia, China, India, Afghanistan, Turkey, USA, Russia and Yugoslavia.

Cucurbita maxima

This is mainly composed of introduced accessions originating from Europe and local forms collected from different regions of the country.

Cucurbita pepo

This comprises mainly accessions introduced from European countries.

Characterization

Table 6 lists the descriptors used for the evaluation of melons, watermelons, cucumbers and squashes at IPGR-Sadovo, according to the COMECON descriptors (Anonymous 1985; Malinina *et al.* 1989).

Table 6. Number of descriptors used at IPGR-Sadovo for the evaluation of melon, watermelon, cucumber and squash collections

Characters	Melon	Watermelon	Cucumber	Pumpkins
Passport data	4	4	7	3
Morphological characters				
1. Plant	6	6	4	2
2. Leaf	5	4	4	3
3. Flower	4	4	4	2
4. Fruit	8	5	4	4
5. Seeds	4	4	3	2
Biological characters				
1. Phenology	5	4	4	3
2. Vegetation period	4	4	4	3
Disease resistance	2	3	3	3
Agronomic characters				
1. Yield	4	3	4	4
2. Chemical composition	2	2	4	2
Total	**48**	**43**	**45**	**32**

Documentation

Passport information is the generally accepted minimum for documentation. Data are computerized. The value of the genepool increases with the increase in the range of characters included in the accession descriptions.

Conservation

All accessions in the collection are conserved in the Gene Bank of IPGR-Sadovo, in a base collection and a working collection. The long-term seed storage temperature is -18°C for the base collection and +6°C for the working collection.

References

Daskalov, H. and P. Popov. 1936. Watermelons and melons. Hristo G. Danov, Plovdiv.

Ivanov, D. 1994. Melons, squashes and patissons. G. Oryahovitsa.

Fursa, T.B., V.A. Korneichuk and L. Rakochi. 1985. International COMECON list of descriptors for the species *Citrullus edulis* L. N.I. Vavilov Research Institute of Plant Industry, Leningrad.

Krasteva, L. 1984a. Resources of musk melons in Bulgaria. *in* Proceedings of the Third Eucarpia meeting on breeding of cucumbers and melons, 2–5 July 1984, Plovdiv, Bulgaria. Maritza Research Institute of Vegetable Crops, Plovdiv, Bulgaria.

Krasteva, L. 1984b. Studies of introduced melon cultivars. Pp. 81-84 *in* Proceedings of the 100th Anniversary of Agricultural Science in Sadovo. Vol. 1. Zemizdat, Sofia.

Krasteva, L. 1987. Studies of local *C. pepo* and *C. maxima* populations. Pp. 4–7 *in* Nauchna Sessiya 100 godini Saedinenie [Proceedings of the Scientific Session of Young Researchers in Bulgaria], 1 November 1985, Plovdiv. Bulgarian Research Union, Plovdiv.

Krasteva, L. 1989. Collection, conservation and use of plant genetic resources in vegetable crops. Pp. 34-44 *in* Problemi za opazvane na rastitelnoto bogatstvo na Bulgaria [Problems of Plant Resource Conservation in Bulgaria]. National Centre of School, Technical and Scientific Art, Sofia.

Krasteva, L. 2000. Organization of melon plant genetic resources in Bulgaria. Acta Horticulturae 510:247-251.

Malinina, M.I., T.B. Fursa, V.A. Korneichuk and L. Rakochi. 1989. International COMECON list of descriptors for the species *Cucumis melo* L. N.I. Vavilov Research Institute of Plant Industry, Leningrad.

Mihov, A. and P. Lozanov. 1979. Watermelons and melons. Zemizdat, Sofia.

Stefanova, L., S. Neykov and T. Todorova. 1994. Genetic diversity in the cucurbit family. Plant Genetic Resources Newsletter 99:3-4.

Vavilov, N.N. 1926. Trudy po Prikl [Centres of crop origin]. Bot. Sel. [Applied Botany, Genetics and Breeding, Leningrad] 16(2).

Evaluation, use and conservation of the *Cucumis melo* L. collection in Bulgaria

Lilia Krasteva
Institute for Plant Genetic Resources (IPGR), Sadovo, Bulgaria

Melon is a very old vegetable crop in Bulgaria. The exact beginning and early cultivation are unknown, being lost long ago in our history. Many authors connect its introduction with the Turkish invasion of the Balkan Peninsula and Bulgaria in particular (Daskalov and Popov 1936; Mihov *et al.* 1979; Ivanov 1994). The crop finds favourable conditions for its development in Bulgaria and its fruits have always been highly prized.

The main targets of melon breeding in Bulgaria are:

- **Earliness:** a very important trait, determined by the duration of the three phenological stages:
  - from emergence to female flower formation,
  - from fruit formation to cessation of fruit enlargement, and
  - from cessation of fruit enlargement to ripening.

  The time from plant emergence to ripening of the first fruit determines the duration of the growth period.
- **Taste qualities:** the fruits are used for dessert, and so require good organoleptic qualities, which depend on their sugar content.
- **Resistance to transport damage:** depends on skin thickness and structure, as well as on the presence of a netted skin. To be highly resistant to transport damage, a melon cultivar should have a thick and elastic skin.
- **Productivity:** productivity depends on the mean fruit weight, the number of fruits per plant, and the agricultural practices used.

Work on melon genetic resources in Bulgaria involves collecting, creation and enrichment of the collection, evaluation, documentation, use and conservation of the material.

Structure of the melon collection

The National Melon Collection is maintained only at the Institute for Plant Genetic Resources in Sadovo. There are small collections for training and experimental purposes at the Agricultural University in Plovdiv and at the Vegetable Experiment Station in Gorna Oryahovitsa.

IPGR-Sadovo has been designated as the national centre for organization and research on collecting, conservation and use of plant resources of foreign and local origin for breeding and direct implementation. The Institute is located in the Thracian Plain of South Central Bulgaria, 20 km from Plovdiv, at an elevation of 141 m asl, latitude 42°07'N and 24°56'E. The mean annual temperature is 12.4°C and the annual precipitation 410 mm (Velev 1990).

The total number of accessions in the collection amounts to 444, including 159 introduced and 285 local forms, 111 accessions kept for long-term conservation and 444 for short-term storage and working collection (Table 1).

Melon genetic resources include four categories: (i) introduced, presently used cultivars; (ii) new Bulgarian cultivars; (iii) local populations; and (iv) breeding lines. The collection consists mainly of cultivars (96.9%) and breeder's lines (3.1%). Among the cultivars, local forms and lines represent 64.2% and introduced material 35.8% (Table 2).

Table 1. Status of the melon (*C. melo* L.) cultivars collection in Bulgaria (number of accessions)

Subspecies	Botanical type (convar.)	Total no.	Type of cultivars		Long-term conservation	Short-term conservation	Working collection
			Foreign	Local			
melo	*adana*	322	102	220	84	322	322
melo	*cassaba*	122	57	65	27	122	122
Total		**444**	**159**	**285**	**111**	**444**	**444**

Table 2. Structure of the melon collection

Subspecies	Botanical type (convar.)	Cultivars		Breeder's lines		Old populations	Wild forms
		Foreign	Local	Foreign	Local		
melo	*adana*	102	220	0	14	216	0
	cassaba	57	65	0	0	65	0
Total		**159**	**285**	**0**	**14**	**281**	**0**

Origin of the accessions

Research on the creation of a national melon (*Cucumis melo* L.) collection was initiated in 1978. Within the framework of non-monetary exchanges between IPGR-Sadovo and related foreign institutes, a collection of 159 melon accessions of foreign origin was established. The major sources of new introduced accessions are the contacts with related institutes, genebanks and experimental stations. The collection comprises accessions from 20 countries in the world (Table 3). Most accessions originate from Europe and Asia.

Table 3. Number of introduced melon accessions by countries, collected from 1978 to 1998

Country of origin	No. of accessions
Afghanistan	3
Cuba	1
Cyprus	2
Czechoslovakia	1
Denmark	7
France	5
Germany	43
Hungary	1
Iraq	1
Israel	7
Italy	2
Japan	13
Netherlands	5
Romania	3
Russia	22
Taiwan	6
Thailand	1
Turkey	5
USA	30
Yugoslavia	1
Total	**159**

A great part of the experimental material was collected in different regions in Bulgaria during expeditions. Thus, 285 local accessions were collected.

The methodology for collecting local genetic resources, suggested by IBPGR, was adapted to the conditions of Bulgaria (Krasteva 1989).

Evaluation

The study was carried out in the experimental field of IPGR-Sadovo during the period 1978-2000. Cultivar Hybrid 1 was used as a standard. Repeated collection and complex evaluation of accessions were done over this period.

The accessions were investigated according to the International COMECON List of Descriptors (Malinina *et al.* 1989). The guidelines of a methodology for evaluating new vegetable cultivars were also taken into consideration (Anonymous 1980). The morphological traits of plants were evaluated at the stage of technical ripeness of 10 plants per accession. This evaluation covered 46 quantitative and qualitative traits. The biochemical evaluation of the collection was done at the Biochemical Laboratory of IPGR using standard methods (Genadiev and Kalchev 1968). Plants were grown according to the adopted technology for medium-early field production of melons (Mihov and Lozanov 1979).

The accessions from the working collection shown in Tables 1 and 2 are at different stages of investigation (first, second and third year). The local Bulgarian accessions were investigated for the third year.

Table 4 shows the distribution of accessions according to the most important morphological, economic and biological traits.

Table 4. Distribution of accessions in the local melon collection according to morphological, economic and biological characters

Indices		No. of accessions
Morphological evaluation		
Stem		
Main stem length, m		
short	< 1.0	3
medium	1.1-1.5	18
long	> 1.5	185
Stem thickness, cm		
3 thin	< 0.4	4
5 medium	0.5-0.6	13
7 thick	> 0.6	189
Internodal length, cm		
short	< 1.0	31
medium	1.1-1.5	28
long	> 1.5	147
Leaf		
Petiole length, cm		
short	< 12.0	21
medium	12.1-20.0	48
long	> 20.0	137
Leaf length, cm		
small	< 14.0	26
medium	14.1-18.0	38
large	> 18.0	142
Flower		
Diameter, cm		
small	< 2.0	3
medium	2.1-3.0	18
large	> 3.0	185
Fruit		
For round fruits - length, cm		
small	< 15.0	27
medium	15.1-22.0	54
large	> 22.0	125

Table 4 (cont.). Distribution of accessions in the local melon collection according to morphological, economic and biological characters

Indices		No. of accessions
For oblong fruits - length, cm		
small	< 25.0	13
medium	25.1-30.0	37
large	> 30.0	156
Fruit weight, kg		
very small	< 0.5	15
small	0.6-1.5	10
medium	1.6-3.5	14
large	3.6-5.5	138
very large	> 5.5	28
Fruit skin thickness, cm		
thin	< 0.5	37
medium	0.6-1.5	151
thick	> 1.5	18
Fruit flesh thickness, cm		
very thin	< 1.6	26
thin	1.7-2.5	34
medium	2.6-4.0	72
thick	> 4.0	74
Seeds		
Seed number per fruit		
few	< 300	21
medium	301-500	102
many	> 500	83
Seed length, cm		
small	< 1.0	23
medium	1.1-1.2	86
large	> 1.2	97
1000-seed weight, g		
small	< 180	10
medium	181-300	38
high	> 300	158
Economic evaluation		
Yield per plant, % of the standard		
very low	< 70	84
low	71-90	66
medium	91-110	56
high	111-130	-
very high	> 130	-
Fruit storability, months		
poor	< 1	200
medium	1-2	6
good	> 2	-
Chemical composition - dry matter refractometric %		
low	< 8	146
medium	8-13	31
high	> 13	29
Biological characteristics		
Earliness, days from emergence to ripeness		
very early	< 70	-
early	70-80	-
medium early	81-90	15
medium late	91-100	34
late	> 100	163
Uniformity of ripening, days		
non-uniform	> 15	201
uniform	< 15	5

The descriptors used for evaluation of the melon collection are listed below.

Phenological characters
Number of days from emergence to flowering
Number of days from emergence to first fruit formation
Number of days from flowering to first fruit formation
Number of days from emergence to technical ripeness

Morphological characters
Plant - vigour
Plant - type
Stem - shape
Stem - pubescence
Leaf - shape
Leaf - colour
Leaf - serration
Leaf - pubescence
Leaf - corrugation
Flower - pistil length
Fruit set - shape
Fruit set - pubescence
Fruit - shape
Fruit - surface
Wax bloom
Skin colour
Skin pattern
Net presence
Net character
Skin thickness
Fruit - seed loculus size
Fruit - placenta character
Flesh - colour
Flesh - consistency
Flesh - juiciness
Flesh - flavour
Flesh - taste
Flesh - taste evaluation
Seed - shape
Seed number per fruit
Seed colour

Biological characters
Earliness
Uniformity of ripening

Economic characters
Fruit number per plant
Productivity per plant, kg
Productivity per hectare, kg

Biochemical evaluation of fruits
Dry matter content (%)
Total sugar content (%)

Disease resistance
Pseudoperonospora cubensis
Sphaerotheca fuliginea (race 1 and race 2)

Documentation

The evaluation of the melon collection included 48 characteristics, including passport data (4), plant morphology, fruit and seeds (35), biological characters (2), economic (3), biochemical (2), and disease resistance (2).

Summary and conclusions

- A melon collection comprising a total of 444 cultivars accessions including 159 introduced accessions and 258 local forms collected from different regions in the country was created and evaluated for 48 traits.
- The available local germplasm of melons was inventoried and evaluated, even though it did not include the whole range of diversity present in Bulgaria. In this respect, more effort is still necessary.
- The information collected on the geographic origin and characteristics of local accessions lays the foundation for defining priorities for on-farm conservation (in yards and gardens).
- The local accession grouping in the collection and the establishment of the parameters of the more important traits could be used as a base for elaborating or updating the methodology for evaluation of melons.

References

Anonymous. 1980. A methodology for complex evaluation of new vegetable and potato cultivars. Zemizdat, Sofia.

Daskalov, H. and P. Popov. 1936. Watermelons and melons. Hristo G. Danov, Plovdiv.

Genadiev, A.D. and D. Kalchev. 1968. Analysis of Foodstuffs. Technika, Sofia.

Ivanov, D. 1994. Melons, squashes and patissons. G. Oryahovitsa.

Krasteva, L. 1984a. Resources of musk melons in Bulgaria. Proceedings of the III[rd] Meeting on Breeding of Cucumbers and Melons, 2–5 July, Plovdiv, Bulgaria. Maritza Research Institute of Vegetable Crops, Plovdiv, Bulgaria.

Krasteva, L. 1984b. Studies of introduced melon cultivars. Pp. 81-84 *in* Proceedings of the 100[th] Anniversary of Agricultural Science in Sadovo. Vol. 1. Zemizdat, Sofia.

Krasteva, L. 1987. Studies of local *C. pepo* and *C. maxima* populations. Pp. 4–7 *in* Nauchna Sessiya 100 godini Saedinenie [Proceedings of the Scientific Session of Young Researchers in Bulgaria], 1 November 1985, Plovdiv. Bulgarian Research Union, Plovdiv.

Krasteva, L. 1989. Collection, conservation and use of plant genetic resources in vegetable crops. Pp. 34-44 *in* Problemi za opazvane na rastitelnoto bogatstvo na Bulgaria [Problems of Plant Resource Conservation in Bulgaria]. National Centre of School, Technical and Scientific Art, Sofia.

Malinina, M.I., T.B. Fursa, V.A. Korneichuk and L. Rakochi. 1989. International COMECON list of descriptors for the species *Cucumis melo* L. N.I. Vavilov Research Institute of Plant Industry, Leningrad.

Mihov, At. and P. Lozanov. 1979. Watermelons and melons. Zemizdat, Sofia.

Velev, St. 1990. The climate of Bulgaria. Technika, Sofia.

The Czech national collection of cucurbitaceous vegetables

Eva Křístková

Research Institute of Crop Production in Prague–Ruzyne, Division of Genetics and Plant Breeding, Department of Gene Bank, Workplace Olomouc, Olomouc–Holice, Czech Republic

Introduction

Principles of plant genetic resources conservation

The Czech Republic (former Czechoslovakia) takes part in international activities aimed at protection of biodiversity. The government took the responsibility for conserving plant genetic resources by signing international documents. In 1994 the Ministry of Agriculture of the Czech Republic accepted the "National programme of conservation and utilization of genetic resources of cultivated plants". The Research Institute of Crop Production in Prague–Ruzyne (RICP) is the national coordinator of this programme, which includes activities of 10 private and/or state institutions in maintaining genetic resources of all plant species cultivated in our climatic area.

History of vegetable genetic resources conservation in Czechoslovakia and the Czech Republic

The first Czechoslovak collection of vegetable genetic resources was kept from about 1920 at the Moravian Institute of Agricultural Research in Brno. In 1951 the collections were placed in the newly established Research Institute of Vegetable Growing and Breeding in Olomouc, whose activity ceased at the end of 1993. Since 1994 the Gene Bank in Olomouc belongs to the Research Institute of Crop Production (RICP) in Prague–Ruyzne and it continues working with germplasm collections.

The Gene Bank in Olomouc, as a workplace of RICP, is responsible for conservation and documentation of the genetic diversity of vegetable, medicinal, aromatic and spice plant species traditionally grown in the Czech Republic. Collections maintained by the Gene Bank in Olomouc include more than 10 000 accessions of about 430 botanical species (Dušek and Křístková 1998). The collection of cucurbitaceous genetic resources with 1787 accessions potentially available is one of the largest.

Position of cucurbitaceous vegetables in Czech agriculture

Cultivation of cucurbitaceous vegetables in the Czech lands has a long tradition. Melons (*C. melo*) are documented in the Middle Ages during the reign of Emperor Charles IV (1346-1378). Cucurbitaceous vegetable species from both Old and New Worlds are described and illustrated also in the Czech translation of Matthiolus herbarium (1596). Cucumbers (*Cucumis sativus* L.) are the most important cucurbitaceous vegetable species in the Czech Republic. In 1999 their growing area reached 1189 ha (Buchtová and Ehrlichová 2000). Most of the gherkin crop is processed as pickles. Pumpkins (C. maxima Duch.) are traditionally cultivated in small fields and hobby-gardens, in the same way as squashes (*Cucurbita pepo* L.) which have become more popular during the last 10-15 years. Melons (*Cucumis melo* L.) and watermelons (*Citrullus lanatus* Mats. Thunb. et Nakai) are cultivated in private gardens in the warmest regions.

The first Czechoslovak cultivars were developed from local and European landraces. Later, modern breeding methods enabled the creation of hybrids. During the 20th century a total of 50 cucumber, 3 melon, 3 watermelon and 8 *Cucurbita* spp. cultivars were bred.

Structure of the collection of cucurbitaceous vegetables

Passport data for all accessions of genetic resources of cucurbitaceous vegetables are available on the Web site (http://genbank.vurv.cz/genetic/resources/default.htm).

Recent development of the collection

During the last seven years the number of accessions increased considerably. By the end of 1994 the collection consisted of 307 accessions and/or records of *Cucumis* spp., 95 of *Cucurbita* spp. and 5 of other cucurbitaceous species. During the period 1995-2001 there were 1644 new accessions added to the collection (Table 1). Old missing Czech cucumber cultivars available in the world genebanks and in the Czech breeding and seed companies were re-introduced. The collection was enriched by wild *Cucumis* and *Cucurbita* species and special sets for downy- and powdery mildew race determination were included.

A substantial part of newly acquired accessions was kindly provided by Prof. A. Lebeda (Palacký University in Olomouc, Czech Republic). Most of these accessions originated from USA germplasm collections in Ames, Geneva, Griffin and Salinas. They were obtained thanks to Dr M. Widrlechner (Plant Introduction Station Iowa State University, Ames, USA). Several accessions were derived from germplasm collections of IVT (Institute for Horticultural Breeding, currently part of Plant Research International, Wageningen, The Netherlands), of the Central Institute for Genetics and Research of Crop Plants (Gatersleben, Germany) and of VIR (St. Petersburg, Russia). Race differential genotypes originated from collections of A. Lebeda (Palacký University in Olomouc, Czech Republic), M. Pitrat (INRA, Montfavet, France) and Y. Cohen (Volcani Center, Bet Dagan, Israel).

Table 1. New accessions of cucurbitaceous vegetable genetic resources acquired by the Gene Bank RICP in Olomouc in 1995-2001

Genus	No. of accessions acquired							
	1995	1996	1997	1998	1999	2000	2001	Total
Cucumis	495	41	336	5	1	8	1	887
Cucurbita	618	1	1	4	-	-	86	712
Other species	42	1	2	-	-	-	-	45

Structure of the collection

By the end of October 2001 the collection of cucurbitaceous vegetables consisted of 967 *Cucumis* spp. accessions, 753 *Cucurbita* accessions and 49 accessions of other cucurbitaceous species potentially available. The other cucurbitaceous species include genera *Benincasa, Citrullus, Lagenaria, Luffa, Momordica* and *Trichosanthes.* Current species structure and availability levels of accessions are given in Table 2. For 105 *Cucumis*, 53 *Cucurbita* and 1 *Luffa* accessions the seed is no longer available and only records in passport data exist.

From a total of 28 wild *Cucumis* species (Kirkbride 1993) the Czech collection of *Cucumis* genetic resources includes accessions of *C. africanus* L., *C. anguria* L., *C. dinteri* Cogniaux, *C. dipsaceus* Ehr. ex Spach, *C. ficifolius* A. Richard, *C. figarei* Delile ex Naudin, *C. heptadactylus* Naudin, *C. leptodermis* Sc., *C. meeusei* C. Jeffrey, *C. metuliferus* E. Meyer ex Naudin, *C. myriocarpus* Naudin, *C. prophetarum* L., *C. rigidus*, C. *sagittatus* Peyritsch and *C. zeyheri* Sonder.

The group of 27 wild *Cucurbita* species (Whitaker and Bemis 1975) is represented in the Czech collection by accessions of *C. cylindrata* Bailey, *C. digitata* Gray, *C. ecuadorensis* Cutler & Whitaker, *C. foetidissima* HBK, *C. fraterna* Bailey, *C. lundelliana* Bailey, *C. martinezii* Bailey, *C. okechobeensis* (Small) Bailey, *C. pedatifolia* Bailey and *C. texana* (Scheele) Gray.

However, the taxonomic verification and/or re-determination of accessions should be done for both genera.

Table 2. Current species structure of cucurbitaceous vegetables collections and availability status of accessions in the Gene Bank in Olomouc (RICP) (as of October 2001)

Genus/group	No. of accessions according to availability		
	Y (available)	N (temporarily not available - low seed amount)	L (available with permission of donor)
Cucumis sativus	410	349	35
Cucumis melo	91	8	2
Wild *Cucumis* spp.	85	4	-
Cucurbita maxima	5	207	-
Cucurbita pepo	62	342	1
Cucurbita moschata	2	23	-
Cucurbita ficifolia	2	6	-
Cucurbita argyrosperma	-	47	-
Wild *Cucurbita* spp.	28	29	-
Other species	23	26	-

Status of accessions

The whole collection contains predominantly landraces, local cultivars and older cultivars (Table 3).

Table 3. Structure of collections of cucurbitaceous vegetables in the Gene Bank in Olomouc (RICP) according to the status of accessions (as of October 2001)

Availability*	No. of accessions					
	Wild	Landrace, old variety	Breeding line	Advanced cultivar	Unknown	Total
***Cucumis* spp.**						
Y	94	315	31	4	142	586
N	5	252	19	13	57	346
L	-	7	28	-	-	35
X	25	53	6	21	-	105
Total *Cucumis*	124	627	84	38	199	1072
***Cucurbita* spp.**						
Y	2	65	-	8	24	99
N	24	268	3	29	329	653
L	-	1	-	-	-	1
X	1	27	-	18	7	53
Total *Cucurbita*	27	361	3	55	360	806
Other Cucurbitaceae						
Y	1	10	-	2	10	23
N	11	5	-	2	8	26
L	-	-	-	-	-	-
X	-	-	-	-	1	1
Total others	12	15	-	4	19	50

* Y = accessions available
N = accessions temporarily not available (low seed amount)
L = accessions available with permission of donor
X = seed of accession does not exist, only passport data are available

The number of advanced cultivars is limited because of the creation of F1 hybrids. From this point of view the collection is closed mainly for new cucumber, squash and watermelon accessions.

On the basis of passport data, especially on the donor number, duplicates within accessions can be detected, mostly within *Cucumis* spp. accessions that originate from the USA (PI numbers). Similarly, there are accessions of the same cultivar name but originating from different sources. For example, the cucumber cultivar 'Delicates' is represented by 9 accessions and an old Czechoslovak cultivar 'Židovická produkta' by 4 accessions.

A potential elimination of duplicates must be based on a detailed study of their morphological characteristics with comparison of their original description and evaluation of biochemical and molecular data.

Origin of accessions

Accessions of cucurbitaceous vegetables and their wild related species originate from approximately 73 countries worldwide and generally cover areas considered as centres of origin of individual species and a majority of areas with high level of diversity of cultivated species (Fig. 1, Table 1). There are 48 original Czechoslovak and/or Czech cultivars and landraces of cucumbers, melons, watermelons and pumpkins and 27 cucumber breeding lines represented in this collection. Names of countries (exception for the Czech Republic and Germany) correspond to their state at the time of acquisition of the sample.

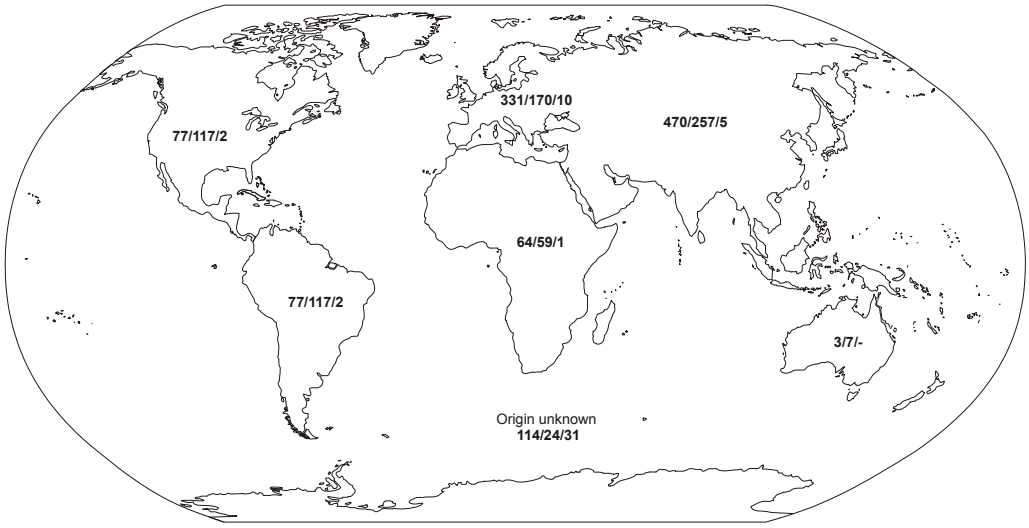


Fig. 1. Origin of accessions of genetic resources of cucurbitaceous vegetables (*Cucumis* spp./*Cucurbita* spp./other species) in the Czech germplasm collection.

Table 4. Structure of the cucurbitaceous vegetables collection in the Gene Bank in Olomouc (RICP) according to the country of origin of accessions (as of October 2001)

	No. of accessions									
	Cucumis			*Cucurbita*						Other*
Continent/ Country	***C. sativus***	***C. melo***	**Other (wild) *Cucumis* sp.**	***C. maxima***	***C. pepo***	***C. moschata***	***C. ficifolia***	***C. argyrosperma***	**Other (wild) *Cucurbita* sp.**	
Europe										
Austria	1	-	-	1	-	-	-	-	-	-
Bulgaria	-	4	-	-	1	-	-	-	4	-
Czech Republic[1]	52	5	-	4	8	-	-	-	2	4
France	13	8	-	-	2	-	-	-	-	-
Germany[2]	26	-	-	1	7	-	1	-	2	-
Greece	1	-	-	-	5	-	-	-	1	-
Hungary	18	2	-	1	5	-	-	-	-	2
Italy	1	2	-	-	3	-	-	-	4	2
Macedonia FYR	-	-	-	-	1	-	-	-	-	-
The Netherlands	51	1	2	-	14	-	1	-	-	1
Poland	10	1	1	-	4	-	-	-	-	-
Portugal	-	-	1	-	-	-	-	-	-	-
Romania	-	-	-	-	-	-	-	-	-	1
Soviet Union	82	2	-	1	4	-	-	-	4	-
Spain	3	-	-	7	14	-	1	-	1	-
Sweden	4	-	-	-	-	-	-	-	-	-
Ukraine	5	-	-	-	2	-	-	-	-	-
United Kingdom	5	-	-	1	4	-	1	-	6	-
Yugoslavia	30	-	-	18	36	-	-	-	-	-
Asia										
Afghanistan	15	3	1	4	2	-	-	-	-	-
Burma	-	1	1	-	-	-	-	-	-	-
China	115	-	1	6	4	1	-	-	1	-
India	52	10	1	6	3	-	-	-	-	2
Indonesia	1	-	-	-	-	-	-	-	-	-
Iran	49	1	1	9	14	-	-	-	-	-
Iraq	1	1	-	-	-	-	-	-	-	-
Israel	7	2	1	-	2	-	-	-	-	-
Japan	43	1	-	7	8	10	-	1	4	3
Korea	7	-	-	-	3	-	-	-	-	-
Lebanon	3	1	-	1	6	-	-	-	-	-
Myanmar	2	-	-	-	-	-	-	-	-	-
Pakistan	6	-	-	3	1	-	-	-	-	-
Philippines	3	-	-	-	-	-	-	-	-	-
Saudi Arabia	-	-	-	1	-	-	-	-	-	-
Sri Lanka	-	1	-	-	-	-	-	-	-	-
Syria	5	-	-	2	5	-	-	-	-	-
Taiwan	5	1	-	-	-	-	-	-	-	-
Thailand	2	-	-	-	-	-	-	-	-	-
Turkey	120	4	1	22	131	-	-	-	-	-
Uzbekistan	1	-	-	-	-	-	-	-	-	-

* Other = other cucurbitaceous species *(Benincasa, Citrullus, Lagenaria, Luffa, Momordica, Trichosanthes)*

[1] Czech Republic: including accessions originating from former Czechoslovakia

[2] Germany: accessions from both countries of formerly divided Germany and from contemporary Germany

Table 4 (cont.). Structure of collection of cucurbitaceous vegetables in the Gene Bank in Olomouc (RICP) according to the country of origin of accessions (as of October 2001)

	No. of accessions									
	Cucumis			*Cucurbita*						Other*
Continent/ Country	*C. sativus*	*C. melo*	Other (wild) *Cucumis* sp.	*C. maxima*	*C. pepo*	*C. moschata*	*C. ficifolia*	*C. argyrosperma*	Other (wild) *Cucurbita* sp.	
Africa										
Angola	-	-	1	-	-	-	-	-	-	-
Bhutan	2	-	-	-	-	-	-	-	-	-
Burkina Faso	-	-	-	2	-	-	-	-	-	-
Cameroon	-	-	-	1	-	-	-	-	-	-
Egypt	7	-	-	-	7	-	-	-	-	-
Ethiopia	1	-	8	5	1	-	-	-	-	-
Kenya	1	1	2	-	-	-	-	-	-	-
Morocco	-	1	-	-	-	-	-	-	-	-
Mozambique	-	-	3	-	-	-	-	-	-	-
Niger	-	-	1	-	-	-	-	-	-	-
Nigeria	-	1	1	3	-	-	-	-	-	-
Senegal	-	1	-	-	-	-	-	-	-	-
South Africa	-	1	24	4	9	-	-	-	-	-
Sudan	-	-	1	-	-	-	-	-	-	-
Tanzania	-	-	2	-	-	-	-	-	-	-
Zambia	-	-	-	23	-	-	-	-	-	-
Zimbabwe	1	-	3	3	1	-	-	-	-	1
Unspecified	-	-	1	-	-	-	-	-	-	-
North America										
Canada	-	-	-	1	-	1	-	-	-	-
USA	67	3	7	12	72	3	-	5	23	2
South America										
Argentina	-	-	-	43	2	-	1	-	-	-
Bolivia	-	-	-	5	2	-	-	-	-	-
Brazil	2	-	4	3	-	1	1	-	-	-
Chile	-	-	-	1	-	-	-	-	-	-
Costa Rica	-	-	-	-	1	-	-	-	-	-
Ecuador	-	-	2	-	-	-	-	-	2	-
Guatemala	-	-	-	2	3	1	-	-	-	1
Mexico	-	-	-	1	24	1	1	40	27	-
Paraguay	-	-	-	6	-	-	-	-	-	-
Peru	-	-	1	2	-	-	-	-	-	-
Puerto Rico	4	-	-	-	-	-	-	-	-	-
Australia										
Australia	1	-	-	3	2	-	-	-	2	-
New Zealand	2	-	-	-	-	-	-	-	-	-
Unknown	18	48	48	3	12	7	1	1	-	31

* Other = other cucurbitaceous species *(Benincasa, Citrullus, Lagenaria, Luffa, Momordica, Trichosanthes)*

Availability of accessions

Accessions of cucurbitaceous genetic resources are freely available for research, breeding and educational purposes on the basis of international agreements and standards.

The availability status of accessions in the Czech national germplasm collection derived from their passport data is listed in Table 2. Accessions with sufficient seed are generally considered as available (letter Y). If the amount of seed is small and/or its germination rate decreases, accessions must be regenerated first and are temporarily unavailable (letter N). The availability of certain accessions (e.g. breeding lines) is possible after permission of the donor (letter L). If the accession does not exist any more because of the loss of seeds, elimination of a duplicate and/or other reasons, only passport data remain in the database. The availability of such accessions is marked by the letter X and their numbers cannot be used for another sample.

By the end of October 2001 a total of 708 accessions of cucurbitaceous vegetables were fully available, 1041 accessions will be available after regeneration, and for the distribution of 38 accessions the permission of donor is requested. In the period 1995–2001 a total of 550 accessions were provided to requesters in the Czech Republic and abroad (Table 5). The Palacký University in Olomouc (Czech Republic), Wisconsin University (USA) and the genebanks in Russia and Taiwan are considered as the most important partners requesting accessions from the cucurbitaceous vegetable collection.

Table 5. Accessions of cucurbitaceous genetic resources distributed by the Gene Bank in Olomouc to requesters in 1995–2001 (as of October 2001)

Genus	No. of accessions distributed in the Czech Republic/abroad							
	1995	1996	1997	1998	1999	2000	2001	Total
Cucumis	2/-	52/58	30/2	31/3	22/-	147/8	22/2	307/73
Cucurbita	14/7	8/-	8/5	11/-	2/-	7/-	10/14	102/26
Other species	6/-	1/-	5/-	4/-	6/-	6/3	11/-	39/3

The number of accessions given in Table 5 does not include approximately 600 *Cucumis* spp. and *Cucurbita* spp. accessions used for study of disease resistance in cooperation with Palacký University in Olomouc (see below, section on evaluation).

Regeneration of accessions, storage conditions and safety-duplication

Regeneration

During the regeneration of cucurbitaceous accessions, international standards are followed and biological requirements of individual species are considered. The Gene Bank in Olomouc possesses 140 isolation cages (2.3 m x 5.5 m), covered by glass or plastic net, for the regeneration of open-pollinated vegetable species. Approximately 40 *Cucumis* plants, vertically trained, can be placed in one cage. Plants are pollinated by honey bees or bumble bees. In 2001 experiments with pollination by flies (*Eristalis tenax*) were carried out and their use will be further considered. Technical capacity enables regeneration of approximately 50–60 *Cucumis* accessions each year.

Storage

Harvested seeds are dried at room temperature, cleaned and then distributed to the main store in the Gene Bank of the Research Institute of Crop Production in Prague–Ruzyne. The seeds are dried to 5-6% moisture content, placed in hermetically closed jars and stored at about -18°C according to international standards in both active and base collections. The working collection is kept directly by the Gene Bank in Olomouc.

Safety-duplicates and "black boxes"

There is a desire to use the capacity of the Gene Bank RICP in Prague–Ruzyne for "black boxes" and/or safety-duplicates of other genebanks. According to the agreement between representatives of the Czech Republic and Slovakia the collection of the most important *Cucumis sativus* accessions, consisting predominantly of Czechoslovak original cultivars and landraces, is prepared for transportation to the Gene Bank in Piešťany (Slovak Republic).

Collecting, characterization and evaluation activities

Collecting

As the cultivation of traditional older cultivars and landraces was eliminated in the 1960s, local cultivars can no longer be collected on family farms. Modern cucumber production is based on Czech and foreign hybrid cultivars. Local cultivars of pumpkin (*Cucurbita maxima*) could be found in hobby-gardens in South Moravia and Central Bohemia. Collecting expeditions for cucurbitaceous vegetables should be organized to certain regions in Europe traditionally aimed at cultivation of landraces.

Characterization

Basic morphological characterization and photographic documentation of accessions are carried out during regeneration and partly in special trials under field conditions. National descriptor lists for *Cucumis* spp. and cultivated *Cucurbita* species are developed.

Evaluation

The work with genetic resources of cucurbitaceous vegetables started by Prof. A. Lebeda (recently Palacký University in Olomouc, Czech Republic) in the 1970s and later developed with his co-workers is aimed at studying possibilities of interspecific hybridization and interactions of *Cucumis* spp. and *Cucurbita* spp. with pathogens and pests. Approximately 1000 accessions have been studied. The study of interactions of *Cucurbita pepo* and *C. maxima* accessions with cucurbit powdery mildew formed part of a PhD thesis on "Biology and epidemiology of *Erysiphales* on *Cucurbita*" (Křístková 1999). Results are published in scientific journals and should also be included in the Czech germplasm database.

The most significant articles are listed below:

- Possibilities of exploration of wild cucurbitaceous species and significance of cucurbitaceous germplasm collections: Křístková and Lebeda 1995, 1997; Lebeda and Křístková 1993a.
- Interspecific crossing of *Cucumis sativus* and *Cucumis melo*: Fellner and Lebeda 1998; Lebeda *et al.* 1996b, 1999c.
- Response of about 400 *Cucurbita pepo* and *Cucurbita maxima* accessions to the cucumber mosaic virus (CMV), watermelon mosaic virus (WMV-2) and zucchini yellow mosaic virus (ZYMV) after artificial inoculation: Křístková and Lebeda 1999a; Lebeda and Křístková 1996b; Lebeda *et al.* 1996a, 1999b.
- Results concerning response of about 60 *Cucumis sativus* accessions to the cucumber mosaic virus (CMV) and watermelon mosaic virus (WMV-2) have not been published yet.
- Response of wild *Cucumis* species to *Pseudomonas syringae* pv. *lachrymans*: Kůdela and Lebeda 1997.
- Interaction of *Cucurbita pepo, Cucurbita maxima, Cucumis melo, Cucumis sativus* and *Citrullus lanatus* with cucurbit powdery mildew (*Erysiphe cichoracearum, Sphaerotheca fuliginea*) under field conditions and after artificial inoculation in a growth chamber:

Křístková 1999; Křístková and Lebeda 1999b, 1999c, 2000a, 2000b; Lebeda and Křístková 1994, 1996a, 1997; Lebeda *et al.* 1999a; Lebeda 1983, 1984.

- Response of about 60 *Cucurbita pepo* and *Cucurbita maxima* recent cultivars to the cucumber downy mildew (*Pseudoperonospora cubensis*) after artificial inoculation: Lebeda and Křístková 1993b, 2000.
- Interaction of *Cucumis* species with cucumber downy mildew: Lebeda and Doležal 1994; Lebeda and Prášil 1994; Lebeda 1991, 1992.
- Results on the field evaluation of about 200 *Cucumis sativus* accessions resistance to cucumber downy mildew have not been published yet.
- Resistance of wild *Cucumis* species to gummy stem blight (*Didymella bryoniae*): Lhotský *et al.* 1991 and to scab (*Cladosporium cucumerinum*) Lebeda 1985.
- Resistance of wild *Cucumis* species to the pests, e.g. *Tetranychus urticae*: Lebeda 1996.

The results obtained generally confirmed a wide morphological and physiological variability within accessions under study. An effective source of valuable characters can be found both within wild and cultivated species.

National and international links and cooperation, capacities and interests of the Gene Bank in Olomouc

The cucurbitaceous germplasm collection was presented in 2001 at the national gardening exhibition Hortikomplex in Olomouc. A seminar on the variability and utilization of vegetable genetic resources was organized in cooperation with Palacký University in Olomouc in 1995 (Křístková and Dušek 1995).

Results of work with the collection of cucurbitaceous vegetables were presented at national and international scientific conferences (France, Italy, Israel, Poland, Slovak Republic, Spain, Turkey). The Gene Bank in Olomouc is not involved in EU projects on cucurbits.

The Olomouc station has good conditions for conserving vegetable genetic resources of the Czech Republic. Besides the tradition, technical equipment and an experienced staff, the links with universities, research institutes and breeding stations have a fundamental importance. Such cooperation resulting in new information about accessions could increase their value and possibilities of further utilization. The Gene Bank RICP in Olomouc is open to all researchers, breeders and students.

Suggestions for future international cooperation on genetic resources of cucurbitaceous vegetables

International cooperation in the area of conservation, exploration and utilization of genetic resources of cucurbitaceous vegetables should be aimed at the following:

- creation of a European database (revision and comparison of collections);
- elaboration of descriptor lists;
- development of documentation;
- ensuring suitable and efficient conditions for regeneration;
- creation of a safety-duplication system;
- saving old varieties and landraces in Europe (if they are not included in collections) and in other continents;
- collecting expeditions which should be organized not only to the centres of origin but also to other "under-investigated" regions; and
- study of accessions (taxonomy, morphology, biological features, etc.).

Acknowledgements

Eva Křístková is obliged to Mr Otík Blahoušek (Palacký University in Olomouc, Czech Republic) for his excellent technical assistance.

References

Buchtová, I. and M. Ehrlichová. 2000. Zelenina. Situační a výhledová zpráva. [Vegetables. Current state and prospects]. Ministry of Agriculture of the Czech Republic, Prague, Czech Republic. (in Czech).

Dušek, K. and E. Křístková. 1998. Gene Bank RICP - workplace Olomouc, Collection of vegetables, aromatic and medicinal plants. Pp. 37-40 *in* National programme on plant genetic resources conservation and utilization in the Czech Republic (L. Dotlačil and K.J. Štolc, eds). Ministry of Agriculture of the Czech Republic/Czech Board on Plant Genetic Resources/Research Institute of Crop Production Prague-Ruzyne, Prague, Czech Republic.

Fellner, M. and A. Lebeda. 1998. Callus induction and protoplast isolation from tissues of *Cucumis sativus* L. and *C. melo* L. seedlings with downy- and powdery mildew resistance as sources for protoplast fusion. Biol. Plantarum 41:11-24.

Kirkbride, J.H. Jr. 1993. Biosystematic monograph of the genus *Cucumis (*Cucurbitaceae*).* Parkway Publ., Boone, North Carolina.

Křístková, E. 1999. Biologie a epidemiologie hub řádu *Erysiphales* na rodu *Cucurbita* [Biology and epidemiology of *Erysiphales* on *Cucurbita*]. Doctor thesis, Palacký University, Faculty of Science, Olomouc, Czech Republic. (in Czech and English).

Křístková, E. and K. Dušek. 1995. Uchování genových zdrojů zeleniny ČR [Conservation of vegetable genetic resources in the Czech Republic]. Zahradnictví (Horticultural Science, Prague) 20(4):22. (in Czech).

Křístková, E. and A. Lebeda. 1995. Genové zdroje zelenin čeledi Cucurbitaceae [Genetic resources of vegetable crops from the family Cucurbitaceae]. Zahradnictví (Horticultural Science, Prague) 22(4):123-128. (in Czech).

Křístková, E. and A. Lebeda. 1997. Možnosti využití plane rostoucích druhů rodu *Cucurbita* ve šlechtění prostřednictvím mezidruhové hybridizace [Possibilities of exploration of wild *Cucurbita* species in breeding via interspecific hybridization]. Zahradnictví (Horticultural Science, Prague) 24(3):113-120. (in Czech).

Křístková, E. and A. Lebeda. 1999a. Variation in response of *Cucurbita* spp. to watermelon mosaic virus-2 infection. Petria, Journal of Plant Pathology (Italy) 9(3):334-335.

Křístková, E. and A. Lebeda. 1999b. Vliv ontogenetického stadia a habitu rostlin *Cucurbita pepo* L. na polní odolnost k padlí tykvovitých [Influence of developmental stage and plant habit of *Cucurbita pepo* L. genotypes on their field resistance to the powdery mildew of cucurbits]. Zahradnictví (Horticultural Science, Prague) 26(1):19-24. (in Czech).

Křístková, E. and A. Lebeda. 1999c. Searching of *Cucumis sativus* L. genetic resources for field resistance to powdery mildew of cucurbits. Acta Hortic. 492:371-375.

Křístková, E. and A. Lebeda. 2000a. Powdery mildew field infection on leaves and stems of *Cucurbita pepo* accessions. Acta Hortic. 510:61-66.

Křístková, E. and A. Lebeda. 2000b. *Citrullus lanatus* – a potential host of powdery mildew in the Czech Republic. Cucurbit Genet. Coop. Rep. 23:46-48.

Kůdela, V. and A. Lebeda. 1997. Response of wild *Cucumis* species to inoculation with *Pseudomonas syringae* pv. *lachrymans.* Gen. Res. Crop Evol. 44:271-275.

Lebeda, A. 1983. The genera and species spectrum of cucumber powdery mildew in Czechoslovakia. Phytopath. Z. 108:71-79.

Lebeda, A. 1984. Screening of wild *Cucumis* species for resistance to cucumber powdery mildew (*Erysiphe cichoracearum* and *Sphaerotheca fuliginea*). Scientia Hortic. 24:241-249.

Lebeda, A. 1985. Resistance of *Cucumis sativus* cultivars to *Cladosporium cucumerinum.* Scientia Hortic. 26:9-15.

Lebeda, A. 1991. Resistance of muskmelons to Czechoslovak isolates of *Pseudoperonospora cubensis* from cucumbers. Scientia Hortic. 45:255-260.

Lebeda, A. 1992. Screening of wild *Cucumis* species against downy mildew (*Pseudoperonospora cubensis*) isolates from cucumbers. Phytoparasitica 20:203-210.

Lebeda, A. 1996. Resistance of wild *Cucumis* species to twospotted spider mite (*Tetranychus urticae*). Acta Phytopath. Ent. Hung. 31:247-252.

Lebeda, A. and K. Doležal. 1994. Peroxidase isozyme polymorphism as a potential marker for detection of a field resistance in *Cucumis sativus* to cucumber downy mildew (*Pseudoperonospora cubensis* (Berk. et Curt.) Rostov.). J. Plant Dis. Prot. 102:467-471.

Lebeda, A., S. Kozelská, E. Křístková and R. Novotný. 1996a. The occurrence of viruses on *Cucurbita* spp. in the Czech Republic and resistance of squash cultivars to CMV and WMV-2. J. Plant Dis. Prot. 103(5):455-463.

Lebeda, A. and E. Křístková. 1993a. Genetická variabilita rodu *Cucumis* a její využití ve šlechtění [Genetic variability of the *Cucumis* genus and its utilization in plant breeding]. Genetika a šlechtění (Genetics and Plant Breeding, Prague) 29:59-66. (in Czech).

Lebeda, A. and E. Křístková. 1993b. Resistance of *Cucurbita pepo* and *Cucurbita moschata* varieties to cucurbit downy mildew (*Pseudoperonospora cubensis*). Plant Var. Seeds 6:109-114.

Lebeda, A. and E. Křístková. 1994. Field resistance of *Cucurbita* species to powdery mildew (*Erysiphe cichoracearum*). J. Plant Dis. Prot. 101:598-603.

Lebeda, A. and E. Křístková. 1996a. Genotypic variation in field resistance of *Cucurbita pepo* assortment to powdery mildew (*Erysiphe cichoracearum*). Gen. Res. Crop Evol. 43: 79-84.

Lebeda, A. and E. Křístková. 1996b. Resistance in *Cucurbita pepo* and *Cucurbita maxima* germplasms to cucumber mosaic virus. Gen. Res. Crop Evol. 43: 461-469.

Lebeda, A. and E. Křístková. 1997. Evaluation of *Cucumis sativus* L. germplasm for field resistance to the powdery mildew. Acta Phytopath. Ent. Hung. 32:299-305.

Lebeda, A. and E. Křístková. 2000. Interaction between morphotypes of *Cucurbita pepo* and obligate biotrophs (*Pseudoperonospora cubensis, Erysiphe cichoracearum* and *Sphaerotheca fuliginea*). Acta Hortic. 510:219-225.

Lebeda, A., E. Křístková and K. Doležal. 1999a. Peroxidase isozyme polymorphism in *Cucurbita pepo* cultivars with various morphotypes and different level of field resistance to powdery mildew. Scientia Hortic. 81:103-112.

Lebeda, A., E. Křístková, S. Kozelská, M. Jokeš and J. Rodová. 1999b. Response of *Cucurbita pepo* and *Cucurbita maxima* genotypes to Czech isolate of zucchini yellow mosaic virus. Petria, Journal of Plant Pathology (Italy) 9(3):335-336.

Lebeda, A., E. Křístková and M. Kubaláková. 1996b. Interspecific hybridization of *Cucumis sativus* x *Cucumis melo* as a potential way to transfer resistance to *Pseudoperonospora cubensis.* Pp. 31-37 *in* Cucurbits towards 2000. Proceedings of the VIth Eucarpia Meeting on Cucurbit Genetics and Breeding, 28-30 May 1996, Málaga, Spain (M.L. Gómez-Guillamón, C. Soria, J. Cuartero, J.A. Torés and R. Fernández-Munoz, eds). Estacion Experimental "La Mayora", C.S.I.C., Malaga.

Lebeda, A., M. Kubaláková, E. Křístková, B. Navrátilová, K. Doležal, J. Doležel and M. Lysák. 1999c. Morphological and physiological characteristics of plants issued from an interspecific hybridization of *Cucumis sativus* and *Cucumis melo.* Acta Hortic. 492:149-155.

Lebeda, A. and J. Prášil. 1994. Susceptibility of *Cucumis sativus* cultivars to *Pseudoperonospora*

cubensis. Acta Phytopath. Ent. Hung. 29:89-94.
Lhotský, B., A. Lebeda and J. Zvára. 1991. Resistance of wild *Cucumis* species to gummy stem blight (*Didymella bryoniae*). Acta Phytopath. Ent. Hung. 26:303-308.
Whitaker, T.W. and W.P. Bemis. 1975. Origin and evolution of the cultivated *Cucurbita.* Bulletin for the Torray Botanical Club 102(106):460-466.

Status of the national cucurbit collection in Hungary

Lajos Horváth
Institute for Agrobotany (ABI), Tápiószele, Hungary

Status on national level

The five institutions listed in Table 1 deal with genetic resources of cucurbits in Hungary. Their collections are maintained for various purposes and hold more than 2500 accessions belonging mainly to the five most important Cucurbitaceae species, grown as vegetables, in the country.

Table 1. Current status of the state-funded cucurbit germplasm collections in Hungary

Institution	Location	Collection type	No. of accessions
Institute for Agrobotany	Tápiószele	Genebank for all species and their wild relatives	1368
National Institute for Agricultural Quality Control	Budapest	Registered varieties for reference	349
Vegetable Production Research Institute	Budapest	Cucumber (breeder's collection)	350
Faculty of Horticulture, St. Stephan University	Budapest	Musk-and watermelon (breeder's collection)	460
Cereal Research Public Utility Company	Szeged	Muskmelon (breeder's collection)	31

Among these institutions the Institute for Agrobotany, Tápiószele (ABI) belongs to the Ministry of Agriculture and Rural Development. ABI is responsible for the development and maintenance of the Hungarian field crop and vegetable genetic resources collections, including cucurbits. ABI is also responsible for the operation of the National Genetic Resources Database (NGRD) and for the maintenance of the National Base Collection (NBC) created for the safety-duplication of seed-propagated accessions, recorded in the NGRD.

In the case of the other four organizations the Ministry also provides funds for the maintenance of those genebank accessions which are included in the NGRD at ABI, and in order to coordinate activities at a national level a technical and scientific advisory body, the National Genebank Council, was created.

The ABI cucurbit collection

Maintenance

For the last few decades the ABI cucurbit collection has been managed in accordance with international genebank standards. Today more than 1300 accessions of 18 Cucurbitaceae species (Table 2) are stored in the active and base collection chambers of the Institute. The storage temperature is 0ºC in the active collection and -20ºC in the base collection chambers, where 243 accessions are kept. There are another 200 duplicates in the NBC deep freezers.

The history of the ABI cucurbit collection began in the 1950s. Since then it has been developed continuously by collecting expeditions in Hungary and with material received from abroad. As shown in Table 3, a considerable part of collection is of Hungarian origin.

Table 2. Species and number of accessions in the ABI cucurbit collection

Genus	Species	No. of accessions
Benincasa	*hispida* (Thunb.) Cogn.	4
Bryonia	*cretica* L.	1
Citrullus	*colocynthis* (L.) Schrad.	9
Citrullus	*lanatus* (Thunb.) Mansf.	200
Cucumis	*anguria* L.	6
Cucumis	*dipsaceus* Ehrh.	3
Cucumis	*melo* L.	182
Cucumis	*prophetarum* L.	1
Cucumis	*sativus* L.	191
Cucurbita	*ficifolia* Bouché	7
Cucurbita	*maxima* Duch. ex Lam.	281
Cucurbita	*mixta* Pang.	1
Cucurbita	*moschata* (Duch. ex Lam.) Duch. ex Poir.	27
Cucurbita	*pepo* L.	416
Lagenaria	*siceraria* (Mol.) Standl.	34
Luffa	*acutangula* (L.) Roxb.	3
Momordica	*charantia* L.	1
Trichosanthes	*cucumerina* L.	1
Total		**1368**

Table 3. Status of the ABI cucurbit collection tabulated by country of origin

Species	Country of origin (ISO code) and no. of accessions	No. of accessions for which indication of country code is	
		present	absent
Benincasa hispida (Thunb.) Cogn.	-	-	4
Bryonia cretica L.	-	-	1
Citrullus colocynthis (L.) Schrad.	-	-	9
Citrullus lanatus (Thunb.) Mansf.	BGR (3); CSK (2); HUN (125); ROM (1); SUN (2); SYR (1); USA (6)	140	60
Cucumis anguria L.	-	-	6
Cucumis dipsaceus Ehrh.	-	-	3
Cucumis melo L.	BGR (2); CSK (2); GRC (6); HUN (67); ITA (2); JPN (2); NLD (1); ROM (4); TUR (1)	87	95
Cucumis prophetarum L.	-	-	1
Cucumis sativus L.	BGR (1); CHN (1); CSK (8); DDR (1); HUN (93); NLD (6); POL (1); ROM (8); SUN (1); USA(1)	121	70
Cucurbita ficifolia Bouché	HUN (3)	3	4
Cucurbita maxima Duch. ex Lam.	BGR (2); CSK (3); HUN (165); ROM (4); SYR (1)	175	106
Cucurbita mixta Pang.	-	-	1
Cucurbita moschata (Duch. ex Lam.) Duch. ex Poir.	ESP (1); HUN (2)	3	24
Cucurbita pepo L.	BEL (1); BGR (3); CSK (7); DEU (3); HUN (200); ITA (1); POL (2); ROM (3); SUN (1); SYR (2); TUR (3); USA (2); YUG (2)	230	186
Lagenaria siceraria (Mol.) Standl.	HUN (10)	10	24
Luffa acutangula (L.) Roxb.	-	-	3
Momordica charantia L.	-	-	1
Trichosanthes cucumerina L.	-	-	1
Total		**599**	**769**

Multiplication and regeneration

The volume of field multiplication and regeneration varies from year to year according to the changes due to newly introduced or collected material and to the regeneration needs of the genebank. For seed multiplication of the insect-pollinated species the technical isolation method (manual pollination and flower bagging) is used. In the near future 191 cucurbit accessions (32 watermelon, 19 muskmelon, 34 cucumber, 32 marrow, 52 pumpkin, 14 bottle-gourd, etc.) require urgent regeneration: the majority of these accessions were deposited for long-term storage in the 1970s.

Characterization and evaluation

According to the specific features of species or genera, four internationally standardized lists (Gourds, Muskmelon, Watermelon, Cucumber) of 25–45 various descriptors are used for the genebank characterization of the cucurbit accessions. More than 90% of the collections already have characterization data.

Primary or secondary evaluation is not regularly carried out on the cucurbit collections, but in cases of necessity or special agreements ABI also undertakes more detailed field or laboratory evaluations.

Documentation

Passport, characterization and genebank management data are fully computerized. The ABI cucurbit database can also be found on the Internet (www.rcat.hu) and it is available to the European Cucurbit Database.

Future activities

Planned activities for future years can be summarized as follows:

- Regeneration of the 191 accessions identified; and
- Compiling of characterization and evaluation data of various origins and making them more readily available to partners.

Status of the cucumber (*Cucumis sativus*) collection of CGN

Willem van Dooijeweert

Centre for Genetic Resources, The Netherlands, DLO Foundation, Wageningen University and Research Centre, Wageningen, The Netherlands

Introduction

The Centre for Genetic Resources, The Netherlands (CGN) is part of Wageningen University and Research Centre. CGN maintains the Dutch genebank for plant genetic resources for food and agriculture under a mandate of the Netherlands government. It was established in 1985.

CGN has focused on a limited number of collections, for which it attempts to maintain high quality seed, which is readily available to *bona fide* users. CGN strives to increase knowledge over its germplasm relevant to its users. All parties which use its germplasm for breeding, research or cultivation and which have access to facilities needed to attain these objectives qualify as *bona fide* users. The complete CGN collection holds about 22 000 accessions, spread over 23 crops.

The cucumber collection

The cucumber (*Cucumis sativus)* collection originates from the former Institute for Horticultural Plant Breeding (IVT). This collection was a working collection for their breeding work. The material has been characterized for morphological characters. The collection includes mainly old cultivars received from Dutch and foreign seed companies and genebanks. CGN adopted the collection in 1992.

The quality and quantity of the seeds of the collection has been assessed and accessions meeting our standards have been given a CGN accession number. The collection is rationalized by rejecting duplicates and hybrids. Passport data are available and searchable on the CGN Web site (http://www.genebank.nl), but far from complete. Missing passport data like population type and origin data need to be added.

The cucumber collection holds only accessions of the cultivated *Cucumis sativus*. It consists of 790 accessions (December 2001). An overview is given in Tables 1 and 2.

Table 1. Number of cucumber accessions per taxon

Botanic name	No. of accessions
Cucumis sativus group unknown	533
Cucumis sativus group Cucumber	153
Cucumis sativus group Gherkin	103
Cucumis sativus var. *hardwickii*	1
Total	**790**

Regeneration

About 200 accessions of cucumber will be added to the collection after they have been regenerated. Regeneration takes place in insect-free glasshouses on rock wool. Two stems per plant are grown along ropes. Ten plants per accession are regenerated. For seed production, so-called chain pollination is carried out by hand. For each accession, plant 1 is crossed with plant 2, plant 2 with plant 3, etc. Two to four ripe fruits are harvested per plant. Biological control is used to maintain a healthy crop. The Dutch breeding companies assist in the regeneration of cucumber.

Sample viability

The seeds are dried until a moisture content of about 5% is reached. Sample viability is determined in germination tests. In general the germination percentage should be at least 80% if samples are to be included in the collection. Five different types of samples for storage are distinguished: user samples (25 seeds), germination samples (200), regeneration sample (100), duplication sample (100 seeds) and a residual sample.

Table 2. Number of accessions per country of origin

Code	Country	No. of accessions	Code	Country	No. of accessions
AFG	Afghanistan	1	ITA	Italy	1
ARG	Argentina	1	JPN	Japan	54
AUS	Australia	1	KGZ	Kyrgyzstan	3
BGD	Bangladesh	1	KOR	Republic of Korea	2
BRA	Brazil	4	LKA	Sri Lanka	2
BRD	Germany, Fed. Rep.	14	MRT	Mauritania	1
CAN	Canada	3	MUS	Mauritius	2
CHN	China	28	NLD	Netherlands	90
CSK	Czechoslovakia	7	NPL	Nepal	3
DDR	German Democratic Rep.	7	PAK	Pakistan	11
DEU	Germany	4	POL	Poland	18
DNK	Denmark	8	ROM	Romania	4
EGY	Egypt	12	SUN	Union of Soviet Soc. Rep.	63
ESP	Spain	1	SUR	Surinam	2
ETH	Ethiopia	1	SWE	Sweden	5
FE.	Far East	2	SYR	Syria	1
FRA	France	6	THA	Thailand	3
GBR	United Kingdom	7	TUR	Turkey	9
GRC	Greece	2	TWN	Taiwan, Province of	6
HKG	Hong-Kong	1	USA	United States	34
HUN	Hungary	13	UZB	Uzbekistan	15
IDN	Indonesia	11	VNM	Vietnam	2
IND	India	25	YUG	Yugoslavia	4
IRN	Iran	15	ZAR	Zaire	2
IRQ	Iraq	1	x	Unknown	273
ISR	Israel	4			
Total no. of accessions: 790					

Storage

Seeds are packed in laminated aluminium foil bags and stored at –20°C. CGN has both long- and medium-term storage facilities. The seed storage facilities of the CGN consist of the following compartments:

- 2 deep-freezer compartments (–20°C) each of 30 m^2
- 1 cooler compartment (+4°C) of 30 m^2
- 1 dryer compartment (+16°C, RH 12%) of 10 m^2
- 1 working compartment of 20 m^2

The numbered boxes are grouped by crop and placed on numbered shelves in the storage rooms. The location of storage (box and shelf) is recorded in the CGN information system.

Safety-duplication

About 90% of the collection is duplicated at the Genetic Resources Unit of HRI, Wellesbourne, United Kingdom. Every year the regenerated accessions are sent to HRI.

Characterization and evaluation

The cucumber collection was characterized for 19 morphological characters. So far, no evaluation data have been recorded. Characterization data can be downloaded from the CGN Web site.

Utilization

Since 1998 the collection has been increased by about 100 accessions a year. Utilization only started a few years ago. Users have to sign a Material Transfer Agreement. Since 1998 more than 300 accessions have been distributed to breeding companies and institutions.

Collecting missions

In 1997 and in 1999 multicrop collection missions to Uzbekistan and Kyrgysztan took place. These two missions resulted in 18 new *Cucumis sativus* accessions.

Research

Most of the accessions distributed in the last three years were used for research purposes. Results can be made public about three years after results are obtained.

References

Groot, E.C. de and I.W. Boukema. 1997. Economisch belangrijke vruchtgroenten geconserveerd [Economically important fruit vegetables conserved]. Prophyta 51(2):14-16.

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

Genetic resources of Cucurbitaceae in Portugal

Valdemar Carnide
Universidade Trás-os Montes e Alto Douro, Vila Real, Portugal

Work on the collecting, conservation and utilization of plant genetic resources has been undertaken since 1977 in Portugal. Several collecting missions were carried out across the country (inland and islands of Azores, Madeira and Porto Santo), and the genetic material was conserved in *ex situ* conditions.

Initially all this work was done by the Banco Português de Germoplasma Vegetal (BPGV), Estação Agronómica Nacional (EAN) and Estação Nacional de Melhoramento de Plantas (ENMP). After that BPGV continued to cooperate with other institutions in Portugal that wanted to implement the task of seed conservation.

Cucurbitaceae genetic resources in Portugal are conserved in three active collections in three different institutions: Universidade de Trás-os-Montes e Alto Douro (UTAD), Vila Real; Banco Português de Germoplasma Vegetal (BPGV), Braga; and Estação Agronómica Nacional (EAN), Oeiras. The Genebank also maintains this material under long-term conditions (-18ºC). Table 1 shows the distribution of the material among the different institutions and storage conditions, together with its documentation status.

Table 1. Cucurbitaceae collections in Portugal

	UTAD Vila Real	**BPGV Braga**	**EAN Oeiras**
Accessions			
Citrullus lanatus	-	36	1
Cucumis melo	14	67	3
C. sativus	-	43	2
Cucurbita ficifolia	-	9	-
C. maxima	-	44	5
C. pepo	-	91	5
Cucurbita spp.	-	-	4
Storage conditions			
Medium-term storage (0 to 5°C, 45% RH)	Yes	Yes	No
Long-term storage (-18°C)	No	Yes	Yes
Data computerized			
Passport data	Database of EU *Cucumis melo* project	Yes	Yes
Characterization data	Database of EU *Cucumis melo* project	No	No

Status of the cucurbit collections in Russia

Tatiana Piskunova
N.I. Vavilov Research Institute of Plant Industry (VIR), St. Petersburg, Russian Federation

The collections

The collections of cucurbits at the VIR consist of 10 151 accessions belonging to 21 species, collected from 97 countries starting from 1925. The current status of the cucurbit collections is given in Table 1.

The collection material includes 5 groups of accessions: landraces – 4659 acc. (45.9% from total), cultivars – 4388 (43.2%), hybrids – 330 (3.3%), wild and weedy – 657 (6.5%) and other (breeding lines, donors) – 103 (1.1%) (Table 2).

Table 1. Status of VIR cucurbit collections

	No. of accessions					
Species	**Total**	**W**	**LR**	**CV**	**H**	**O**
Cucurbita pepo L.	1004	-	335	641	14	14
Cucurbita maxima Duch.	575	-	248	306	6	15
Cucurbita moschata Duch.	461	-	284	176	-	1
Cucurbita mixta Pang.	17	-	-	12	5	-
Cucurbita ficifolia Bouché	7	-	7	-	-	-
Cucumis sativus L.	1935	-	524	1188	191	32
Cucumis melo L.	2986	34	1800	1059	72	21
Cucumis sp.	10	-		-	-	-
Citrullus lanatus (Thunb) Matsum et Nakai.	2498	-	1416	1013	42	27
Citrullus colocynthis Schrad.	56	56	-	-	-	-
Citrullus mucosospermus Fursa	46	46	-	-	-	-
Citrullus ecirrhosus Cogn.	2	2	-	-	-	-
Luffa cylindrica (L.) Roem	156	156	-	-	-	-
*Luffa acutangula (*L.) Roxb.	55	55	-	-	-	-
Lagenaria siceraria (Molina) Standl.	255	210	45	-	-	-
Benincasa sp.	37	37	-	-	-	-
Momordica charantia L.	15	15	-	-	-	-
Trichosanthes anguina L.	15	15	-	-	-	-
Ecballium elaterium (L.) A. Rich	5	5	-	-	-	-
Echinocystis lobata Tour et Gray	2	2	-	-	-	-
Bryonia sp.	4	4	-	-	-	-
Cyclanthera sp.	4	4	-	-	-	-
Cucumeropsis edulis (Hook) Cogn	1	1	-	-	-	-
Melothria scabra Naud.	5	5	-	-	-	-
Total	**10151**	**657**	**4659**	**4395**	**330**	**110**

Legend: W = wild and weedy; LR = landraces; CV = cultivars; H = hybrids; O = other.

Table 2. Structure of the VIR cucurbit collections

	No. of accessions					
Name	**Total**	**W**	**LR**	**CV**	**H**	**O**
Squash and pumpkin	2064	-	874	1135	25	30
Cucumber	1935	-	524	1181	191	32
Melon	2986	34	1800	1059	72	21
Watermelon	2602	104	1416	1013	42	27
Other	564	519	45	-	-	-
Total	**10151**	**657**	**4659**	**4395**	**330**	**110**
% of total	**100**	**6.5**	**45.9**	**43.3**	**3.3**	**1.1**

Legend: W = wild and weedy; LR = landraces; CV = cultivars; H = hybrids; O = other.

Storage and safety-duplication

At present working collections are stored at room temperature at the VIR Headquarters Department of Vegetable and Cucurbits Crops in St. Petersburg. In 2002 active collections will be placed in storage at +4°C. Base collections are preserved in medium-term storage at +4°C at the Kuban Experiment Station and in 2002 will be stored as safety-duplicates at the VIR HQ genebank. Part of the base collections is already preserved in laminated aluminium foil bags at -10°C for long-term storage. At present the cucurbit collections of VIR are not duplicated at other genebanks.

Regeneration practices and availability of the material

The collection materials are regenerated at the nine experiment stations which are situated within the country's different ecogeographical zones. About 1400 accessions are regenerated every year. But some seed material does not fulfil our requirements regarding quantity of seeds. The limiting factors for multiplication are (i) the large quantity of accessions needing regeneration; (ii) the necessity of hand pollination; and (iii) the lack of financial and human resources.

Availability of the materials is determined according to the seed quantity and the type of accessions. Small seed samples, new breeding lines, donors of most important commercial traits are limited for distribution and, in some cases, not available.

Characterization and evaluation

Most accessions have been characterized for different morphological traits according to VIR descriptor lists and evaluated for main commercial traits (Table 3). Some of the squash accessions were evaluated for seed oil content (200 accessions), cold resistance (890 acc.) and resistance to *Meloidogyne incognita* (200 acc.). In addition, 209 cucumber accessions were evaluated for resistance to scab, 100 watermelon accessions for cold resistance, 800 accessions of melon and watermelon for resistance to anthracnose, powdery mildew and fusarium wilt. Passport data are fully computerized. Characterization and evaluation data are now recorded in journals, special cards and catalogues, and need to be computerized.

Table 3. Documentation status of the cucurbit collections

	% of accessions with		
Name	**Passport data**	**Characterization data**	**Evaluation data**
Squash and pumpkin	100	88	60
Cucumber	100	95	25
Melon	100	95	30
Watermelon	100	84	34

Collecting activities

At present collecting missions have been reduced because of the lack of funds. During 1996-2001 different collecting missions of the VIR collected 41 accessions of squash, 26 of watermelon, 109 of melon and 82 of cucumber.

Planned activity for the near future

- To continue multiplication of collected accessions for long-term storage at -10°C
- To create a computerized evaluation database.

Status of the cucurbit collection at COMAV, Spain

Belén Picó, Maria José Díez, Maria Ferriol, Pascual Fernández de Córdova, Jose Vicente Valcárcel and Fernando Nuez

Center for the Conservation and Breeding of the Agricultural Biodiversity (COMAV), Polytechnic University of Valencia, Valencia, Spain

Introduction

Activities related to vegetable genetic resources in Spain started in the early 1980s. Before the establishment of a national coordinating programme for vegetable genetic resources activities, two institutions—the Polytechnic University of Valencia (UPV), Valencia, and the Servicio de Investigación Agroalimentaria (SIA), Zaragoza—created two genebanks (initially headed by F. Nuez and J.M. Alvarez, respectively). The coordination of national activities started with the establishment of the Programme for Conservation and Use of Genetic Resources by the Spanish Ministry of Agriculture, Fisheries and Food (MAPA). The national project "Collecting, Multiplication and Evaluation of Vegetable Genetic Resources for their Conservation in Genebanks" was coordinated by M. Carravedo (SIA) from 1987 to 1993. F. Nuez (UPV) assumed this responsibility from 1994 on (Nuez and Fernández de Córdova 1994; Nuez and Ruiz 1999a). This project includes activities of nine other state institutions:

- Estación Experimental La Mayora-CSIC, Málaga
- Servicio de Investigación Agroalimentaria (SIA), Zaragoza
- Instituto Valenciano de Investigaciones Agrarias (IVIA), Valencia
- Centro de Investigación y Formación Agraria (CIFA), Andalucia
- Centro de Investigación y Desarrollo Agroalimentario (CIDA), Murcia
- Servicio de Investigación y Desarrollo Tecnológico (SIDT), Extremadura
- Centro de Investigación y Desarrollo Agrario (CIDA), La Rioja
- Dirección General de la Producción Agraria (DGPA), Castilla-La Mancha
- Misión Biológica de Galicia-CSIC, Galicia
- Instituto de Agricultura Sostenible (IAS), Córdoba.

The Genebank of the Polytechnic University of Valencia together with several research groups (groups from the UPV and other Spanish institutions working on vegetable breeding) constituted in 1999 the Center for the Conservation and Breeding of the Agricultural Biodiversity (COMAV). The collections currently maintained in the COMAV Genebank include more than 7000 accessions belonging mainly to the 17 most important species cultivated as vegetables in the country (tomato, pepper, eggplant, lettuce, onion, *Brassica* spp., spinach, bean, radish, cucumber, muskmelon, watermelon, pumpkin, squash, zucchini, etc.) (Nuez and Ruiz 1999b; Picó and Nuez 1999). The cucurbit collection is one of the largest.

Importance of cucurbit cultivation in Spain

Spain is not a centre of origin of cucurbits. However, they are among the most economically important vegetables cultivated in Spain (Table 1), displaying a rich genetic diversity. Melon (*Cucumis melo*), watermelon (*Citrullus lanatus*), cucumber (*Cucumis sativus*) and zucchini (*Cucurbita pepo*) are the main crops. These cucurbits are mostly cultivated in southeastern regions, Murcia and Almeria (Andalucia), where intensive agriculture under greenhouses is practised for national markets and export. Both cultivars and hybrids are used in the producing areas. Pumpkins and gourds (*C. maxima, C. moschata*, *C. ficifolia* and *Lagenaria siceraria*) are mainly grown as cattle food and for human consumption on small plots all over

the country, mostly for home use and for local markets. Traditional cultivars are mostly used.

Table 1. Economic importance of cucurbits in Spain

Crop	Crop ranking*	Area harvested (ha)	Yield (Mt)	Ranking of Spanish production in Europe (ha/Mt)
Muskmelon	5	38500	993300	2 / 1
Watermelon	6	18000	605900	3 / 2
Cucumber	7	7000	420000	8 / 4
Zucchini, pumpkin and gourds	8	7000	300000	4 / 3
Total cucurbits		**70500**	**2319200**	

* After tomato, pepper, lettuce and onion.
Source: FAOSTAT 2001 (http://apps.fao.org/page/collections?subset=agriculture)

The cucurbit collection at COMAV

The history of the cucurbit collection at COMAV began in the 1980s. Since then, the collection has been continuously increased by collecting expeditions (Nuez *et al.* 1994, 2000; Fernández de Córdova *et al.* 1995). The COMAV cucurbit collection consists of 2025 accessions mostly belonging to 10 species originating from 15 countries (Tables 2 and 3). Most of the accessions belong to cultivated species of three genera: *Cucumis*, *Cucurbita* and *Citrullus*. A summary of the current status of the cucurbit collection is given in Table 2. Most are landraces, local and older cultivars. The group of minor cucurbits includes the genera *Luffa* and *Cyclanthera*. The COMAV Genebank also maintains some wild *Cucumis* accessions belonging to different species. However, the taxonomic classification of many of these wild accessions should be confirmed. Some *Cucurbita* accessions also remain unclassified.

Table 2. Species and number of accessions in the COMAV cucurbit collection

Genera	Species	No. of accessions
Cucumis	*melo* L.	612
	sativus L.	129
	Wild *Cucumis; C. africanus, C. anguria, C. asper, C. callosus, C. dinteri, C. dipsaceus, C.ficifolius, C. hardwickii, C. heptadactylus, C. zeyheri*	57
Citrullus	*lanatus* (Thunb.) Matsum. et Nakai	236
	colocynthis	3
Cucurbita	*ficifolia* Bouché	92
	maxima Duch. ex Lam.	249
	moschata (Duch.ex Lam.) Duch. ex Poir	223
	pepo L.	291
	unclassified	70
Lagenaria	*siceraria* (Mol.) Standl.	51
Minor cucurbits	*Luffa* spp., *Cyclanthera pedata*	12
Total cucurbits		**2025**

Collecting expeditions

Much of the COMAV cucurbit collection is of Spanish origin (Table 3). The expeditions in Spain have concentrated on collecting the local landraces to avoid genetic erosion of traditional cultivars and ecotypes adapted to different environments (Table 4 and Fig. 1). Some of these ecotypes have already disappeared from the traditional cultivation areas. Additionally, collecting expeditions to other countries have also been conducted, mostly to South and Central America (Guatemala, Ecuador, Peru, etc.), centre of origin of *Cucurbita* species, and also to some European, African and Asiatic countries (Greece, Morocco, etc.).

The COMAV Genebank also maintains cucurbit accessions from other international germplasm collections.

Table 3. Origin of the cucurbitaceous accessions maintained at the COMAV Genebank

Origin	*C. melo*	*C. sativus*	*C. lanatus*	*C. ficifolia*	*C. maxima*	*C. moschata*	*C. pepo*	*L. siceraria*	Total
Europe (Spain, Greece, Portugal)	557	124	221	77	218	201	274	46	1718
Asia (China, India)	1	3	3	-	-	-	-	-	7
America (Argentina, Bolivia, Cuba, Ecuador, USA, Guatemala, Peru, Uruguay)	37	1	11	15	24	14	10	1	113
Africa (Angola, Morocco)	17	1	1	-	6	8	7	4	44
Total	**612**	**129**	**236**	**92**	**249**	**223**	**291**	**51**	**1883**

Table 4. Structure of the Spanish cucurbit collection maintained at the COMAV Genebank

Region	*C. melo*	*C. sativus*	*C. lanatus*	*C. ficifolia*	*C. maxima*	*C. moschata*	*C. pepo*	*L. siceraria*
Andalucía	135	39	31	10	49	17	37	5
Aragón	9	11	6	2	5	-	11	3
Asturias	-	1	-	-	1	-	11	-
Baleares	17	-	3	2	6	13	6	2
Canarias	31	7	43	28	8	117	86	4
Cantabria	-	-	-	-	-	-	4	-
C. La Mancha	44	20	24	3	17	7	19	4
C. León	4	1	1	-	15	-	1	-
Cataluña	43	3	55	6	23	14	30	-
Extremadura	52	3	12	1	9	3	8	2
Galicia	1	-	-	-	-	-	-	-
La Rioja	-	-	1	-	2	-	-	-
Murcia	48	8	5	2	9	3	3	3
Navarra	1	-	-	-	1	-	1	-
C. Valenciana	165	30	39	23	73	27	54	23
Total	**550**	**123**	**220**	**77**	**218**	**201**	**271**	**46**

Storage conditions

The COMAV cucurbit collection is managed in accordance with the international genebank standards. Nowadays the 2025 accessions of cucurbitaceous species are stored in glass jars in the active collection chambers. Two coolers, each of 25 m^2 with numbered shelves and a working compartment of 15 m^2 are available for seed management and conservation. The seeds are first dried until seed moisture content of about 5-6% is reached. COMAV is an active bank with medium-term storage facilities. The storage conditions in the chambers are –3°C and 30% relative humidity.

Approximately 40% of the collection is duplicated at the CRF (Centre for Genetic Resources, Madrid, headed by L. Ayerbe) and the Genebank of the SIA (Zaragoza, headed by M. Carravedo) under long-term storage conditions.

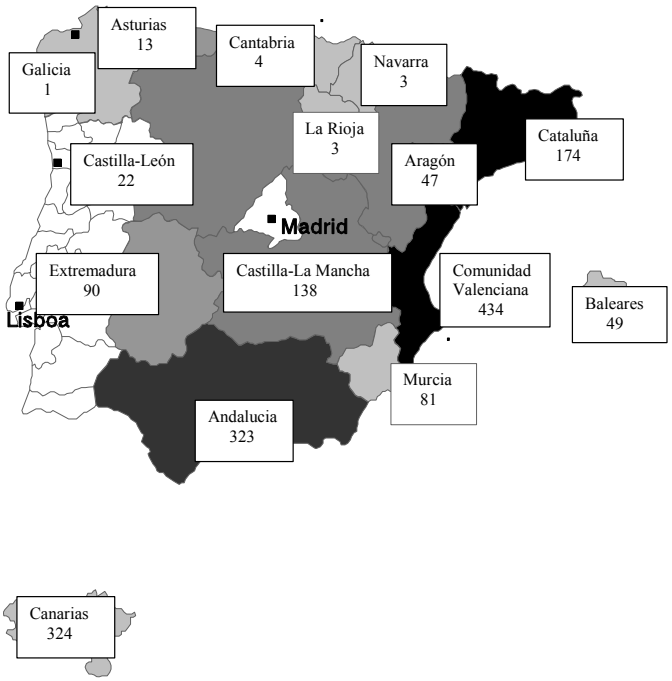


Fig. 1. Number of cucurbit accessions collected in different Spanish regions and maintained at the COMAV Genebank.

Multiplication and regeneration

The collection materials are regenerated in the COMAV greenhouses and fields at the Polytechnic University of Valencia. Some other Spanish institutions located in different provinces also have multiplied cucurbit accessions of the COMAV collection (IVIA, Valencia; SIA, Zaragoza; CIFA, Málaga; CIDA, Murcia; SIDT, Extremadura; DGPA, Castilla-La Mancha). About 200 accessions are regenerated each year. The multiplication of the cucurbit species is performed by flower bagging and manual pollination.

Availability of accessions

The availability of the materials is determined according to seed quantity and germinability. The availability level of cucurbit accessions is given in Table 5. The regenerated accessions are freely available for research, breeding and education purposes. By the end of February 2002 a total of 581 accessions of cucurbitaceous vegetables were fully available (with more than 1000 regenerated seeds) and 1359 will be available after regeneration (they have less than 1000 seeds and need to be regenerated). Approximately 100 accessions of different cucurbitaceous species were distributed by the Genebank to requesters in 2001.

Table 5. Availability of cucurbitaceous accessions in the COMAV Genebank (as of February 2002)

	No. of accessions according to availability		
Species	**Available**	**Temporarily not available**	**Total**
C. melo	271	341	612
C. sativus	46	83	129
Wild *Cucumis*	0	57	57
C. lanatus	70	166	236
C. ficifolia	4	88	92
C. maxima	29	220	249
C. moschata	58	165	223
C. pepo	93	198	291
L. siceraria	10	41	51
Total	**581**	**1359**	**1940**

Characterization

The characterization of the cucurbit collection is mainly performed according to the IPGRI descriptors for cucurbits (Esquinas-Alcázar and Gulick 1983) and the guidelines for the conduct of tests for distinctness, homogeneity and stability of the International Union for the Protection of New Varieties of Plants (UPOV) for watermelon, melon, cucumber, pumpkin, squash and zucchini (http://www.upov.org/eng/content.htm).

Most of the characterization assays have been conducted in the greenhouses and fields at the Polytechnic University of Valencia. Additionally, characterization assays of part of the COMAV cucurbit collection have been performed at some other Spanish institutions (IVIA, Valencia; La Mayora-CSIC, Málaga; SIA, Zaragoza; CIDA; Murcia; SIDT, Extremadura). Table 6 summarizes the level of characterization of the cucurbit collection. Approximately 40% have already been characterized using the descriptors mentioned above.

Molecular characterization is also being used to analyze the *Cucurbita* germplasm in order to develop a core collection representing the variability of the global collection. Different types of molecular markers are used (RAPDs, SBAPs, AFLPS, microsatellites) to reach this objective (Ferriol *et al.* 2002). Molecular analysis of the pathogen-resistance gene homologues (R-homologues) is also being conducted.

Table 6. Current level of characterization of the COMAV cucurbit collection

	Characterization (%)	
Species	**Morphological**	**Molecular**
C. sativus	22	-
C. melo	64	-
C. lanatus	44	-
C. ficifolia	16	51
C. maxima	49	17
C. moschata	43	25
C. pepo	40	19
L. siceraria	37	39

Duplicates

On the basis of passport data, possible duplicates have been detected in the COMAV collection, i.e. similar accessions with the same origin, accessions with the same cultivar name but originating from different sources, etc. The level of duplication of the collection is now being studied based on their morphological characteristics and molecular data.

Evaluation

The COMAV evaluation activities are aimed at studying interactions with pathogens and pests. Approximately 250 accessions have been evaluated with different objectives:

- The response of *C. melo* accessions and wild *Cucumis* species against melon vine decline is being tested. Melon vine decline is a major disease of melon all over the world caused by fungal pathogens (*Acremonium cucurbitacearum* and *Monosporascus cannonballus*) (Iglesias *et al.* 2000a, 2000b). The accessions are assayed under field conditions with artificial inoculation with the pathogenic fungi.
- Some accessions of *C. melo* were also characterized against the potyvirus (Potyviridae) melon yellows virus (MYV) using whitefly-mediated inoculation with the transmission vector *Trialeurodes vaporariorum* (Nuez *et al.* 1999).
- The *C. sativus* collection is being assayed against the ipomovirus (Potyviridae) cucumber vein yellowing virus (CVYV), recently introduced in Spain, using sap-inoculation.
- Response of about 100 accessions of *Cucurbita pepo* and *Cucurbita maxima* to the zucchini yellow mosaic virus (ZYMV) under natural infection conditions has also been assayed.

COMAV´s breeders have incorporated those resistant accessions into the different breeding programmes carried out. Moreover, some *Cucumis* spp. accessions were evaluated for their *in vitro* regeneration ability (Molina and Nuez 1995, 1997) for use in genetic engineering. The results of these evaluation assays have been published in scientific journals and should be included in the European Central Cucurbits Database (ECCUDB).

Documentation

Passport data are fully computerized. The characterization data of part of the collection are recorded in three crop-specific catalogues: muskmelon (Nuez *et al.* 1996), watermelon (Nuez *et al.* 1998) and *Cucurbita* (Nuez *et al.* 2000). The passport data along with the characterization data will be available for ECCUDB.

References

Esquinas-Alcázar, J.T. and P.J. Gulick. 1983. Genetic resources of Cucurbitaceae: a global report. International Board for Plant Genetic Resources, Rome.

Fernández de Córdova, P., M.J. Díez, A. Iglesias and F. Nuez. 1995. Germplasm resources of *Citrullus lanatus* in the Genebank of the Polytechnic University of Valencia. CGC Report. 18:52-54.

Ferriol, M., B. Picó and F. Nuez. [2002]. Genetic diversity of some accessions of *Cucurbita maxima* from Spain using RAPD and SRAP markers. Genetic Resources and Crop Evolution. (*in press*).

Iglesias, A., B. Picó and F. Nuez. 2000a. A temporal genetic analysis of disease resistance genes: resistance to melon vine decline derived from *C. melo* var *agrestis*. Plant Breeding 119:329-334.

Iglesias, A., B. Picó and F. Nuez. 2000b. Pathogenicity of fungi associated with melon vine decline and selection strategies for breeding resistant cultivars. Annals of Applied Biology 137:141-151.

Molina, R.V. and F. Nuez. 1995. Characterization and classification of different genotypes in a population of *Cucumis melo* L. based on their ability to regenerate shoots from leaf explants. Plant Cell Tissue Organ Culture 43: 249-257.

Molina, R.V. and F. Nuez. 1997. Sexual transmission of the *in vitro* regeneration capacity via caulogenesis of *Cucumis melo* in a medium with a high auxin-cytokinin ratio. Scientia Hortic. 70:237-241.

Nuez, F. and P. Fernández de Córdova. 1994. Los recursos genéticos de hortalizas en España (I) [Vegetable genetic resources in Spain (I)]. Hortofruticultura 1(94): 31-36.

Nuez, F. and J.J. Ruíz. 1999a. Conservación y utilización de recursos fitogenéticos [Conservation and utilization of plant genetic resources]. Servicio de Publicaciones de la Universidad Politécnica de Valencia. 263pp.

Nuez, F. and J.J. Ruíz. 1999b. La biodiversidad agrícola valenciana: estrategias para su conservación y utilización [Agricultural biodiversity of the Valentian region: strategies for conservation and utilization]. Ed. Universidad Politécnica de Valencia. 130pp.

Nuez, F., J. Prohens, M.J. Díez and P. Fernández de Córdova. 1994. *Cucumis melo* L. accesions of the Genebank of the Polytechnical University of Valencia. CGC. Report 17:57-60.

Nuez, F., J. Prohens, A. Iglesias and P. Fernández de Córdova. 1996. Catálogo de semillas de melón [Melon seed catalogue]. Monografías INIA. N°96. Ministerio de Agricultura, Pesca y Alimentación, Madrid. 178pp.

Nuez, F., J. Prohens, A. Rodriguez, J.A. González and P. Fernández de Córdova. 1998. Catálogo de semillas de sandía [Watermelon seed catalogue]. Monografías INIA. N°104. Ministerio de Agricultura, Pesca y Alimentación, Madrid. 104pp.

Nuez, F., B. Picó, A. Iglesias, J. Esteva, and M. Juarez. 1999. Genetics of melon yellows virus resistance derived from *Cucumis melo* spp. *agrestis*. European Journal of Plant Pathology 105:453-464.

Nuez, F., P. Fernández de Córdoba, M. Ferriol, J.V. Valcárcel, B. Picó, and M.J. Díez. 2000. *Cucurbita* spp. and *Lagenaria siceraria* Collection at the Center for Conservation and Breeding of Agricultural Biodiversity (CCMAV), Polytechnical University of Valencia. CGC. Report 23:60-61.

Nuez, F., J.J. Ruiz, J.V. Valcárcel and P. Fernández de Córdova. 2000. Colección de semillas de calabaza del Centro de Conservación y Mejora de la Agrodiversidad Valenciana [Squash and pumpkin seed collection of the Centro de Conservación y Mejora de la Agrodiversidad Valenciana]. Monografías INIA Agrícola N°4. Ministerio de Ciencia y Tecnología, Madrid. 158pp.

Picó, B. and F. Nuez. 1999. Collections of vegetable crops and wild relatives in the Center for Conservation and Breeding of the Agricultural Biodiversity (Spain). Plant Genetic Resources Newsletter 118:68.

Cucurbit genetic resources collections in Turkey

***Ali Küçük*[1], *Kazim Abak*[2] *and Nebahat Sari*[2]**

[1] *Aegean Agricultural Research Institute (AARI), Izmir, Turkey*
[2] *Çukurova University Faculty of Agriculture, Department of Horticulture, Adana, Turkey*

Introduction

The Cucurbitaceae family has an important place in vegetable cultivation of Turkey. Cucurbit crop production of 7.7 million tons represents 31% of the total vegetable production (24.7 million tons). Watermelon ranks first (4 million tons), followed by melon (1.8 million tons), cucumber (1.6 million tons) and squash (0.3 million tons).

Cultivated species of this family in Turkey are *Citrullus lanatus, Cucumis sativus, Cucumis melo, Cucumis flexuosus, Cucurbita maxima, Cucurbita moschata* and *Cucurbita pepo.* In addition, *Lagenaria siceraria, Luffa cylindrica* and *Momordica charantia* are also grown although less important.

Turkey is one of the world's important centres for plant genetic resources and its flora displays a remarkable diversity. This is due to the following features of the country:

- It overlaps the Near Eastern and Mediterranean Vavilovian centres of plant diversity;
- It is a meeting place of three phytogeographical regions, namely the Euro-Siberian, the Mediterranean and Irano–Turanian regions;
- It is a bridge between southern Europe and southwest Asia, and has apparently served as a migration route;
- It is a centre of diversity for many genera and sections;
- It is a centre of origin for many cultivated plants and weeds in Europe;
- And finally, it has a high level of species endemism (Tan 1998).

Turkey is not a centre of origin of cucurbits. Hence, there are no wild types or forms of genera such as *Cucumis, Cucurbita, Citrullus, Lagenaria*. However, a rich genetic diversity of melon, watermelon, squash and sneak cucumber species is found in Anatolia. In many crops including cucurbits, microcentres of diversity were identified in Anatolia (Harlan 1951). Zhukovsky (1933) emphasized that Anatolia has a great genetic diversity specifically for melon, watermelon and squash. The author reported that the origin of melons, watermelons and some squashes grown in Ukraine and Russia is Anatolia; in addition, it was proposed that the cantaloupe melons of Europe originate from the Van area in eastern Anatolia. Pitrat *et al.* (1999) reported that Anatolia belongs to the secondary centre of genetic diversity of melon. In almost all regions of the country, landraces of Cucurbitaceae are still grown by farmers and are highly variable in morphology and taste. They are used as vegetables or for pickling.

Plant genetic resources activities in Turkey started in the 1920s. However, a government institute was not established until 1964. Because of the importance of the country for plant genetic resources, these studies were implemented within the framework of the National Plant Genetic Resources/Diversity Research Programme (NPGRRP) in 1976. The Aegean Agricultural Research Institute (AARI) has taken over all responsibility as project centre. Cooperation with various institutes is organized according to the principles of the National Code of Conduct on Collection, Conservation and Utilization in 1992. All joint programmes are conducted on a project basis within agreements (Firat and Tan 1995).

Turkey is also a member of several international programmes working on plant genetic resources such as the Commission on Genetic Resources for Food and Agriculture (CGRFA) of the Food and Agriculture Organization of the United Nations (FAO). Turkey adhered to the International Undertaking on plant genetic resources and is a member of the European

Cooperative Programme for Crop Genetic Resources Networks (ECP/GR), the West Asia and North Africa Network on plant genetic resources (WANANET), the World Wheat Genetic Resources Networks and the World *Beta* Network (WBN).

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

Collections of cucurbits in Turkey

The largest part of genetic resources of the Cucurbitaceae family collected in Turkey is in AARI. More than 1600 accessions have been collected since 1964. Detailed information about these accessions is given in Table 1. They include watermelon, melon, cucumber, squash and other species. Furthermore, melon accessions have been collected by the Faculty of Agriculture, University of Çukurova since 1990. The number of accessions in Çukurova University is over 300 (Table 2).

Table 1. *Ex situ* collections of Cucurbitaceae of the Aegean Agricultural Research Institute (1964-2000)

Botanic name	English name	Collecting sites (provinces)*	No. of accessions
Citrullus vulgaris (= C. lanatus)	Watermelon	40	329
Cucumis spp.	-	6	8
Cucumis flexuosus	Adjurmelon, snakemelon	19	52
Cucumis melo (including subsp. *melo* and *conomon)*	Melon, muskmelon	48	351
Cucumis sativus	Cucumber	45	221
Cucurbita spp.	-	56	432
Cucurbita maxima	Winter squashes	6	10
Cucurbita moschata	Winter squashes (cushaw)	21	65
Cucurbita pepo	Field pumpkin	41	138
Ecballium elaterium	Squirting cucumber	5	5
Lagenaria spp.	-	3	3
Lagenaria siceraria	Bottle gourd	1	1
Bryonia dioica	Bryony	1	1
Total			**1616**

* see Figs. 1 to 5

Table 2. The cucurbit collection of Çukurova University

Genera	No. of accessions
Citrullus vulgaris	45
Cucumis melo	301
Cucurbita spp.	14
Cucurbita spp.	10
Luffa spp.	6
Momordica	1
Others	10
Total	**387**

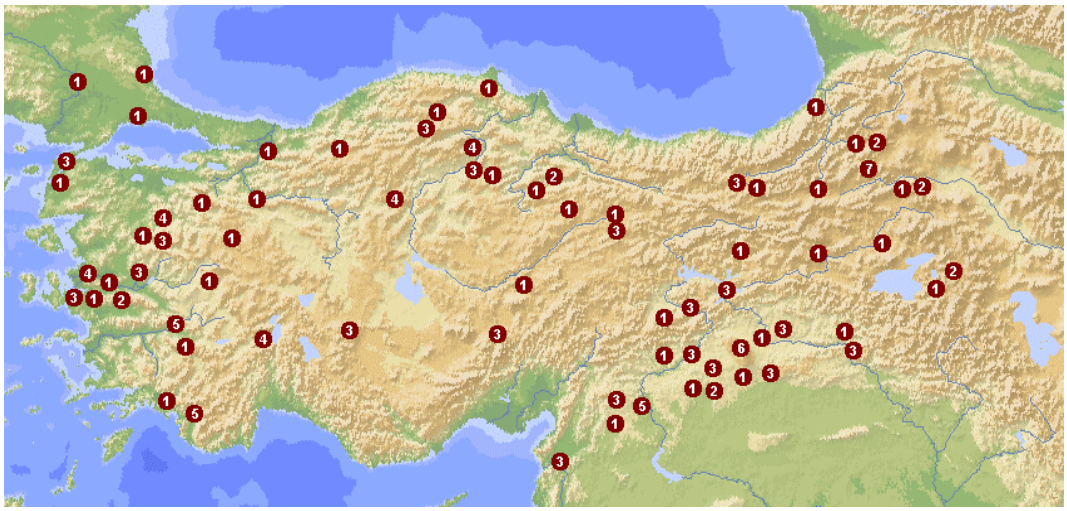


Fig. 1. AARI *ex situ* collections of *Citrullus vulgaris* (1)*, Cucumis* spp. (2), *Cucumis flexuosus* (3), *Ecballium elaterium* (4), *Lagenaria* spp. (5), *Lagenaria siceraria* (6) and *Bryonia* (7) in Turkey.

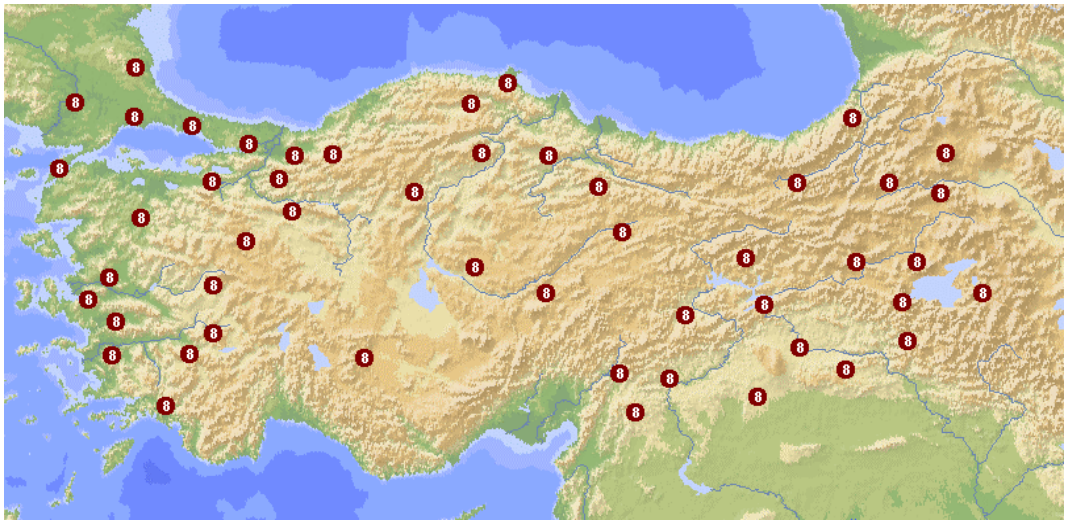


Fig. 2. AARI e*x situ* collections of *Cucumis melo* (including subsp. *melo* and *conomon*) (8) in Turkey.

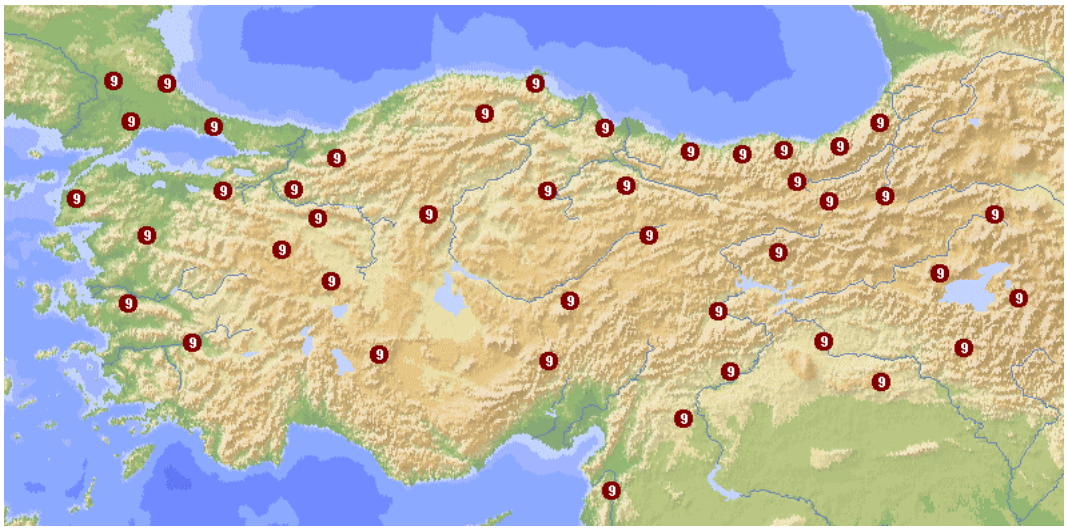


Fig. 3. AARI e*x situ* collections of *Cucumis sativus* (9) in Turkey.

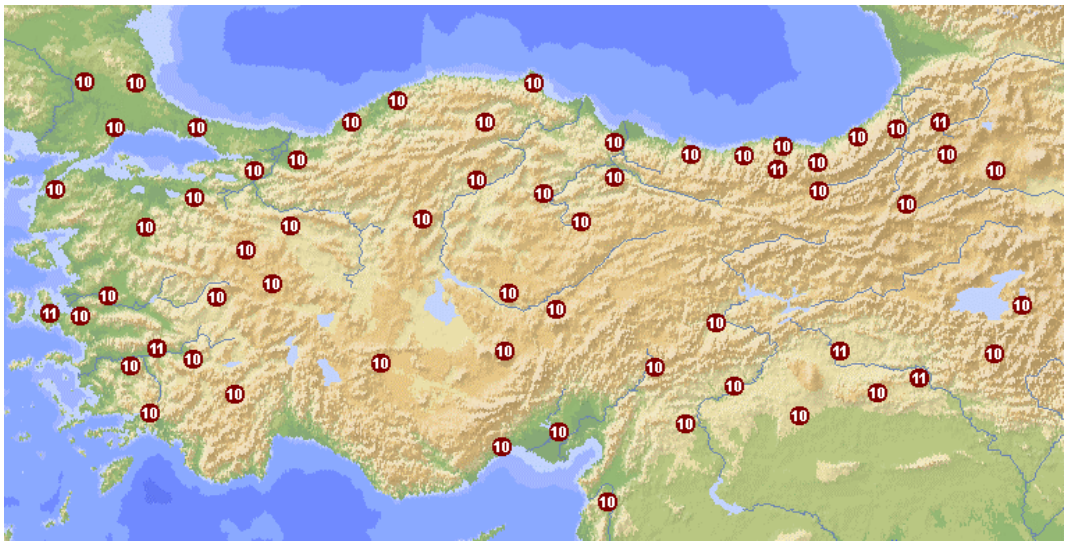


Fig. 4. AARI e*x situ* collections of *Cucurbita* spp. (10) and *Cucurbita maxima* (11) in Turkey.

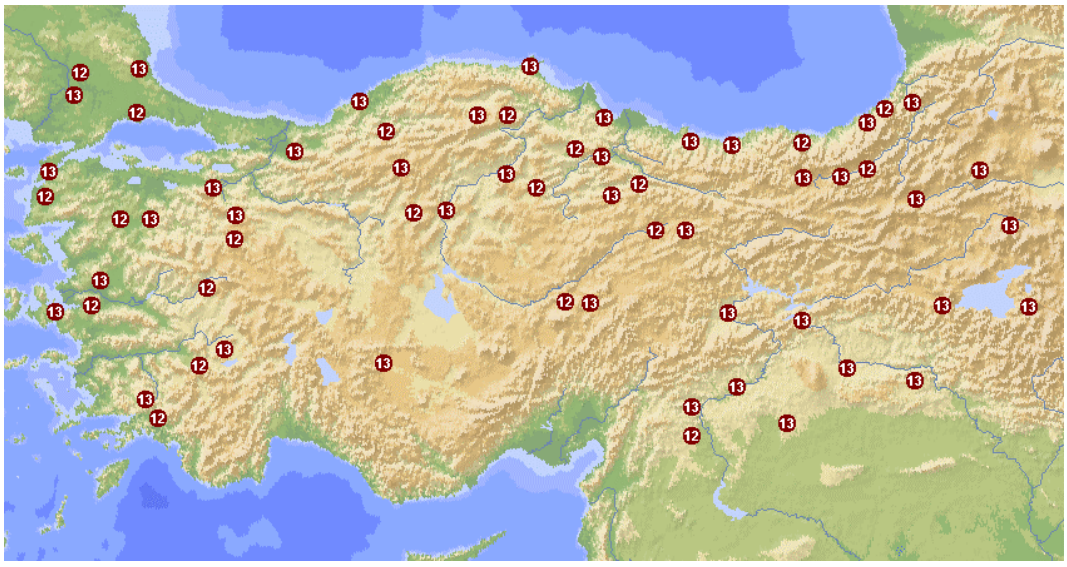


Fig. 5. AARI e*x situ* collections of *Cucurbita moschata* (12) and *Cucurbita pepo* (13) in Turkey.

Storage conditions

Seed material is preserved in the cold store of the genebank at AARI. Material collected by Çukurova University is also stored in cold stores at +4° C. AARI has facilities for short-, medium- and long-term storage (Table 3).

Table 3. Conservation facilities in cold stores of AARI genebank

	Short-term storage	Medium-term storage	Long-term storage
Temperature (°C)	+4	0	-20
Moisture content (%)	6-8	6-8	6
Space availability	yes	yes	yes
Container type	LAP	ASCN	ASCN
Viability monitoring	-	5-year intervals	10-year intervals

LAP: laminated aluminium foil bags; ASCN: aluminium sealed can containers

Additionally, in Ankara, there are also storage facilities of base collections at the Field Crop Improvement Centre for safety-duplicates.

Regeneration

Stored accessions with low germination rate or a small amount in active collections and insufficient collection material are subjected to a multiplication and regeneration programme. Much of the Çukurova University collection has been regenerated during the EU-funded RESGEN-CT99-108 project on *Cucumis melo*. The regeneration work started in 2000 will continue in 2002 and all accessions will be regenerated.

Cucurbitaceae are assumed to be open-pollinated species. Where accessions are liable to cross, isolation is assured during multiplication and/or regeneration of the accessions. Because of the problem with isolation by distance with many accessions, in Çukurova University, accessions are selfed and the seeds harvested; in AARI, cages are used for isolation.

Characterization

Characterization studies of Çukurova University material will be completed in 2002. Criteria determined in the RESGEN project are followed. Resistance of accessions to fusarium wilt and their molecular characterization have been studied by a PhD student.

For AARI material, although there is no project on the evaluation and characterization of Cucurbitaceae crops, some of the basic characteristics of the accessions are recorded during multiplication.

In situ *conservation*

The "*In situ* Conservation of Plant Genetic Diversity Project" is an important part of the National Plant Genetic Resources Research Project, and was started in 1993 with wild relatives of crop species. In 1999, *in situ* (on-farm) conservation studies started in a selected pilot area in the northwestern transitional zone. The objective of the project is to identify the possibilities of *in situ*/on-farm conservation of landraces. Although cereals (hulled wheat) and legumes (chickpea, lentil, bean) have been selected as target species, the inventory of all landraces (including Cucurbitaceae landraces) in the selected area is under study. Cucurbitaceae landraces in this part of the transitional zone are mainly grown as home-garden crops. The Sakarya valley of this region is a vegetable-growing area. In recent years, landraces were replaced with improved varieties, but some of the farmers still prefer to grow their landraces for their own consumption and for the local market, together with commercial varieties. Within the framework of the project, socioeconomic surveys are also conducted to explain the preference of farmers for growing the landraces.

Status of the central database

The NPGRRP activity data are maintained in the databases created and managed under dBase 4, visual dBase and Excel. Passport/collecting and storage data have already been documented and computerized. Evaluation data are analyzed by multivariate analysis and a statistical program. The standard formats for each activity are used for easy recording and computerization. The Mapmaker package is also used for map production if the location of collection sites is recorded with a Global Positioning System (GPS). The recent application of Geographical Information System (GIS) technology has allowed geographic analysis of the data to begin (Tan and Tan 1998). The documentation unit is responsible for the centralized database of NPGRRP.

Breeding work and molecular studies

Breeding programmes on melon, watermelon and squash are carried out by classical methods in the Department of Horticulture, Faculty of Agriculture, University of Çukurova. The hybrid melon breeding programme for resistance to *Fusarium* and powdery mildew is almost complete and studies have reached the stage where hybrid cultivars will be marketed. In addition, there is a well-equipped biotechnology laboratory

in the Department. Haploid embryo induction is done in melon, watermelon and squash. Haploid plant production can be performed routinely for local and foreign private firms as well as state research institutes. Furthermore, regeneration and transformation studies and molecular marker studies are carried out. AARI also has a melon breeding programme and new varieties have been bred recently.

References

Harlan, J.R. 1951. Anatomy of gene centers. Am. Nat. 85:95-103.

Pitrat, M., M. Chauvet and C. Foury. 1999. Diversity, history and production of cultivated cucurbits. Acta Hort. 492:21-28.

Tan, A. 1998. Current status of plant genetic resources conservation in Turkey. Pp. 5-16 *in* Proceedings of International Symposium on *in situ* conservation of plant genetic diversity, 4-8 November 1996, Antalya, Turkey (N. Zencirci, Z. Kaya, Y. Anikster and W.T. Adams, eds). Central Research Institute for Field Crops, Ankara, Turkey.

Tan, A. and A.S. Tan. 1998. Database management systems for conservation of genetic diversity in Turkey. Pp. 309-321 *in* Proceedings of International Symposium on *in situ* conservation of plant genetic diversity, 4-8 November 1996, Antalya, Turkey (N. Zencirci, Z. Kaya, Y. Anikster and W.T. Adams, eds). Central Research Institute for Field Crops, Ankara, Turkey.

Zhukovsky, P.M. (ed.) 1933. Agricultural Turkey. Acad. Sci. USSR, Moskow.

Appendices

Appendix I. Abbreviations and acronyms

AARI	Aegean Agricultural Research Institute, Izmir, Turkey
ABI	Institute for Agrobotany, Tápiószele, Hungary
AFLP	Amplified fragment length polymorphism
BPGV	Banco Português de Germoplasma Vegetal, Braga, Portugal
CGN	Centre for Genetic Resources, Wageningen, The Netherlands
CIDA	Centro de Investigación y Desarrollo Agroalimentario, Spain
CIFA	Centro de Investigación y Formación Agraria, Spain
CMV	Cucumber mosaic virus
COMAV	Centre for Conservation and Breeding of the Agricultural Biodiversity, Polytechnic University of Valencia, Spain
COMECON	Council for Mutual Economic Assistance
CRF	Centre for Genetic Resources, Madrid, Spain
CSIC	Consejo Superior de Investigaciones Científicas, Spain
CVYV	Cucumber vein yellowing virus
DGPA	Dirección General de la Producción Agraria, Castilla-La Mancha, Spain
EAN	Estação Agronómica Nacional, Oeiras, Portugal
ECCUDB	European Central Cucurbit Database
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks
ENMP	Estação Nacional de Melhoramento de Plantas, Portugal
EPGRIS	European Plant Genetic Resources Information Infra-Structure
EU	European Union
EURISCO	European Search Catalogue (EPGRIS project)
HRI	Horticulture Research International, Wellesbourne, United Kingdom
IAS	Instituto de Agricultura Sostenible, Córdoba, Spain
IPGR	Institute for Plant Genetic Resources, Sadovo, Bulgaria
IPK	Institut für Pflanzengenetik und Kulturpflanzenforschung (Institute for Genetics and Plant Breeding), Germany
IVIA	Instituto Valenciano de Investigaciones Agrarias, Valencia, Spain
MYV	Melon yellows virus
RAPD	Random amplified polymorphic DNA
RICP	Research Institute of Crop Production, Prague–Ruzyne, Czech Republic
SBAP	Sequence-based amplified polymorphism
SIA	Servicio de Investigación Agroalimentaria, Spain
SIDT	Servicio de Investigación y Desarrollo Tecnológico, Spain
UPOV	Union internationale pour la protection des obtentions végétales (International Union for the Protection of New Varieties of Plants), Geneva, Switzerland
UPV	Polytechnic University of Valencia, Spain
UTAD	Universidade de Trás-os-Montes e Alto Douro, Vila Real, Portugal
VIR	N.I. Vavilov Research Institute of Plant Industry, St. Petersburg, Russian Federation
WMV-2	Watermelon mosaic virus
ZYMV	Zucchini yellow mosaic virus

Appendix II. Agenda

ECP/GR Ad hoc *meeting on Cucurbit Genetic Resources*
19 January 2002, Adana, Turkey

9:00-10:00 Introduction

- Opening remarks
- Self-introduction of the participants
- Brief description of the collections of ECP/GR partners

10:00-11:00 The ECP/GR Informal Group on Cucurbits

- Presentation of ECP/GR
- Cucurbit genetic resources in Europe: general situation
- Introduction of the workplan
- Voluntary involvement in the ECP/GR informal group on Cucurbits

11:00-11:30 Tea & Coffee break

11:30-12:30 Mode of operation: Discussion of the workplan and its schedule

1. Establishment of a Central Cucurbit Database

- Presentation on the current state of the Cucurbit database at the Polytechnic University of Valencia
- Presentation of the EPGRIS project
- Compilation of data from holding institutions

12:30-14:00 Lunch

14:00-15:30 Mode of operation (cont.)

2. Storage: planning of safety-duplication of each collection under long-term conservation conditions

- Current level of safety-duplication: what is safety-duplicated, where?
- Which holding has long-term conservation facilities?
- Who would be available to host safety-duplicates as "black boxes"?

3. Regeneration guidelines and primary characterization

- Establishment of regeneration protocols (number of plants, plant density, pollination procedures, etc.)
- Definition of descriptors
- Establishment of a minimum primary descriptor list
  - *Cucumis melo* - the establishment of a minimum descriptor list is one of the objectives of the EU *Cucumis* project
  - Other crops: to be discussed - sharing of responsibilities by other institutions and mode of operation
- Protocols for primary characterization

15:30-16:00 Tea & Coffee break

16:00-16:30 Conclusion

Appendix III. List of Participants

ECP/GR Members

Lilia Krasteva
Institute of Introduction and Plant Genetic Resources "K. Malkov"
4122 Sadovo, Plovdiv district
Bulgaria
Tel: (359-32) 629026
Fax: (359-32) 629026/270270 (post)
Email: krasteva@ipgr-bg.org
or rada_k@abv.bg

Eva Krístková
Research Institute of Crop Production (RICP)
Division of Genetics and Plant Breeding
Department of Gene Bank
Workplace Olomouc
Šlechtitelů 11
783 71 Olomouc-Holice
Czech Republic
Tel: (420-68) 5209966
Fax: (420-68) 5209963
Email: kristkova@genobanka.cz

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

Willem van Dooijeweert
Centre for Genetic Resources, The Netherlands (CGN)/Unit Statutory Tasks CGN-DLO Foundation
Wageningen University and Research Centre
PO Box 16
6700 AA Wageningen
The Netherlands
Tel: (31-317) 477083
Fax: (31-317) 418094
Email: W.vandooijeweert@plant.wag-ur.nl

Tatiana Piskunova
N.I. Vavilov Research Institute of Plant Industry (VIR)
42, B. Morskaya Street
190000 St Petersburg
Russian Federation
Tel: (7-812) 315-5093
Fax: (7-812) 311-8762
Email: s.alexanian@vir.nw.ru

Maria José Díez
COMAV
Depto. Biotecnologia, E.T.S.I.A.
Universidad Politécnica de Valencia
Camino de Vera 14
46022 Valencia
Spain
Tel: (34-96) 3877421
Fax: (34-96) 3877429
Email: mdiezni@btc.upv.es

Belén Picó Sirvent
COMAV
Depto. Biotecnologia, E.T.S.I.A.
Universidad Politécnica de Valencia
Camino de Vera 14
46022 Valencia
Spain
Tel: (34-96) 3877421
Fax: (34-96) 3877429
Email: mpicosi@btc.upv.es

Ali Küçük
Aegean Agricultural Research Institute
PO Box 9
Menemen 35661, Izmir
Turkey
Tel: (90-232) 8461331
Fax: (90-232) 8461107
Email: Kucukseydali@hotmail.com

GENRES *Cucumis melo* Project Members

Valdemar Carnide
University Tras-os-Montes and Alto Douro
Dept. Genetics and Biotechnology
Portugal
Tel: (351) 259 35 05 01
Fax: (351) 259 35 9480
Email: vcarnide@utad.pt

M. Luisa Gómez-Guillamón
Estación Experimental "La Mayora"
CSIC
29750 Algarrobo Costa, Málaga
Spain
Tel: (34-952) 55 26 56
Fax: (34-952) 55 26 77
Email: Guillamon@eelm.csic.es

Enrique Moriones
Estación Experimental "La Mayora"
CSIC
29750 Algarrobo Costa, Málaga
Spain
Tel: (34-952) 55 26 56
Fax: (34-952) 55 26 77
Email: moriones@eelm.csic.es

Jose Mª Alvarez
Servicio de Investigación Agroalimentaria
727 50080 Zaragoza
Spain
Tel: (34-976) 576311
Fax: (34-976) 575501
Email: Jmalvarez@aragob.es

M. Sol Luis-Arteaga
Servicio de Investigación Agroalimentaria
727 50080 Zaragoza
Spain
Tel: (34-976) 576311
Fax: (34-976) 575501
Email: mpluis@aragob.es

Kazim Abak
Çukurova University
Agriculture Faculty
Dept. of Horticulture
01330 Adana
Turkey
Tel: (90-322) 338 63 88
Fax: (90-322) 338 63 88
Email: abak@mail.cu.edu.tr

Nebahat Sari
Çukurova University
Agriculture Faculty
Dept. of Horticulture
01330 Adana
Turkey
Tel: (90-322) 338 63 88
Fax: (90-322) 338 63 88
Email: nesari@mail.cu.edu.tr

Unable to attend

Michel Pitrat
INRA, Unité de Génétique et
d'Amélioration des Fruits et Légumes
BP 94
84143 Montfavet cedex
France
Tel: (33) (0) 432 722717
Fax: (33) (0) 432 722702
Email: Michel.Pitrat@avignon.inra.fr

Andreas Börner
Institute of Plant Genetics and Crop Plant Research (IPK)
Corrensstrasse 3
06466 Gatersleben
Germany
Tel: (49-39) 482 52 29
Fax: (49-39) 4825155
Email: boerner@ipk-gatersleben.de

Janos Berenji
Institute of Field and Vegetable Crops
Novi Sad
21470 Backi Petrovac
Yugoslavia, F.R.
Tel: (381-21) 780-365
Fax: (381-21) 780-198
Email: berenji@eunet.yu

Index of authors

ISBN 92-9043-556-9

Cover photo: courtesy of © P. Fernández de Córdova, COMAV, Valencia, Spain