European Cooperative Programme for Crop Genetic Resources Networks

ECP/GR

Solanaceae Genetic Resources in Europe

IPGRI

Report of two meetings
21 September 2001, Nijmegen, The Netherlands
22 May 2003, Skierniewice, Poland

M.C. Daunay, L. Maggioni and E. Lipman, *compilers*

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CONTENTS

PART I. DISCUSSION AND RECOMMENDATIONS

Ad hoc Meeting, held jointly with the Second Meeting of the Project GEN RES 113 (EGGNET), 21 September 2001, Nijmegen, The Netherlands

Introduction

In May 2000, the *ad hoc* meeting of the Network Coordinating Group on Vegetables of ECP/GR held in Vila Real (Portugal) decided to promote new activities by creating informal groups on Solanaceae, Cucurbitaceae and Leafy Vegetables.[1] The first meeting of the informal group on Solanaceae was held on 21 September 2001 in Nijmegen, the Netherlands, back-to-back with the second annual meeting of the EU-funded EGGNET project.

The participation of five partners supported by ECP/GR in the 2-day EGGNET meeting allowed the latter to meet EGGNET partners and to observe their working methods for eggplant genetic resources. Members invited by ECP/GR were the following: Lilia Krasteva (Institute for Plant Genetic Resources (IPGR), Sadovo, Bulgaria); Árpád Kiss (Institute for Agrobotany (ABI), Tápiószele, Hungary); Olga Dmitrieva (N.I. Vavilov Research Institute of Plant Industry (VIR), St. Petersburg, Russian Federation); Ali Küçuk (Aegeaen Agricultural Research Institute (AARI), Izmir, Turkey); and Bogoljub Zeűeviû (Center for Vegetable Crops, Smederevska Palanka, Yugoslavia).

Four other experts from the Czech Republic, Hungary, Israel and Poland were invited to attend at their own expense. Only H. Stavçlikova, from the RICP Vegetable Gene Bank in Olomouc, was able to attend.

M.J. Díez (Center for the Conservation and Breeding of the Agricultural Biodiversity (COMAV), Polytechnic University of Valencia, Spain), focal person of the informal working group on Cucurbits, also attended the meeting.

T. van Hintum (Plant Research International (PRI), Wageningen, the Netherlands) was invited as a consultant in international database management but was unable to attend.

The objective of this first meeting of the informal group on Solanaceae was to start collaboration on Solanaceae genetic resources between EGGNET partners involved in eggplant genetic resources and other partners from Eastern Europe. Many are also working with tomato and pepper.

The survey of Solanaceae genetic resources held in Europe (Appendix I), when compared with the list of participants (Appendix X), shows that this first meeting of the informal group on Solanaceae brought together most of the institutions holding the largest European collections of eggplant and/or tomato and/or pepper.

Presentation of Solanaceae collections held by ECP/GR partners

Each ECP/GR partner provided a report on the Solanaceae collections held by their respective institute (content and structure of the collection, storage type(s), regeneration, evaluation, databases, safety-duplication status, collecting missions). Full reports are given in Part II of this report (Status of national collections). The curators of the respective crops are listed in Table 1 below.

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[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.

Table 1. Curators for eggplant, pepper and tomato (ECP/GR members)

Country	Curator	Crop		
		Eggplant	Pepper	Tomato
Bulgaria	L. Krasteva	+		+
	T. Todorova		+	
Czech Republic	H. Stavçlîková	+	+	
	J. Losik			+
Hungary	Á. Kiss	+	+	+
Russian Federation	O. Dmitrieva			+
	T. Loskutova			
Turkey	A. Küçük	+	+	+
Yugoslavia	B. ZeÚeviÛ	+	+	
	J. ZdravkoviÛ			+

Information on eggplant, pepper and tomato collections held by EGGNET partners

The EGGNET project brings together nine partners from seven countries:

P1 INRA-Montfavet, France
P2 Botanical and Experimental Garden, University of Nijmegen, The Netherlands
P3 Birmingham University Botanic Gardens, Birmingham, United Kingdom
P4 Plant Research International (PRI), Centre for Genetic Resources, the Netherlands (CGN), Wageningen, The Netherlands
P5 Biotechnology Department (Genetics), Polytechnic University of Valencia (UPV), Valencia, Spain
P6 Department of Vegetables, Agricultural Research Centre of Macedonia and Thrace (ARCMT), Thermi-Thessaloniki, Greece
P7 Istituto del Germoplasma (IDG), Consiglio Nazionale delle Ricerche, Bari, Italy
P8 Institute of Plant Genetic and Crop Plant Research (IPK), Gatersleben, Germany
P9 Institut National d'Horticulture (INH), Angers, France

The information on eggplant genetic resources managed by the EGGNET group is available at the EGGNET Web site (http://www-bgard.sci.kun.nl/eggnet/eggenet01.html). The Eggplant database is planned to become available in 2003 (http://www-bgard.sci.kun.nl/WWW-IPGRI/eggplant.htm).

The information on the pepper and tomato collections held by EGGNET partners is presented in Part III of this report (Overview of the EGGNET collections).

Involvement of ECP/GR members in EGGNET activities (eggplant only)

All ECP/GR members agreed to participate in EGGNET activities, either to standardize their own descriptors with those used by EGGNET, characterize accessions, regenerate seed, add references to the eggplant literature database, or simply to be kept regularly informed of EGGNET progress. It was decided that the EGGNET group would send to all ECP/GR members its list of eggplant primary descriptors, as soon as this list is finalized.

The EGGNET group should also seek financial support from the EU for the funding of non-EU partners' participation in EGGNET activities.

Possible support of private companies to the activities of the informal group on Solanaceae

The ECP/GR working groups operate on a voluntary basis, involving self-funding and participation "in kind". However, since the activities carried out by these working groups are considered to be of outstanding interest to breeders, the possibility of obtaining financial support from the private sector should be investigated.

A preliminary discussion with the representatives of two private breeding companies (EGGNET sub-contractors) showed that direct financial support from the private sector was very unlikely. However, private eggplant, pepper and tomato breeders could be very interested in participating in the regeneration and characterization of Solanaceae genetic resources, since this activity could offer an outstanding opportunity for them to handle new genetic variability with potential use for breeding. In France as well as in the Netherlands, several private companies already participate in national plant genetic resources networks, together with national public institutions. The informal group on Solanaceae could benefit from this help from the private sector, and it was decided to further explore a possible mechanism to establish this type of collaboration.

Workplan and mode of operation of the informal group on Solanaceae

The achievements of the ECP/GR working groups vary from one group to the other. The workplan of each group is agreed jointly and carried out by the group members with their own resources. Achievements usually include the creation and management of central databases, development of core collections, organization of safety-duplicates of all partners' collections, development of joint project proposals (e.g. responding to EU calls for proposals in the field of plant genetic resources), etc.

Range of Solanaceous species of interest to the informal group on Solanaceae

It was agreed that eggplant, pepper and tomato are the key species which almost all partners are interested in (Table 2). However, other species of interest to several partners should also be considered, in particular *Physalis* sp. and *Cyphomandra* sp.

Table 2. Interest of the members of the informal group in Solanaceae and various Solanaceous crops

Partner	Eggplant	Pepper	Tomato	Other crops
EGGNET				
P1 - M.C. Daunay	yes	(yes)	(yes)	yes
P2 - G. van der Weerden	yes	yes	yes	yes
P3 – R. Lester	yes	yes	yes	yes
P4 - I. Boukema and W. Dooijeweert	yes	yes	yes	
P5 - J. Prohens	yes		yes	yes
P6 - F. Bletsos	yes	(yes)	(yes)	
P7 - G. Polignano	yes	yes	yes	
P8 - A. Börner	yes	(yes)	(yes)	?
P9 - J.Y. Péron	yes	(yes)	(yes)	yes
ECP/GR				
Bulgaria - L. Krasteva	yes	(yes)	yes	yes
Czech Republic - H. Stavçlikova		yes		
Hungary - Á. Kiss		yes	yes	
Russian Federation - O. Dmitrieva			yes	
Turkey - A. Küçük	(yes)	yes	(yes)	
Yugoslavia - B. ZeÚeviÛ	yes	yes		

Objectives of the group

The group agreed on the following priority objectives:

1. Application to ECP/GR Steering Committee for the establishment of a formal working group

Presently, the status of the group is an "informal working group on Solanaceae". All members wish that this informal group becomes official[2]. An application letter should be submitted to the ECP/GR Steering Committee before mid-October 2001.[3]

2. Inventory of the germplasm collections for each species

The question of whether there should be a single database for eggplant, pepper and tomato or several crop-specific databases was discussed at length. The group discussed whether it should concentrate on creating central databases for eggplant, pepper, tomato and "other Solanaceae" (this solution requires a database manager) or rather incorporate the crop-specific information and make it accessible via existing databases (e.g. EGGNET) or Web sites under development (e.g. EURISCO, see below).

The compilation of all basic passport data from the databases of each partner is the first step to identify "who holds what" and to estimate the degree of duplication amongst collections. A first list of passport data fields was proposed for the Solanaceae inventory (Appendix II). This list is based on the EGGNET database fields, which were defined on the basis of the *Standard Passport Descriptor list* (IPGRI/FAO 1996), the first version of the *Multi-Crop Passport Descriptors* (MCPD) (IPGRI/FAO 1997)[4], the IBPGR *Descriptors for Eggplant,* and the ITF (International Transfer Format) database for Solanaceae at the Botanical Garden of the University of Nijmegen.

It was agreed that the partners in charge of the compilation would be EGGNET Coordination Board for eggplant, A. Küçük for pepper, O. Dmitrieva for tomato and J. Pohens for *Physalis* sp., *Cyphomandra* sp. and possibly other genera. The deadline for producing the compiled list from all partners' data is March 2002.

Information on EURISCO

The EU-funded EPGRIS project (European Plant Genetic Resources Information Infra-Structure[5]) is establishing a European Internet Search Catalogue (EURISCO) with passport information of PGR collections maintained *ex situ* in Europe, in order to facilitate the dissemination of information on these collections. This project is in the process of finalizing a standard list of passport data. These data will be based on the revised version of the FAO/IPGRI Multicrop Passport Descriptor List (MCPDv2, see footnote 4 below). Before the end of 2003, the first version of EURISCO is expected to be launched on-line and to contain a combination of data available from the existing national inventories and from the existing CCDBs. EURISCO is expected to gradually develop and become the most complete and reliable source of passport data in Europe. The catalogue will carry an important minimum set of passport data, frequently and automatically updated from the national inventories. Each partner country in the EPGRIS project has nominated a focal person for EPGRIS, in charge of the national inventory.

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[2] The ECP/GR formal Working Groups share a budget set aside for more regular meetings and publications than those of informal groups. Each Working Group is made of country representatives nominated by the respective national coordinators

[3] See Report of the Skierniewice meeting, page 7.

[4] At the time of the meeting, the MCPD list was under revision. The new version (MCPDv2) was released in December 2001 (http://www.ipgri.cgiar.org/publications/pubfile.asp?ID_PUB=124). Therefore the Solanaceae passport data fields will have to be updated and the Group agreed to adopt this passport list for the Solanaceae databasesd (see Appendix III). The MCPDv2 list is published here for the first time in a printed report.

[5] http://www.ecpgr.cgiar.org/EPGRIS/Index.htm

3. Identification of the degree of duplication among the collections of the different partners

Once the compiled lists have been produced for eggplant, pepper, tomato and the other species, the detection of the degree of duplication among collections will be possible, based in particular on the analysis of the passport fields "collector's name", "collecting date", "collecting number", "donor name", "donor number" and "other numbers associated with the accession".

4. Development of standardized protocols for seed regeneration and seed storage

Presently, the different partners use different protocols. Some basic information on these is already available (see Appendix IV), but should be completed with more details. For eggplant, these protocols have already been harmonized amongst EGGNET partners (Appendix V). The partners of the informal group on Solanaceae are encouraged to use EGGNET protocols as far as eggplant is concerned, and should agree jointly on common protocols for pepper, tomato, *Physalis* sp. and *Cyphomandra* sp.

5. Development of standardized descriptors and protocols for primary characterization

At present the different partners use different descriptors and protocols, the details of which are not yet compiled. For eggplant, a set of descriptors has been defined in common by EGGNET partners, but is not fully finalized yet. The members of the informal group on Solanaceae should agree jointly on common descriptors and protocols for pepper and for tomato. Furthermore, when descriptors and the relevant protocols are lacking (e.g. primary characterization of *Physalis* sp. and *Cyphomandra* sp.), the group should define them.

6. Development of a standardized set of agronomic traits to be evaluated and of relevant protocols (secondary characterization)

The situation is similar to that described for primary characterization.

7. Clarification of issues related to international legislation on exchange of PGR

International legislation and agreements have been evolving for many years, and many partners have difficulties in understanding their rights and duties regarding the possibility of accessing the genetic resources. Partners are invited to formulate any questions they may have on this topic and address them to G. van der Weerden (Botanical Garden, Nijmegen, the Netherlands) who will centralize those questions, reformulate them, and forward them to the ECP/GR Secretariat, which will provide answers and advice, in consultation with lawyers working at IPGRI.

8. Identification of the wild species and use of the current taxonomy

According to the survey carried out in spring 2001 for Solanaceae genetic resources in Europe[6], the identification of the Solanaceae species (especially wild) by each partner often does not follow the currently prevailing taxonomy. This results in some confusion regarding the taxonomic classification of accessions. In order to solve this issue, partners are invited to send photocopies of plant organs (shoots, leaves, flowers, fruits), photographs, or even seeds in the case of growing plants, to G. van der Weerden (Botanical Garden, Nijmegen) who will, together with G. Barendse and R.N. Lester, identify those accessions and assign their appropriate scientific name.

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[6] See pp. 22-33 *in* 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.

Mode of operation of the group

The activity of the partners is based on voluntary involvement and self-funding, but the interest of private breeders in being involved in the technical activities of the group (regeneration, characterization) will be investigated.

The group elected M.C. Daunay as Chairperson.

A majority of participants were not in favour of creating crop-specific subgroups (eggplant, pepper, tomato, etc.). Therefore the management of the group will remain centralized.

Partners were requested to propose a logo for the informal group on Solanaceae.

Safety-duplicates and possibly endangered collections

These aspects were discussed round the table: safety-duplication is satisfactory for most partners, and there are no critical problems as far as pepper and tomato are concerned.

Conclusion

The first meeting of the informal group on Solanaceae was fruitful, in particular owing to its combination with the EGGNET second annual meeting. All ECP/GR partners benefited from the experience of EGGNET partners. Based on the information provided by all participants on the status of European Solanaceae collections, a first set of priorities for actions was defined.

Many partners (ECP/GR as well as EGGNET) are curators of only one or two of the crops discussed. Therefore, before going ahead with the objectives of the group, they need to obtain authorization from their higher management. Furthermore, the group will go ahead with its objectives only if it is recognized in the near future as an official Working Group on Solanaceae by the ECP/GR Steering Committee.

Session on Solanaceae held on 22 May 2003 during the Vegetables Network Meeting in Skierniewice, Poland – Summary report

Note: a detailed report of the session on Solanaceae will also be included in the proceedings of the Vegetables Network meeting (in preparation at time of publication of this report).

Introduction

During the Vegetables Network Meeting held in Skierniewice, Poland, 22-24 May 2003, the members of the newly established Working Group on Solanaceae had the opportunity to meet for the first time.

M.C. Daunay chaired the meeting, with the help of W. van Dooijewert as Vice-Chair. The other participants were new to the group: K. Sarikyan (Armenia), W. Palme (Austria), I. Paran (Israel), P. Coelho (Portugal), M.J. Diez (Spain), S. Mutlu (Turkey – replacing A. Kücük, who recently retired) and O. Shabetya (Ukraine) (contact details included in Appendix XII).

M.C. Daunay presented the historical background of the establishment of the Working Group, approved by the ECP/GR Steering Committee in October 2001.

Update on European Solanaceae collections

The table summarizing the status of European Solanaceae collections as reported by partners at the Nijmegen meeting in 2001 was updated with new information, including data provided by R. Geydarova (Azerbaijan) and T. KotliĘska (Poland) after the meeting (Appendix I).

All attending participants presented the status of their national Solanaceae collections and ongoing activities. These presentations are included in the present report (Part II, National collections).

Review and update of the workplan

The workplan agreed upon in Nijmegen (objectives 1 to 8 above, pages 4-5) was distributed. The progress made was discussed and further actions to be taken identified (see Appendix VIII). Activities were assigned priorities referring to those identified in the draft recommendations of the Task Force to the ECP/GR Steering Committee for the preparation of Phase VII.

Databases

Eggplant

The eggplant database, though still incomplete, is already searchable on the ECP/GR Web site (http://www-bgard.sci.kun.nl/WWW-IPGRI/eggplant.htm).

Tomato, pepper, *Physalis* and *Cyphomandra*

These databases are under construction. Entry pages are already available from the ECP/GR Web site (http://www.ipgri.cgiar.org/links/selectcrop.asp) under Crop type = Vegetables).

The data presented in Table 3 were provided in May 2003 by J. Prohens (UPV, Spain), manager of the *Physalis* and *Cyphomandra* database.

Table 3. No. of accessions in the *Physalis* and *Cyphomandra* database

Species	No. of accessions
Cyphomandra abutiloides	1
C. amotapensis	1
C. betacea	65
C. corymbifolia	2
C. endopogon	1
Cyphomandra sp.	7
Total *Cyphomandra*	**77**
Physalis acutifolia	1
P. aequata	2
P. alkekengi	22
P. angulata	6
P. coztomatl	4
P. crassifolia	2
P. curassavica	4
P. edulis	1
P. floridana	5
P. fuscomaculata	4
P. heterophylla	1
P. ixocarpa	22
P. lagascae	1
P. lanceifolia	1
P. longifolia	1
P. mexicana	2
P. minima	3
P. peruviana	84
P. philadelphica	10
P. pruinosa	7
P. pubescens	6
P. subglabrata	1
P. virginiana	1
P. viscosa	4
Physalis sp.	42
Total *Physalis*	**237**

Conclusion - Next meeting

The date and venue of the next meeting were discussed, and it was agreed that there would be no need for all members of the WG on Solanaceae to attend the next EGGNET project meeting in September 2003 as previously planned, since both the Chair and Vice-Chair of the WG on Solanaceae are also EGGNET partners and will be able to ensure the liaison between both groups. However it was recommended that the next meeting of the WG on Solanaceae be organized jointly with the final EGGNET meeting to be held end of 2004.

PART II. STATUS OF NATIONAL COLLECTIONS

Note: this section includes papers presented at both meetings, organized by alphabetical order of country name.

Solanaceae genetic resources in Armenia

Karine Sarikyan
Scientific Centre of Vegetable and Industrial Crops, Daracert, Armenia

Introduction

The Solanaceae family holds an important place in vegetable cultivation in Armenia. Cultivated species of this family in Armenia are *Lycopersicon esculentum* Mill., *Solanum melongena* L., *Capsicum annuum grossum* and *C. annuum* var. *longum*. These Solanaceous crops are mostly cultivated in the Ararat valley, where intensive agriculture is practised for national markets and export in greenhouses. Solanaceous vegetable crops are among the most economically important vegetables cultivated in Armenia (Table 1).

Table 1. Economic importance of Solanaceae in Armenia

Crop	Rank	Harvested area (ha)	Yield (t/ha)
Eggplant	2	2000	0.7
Pepper	3	1500	0.4
Tomato	1	5700	1.70
Total Solanaceae		**9200**	

Solanaceae collections are located in the Scientific Centre of Vegetable and Industrial crops. Breeding and cultivation of Solanaceous crops also have a long tradition in Armenia.

The Scientific Centre of Vegetable and Industrial crops has made important progress in the development of new varieties and hybrid Solanaceous field- and greenhouse-grown vegetables for 50 years.

The varieties and hybrids created by the breeders of the Scientific Centre of Vegetable and Industrial crops (such as eggplant, pepper and tomato hybrids) were distributed throughout the districts of the country containing 80% of the area occupied by these crops. Eggplant is a very old vegetable crop in Armenia, grown for many centuries according to official statistics.

The collection

Most of the Solanaceae accessions are kept in the Scientific Centre of Vegetable and Industrial crops (Table 2).

Table 2. Number of accessions in the Solanaceae collection in Armenia

Crop	No. of accessions
Eggplant	151
Pepper	34
Tomato	190
Total Solanaceae	**595**

The material includes five groups of accessions: landraces (21 accessions), cultivars (29), hybrids (180) (breeding lines, donors), wild (7) and others (94) (Table 3).

Table 3. Structure of the Armenian Solanaceae collections

Crop	No. of accessions					
	Total	W	LR	CV	H	O
Eggplant	151	3	7	9	92	39
Pepper	34	-	4	9	14	10
Tomato	190	4	10	15	74	45
Total	**595**	**7**	**21**	**29**	**180**	**94**

Legend: W = wild; LR = landraces; CV = cultivars; H =hybrids; O = Other

- **Eggplant genetic resources** comprise mainly *Solanum melongena* L. accessions, several samples of a worldwide collection (38 accessions), old varieties and forms such as a local population of eggplant of Yerevan, which includes cultivated eggplant varieties, hybrid and original material created on the basis of other cultivated eggplants and wild species.
- **Pepper genetic resources** comprise mainly *Capsicum annuum* L. accessions. Sweet pepper includes several samples of *Capsicum annuum grossum* (7 accessions) of foreign origin and cultivated varieties or forms. Hot pepper includes several samples of old local populations, e.g. a population of local hot pepper, foreign varieties (6 accessions) and hybrid material created from *Capsicum annuum grossum* and *C. annuum* var. *longum.*
- **Tomato genetic resources** comprise the single cultivated species *Lycopersicon esculentum* Mill. maintained in Armenia, which includes cultivated tomato varieties, foreign varieties (20 accessions), hybrid and original material created from of the wild species *Lycopersicon hirsutum* H. et B. var. *Chessmani* R., var. *pimpinellifolium* Br. and L. *peruvianum* M. Interspecific hybridization resulted in male and functional sterility in tomatoes.
- **Wild relatives of the Solanaceae Juss. family in the Armenian flora** include mainly the two genera *Physalis (P. alkekengi)* and *Solanum (S. dulcamara, S. persicum, S. pseudopersicum, S. nigrum, S. alatum, S. voronowi, S. nigrum schutesi* and *S. transcaucasiacum).* However, it should be noted that Solanaceous crops of the Armenian flora include some important medicinal plants. *Solanum* and *Physalis* are not widely used yet in the selection process, agriculture, modelling systems or ethnobotany owing to funding limitations.

Evaluation and characterization

The Solanaceae collection is evaluated for morphological, economic and agronomic characters (Table 4).

Our accessions are used for secondary characterization (resistance to specific disease and pests, good fruit set at low temperature, reduced growth under winter cultivation, nutritional value, etc.).

Table 4. Number of descriptors used in Armenia for the evaluation of eggplant, pepper and tomato collections

Characters	Eggplant	Pepper	Tomato
Morphological characters			
Plant	13	13	10
Leaf	13	12	11
Flower	9	9	9
Fruit	18	18	18
Seeds	4	4	4
Total	**57**	**56**	**52**
Biological characters			
Phenology	14	14	14
Vegetation period	10	10	10
Disease resistance	4	2	4
Total	**28**	**26**	**28**
Agronomic characters			
Yield	25	25	15
Chemical composition	5	3	4
Total	**30**	**28**	**19**

Storage

Seeds are kept at room temperature. There is no cold chamber or deep-freezers owing to lack of financial resources.

Regeneration and safety-duplication

The local landraces still face genetic erosion. We are eager to be active in the seed regeneration programme and wish to collaborate with EGGNET.

Some of the accessions are regenerated every year and the other within 3-5-7 years based on the age and amount of seeds. We lack techniques for pollination control but we work on the regeneration of open–pollinated vegetable species.

The collection contains endangered accessions which need urgent regeneration and we wish to rescue our collection and create a safety-duplication system.

Documentation and availability

The collection data are computerized and the documentation should be developed to participate in EGGNET and European databases.

Our accessions are available on request. We do not have access to Internet.

Breeding activities

Breeding programmes on eggplants, peppers and tomatoes are carried out in the Department of Solanaceae (open field and greenhouses) and in the biotechnology laboratory. They include breeding for disease resistance, earliness, flavour, resistance to transport damage and productivity.

Concluding remarks

Armenia is very happy to become an active member of the ECP/GR Solanaceae WG and to participate in its activities:

- Exchange of germplasm and sharing of information and technologies
- Collaboration in joint research priorities and training courses
- Collaborative activities for the collecting, evaluation and characterization of eggplant, pepper, tomato and other Solanaceae germplasm of the Armenian flora.

Solanaceae genetic resources in Austria

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Introduction

In Austria genetic resources of Solanaceae are conserved in 2 governmental institutions and in a non-governmental organization. A small collection is conserved in the Austrian Agency for Health and Food Safety in Linz and belongs to the Horticultural College and Research Institute Wien-Schönbrunn. In Styria there is another public collection at the National Research Centre Styria, Research Station for Special Crops. The NGO Arche Noah holds a larger collection of Solanaceae.

In Austria a National Programme for Genetic Resources was established for both plant and animal genetic resources with a national working group including governmental and non-governmental institutions.

The Solanaceae collections

The governmental collection of Solanaceae is very small. It includes only varieties that were important for professional horticultural production in Austria in the past. Arche Noah tries to hold a wide collection of varieties that offer multiple possibilities for utilization. Table 1 lists the Solanaceae accessions conserved in Austrian genebanks.

Table 1. Number of Solanaceae accessions in the Austrian genebanks

Species	Name	Total Arche Noah	Total governmental genebanks
Lycopersicon lycopersicum	Tomato	580	7
Capsicum sp.	Pepper	190	16
Solanum melongena	Eggplant	15	1
Solanum sp. *(S. nigrum, S. sisymbriifolium,* etc.)		11	1
Physalis sp.	Cape gooseberry, tomatillo, etc.	15	10
Total		**811**	**35**

The Multicrop Passport Data of accessions in governmental genebanks are recorded in the *Index Seminum Austriae* which is published on the Internet (http://www.lwlnz.ages.at/genbank). Main users of the material are research institues in Austria.

Every year a seed handbook is published by Arche Noah where access to material is offered to the public (http://www.arche-noah.at) but also for research and regeneration purposes.

Storage facilities and regeneration

Governmental genebanks

In the long-term collection the accessions are stored at –20°C in glass flasks. The germination is tested regularly. When the rate falls below 60% the material is regenerated in the field. Drying is carried out using silica gel.

Arche Noah
In the working collection the material is stored in air-tight glass flasks. Small samples of the accessions are also stored in a long-term collection in sealed, laminated bags at –15°C. Regeneration is carried out in small plots. The seeds are cleaned manually and dried with silica gel.

Some of the accessions are also maintained by members of the organization in a decentralized system of conservation and regeneration.

Characterization and safety-duplication

In governmental genebanks characterization and evaluation of Solanaceae genetic resources has not yet been done. Basic characterization is being implemented. Arche Noah has carried out basic characterization of 60% of their Solanaceae accessions. Basically IPGRI descriptors were used. Text information and photo-documentation are also available.

There are no safety-duplications of Austrian Solanaceae accessions yet. The material from Arche Noah was partly provided by IPK Gatersleben (Germany).

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The Bulgarian Solanaceae collections

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The eggplant collection

Eggplant (*S. melongena* L.) is a traditional vegetable crop in Bulgaria. It was introduced into the country at the time of the Turkish invasion of the Balkan Peninsula.

The creation of the national eggplant collection dates back to 1982. Through exchanges between the Institute for Plant Genetic Resources (IPGR) in Sadovo and related foreign institutes, a collection of 127 eggplant accessions of foreign origin was established. The major sources of acquisition of new accessions are contacts with other institutes, genebanks, experiment stations and botanical gardens.

The collection comprises accessions from 15 countries. Most accessions originate from Europe and Asia (Fig. 1). Part of the material was collected during expeditions in various regions of Bulgaria, resulting in the collecting of 45 local accessions. This was the first step in the introduction process. Efficient planning and organization of these expeditions was essential. The IBPGR methodology for collecting local genetic resources was adapted for Bulgarian conditions (Krasteva 1989).

The national eggplant collection is maintained at the IPGR in Sadovo. There is also a small collection for training purposes at the Agricultural University in Plovdiv.

Structure of the eggplant collection

The national collection consists of foreign and local cultivars and populations with a predominance of foreign cultivars (73.42%) over local cultivars (26.5%) (Fig. 1).

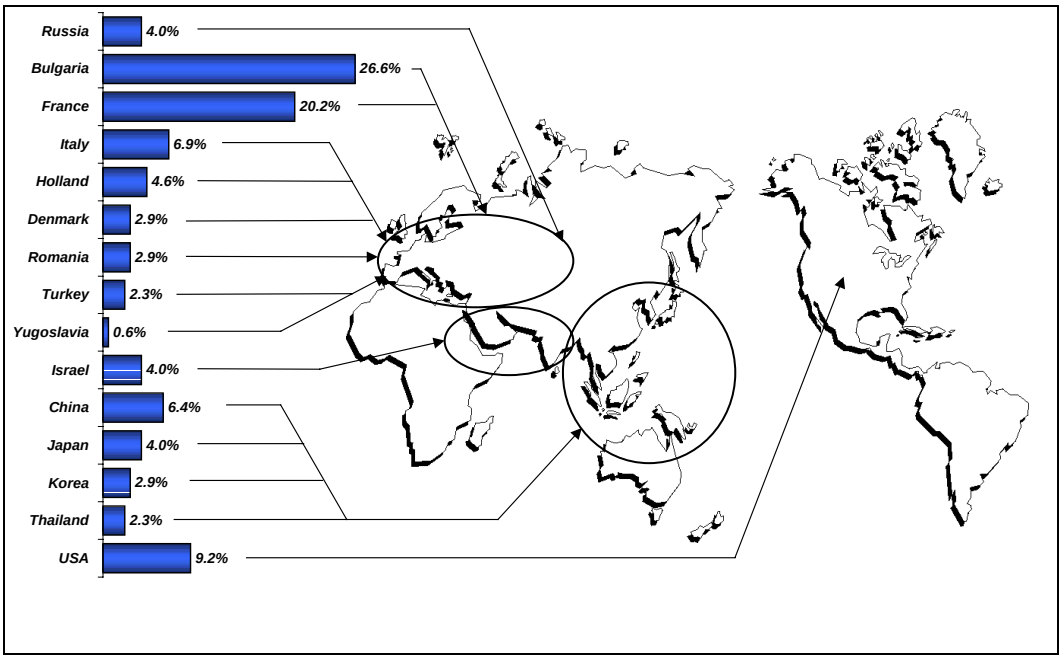

Fig. 1. Geographic origin of the eggplant accessions

[8] Author and curator for eggplant and tomato
[9] Author and curator for pepper

Seventy-two accessions of *S. melongena* L. were placed in long-term storage and 173 accessions are kept in the working collection under short-term conservation (Table 1).

Table 1. Structure of the eggplant (*S. melongena)* collection (sample type and conservation status)

Species/subspecies	Total no. of accessions	No. of cultivars		Conservation status		
		Foreign	Local	Long-term	Short-term	Working collection
S. melongena L.	173	127	46	72	173	173
S. melongena L. subsp. *subspontaneum*	1				1	1
Total	**174**	**127**	**46**	**72**	**174**	**174**

Evaluation of the eggplant collection

This task involved additions to and adaptation of the standard East European eggplant descriptors (Dikij *et al.* 1979). Accessions were tested in a quarantine field and afterwards included in a collection nursery. The study lasted 3 years. Evaluation was conducted for 32 characters according to VIR descriptors (Dikij *et al*. 1979), listed below.

Descriptors used for evaluation of the Bulgarian eggplant collection

I. Phenological characters
1. Number of days from emergence to flowering
2. Number of days from emergence to first fruit formation
3. Number of days from flowering to first fruit formation
4. Number of days from emergence to technological ripeness

II. Morphological characters
5. Bush colour
6. Presence of spikes on the bush
7. Plant height (cm)
8. Leaf length (cm)
9. Leaf width (cm)
10. Leaf colour
11. Petal colour
12. Flower diameter (cm)
13. Colour of fruits at technological ripeness
14. Presence of spikes on the fruit calyx
15. Fruit length (cm)
16. Fruit diameter (cm)
17. Fruit shape
18. Fruit flesh colour
19. Change of fruit flesh colour at cutting (min)
20. Seed weight per fruit (g)
21. Seed colour
22. 1000-seed weight (g)

III. Biological characters
23. Earliness
24. Uniformity of ripening

IV. Productivity characters
25. Fruit number per plant
26. Productivity per plant (kg)
27. Productivity per hectare (kg)

V. Biochemical evaluation of fruits
28. Dry matter content (%)
29. Crude protein content (%)
30. Total sugar content (%)

VI. Disease resistance
31. *Phytophthora capsici* (Leon)
32. *Verticillium dahliae* (Kleb)

The accessions in the working collection listed in Table 1 above are at different stages of evaluation (first, second or third year).

High yield and good quality are much affected by some economically important diseases. The most severe of these diseases are *Verticillium dahliae* and *Phytophthora capsici* (Georgieva *et al*. 1995). In a number of countries, this problem has been solved for the local ecological conditions through breeding of resistant cultivars (Neshev *et al*. 1999). According to Merezhko (1984), the first step in research for breeding purposes is the constitution of working collections for each valuable breeding trait. These collections can be classified by trait or by source. A "source" is a valuable genotype possessing a definite level of a given useful trait that has not been investigated by genetic methods. Further to the thorough evaluation of the collection and according to breeding needs, the accessions were grouped according to the degree of manifestation of each trait and a trait collection was created (Table 2).

Table 2. Eggplant trait collection

Trait	Accessions catalogue numbers	No. of accessions
Earliness	85002, 85023, 85043	16
Productivity	93005, 85010, 85041	8
Egg-shaped fruits	85047, 85043, 91010	5
Cylindrical fruits	94004, 94005, 97001	6
High sugar content	98002, 93011, 91022	5
High dry matter content	90005, 91009, 91010	8
Resistance to *Phytophthora capsici* (Leon)	87005, 85022	2
Resistance to *Verticillium dahliae* (Kleb)	85038, 87101, 91009	24

Utilization of eggplant genetic resources

Active cooperation between IPGR-Sadovo and other breeding institutes regarding germplasm collections and their evaluation resulted in the creation of the new eggplant cultivars 'Luch' and 'Antim' which were registered by the State Varietal Commission (Petrov *et al*. 1978; Krasteva 1997).

Documentation

The eggplant collection is evaluated for the 32 descriptors listed above (passport data - 4; morphological - 22; biological - 2; productivity - 3; biochemical - 3; and disease resistance - 2). The passport information is the minimum for documentation. The value of the germplasm increases with the level of coverage of its description (Vavilov 1962).

Storage

Accessions are stored in three types of collections: a *base collection* for long-term conservation, maintained at a temperature of -18°C. Part of it is duplicated in the *working collection,* which is maintained at +6°C and used for all germplasm testing. The *exchange collection* includes only accessions and cultivars used for exchange with related institutes and companies.

Summary

1. An eggplant collection comprising a total of 174 accessions, including 127 foreign and 46 local cultivars and 1 wild species was constituted and improved.
2. A trait collection was created for earliness, productivity, fruit shape, high sugar and dry matter contents, and disease resistance.
3. A database recording 32 quantitative and qualitative traits was created; it will contribute to more effective utilization of the germplasm for breeding.
4. The new eggplant cultivars 'Luch' and 'Antim' were added to the Bulgarian cultivar list.

The tomato collection

Tomato is the most common vegetable crop in Bulgaria. This is explained by its ecological plasticity, high fertility, multipurpose use and the biological value of fruits. The exact time of tomato introduction to Bulgaria is not known. Several chronological stages can be distinguished:

1. 1882 Introduction by unknown gardeners
2. 1890-1928 Introduction and investigation of varieties
3. 1930-1931 Establishment of the Agricultural Experiment Station in Plovdiv; initiation of plant introduction based on scientific methods
4. 1932-1939 Introduction of many wild forms from Russia, Germany, the Netherlands and USA; organization of the first expeditions in the country
5. 1953-1977 Establishment of a section for introduction and plant genetic resources at the Institute of Crop Production in Sofia, which played an important role in the development of the tomato collection
6. 1977 Establishment of the Institute for Introduction and Plant Genetic Resources in Sadovo; creation of a national tomato collection
7. 1978-2000 Enrichment and evaluation of the collection; creation of a database.

Structure of the tomato collection

Tomato genetic resources include six categories: introduced, currently used cultivars; new Bulgarian cultivars; old primitive cultivars, removed from the national cultivar list; local populations; wild relatives; and breeding lines (Table 3).

Table 3. Structure of the tomato (*Lycopersicon* spp.) collection according to type of sample

	Cultivars		Breeding lines			
Species	**Foreign**	**Local**	**Foreign**	**Local**	**Old populations**	**Wild species**
L. esculentum	846	18	5	120	120	-
L. pimpinellifolium	-	-	-	-	-	4
L. racemigerum	-	-	-	-	-	3
L. humboldti	-	-	-	-	-	4
L. chilense	-	-	-	-	-	2
L. pennellii	-	-	-	-	-	5
L. hirsutum	-	-	-	-	-	3
L. chmielevskii	-	-	-	-	-	4
Total	**846**	**18**	**5**	**120**	**120**	**25**
Grand total				**1134**		

The modern introduced cultivars are the most important resources in terms of quality and represent the major part of the collection (846 accessions = 14%). Foreign introduced cultivars originated mostly from European countries: the Netherlands (15.5%), Germany (11.2%), Hungary (4.2%), Italy (3.5%), France (2.5%) and Israel (4%). The percentage of accessions from USA and Canada is also significant (17.3% and 6.9% respectively) (Fig. 2).

The new Bulgarian cultivars included in the national cultivar list represent only a small part of the collection (18 accessions).

The old primitive varieties (9) were grown in the past, but they are not used any more and are included in the collection.

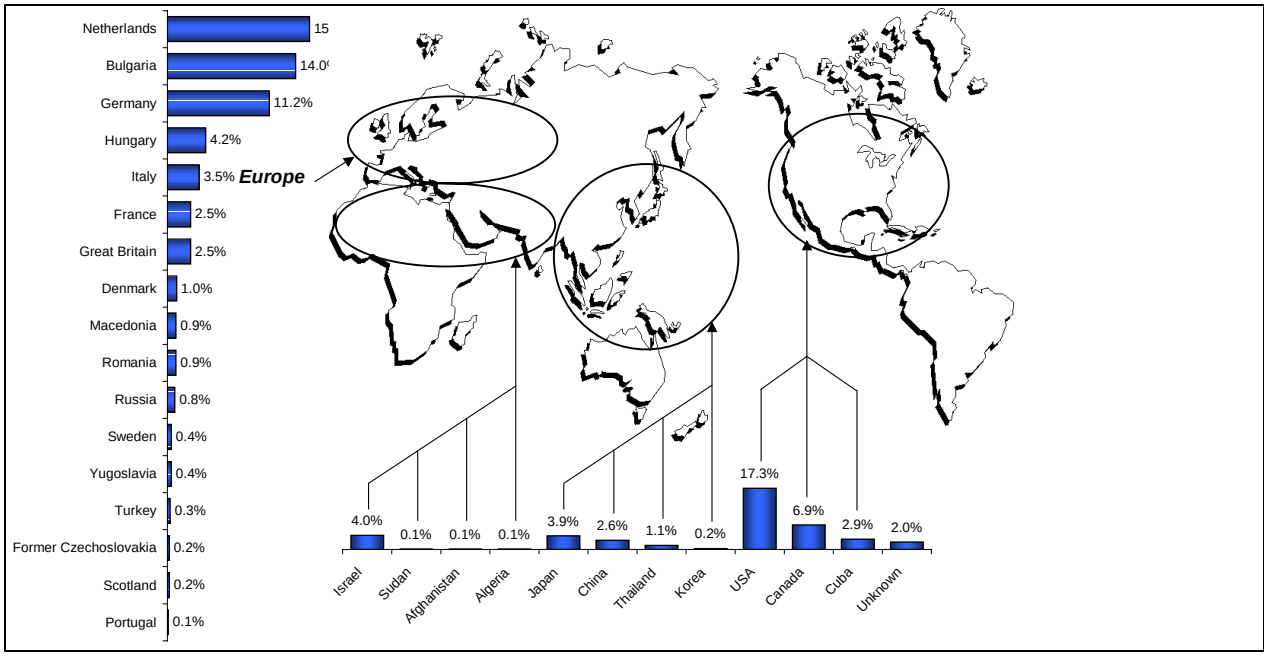

Fig. 2. Geographic origin of the tomato accessions

The 111 local populations listed in Table 4 below result from natural evolution and human interference through directed selection. The influence of the environment should not be neglected. Their great adaptability is due to their high genetic diversity and makes them particularly valuable genetic resources.

Table 4. Tomato accessions collected during expeditions in Bulgaria (1977-1996)

	Expeditions		
Year	**No.**	**Region**	**No. of accessions**
1977	1	Pazardzik, Plovdiv, Stara Zagora, Kardzali	4
1978	1	Sliven, Targovishte, Razgrad, Shumen	5
	2	Vidin, Vratza, Montana	12
	3	Stara Zagora, Sliven, Rousse, Dobrich, Gabrovo, Varna	10
		Total for 1978	**27**
1980	1	Veliko Turnovo	11
	2	Lovech	2
	3	Gabrovo	1
		Total for 1980	**14**
1981	1	Blagoevgrad	3
	2	Montana, Varna	7
	3	Botevgrad	2
		Total for 1981	**12**
1983	1	Pleven, Sliven, Shumen, Burgas	13
	2	Blagoevgrad, Kjustendil, Sofia	5
		Total for 1983	**18**
1985	1	Kjustendil	4
1986	1	Burgas	4
	1	Sofia	1
		Total for 1986	**5**
1989	2	Lovech, Yambol, Lom, Razgrad	**5**
1990	1	Smolyan	**-**
1991	1	Veliko Turnovo	**9**
1992	1	Veliko Turnovo, Targovishte	**5**
1993	1	Plovdiv, Pazardzik, Burgas	**4**
1994	1	Smolyan	**2**
1995	1	Sofia	2
1996	1	Stara Zagora, Plovdiv	4
Total for the period			**111**

Wild relatives (25) are potential breeding sources for improvement of resistance to stress factors (diseases, pests and soil salinity).

The breeding lines are a special genetic stock used in the current breeding programmes. They include accessions and lines of no economic value but possessing genes or combinations of genes with a definite breeding value. The Institute of Genetics in Sofia and the Institute of Horticulture and Canning Industry in Plovdiv use 400 and 250 tomato breeding lines in their programmes respectively, and the Vegetable Experiment Station in Gorna Orjahovitsa maintains a collection of 90 accessions for breeding purposes.

In IPGR-Sadovo, 573 accessions were placed in long-term storage (478 cultivars and 95 local populations). Another 1134 accessions are kept in short-term conservation and replicated in a working collection (Table 5).

In recent years, the curator's efforts at the IPGR have been directed towards the creation of a network of partners involved in the study and conservation of old local populations and forms. The scheme involves different structures (research institutes, schools and farmers), allowing maximum use of all opportunities for conservation of these resources. Joint programmes have been developed with students from secondary schools for collecting and conservation of their local germplasm.

Table 5. Structure of the tomato collection according to conservation status

	Total no. of	Cultivars		Conservation status		
Species	**accessions**	**Foreign**	**Local**	**Long-term**	**Short-term**	**Working collection**
L. esculentum	1134	846	138	573	1134	1134
L. pimpinellifolium	-	-	-	-	-	4
L. racemigerum	-	-	-	-	-	3
L. humboldti	-	-	-	-	-	4
L. chilense	-	-	-	-	-	2
L. pennellii	-	-	-	-	-	5
L. hirsutum	-	-	-	-	-	3
L. chmielevskii	-	-		-	-	4
Total	**1134**	**846**	**138**	**573**	**1134**	**1159**

Evaluation of the tomato collection

This includes three main stages: preliminary evaluation, "complex" (main) evaluation, and "special" evaluation.

Preliminary evaluation is obligatory and is conducted in a quarantine field, where accessions are checked for freedom from diseases and pests.

"**Complex" evaluation** is the main source of information for documentation of the databases and is the requisite for placement for long-term conservation in the national genebank. It is based on the comparison of accessions with the national tomato standards. There are three tomato standards (early, medium-early and late). Evaluation was conducted according to the COMECON descriptor list (Glushchenko *et al*. 1986) and IPGRI *Descriptors for tomato* (IPGRI 1996) for 45 traits listed below. All accessions have been characterized thoroughly.

Descriptors used for evaluation of the Bulgarian tomato collection

I. Phenological characters
1. Number of days from emergence to flowering
2. Number of days from emergence to first fruit formation
3. Number of days from flowering to first fruit formation
4. Number of days from emergence to technological ripeness

II. Morphological characters
5. Plant - habit
6. Stem - height of main stem (cm)
7. Stem - foliage
8. Stem - pubescence
9. Leaf - size (cm)
10. Leaf - type
11. Leaf - surface
12. Leaf - colour
13. Inflorescence - type
14. Inflorescence - texture
15. Flower - number of flowers per inflorescence
16. Flower - size (cm)
17. Flower - type
18. Peduncle - type
19. Fruit - shape
20. Fruit - weight (g)
21. Fruit - surface
22. Fruit - complementary colour
23. Fruit - colour
24. Fruit - number of locules
25. Fruit - cracking
26. Seeds - seed number per fruit
27. Seeds - 1000-seed weight (g)
28. Seeds - colour

III. Biological characters
29. Seasonality
30. Uniformity of ripening
31. Heat and stress resistance

IV. Agronomic characters
32. Yield of marketable fruits per hectare (kg)
33. Yield of marketable fruits for 15 days of fruit bearing (kg)
34. Yield of marketable fruits per plant (kg)

V. Biochemical and technological evaluation of fruits
35. Dry matter content (%)
36. Total sugar content (%)
37. Titratable acidity (%)
38. Ascorbic acid content (mg/g)
39. Keeping ability at 12-15°C

VI. Disease resistance
40. Late blight
41. Fusarium wilt
42. Tobacco mosaic
43. Verticillium wilt
44. Cladosporium leaf mould
45. Septoria blight

Complex evaluation took place in the experimental field of IPGR-Sadovo over a 3-year period, for a number of traits related to plant phenology, morphology, biology and biochemistry. Trait collections were created according to tomato breeding requirements (Sotirova *et al*. 1989; Dobrev and Krasteva 1989; Krasteva *et al*. 1990; Georgiev *et al*. 1993; Stancheva and Krasteva 1993; Krasteva *et al*. 1993). Accessions were grouped as shown in Table 6.

Table 6. Tomato trait collection

Trait	Accessions catalogue numbers	No. of accessions	
		Tested	Sources
Earliness	85012, 85013, 87037, 88032, 91015, 91045, 91048	572	30
Productivity	91045, 91030, 91022, 91024, 91010	572	47
High dry matter content	85019, 91029, 91050, 93006, 94016	364	72
High vitamin C content	84031, 84035, 91029, 91038, 94003	364	83
Cladosporium michiganensis	82154, 82129	72	2
Septoria lycopersici A. and Reynard	82102, 82158, 82129	72	3
Powdery mildew f. *lycopersicum*	92101, 92113, Lira, Vihren	174	4
Alternaria solani	83011, 83029, 83030, 84048, 82113, 83004, 84019, 82167, 82025, 83046, 84021, 6752	323	24
Fusarium oxysporum f.sp. *lycopersici* race 1	2109, 2186, 2213, 2198	50	4
Fusarium oxysporum f.sp. *lycopersici* race 2	2187, 2198, 2224, 2109, 2181		4
Phytophthora infestans (Mont) Bary race T_0	82158, 84015, 87017, 84023, 84041, 83029, 83030, 83033, 83037, 83038, 83039	120	18
Phytophthora infestans (Mont) Bary race T_1	84015, 84031, 83028, 83034, 83039, 83044, 84030	120	15

Special evaluation is conducted only for accessions that have undergone complex evaluation. Taking into consideration breeding objectives, some additional trait evaluations such as resistance to low and high temperatures should be carried out.

The main cooperative relationships maintained by IPGR-Sadovo are with plant breeders from the Institute of Genetics in Sofia, the Institute of Horticulture and Canning Industry in Plovdiv, the Agricultural University in Plovdiv and the Vegetable Experiment Station in Gorna Orjahovitsa. These research centres maintain breeding material collections. Joint breeding research and studies are carried out. The tomato cultivars 'Lira', 'Vihren', 'Trapezitza' and 'Bononia' were developed jointly with the Institute of Genetics in Sofia, and the cultivar 'Elitza' with the Institute of Horticulture and Canning Industry in Plovdiv.

Using previously developed computer programs, 518 tomato accessions, divided into two groups (indeterminate and determinate), were statistically processed at IPGR. *Max* and *min* values and their differences were determined for 18 main traits. Trait variation was expressed by the coefficient of variation (CV, %) and the mean square deviation. A correlation analysis was conducted for the same traits. The relationship between the analyzed traits and their interactions was studied on the basis of the calculated correlation coefficients. Multiple correlation and regression analyses were made to assess the collective effect of the aforementioned traits, important for tomato breeding. Multiple correlation coefficients and regression equations were calculated for 12 main traits. The calculation was made in two steps, using 13 traits for the first step and 18 for the second step. Two regression equations and multiple correlation coefficients were obtained, providing a statistical picture of multiple correlations between dependent and independent variables.

Utilization of tomato genetic resources

Based on complex evaluation and continuous improvement of the trait collections, five new tomato cultivars were developed and registered by the State Varietal Commission.

Management of tomato genetic resources

Based on the experience gained during long-term work with tomato germplasm, all aspects of germplasm management and conservation have been organized: introduction of foreign accessions, collecting of local forms, documentation of primary information, reproduction and analysis of seed material collected, completion of the database with information about each newly acquired accession, statistical analysis of this new information, evaluation of the

genetic properties of new accessions, classification of selected sources, updating of trait collections, and determination of the source conservation method.

Storage

The tomato collection is stored in the genebank of IPGR-Sadovo. Long-term conservation technology follows FAO/IPGRI standards. There are three types of collection, as for eggplant: a base collection, a working collection and an exchange collection (see above).

Summary

1. A national tomato collection, consisting of 1134 accessions (846 introduced from 29 countries, 111 local forms collected from different regions in Bulgaria, 125 breeding lines and 25 wild species) was created.
2. The information collected on the geographic origin and characteristics of local accessions provides the basis for prioritizing on-farm conservation.
3. A complete system was developed for the management of the *L. esculentum* L. collection, involving resource planning, collecting, introduction, reproduction, documentation, analysis, classification and conservation.
4. The international classifiers (COMECON descriptors) of *L. esculentum* L. were adapted to Bulgarian conditions for the description, evaluation and analysis of the genetic material during reproduction over the period 1977-2000.
5. A scientific approach was developed for the management, study and utilization of specific plant genetic resources within the national germplasm.
6. For the first time in our country, the collection was classified according to two systems — the first one based on the national standards for *L. esculentum* L. and the second based on the unified international classifiers (descriptors).
7. A computerized database, recording 45 traits in addition to passport information for 518 accessions, was created.

The pepper collection

Pepper (*Capsicum annuum* L.) is one of the major vegetable crops in Bulgaria. It was introduced into the country in two ways: from Istanbul by the Turkish troops, and from Central and Western Europe by gardeners (Austro-Hungary).

In Bulgaria pepper finds good conditions for its development, so that Bulgaria has become a secondary centre of origin.

The first local forms were named either after the gardener who maintained them (Marinovski and Otche Matei) or the settlement where the cultivar was stabilized (Kurtovska kapia, Sofiiska kapia, Dzuljonska chipka). Some of these forms are still main cultivars in Bulgaria.

Structure of the pepper collection

The pepper collection consists of 643 accessions, including 363 of foreign origin and 280 collected during expeditions conducted in Bulgaria (Table 7). Most foreign accessions originate from Spain, Italy, France and the Netherlands. Few countries have at their disposal such a rich diversity of local forms. All varieties are presented together here, but the major part of the collection is represented by accessions from varieties 'Kapia' and 'Chipka' (Todorova 1999).

Table 7. Status of the pepper (*Capsicum annuum* L.) collection in Bulgaria

Species	Total no. of accessions	Cultivars		Conservation status		
		Foreign	Local	Long-term	Short-term	Working collection
C. annuum L.	643	363	280	250	643	643
Wild species	-	-	-	-	4	4
Total	**643**	**363**	**280**	**250**	**643**	**643**

IPGR has established cooperative relations with the Institute for Horticulture and Canning Industry in Plovdiv. The latter maintains a pepper collection of 437 accessions and lines for breeding purposes. Good contacts are also maintained with the Institute of Genetics in Sofia where a pepper collection of 210 accessions is available. The Vegetable Experiment Station in Gorna Orjahovitsa holds a collection of 56 pepper accessions for breeding purposes.

Evaluation of the pepper collection

All accessions of the national collection at the IPGR are evaluated according to the International COMECON List of Descriptors for the species *Capsicum annuum* L. (Dikij *et al*. 1979). The main characters are listed below. Around 70% of the collection at the IPGR Sadovo has been evaluated according to this COMECON list.

Descriptors for evaluation of the Bulgarian pepper collection

I. Phenological characteristics

1. Number of days from emergence to flowering
2. Number of days from emergence to first fruit formation
3. Number of days from flowering to first fruit formation
4. Number of days from emergence to technical ripeness

II. Morphological characters

5. Bush - height
6. Bush - type of bush
7. Bush - number of shoots
8. Leaf - shape
9. Leaf - colour
10. Flower - number of flowers per inflorescence
11. Flower - size
12. Flower - corolla colour
13. Flower - pistil attitude
14. Fruit - direction
15. Fruit - shape
16. Fruit - length
17. Fruit - diameter
18. Fruit - calyx attitude
19. Fruit - colour at technical ripeness
20. Fruit - colour at biological ripeness
21. Fruit - surface
22. Fruit - ribbing
23. Seed - 1000-seed weight

III. Biological characters

24. Seasonality
25. Uniformity of seed ripening

IV. Agronomic characters

26. Yield of marketable fruits/plant
27. Yield of marketable fruits per plant for 15 days of fruit bearing
28. Marketable fruit yield/m^2
29. Fruit weight

V. Chemical composition and technological evaluation
30. Dry matter content (%)
31. Total sugar content (%)
32. Ascorbic acid content (mg/g)

VI. Disease resistance
33. Verticillium wilt
34. Fusarium wilt
35. *Phytophthora capsici*

The collections used by the breeders of the Institute for Horticulture and Canning Industry in Plovdiv, Institute of Genetics in Sofia, and Vegetable Experiment Station in Gorna Orjahovitsa are evaluated according to characters of importance for breeding.

Utilization of pepper genetic resources

Many of the accessions which exceed the standards for certain characters are given to the Institute for Horticulture and Canning Industry in Plovdiv for inclusion in breeding programmes.

Storage

Pepper accessions are distributed in the same three types of collections as for eggplant and tomato: base collection, working collection and exchange collection (see above).

Summary

- A national collection of 643 pepper accessions of foreign and local material was created.
- A computerized database recording all local forms was developed.
- The development of databases for the rest of accessions is ongoing; this will make the collection available for use.

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Current status of the Solanaceae collection in the genebank Olomouc, RICP-Prague

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Solanaceae genetic resources are maintained in the Gene Bank in Olomouc, which is now part of the Czech national genebank for agricultural crops. Since 1994 it has been affiliated to the Research Institute of Crop Production (RICP) in Prague–Ruzyne. The germplasm collections were first established at the Research Institute of Vegetable Growing and Breeding in Olomouc (RIVGB-Olomouc), established in 1951 and closed in 1994. The workstation in Olomouc now maintains genetic resources of all vegetable species usually grown in Central Europe (genera *Allium, Beta, Brassica, Capsicum, Cucumis, Cucurbita, Daucus, Lactuca, Lycopersicon,* etc.) and a large spectrum of aromatic, culinary and medicinal plants. It also maintains the international collection of vegetatively propagated *Allium* species.

The Solanaceae collection of the RICP Gene Bank in Olomouc is currently divided into three parts: eggplant (*Solanum melongena* L.), pepper (*Capsicum annum L.,*) and tomato (*Lycopersicon esculentum* Mill.).

Tomato collection

The tomato collection consists of 1604 accessions. Its structure is presented in Table 1. Most of the collection consists of old open-pollinated varieties from USA, Former Soviet Union and Former Czechoslovakia. The most represented species is *Lycopersicon esculentum* Mill. with 1583 accessions.

Wild species include *L. hirsutum* Humb. (8 accessions), *L. chmielewskii L.* (1.), *L. parviflorum* L. (3), *L. peruvianum* Mill. (1) and *L. pimpinelifolium* Mill. (8). Regarding plant growth type, the collection includes both indeterminate (1069) and determinate (535) types. New accessions are acquired from seed companies, research institutes and collecting missions.

Table 1. Structure of the Czech tomato collection according to country of origin, species and growth type

Country of origin	No. of accessions
USA	332
Former Soviet Union	326
Former Czechoslovakia	127
Hungary	94
United Kingdom	80
Germany (DDR)	69
Italy	68
Germany (DEU)	66
The Netherlands	62
Poland	57
Other	323
Total	**1604**

Species	No. of accessions
L. esculentum Mill.	1583
L. hirsutum Humb.	8
L. chmielewskii	1
L. parviflorum	3
L. peruvianum Mill.	1
L. pimpinelifolium Mill.	8
Total	**1604**

Growth type	No. of accessions
Determinate	535
Indeterminate	1069
Total	**1604**

The tomato accessions are grown in the field in Holice, Gene Bank Olomouc. Every year 150 accessions are regenerated on average. The regeneration of the tomato collection was started 6 years ago, in 1995. The whole collection will be regenerated during the next 5 years. The harvested seeds are stored in boxes at a temperature of –20°C. Activities on genetic resources follow the rules of the National programme for plant genetic resources

conservation and utilization in the Czech Republic. Regarding distribution, 50% of accessions are available without restrictions and 40% of accessions are available depending on their seed germination rate.

Tomato is evaluated for 45 characters according to the descriptor list for genus *Lycopersicon* Mill. (Pekárková-TroníÚková *et al.* 1988). These descriptors, listed below, are identical to those of the *Descriptors for tomato* (IPGRI 1996).

Passport data are fully recorded and computerized, and evaluation data are being entered in a database.

Descriptors used for evaluation of the Czech tomato collection

1. Hypocotyl colour
2. Primary leaf length
3. Primary leaf width
4. Plant growth type
5. Vine length
6. Stem pubescence density
7. Stem internode length
8. Foliage density
9. Leaf attitude
10. Leaf type
11. Degree of leaf dissection
12. Inflorescence type
13. Corolla colour
14. Corolla blossom type
15. Flower sterility type
16. Petal length
17. Sepal length
18. Style position
19. Style shape
20. Style hairiness
21. Stamen length
22. Dehiscence
23. External colour of immature fruit
24. Presence of green (shoulder) trips on the fruit
25. Predominant fruit shape
26. Fruit size
27. Fruit weight
28. External colour of mature fruit
29. Ribbing at calyx end
30. Fruit shoulder shape
31. Pedicel length from abscission
32. Presence/absence of jointless pedicel
33. Width of pedicel scar
34. Flesh colour of pericarp (interior)
35. Colour (intensity)of core
36. Seed shape
37. 1000–seed weight
38. Seed colour
39. Number of days to maturity
40. Ripening uniformity of the whole plot
41. Fruit cross – sectional shape
42. Number of locules
43. Fruit blossom end shape and number of flowers per inflorescence
44. Radial cracking
45. Concentric cracking.

Pepper collection

The pepper collection consists of 514 accessions. The distribution of accessions according to their country of origin is shown in Table 2. Most of this collection is represented by old open-pollinated varieties from Hungary, Former Soviet Union, Former Czechoslovakia and the Czech Republic. New accessions are obtained from seed companies.

Table 2. Structure of the pepper collection according to country of origin

Country of origin	No. of accessions
Hungary	131
Former Soviet Union	60
Former Czechoslovakia	52
USA	49
Bulgaria	45
Romania	32
Poland	22
Czech Republic	15
Germany	13
Other	95
Total	**514**

Two systems are used for pepper growing. From 1995 to 1999 it was grown in polythene tunnels. The plants were isolated using special bags to avoid cross-pollination. After removal of the bags the fruits were tagged by a cotton thread. Since 2000 individual pepper accessions are grown in individual isolation cages. Seeds were harvested only from tagged fruits. The harvested seeds are stored at –20°C. At present 95% of the collection is regenerated and 90% of accessions are available for distribution (depending on their multiplication status).

Pepper is evaluated for 31 characters, according to the *Descriptors for* Capsicum *(*Capsicum *spp.)* (IPGRI 1995) (listed below).

Passport data are fully processed and computerized. Evaluation data are gradually being recorded and computerized.

Descriptors used for evaluation of the Czech pepper collection

1. Plant – stem pubescence
2. Height
3. Habit
4. Leaf – pubescence
5. Length
6. Inflorescence – number of flowers per axil
7. Flower position
8. Corolla colour
9. Corolla spot colour
10. Anther colour
11. Filament colour
12. Stigma exsertion
13. Calyx margin
14. Calyx annular constriction
15. Fruit – anthocyanin spots or stripes
16. Colour at intermediate stage
17. Position
18. Set
19. Colour at mature stage
20. Shape
21. Length
22. Width
23. Shape at pedicel attachment
24. Nectary at base of fruit
25. Shape at blossom end
26. Cross-sectional corrugation
27. Surface
28. Seed – colour
29. 1000-seed weight
30. Fruit dry matter content
31. Ascorbic acid content and capsaicin content.

Eggplant collection

The eggplant collection is small, consisting of only 25 accessions. Eggplants are grown in isolation cages. The characters used for evaluation of eggplant are listed below. Passport data are fully recorded and computerized.

Descriptors used for evaluation of the Czech eggplant collection

habit
maturity
fruit length
fruit width
fruit shape
fruit colour

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Status of the Hungarian Solanaceae collections

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Status of the Solanaceae collections

The Institute for Agrobotany in Tápiószele maintains genetic resource collections of the three cultivated Solanaceae crops: tomato, pepper and eggplant. The Vegetable Research Institute Ltd. in Budapest maintains an additional pepper collection (1400 accessions).

The composition of the collections of the Institute for Agrobotany is given in Table 1, and the composition of both collections according to status of sample is given in Table 2.

All accessions maintained at Tápiószele and Budapest are available upon request according to the prescriptions of the Convention on Biological Diversity (CBD).

Table 1. Pepper, tomato and eggplant collections of the Institute for Agrobotany

Species	No. of accessions
Capsicum	
Capsicum annuum L.	725
C. baccatum L.	5
C. chinense Jacq.	1
C. testiculatum Vis.	3
Total *Capsicum*	**734**
Lycopersicon	
Lycopersicon esculentum Mill.	1612
L. pimpinellifolium Mill.	17
L. peruvianum Dun.	10
L. hirsutum Humb. et Bonpl.	4
L. glandulosum C.H. Müller	1
Total *Lycopersicon*	**1644**
***Solanum melongena* L.**	**9**

Table 2. Status of samples in the Hungarian pepper, tomato and eggplant collections

Species	Type of sample				
	Wild relatives	Landraces	Advanced cultivars	Foreign varieties	Mutants/ Breeding lines
Institute for Agrobotany					
Capsicum spp.	9	290	126	309	
Lycopersicon spp.	32	216	147	1249	
Solanum melongena		2	1	6	
Vegetable Research Institute Ltd.					
Capsicum spp.	244				1156

Storage

Storage conditions are satisfactory. In the Institute for Agrobotany the seeds are stored in chambers in active and base collections (Table 3).

After harvest the seeds are cleaned and dried to 5-7% moisture content. The drying process starts in special rooms where relative air humidity is reduced to 15-20%, controlled by automatic sensors. The moisture content and viability of seeds are regularly checked. After the samples have been weighed, checked and the information recorded, they are placed in air-tight glass jars which are then placed in pre-storage chambers for temporary storage and subsequently moved to the active and base collections chambers, at a temperature of 0°C and -20°C respectively.

Table 3. Storage of Solanaceae germplasm at the Institute for Agrobotany

Crop	No. of accessions	Active collection	Base collection
Tomato	1644	1357	287
Pepper	734	609	125
Eggplant	9	9	-

Regeneration

Regeneration of samples depends on the viability and amount of seeds and on the level of characterization and evaluation. Changes in seed viability are monitored by germination tests every 10 years. When viability declines to 80% of its original value, the sample is regenerated. Whenever the amount of seed in storage reaches a minimum level (200 seeds/sample) as a result of utilization and/or distribution, the accession should also be planted for regeneration. Characterization and evaluation are conducted continuously and data are available for approximately one-third to one-half of the accessions. Each year, 50-150 samples of tomato and pepper collections are planted. The minimum number of plants for regeneration is 5 plants per accession (generally 12 plants for tomato and 24 for pepper and eggplant). Because of cross-pollination, the hybrids and off-types must be eliminated in the pepper and eggplant collection, but genetic variation should be recorded.

The newly acquired accessions are propagated in isolation tunnels. This means that fertilization is shifted towards autogamy which is a compromise and may alter the genetic composition of accessions. Therefore another technique for the multiplication of most valuable landraces and old cultivars is used under isoclimatic conditions, i.e. accessions are multiplied in selected districts where the climatic conditions are similar to those of their places of origin. In these districts farmers grow about 10-40 accessions per year. The advantage of this method is to keep the original genetic composition of landraces and old cultivars.

Safety-duplication

The unique samples of tomato, pepper and eggplant in the Institute for Agrobotany and other Hungarian institutions are safety-duplicated in the National PGR Base Collection at Tápiószele which currently contains 109 accessions of tomato and 974 of pepper.

Characterization/evaluation

For effective utilization of germplasm it is essential that the collections be adequately evaluated and characterized. In the beginning most methods were adapted from breeders' practices. Then we used the COMECON descriptors and our own lists, and later on the IPGRI descriptor lists. These descriptor lists provide clear descriptor definitions and coding of the descriptor states. Our characterization and evaluation work is based on these descriptor lists. To provide additional information on quantitative characters, statistical information (mean, range of variation, variance) is also made available. These data are very useful in the case of variable populations. When the descriptors are discontinuous, several descriptor states are recorded, according to their frequencies within each accession.

Collecting activities

The Institute has organized several short collecting missions in Hungary with special emphasis on local forms and ecotypes. Usually one collecting mission is organized per year to collect landrace accessions of Solanaceous vegetable crops. Since the establishment of the Institute in 1958, 508 samples of locally adapted varieties and ecotypes of the three Solanaceous crops have been collected.

The Solanaceae germplasm collection in Israel

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Extensive basic and applied research is conducted in Israel with Solanaceous crops, in particular pepper and tomato. A collection of tomato, pepper and eggplant accessions is deposited in the national genebank located in The Volcani Center, Bet Dagan (Table 1) and is stored in a deep freeze (-10°C). Regeneration protocols are not available for these accessions which have not been characterized or evaluated. The Israeli genebank contains about 20 000 accessions of various crops. However, since the Solanaceae species are not endemic to Israel, these crops are of low priority in the overall activity of the genebank. The Solanaceae collection is composed mostly of introductions obtained from other genebanks. Unique Solanaceae collections that were developed through breeding are currently stored in the individual research laboratories. An effort should be made to deposit these collections in the national genebank for proper long-term storage and regeneration. The genebank database was upgraded recently and a searchable Web site is under final construction.

A unique tomato germplasm collection was generated in the laboratory of Prof. Dani Zamir at the Hebrew University of Jerusalem that includes two genetic resources:

- The first is a population of *Lycopersicon pennellii* **introgression lines** (IL). These congenic lines differ in a single defined chromosome segment and are useful as a permanent mapping population and for the study of complex phenotypes. The IL population is composed of 76 ILs, each containing a single introgression from *L. pennellii* (LA 716) in the genetic background of the processing tomato variety M82. Seeds of the IL population can be requested from the tomato genetic resource centre in the University of California, Davis, USA (www.tgrc.ucdavis.edu). The tomato genetic map of the IL population as well as quantitative trait data measured for the population is presented on the Web site of the Solanaceae genomics networks (www.sgn.cornell.edu).
- The second tomato resource that was generated in the Hebrew University is a collection of **monogenic mutants**, mostly created by chemical mutagenesis (EMS). Currently, the collection contains 3000 mutants that originated from M2 seeds of M82. A database "The Genes That Make Tomatoes" contains the description of the mutants and can be searched using a detailed phenotypic catalogue and combinations of traits on the Web site of the Solanaceae genomics networks (www.sgn.cornell.edu). Seeds of the mutants can be requested from the tomato genetics resource centre in the University of California, Davis, USA (www.tgrc.ucdavis.edu).

Table 1. Solanaceae accessions deposited in the Israeli genebank

Crop	Species	No. of accessions
Tomato	*Lycopersicon esculentum*	31
	L. peruvianum	1
	L. pimpinellifolium	2
Pepper	*Capsicum annuum*	167
	C. baccatum	1
	C. chinense	1
Eggplant	*Solanum melongena*	62
Physalis	*Physalis alkekengi*	2
	P. edulis	1
	P. pruinosa	1

Solanaceae genetic resources maintained in the Polish Genebank

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Status of the collection

The Solanaceae germplasm collection includes 1122 accessions of cultivated and wild species belonging to 4 genera. This collection is maintained by the Plant Genetic Resources Laboratory of the Research Institute of Vegetable Crops (RIVC) in Skierniewice, which is responsible for the national vegetable genetic resources conservation programme (including Solanaceae) and is part of the national genebank. The current status of the Solanaceae collection is presented in Table 1.

Table 1. Current status of the Solanaceae collection, Skierniewice 2003

Species / Names	Total	Passport data	Evaluation / Characterization	Seed in long-term storage	Regeneration 2002
Lycopersicon esculentum Tomato (Pomidor)	917	917	756	917	57
Capsicum annuum Pepper (Papryka	189	189	65	189	
Solanum melongena Eggplant (Oberzyna)	10	10		10	
Physalis ixocarpa Husk tomato (Miechunka pomidorowa)	6	6	3	6	
Total	**1122**	**1122**	**824**	**1122**	**57**

The collection covers different types of accessions, from which the most valuable are the old national cultivars and landraces of tomato and pepper collected in Poland and other countries such as Albania, China, Moldova and Ukraine. The type of accessions is presented in Table 2.

Table 2. Type of sample of the Solanaceae accessions, Skierniewice 2003

Species	Advanced cultivars	Landraces	Breeding lines	Wild species	Total
Tomato	626	173	66	52	**917**
Pepper	54	133	2		**189**
Eggplant	3	7			**10**
Husk tomato	4	2			**6**
Total	**687**	**315**	**68**	**52**	**1122**

Storage and regeneration

Seeds are stored in controlled conditions in the national genebank located at the National Centre for Plant Genetic Resources (PBAI) in Radzików. The temperature in chambers is 0°C/-18°C and humidity of seeds 5–7% depending on the species. Seeds are kept in vacuum glass jars and an "iron reserve" is kept in small hermetically closed metal boxes. The size of stored samples depends on the accession and ranges from 0.5 g to 400 g.

The oldest seeds have been stored for 20 years. For some accessions there is a very small amount of seeds and these samples are successively regenerated. Regeneration of tomato accessions is performed every year and covers 50–100 accessions. Regeneration of other species such as pepper can be done every year but depends on the financial position.

There are no duplicates of Solanaceae accessions so far.

Characterization and evaluation

A total of 824 accessions have been characterized and evaluated, including 756 of tomato, 65 of pepper and 3 of husk tomato (Table 1). These activities are carried out on the working collections. The working collection of field tomato is maintained every year - multiplication and evaluation of the accessions collected during collecting missions or of those accessions stored in the genebank which require regeneration. Evaluation is made according to descriptor lists of IPGRI, UPOV and those developed by RIVC and includes characterization of morphological characters, evaluation of agronomic traits, disease resistance, reaction to stress conditions, etc. For tomato, 42 traits (10 plant traits and 32 fruit traits) are evaluated each year for 55-120 accessions in field trials using 2 or 3 replications. In each replication 20–25 plants are characterized. Data for the characterization and evaluation status are included in Table 1.

Documentation

Passport data are recorded for all accessions according to IPGRI Multi-crop Passport Descriptors and FAO WIEWS Descriptors. All passport, characterization and evaluation data are computerized. Softwares used are Dbase, MS Access 2000 and MS Excel 2000. Images of tomato are stored in JPEG format.

Availability of germplasm

Most accessions are freely available upon request if sufficient seed is available. For ex-directory breeding material, written permission from the donor breeder is required.

Information is available upon request and can be provided by email or on CD-ROM and floppy discs.

Collecting expeditions

Collecting expeditions are organized each year in different regions of Poland and neighbouring countries to collect local forms and wild relatives. When possible we participate in joint expeditions together with other organizations such as VIR, USDA, IPGRI, etc.

During the period 2000-2002 seven missions were organized in Poland. A total of 671 accessions were collected, including 41 Solanaceae (29 landraces of tomato and 12 of pepper). The main sources of new germplasm are home gardens and traditional small farms, in which farmers grow different forms of vegetables for domestic use, and have often done so for a long time. The areas covered by collecting missions and numbers of collected accessions are given in Table 3. Each collected seed sample is split into two parts: one part is added to the base collection, the other is used for regeneration and preliminary evaluation.

Table 3. Solanaceae germplasm collected during explorations in Poland organized by the Polish Gene Bank, 2000-2002

Date	Area	No. of collected accessions	No. of species	Tomato	Pepper	Eggplant	Husk tomato
Oct 2000	Tarnow	114	24	5			
Oct 2000	Sokolka	150	28	5	4		
Oct 2001	Augustów	72	23	2	1		
Oct 2002	Kurpie I	8	5				
Oct 2002	Kurpie II	130	35	8	2		
Nov 2002	Mragowo-Pisz	114	35	3	2		
Dec 2002	Ciechanów	83	25	6	3		
Total		**671**		**29**	**12**	**0**	**0**

Research activities carried out on the collection

Accessions kept in the genebank are used in different research programmes carried out at the universities, institutes and breeding companies (in resistance breeding to *Phytophtora infestans,* bacterial spot, cytological studies concerned with resistance to *Oidium licopersici*). The results of these studies are provided to the genebank and entered into the database.

The Plant Genetic Resources Laboratory cooperates with breeding companies and agricultural universities which have research or breeding programmes and experts in species of interest to the Laboratory. The cooperation covers regeneration of seeds, maintenance of field collection, evaluation of morphological and marketable characters, resistance to pathogens, etc. The materials from the genebank are used in creative breeding programmes. This kind of cooperation is supported by genebank funds provided by the Ministry of Agriculture and Rural Development on the basis of special agreements.

Financial support received from the Ministry of Agriculture for genetic resources preservation is decreasing, which limits collecting activities, regeneration, characterization, evaluation, etc. The major problem is the lack of funds for expeditions on Polish territory where valuable local forms, highly threatened, are still present.

Solanaceae collections in Portugal

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The status of the Portuguese Solanaceae collections is shown in Table 1.

Table 1. Number of species (Sp.) and number of accessions (Acc.) in the pepper and tomato collections held in Portuguese institutions

Institute	Eggplant		Pepper		Tomato	
	Sp.	Acc.	Sp.	Acc.	Sp.	Acc.
BPGV, Braga	0	0	1	108	1	79
EAN, Oeiras	0	0	2	51	0	0

BPGV = Banco Português de Germoplasma Vegetal
EAN = Estação Agronómica Nacional

The Banco Português de Germoplasma Vegetal (BPGV) is the National Portuguese Vegetable Gene Bank located at Braga. The 108 pepper accessions and the 79 tomato accessions existing in this genebank were collected in Portugal and they are documented for passport data. The seeds are stored in good conditions: medium-term: 0 to 5ºC, 40-50% RH; long-term: -20ºC, no humidity control. The seeds are not in danger and the last regeneration occurred 3 years ago. Some of the accessions are being characterized.

Another pepper collection is located at the National Agrarian Research Institute (Estação Agronómica Nacional, EAN) at Oeiras with 51 accessions. These accessions have several origins: some were collected in Portugal and others come from foreign genebanks (Spain, Italy, USA and France). For 48 accessions, seeds are kept in medium-term conditions at 4°C in aluminium foil packets, under vacuum. The last regeneration occurred in 1990 and there are approximately 500 seeds/accession. For the other 3 accessions seeds are stored in long-term conditions (-16ºC, no humidity control); there are very few seeds, the seeds were collected in 1982 and were never regenerated. The possibility to carry out germination tests for all accessions and store all accessions in long-term conditions (-16ºC) in the future is being discussed at EAN.

Contacts

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Solanaceae collections of the Vavilov Institute, Russian Federation

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Composition of the collections

The Vavilov Institute (VIR) currently holds 7250 tomato accessions, 681 eggplant accessions and 2313 pepper accessions, distributed between a permanent (main) catalogue and a temporary catalogue, as shown in Table 1.

Table 1. Structure of VIR tomato, eggplant and pepper collections

	No. of accessions		
Crop	**Total**	**Permanent catalogue**	**Temporary catalogue**
Tomato	7250	4426	2825
Eggplant	681	583	98
Pepper	2313	1284	1029

These collections contain samples of various origin and types: local varieties, cultivars and hybrids from domestic and foreign breeding, wild species, and a number of mutant lines. The collections are increased by collecting missions, germplasm exchange between genebanks, or acquisition of new initial breeding material.

Table 2 presents the taxonomic composition of the collections. The genus *Lycopersicon* is represented by 12 species, mostly of *L. esculentum (*7078 accessions). Other widely represented species are *L. pimpinellifolium* (45 accessions), *L. peruvianum* (52) and *L. hirsutum* (23). The genus *Solanum* is represented by two species: *S. melongena* (674 accessions) and *S. integrifolium* (7 accessions). The genus *Capsicum* includes three species: *C. annuum* (2254 accessions), *C. angulosum* (24) and *C. conicum* (25).

Table 2. Taxonomic composition of VIR tomato, eggplant and pepper collections

Genus/species	**No. of accessions**
***Lycopersicon* Tourn.**	
L. esculentum	7078
L. pimpinellifolium	45
L. humboldtii	3
L. cheesmanii	12
L. peruvianum	52
L. hirsutum	23
L. chilense	7
L. minutum	1
L. parviflorum	6
L. chmielewskii	9
L. glandulosum	13
L. pennellii	1
Total *Lycopersicon*	**7250**
***Solanum* L.**	
S. melongena	674
S. integrifolium	7
Total *Solanum*	**681**
***Capsicum* L.**	
C. annuum	2254
C. angulosum	24
C. conicum	25
Total *Capsicum*	**2313**

Storage conditions

All crops are stored in working collections, which are continuously used by researchers. Storage temperature is maintained between +10 and +15ºC. Accessions are stored in tin boxes on shelves. Under these conditions, seed germination is maintained for 8–10 years for tomato and 4-5 years for eggplant and pepper. The weight of the preserved seed sample for each accession ranges from 0.1 g to 15-20 g.

Base collections are maintained in the National Seed Store in Kuban, Krasnodar Region, at a storage temperature of +4ºC. Table 3 presents the number of accessions of the three crops placed for short-term and long-term storage. Seed samples with low germination rate (<85%) or low seed weight (<10 g) are selected for short-term storage. Accessions with seed germination above 85% and seed weight over 10 g are placed in long-term storage. Most of the tomato, eggplant and pepper base collections has been placed in long-term storage. Seed weight of the samples under these storage conditions is 10-15 g, depending on the species (10 g-samples for wild species, 15 g for all others).

Table 3. Storage of Solanaceae collections in the National Seed Store (base collections)

	No. of accessions		
Crop	**Short-term storage**	**Long-term storage**	**Total**
Tomato	237	3174	3511
Eggplant	135	407	542
Pepper	385	812	1197

The Institute is currently building a long-term storage facility where all accessions in collections will be kept at +4ºC and –10ºC. Some accessions of different crops have already been placed in this new facility. Table 4 presents the number of tomato, eggplant and pepper accessions in long-term storage at VIR.

Table 4. Solanaceae collections in the long-term storage laboratory at VIR

	No. of accessions		
Crop	**Short-term storage**	**Long-term storage**	**Total**
Tomato	429	135	564
Eggplant	251	34	285
Pepper	670	17	687

Efforts to restore seed germination ability in the working collections are made on a regular basis at the Experiment Stations of VIR. To maintain the prescribed germination level, each accession of the collection is regenerated after a certain number of years. Regeneration intervals for restoration of germination are determined by the sowing fitness of the seed. For tomato this interval is 8–10 years, for eggplant and pepper 3–4 years. The seeds are multiplied to give the amount needed for their conservation in the working collections, for seed exchange with breeding centres and for placement in long-term storage if they are not already in store.

The passport data for all tomato, eggplant and pepper accessions in the base collections are computerized. Characterization data of the accessions are recorded in catalogues and card files.

Every year new accessions are studied at the Experiment Stations of VIR. Phenological and morphological data collected over three years of study form the basis of the characterization of each accession for maturity, yield parameters, resistance to diseases, pests and unfavourable environmental factors, etc. Sources and donors of economically valuable traits are selected and distributed to plant breeders for inclusion in their breeding programmes.

Solanaceae genetic resources activities in Turkey

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Introduction

Plant genetic resources activities in Turkey started in 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 (Tan 1998).

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.

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).

Ex situ *conservation*

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

Table 1. Conservation facilities in cold stores of 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: aluminium laminated 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.

Collecting Solanaceae in Turkey

Turkey is a micro-gene centre for many landraces including Solanaceae. Therefore these landraces are still grown by farmers in almost all regions. Over 1500 accessions of Solanaceae have been collected since 1964 (Table 2). Systematic collecting and surveys are carried out, taking into account various priorities such as erosion factors, construction of dams and irrigation canals, land opening to industry and settlements; tourism also affects farming land and therefore landrace cultivation. Collecting is still a priority in order to fill gaps in Turkish landraces, especially in the regions of the country which have never been explored.

Table 2. *Ex situ* collections of Solanaceae at AARI (1964-2000)

Botanic name	Collecting sites (provinces)*	No. of accessions
Capsicum annuum	Adiyaman, Afyon, Aksaray, Amasya, Ankara, Antalya, Artvin, Aydin, Balikesir, Bartin, Bilecik, Bingöl, Bitlis, Bolu, Burdur, Bursa, Çanakkale, Çankiri, Çorum, Denizli, Diyarbakir, Edirne, Elazié, Erzincan, Erzurum, Eskiċehir, Gaziantep, Giresun Gümüċhane, Isparta, ±stanbul, ±zmir, Kahramanmaraċ, Karaman, Kars, Kastamonu, Kayseri, Kirikkale, Kirklareli, Kirċehir, Kocaeli, Konya, Kütahya, Malatya, Manisa, Muéla, Ordu, Rize, Sakarya, Siirt, Sinop, Sivas, Àanliurfa, Tekirdaé, Tokat, Trabzon, Tunceli, Uċak, Van	800
C. annuum grossum	Aksaray, Antalya, Bolu, Kocaeli, Konya, Sakarya	11
C. annuum longum	Aksaray, Antalya, Karaman, Konya	10
C. frutescens	Afyon, Balikesir, Bilecik, Burdur, Bursa, Çanakkale, Eskiċehir, Isparta, ±zmir, Manisa, Uċak	29
Lycopersicon esculentum	Adiyaman, Afyon, Aéri, Aksaray, Amasya, Ankara, Antalya, Artvin, Aydin, Balikesir, Bartin, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankiri, Çorum, Denizli, Diyarbakir, Edirne, Erzincan, Erzurum, Eskiċehir, Gaziantep, Giresun, Isparta, ±stanbul, ±zmir, Kahramanmaraċ, Karaman, Kars, Kastamonu, Kayseri, Kirikkale, Kirklareli, Kirċehir, Kocaeli, Konya, Kütahya, Malatya, Manisa, Mardin, Muéla, Ordu, Sakarya, Samsun, Siirt, Sinop, Sivas, Àanliurfa, Tekirdaé, Tokat, Trabzon, Tunceli, Uċak, Zonguldak	516
Solanum melongena	Adiyaman, Afyon, Aksaray, Amasya, Ankara, Antalya, Artvin, Aydin, Balikesir, Bartin, Bilecik, Bolu, Burdur, Bursa, Çanakkale, Çankiri, Çorum, Denizli, Diyarbakir, Edirne, Erzincan, Erzurum, Eskiċehir, Gaziantep, Giresun, Hatay, Isparta, ±zmir, Karaman, Kars, Kastamonu, Kayseri, Kirikkale, Kirċehir, Kocaeli, Konya, Kütahya, Manisa, Muéla, Ordu, Rize, Sinop, Àanliurfa, Trabzon, Uċak, Van, Zonguldak	192
Total		**1558**

* see Figs. 1 to 5

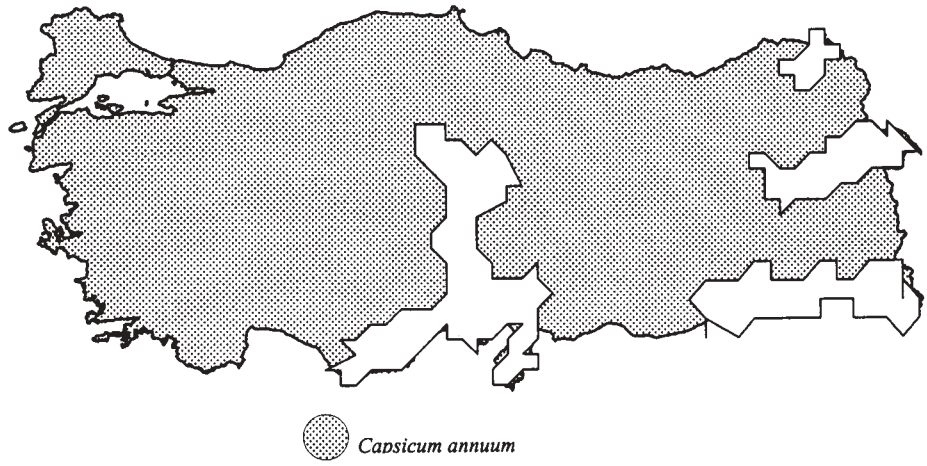

Fig. 1. AARI *ex situ* collections of *Capsicum annuum* in Turkey.

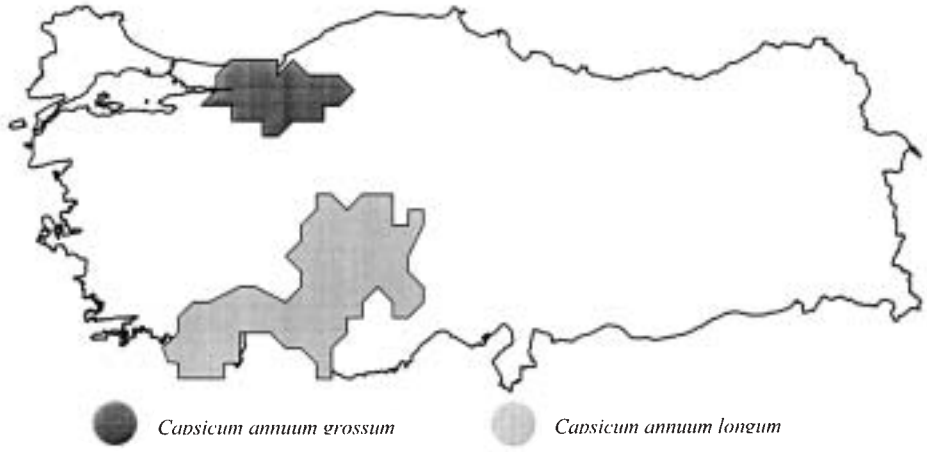

Fig. 2. AARI *ex situ* collections of *Capsicum annuum grossum* and *C. annuum longum* in Turkey.

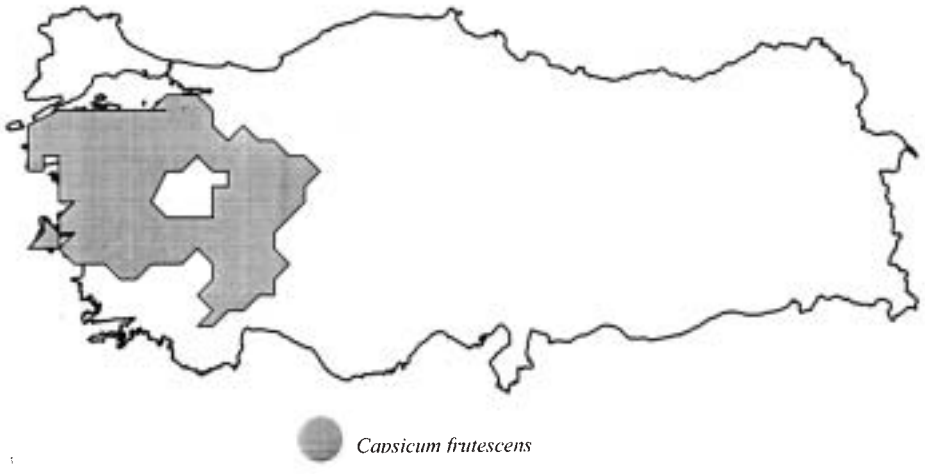

Fig. 3. AARI *ex situ* collections of *Capsicum frutescens* in Turkey.

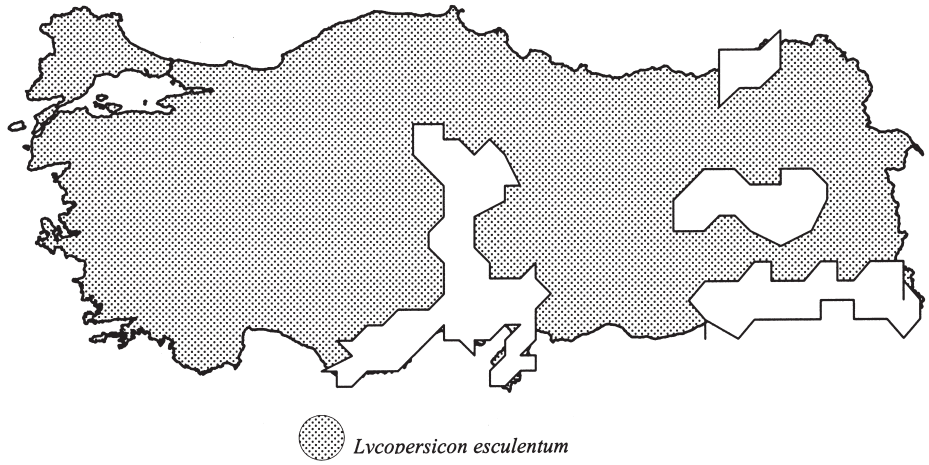

Fig. 4. AARI *ex situ* collections of *Lycopersicon esculentum* in Turkey.

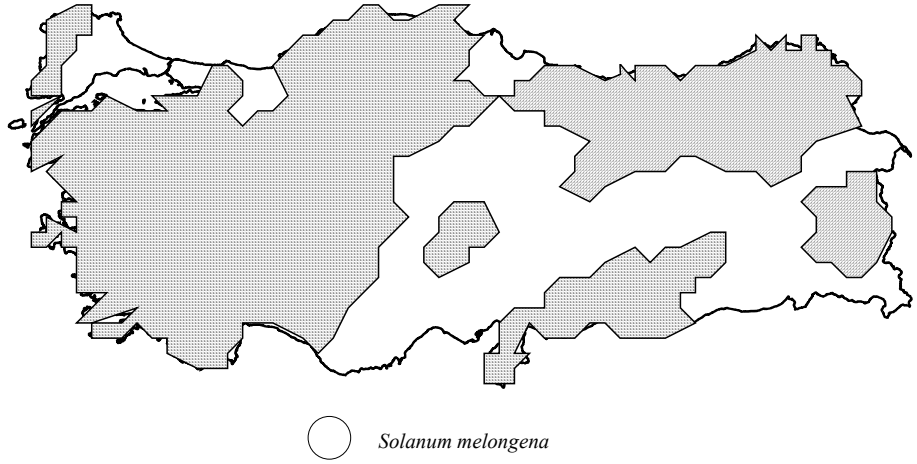

Fig. 5. AARI *ex situ* collections of *Solanum melongena* in Turkey.

Multiplication/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. Solanaceae are assumed to be open-pollinated species. Where accessions are liable to cross, isolation is assured during multiplication and/or regeneration of the accessions.

Evaluation and characterization

Although there is no project on the evaluation and characterization of Solanaceous crops, some of the basic characteristics of the accessions are recorded during multiplication and regeneration. Evaluation and characterization of Solanaceous crops will be conducted in the future.

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 Solanaceae landraces) in the selected area is under study. Solanaceae 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.

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The national Solanaceae collections of the Ukraine

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Introduction

The National Programme "Plant Genetic Resources" of the Ukraine deals with the enrichment, utilization, conservation and investigation of plant genetic resources for agricultural, breeding, scientific and educational purposes. The National Plant Genebank (NPG) was established to implement these tasks. Maintenance and management of the NPG are implemented by the PGR System which includes 34 institutions specialized in the breeding of specific crops. The coordinating centre, the National Centre for PGR of the Ukraine (NCPGRU) is based at the Yurjev Institute of Plant Production in Kharkiv.

The Solanaceae *collections*

The Ukrainian collection currently contains 3357 accessions of Solanaceae (Table 2).

Table 3. Composition of the National Solanaceae collection of the Genebank of Ukraine

Crop	No. of accessions
Tomato	2433
Capsicum - sweet and bitter	625
Eggplant	299
Total	**3357**

A comprehensive study of the **tomato collection** accounting for over 1000 accessions allowed special collections to be formed for early ripening (about 40 accessions), productivity, good fruit marketability and *Phytophtora* resistance.

The laboratory screening revealed sources of cold resistance and salt tolerance; the latter is of interest for southern regions of the Ukraine.

From the **eggplant collection** (270 accessions), sources of various economically valuable traits were chosen, from which parental lines having high general and specific combining ability for early ripening and productivity were obtained. They were used to create new eggplant hybrids, two of which were included in the Ukrainian Official List of Cultivars in 2001 and 2002 respectively. Eggplant trait collections are established for early ripening, productivity and fruit quality.

The **pepper collection** accounts for over 500 accessions. Over 400 of them have already been studied for 3 years. A special collection was formed for early ripening. It includes 20 accessions, mostly with a short germination-to-flowering period, stable in various ecological conditions and cold tolerant.

At present, we use mostly "passive screening", i.e. agrobiological studies using conventional methods. In the future, we plan to carry out "active screening" using provocative backgrounds, i.e. artificial conditions increasing the influence of environmental factors such as disease, pests, soil salinity, etc. Crosses will be analyzed and genes identified, etc., which will allow genetic collections of vegetable crops to be formed. It will then be possible to provide breeding programmes not only with sources but also donors of valuable traits.

Long-term seed storage is currently carried out at –18°C. Cryoconservation of vegetative parts of plants is under study.

Overview of the Solanaceae collections in Yugoslavia

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Introduction

Solanaceous species rank among the first vegetable crops in terms of production area in Yugoslavia. Tomato and pepper are particularly significant for the Yugoslav market, while eggplant is less important. A long tradition of tomato and pepper growing has generated a wide natural diversity for these species.

Collecting of pepper, eggplant and tomato genetic resources started in the late 1960s and early 1970s, when fundamental breeding activities were undertaken. This work was carried out by the Centre for Vegetable Crops in Smederevska Palanka and the Institute of Field and Vegetable Crops in Novi Sad. Until the end of the 1980s the collections were not systematically organized and could be used only by the breeders who had established these collections. The National Gene Bank decided that part of the pepper and tomato collections of the Centre for Vegetable Crops would become national collections. During the 1990s the project of the National Gene Bank was not fully implemented due to the situation in the country. The national collections were not enlarged and the number of accessions has remained constant since the establishment of the collections. On the other hand, the pepper, tomato and eggplant collections of the Centre for Vegetable Crops were improved as regards the number of accessions their classification, storage conditions, etc. The collections of the Centre for Vegetable Crops currently represent the most important holdings of Solanaceous genetic resources in Yugoslavia.

Status of the collections

The pepper collection in the Centre for Vegetable Crops currently contains 352 accessions. Most of them belong to the species *Capsicum annuum* L. (316 accessions). Other species represented include *C. pubescens* (8 accessions), *C. baccatum* (11), *C. chinense* (5), *C. frutescens* (9), *C. chacoense* (1), *C. galapagoensis* (1) and *C. praetermissum* (1). The collection of tomato consists of 345 accessions, all of *Lycopersicum esculentum*. The eggplant collection contains 44 accessions, all of *Solanum melongena*.

Table 1 provides an overview of the status of the pepper, tomato and eggplant collections.

Technical characteristics of the storage chambers can be considered as satisfactory. However, there is a problem with the cooling system and the temperature sometimes exceeds the expected value. Storage temperature is generally high and it is planned to improve storage conditions in order to ensure a lower temperature. High temperature leads to a quick decrease in germination ability. The level of germination ability of accessions is frequently checked, and regeneration is carried out afterwards. Parts of the pepper and tomato collections are placed in the Gene Bank of the Maize Research Institute in Zemun Polje (National Gene Bank project).

Only 40 pepper accessions are described according to IPGRI descriptors. Other accessions of pepper, tomato and eggplant have passport data. In the last 10 years only a few collecting missions have been organized.

Table 1. Status of the pepper, tomato and eggplant collections in Yugoslavia

Information	Pepper	Tomato	Eggplant
Number of accessions	352	345	44
Quantity of seed	Average 5g	From a few seeds (10) to 20g	Average 5g
Conservation	Cold chamber, 8°C	Cold chamber, 8°C	Cold chamber, 8°C
Endangered accessions (no.)	Low germination ability (44), few seed (9)	Low germination ability (75), few seed (21)	Low germination ability (4)
Regeneration	Depending on level of germination	Depending on level of germination	Depending on level of germination
Additional passport data	40 accessions have passport data (IPGRI descriptors)	45 accessions have passport data and evaluation data	-
Information status	Paper files	Paper files	Paper files
Curator	Bogoljub ZeÚeviÛ	Jasmina ZdravkoviÛ	Bogoljub ZeÚeviÛ

Conclusion

Solanaceae genetic resources are well represented in Yugoslavia by many genotypes of pepper, tomato and eggplant. In the last 10 years, the political and economic situation in Serbia prevented the collecting of pepper genotypes and their inclusion in the collection. Cooperation with EU projects in the field of plant genetic resources and with international programmes such as ECP/GR could result in substantial improvement of the collecting and conservation of Solanaceae genetic resources.

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PART III. OVERVIEW OF THE PEPPER AND TOMATO COLLECTIONS OF EGGNET PARTNERS

Partner 1 - INRA-Montfavet, France

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Status of the collections

Table 1. Pepper and tomato collections held at INRA-Montfavet

Species	No. of accessions	Remarks
Capsicum annuum	900	
C. baccatum	100	
C. chinense	75	
C. frutescens	35	
C. pubescens	10	
C. chacoense	14	
C. microcarpum	1	
C. cardenasii	3	
C. galapagoense	1	
C. eximium	3	
Total pepper and relatives	**1142**	
Lycopersicon esculentum Mill. (including var. *cerasiforme* (Dun.) Gray.)	1315	
L. pimpinellifolium (Jusl.) Mill.	16	
L. cheesmanii Riley	1	
L. hirsutum Humb. et Bonpl. (including *glandulosum, glabratum, minutum)*	11	3 leaves sympodia
L. parviflorum Rick, Kesichi, Fob et Halle	1	2 leaves sympodia
L. chmielewskii Rick, Kesichi, Fob et Halle	1	2 leaves sympodia
L. chilense Dun.	2	2 leaves sympodia
L. peruvianum (L.) Mill.	6	2 leaves sympodia
L. pennellii (Solanum pennellii) (Correll) D'Arcy)	2	2 leaves sympodia
Solanum lycopersicoides	2	
S. juglandifolium	1	
S. ochrantum	1	
S. rickii	1	
Total tomato and relatives	**1360**	

Seed production

Regeneration frequency is as low as possible (10-15 years), but if less than 500 seeds are available for a given accession, regeneration must be carried out again. Cultivated species are sown in the greenhouse, checked for homogeneity among plantlets and transplanted in pots; young plants are grown either in the greenhouse or in plastic tunnels. For pepper, 3 plants per accession are transplanted in the greenhouse or open field and for tomato 10 plants per accession. The homogeneity of each accession is checked during growth. Since pepper has a strong tendency to allogamy, although it is an autogamous species, pollen pollution must be avoided either by hand selfing or by using insect-proof conditions. For tomato, there is less risk of pollen pollution, but truss bagging or insect-proof conditions are better than open-pollination in the open. For species related to pepper, 15 plants are planted in isolation fields; all plants are harvested mixed. For wild tomato species, plants of a given accession are cross-pollinated, which is necessary for some self-incompatible species.

Seed harvest and conservation

A mixture of fruits from the different homogeneous plants grown is harvested. The germination quality of the harvested seeds is assessed on the basis of optimal fruit harvest

and seed extraction process. The theoretical threshold is a minimum of 10-15 grams of seeds harvested, for pepper as well as for tomato, but currently this minimum seed amount may be less (INRA is a research institute and not a genebank, therefore it has different aims). The sanitary quality of tomato seeds is guaranteed by the extraction process, in acid conditions; but a further treatment (30 minutes in a solution of sodium hypochlorite) is advised in case the plants harvested are not healthy. Pepper seeds must be treated for 15 minutes with 10% trisodic phosphate (Na_3PO_4), then rinsed to eliminate possible TMV (tobacco mosaic virus). Seed dehydration is currently ensured by 48-hour drying in laboratory conditions, but in future the use of silica gel is intended. If necessary, germination tests are carried out. Seeds are stored in a cold chamber at 3-5°C, 40% max RH in sealed bags. There are no safety-duplicates.

Databases

The eggplant database (passport, primary descriptors, disease resistance data) is managed under DBaseIII.

The pepper electronic database is incomplete for passport data, and is managed under Excel.

The tomato database (passport and primary descriptors) was managed under DBaseIII and was recently transferred to Microsoft Access.

Collecting missions

No collecting missions are organized by INRA.

Primary descriptors for pepper

1. Flowering time	number of days between sowing and opening of first flower number of days before or after the flowering of the reference variety 'Yolo Wonder'
2. Main stem length (cm)	length between cotyledon level and first stem ramification
3. Leaves - size	very small small intermediate large very large
4. Foliage colour	very light green light green intermediate green dark green very dark green
5. Leaf surface	flat bullate[10]
6. Number of leaves on the stem	number of leaves between cotyledon level and first stem ramification
7. Internode length (cm)	ratio stem length / number of leaves
8. Plant hairiness	very light light intermediate strong very strong

[10] bullate = appearing puckered as if blistered

9. Time for the development of one internode (days)

10. Plant growth habit

upright
upright intermediate
intermediate
intermediate prostrate
prostrate

11. Fruit type (see Fig.1)

type 1 - square
type 2 - rectangular
type 3 - horned or triangular
type 4 - elongated, length > 5cm
type 5 - short and small, length < 5cm
type 6 - tomato type
type 7 - type 'Morron conserva'
type 8 - other types

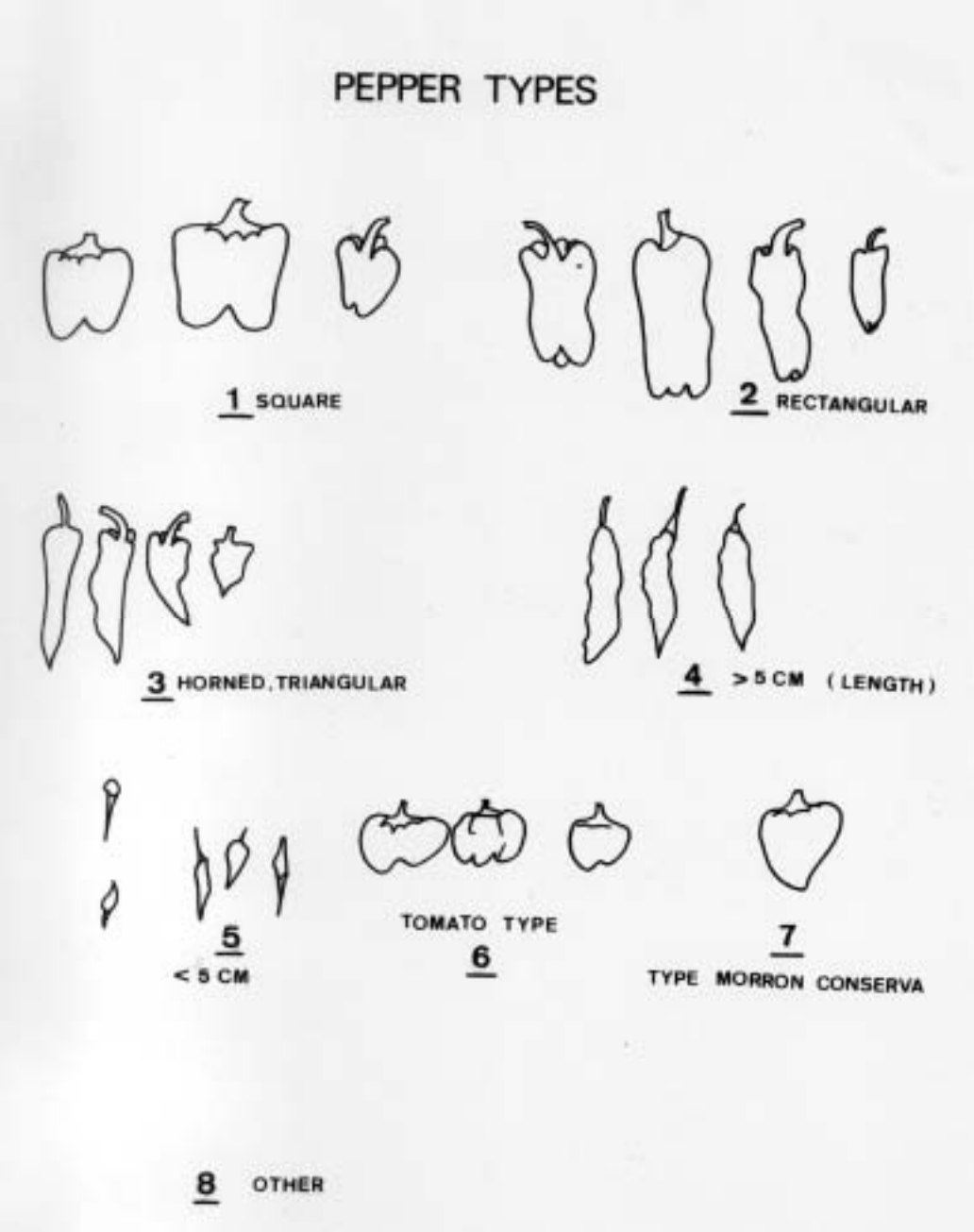

Fig. 1. Pepper types

12. Fruit habit	upright horizontal pendant variable
13. Fruit length (cm)	measured on a representative fruit
14. Fruit width (cm)	largest diameter, on a representative fruit
15. Ratio fruit length/fruit diameter	calculation
16. Pericarp thickness (mm)	measured on a transverse section, about 1/3 way from peduncle to fruit apex
17. Fruit colour before physiological ripeness	ivory white yellowish white yellow yellow green green orange violet black
18. Intensity of fruit colour (before physiological ripeness)	very light light intermediate dark very dark
19. Fruit colour at physiological ripeness	white yellow orange salmon orange red brown violet
20. Intensity of fruit colour (at physiological ripeness)	very light light intermediate dark very dark
21. Fruit epidermis shininess	very dull dull intermediate shiny very shiny
22. Fruit surface	smooth wrinkled rugose
23. Fruit grooves	absent few intermediate many very many

24. Fruit apex depression	none weak intermediate strong very strong
25. Fruit firmness (at commercial ripeness)	very soft soft intermediate firm very firm
26. Capsaicin	absent slightly present present
27. Miscellaneous	e.g. presence of cork at maturity, etc.

Primary descriptors for tomato

PLANT

Anthocyanic pigmentation of hypocotyl	absent present
Hairiness	absent present
Plant type	dwarf normal
Leaflet indentation	leaflet entire leaflet indent
Leaf growth habit	half erected horizontal pendant
Growth habit	self pruned indeterminate
Number of inflorescences on main stem (for sp/sp varieties)	2-4 4-6 >6
Internode length	short medium long
Miscellaneous (vigour, colour, etc.)	

FLOWER, INFLORESCENCE, PEDUNCLE

Flower colour	yellow orange white
Inflorescence type	simple simple or ramified ramified
Peduncle abscission area	absent present
Miscellaneous (flower, inflorescence, peduncle)	

FRUIT COLOUR

Green collar before maturity	absent present
Collar colour intensity	light medium dark
Green colour intensity before maturity	light medium dark
Fruit colour at physiological ripeness	green white yellow orange pink red other
Flesh colour at physiological ripeness	green white yellow orange crimson red other
Epidermis colour at physiological ripeness	no colour coloured

FRUIT SIZE AND SHAPE

Fruit size	5-20g 20-60g 60-100g 100-140g 140-180g >180g
Uniformity of fruit size	bad medium good

Fruit shape (Fig. 2)

1 flattened
2 lightly flattened
3 round
4 heart-shaped
5 rectangular
6 oval
7 cylindrical
8 elongated oval
9 pear-shaped

Uniformity of fruit shape

bad
medium
good

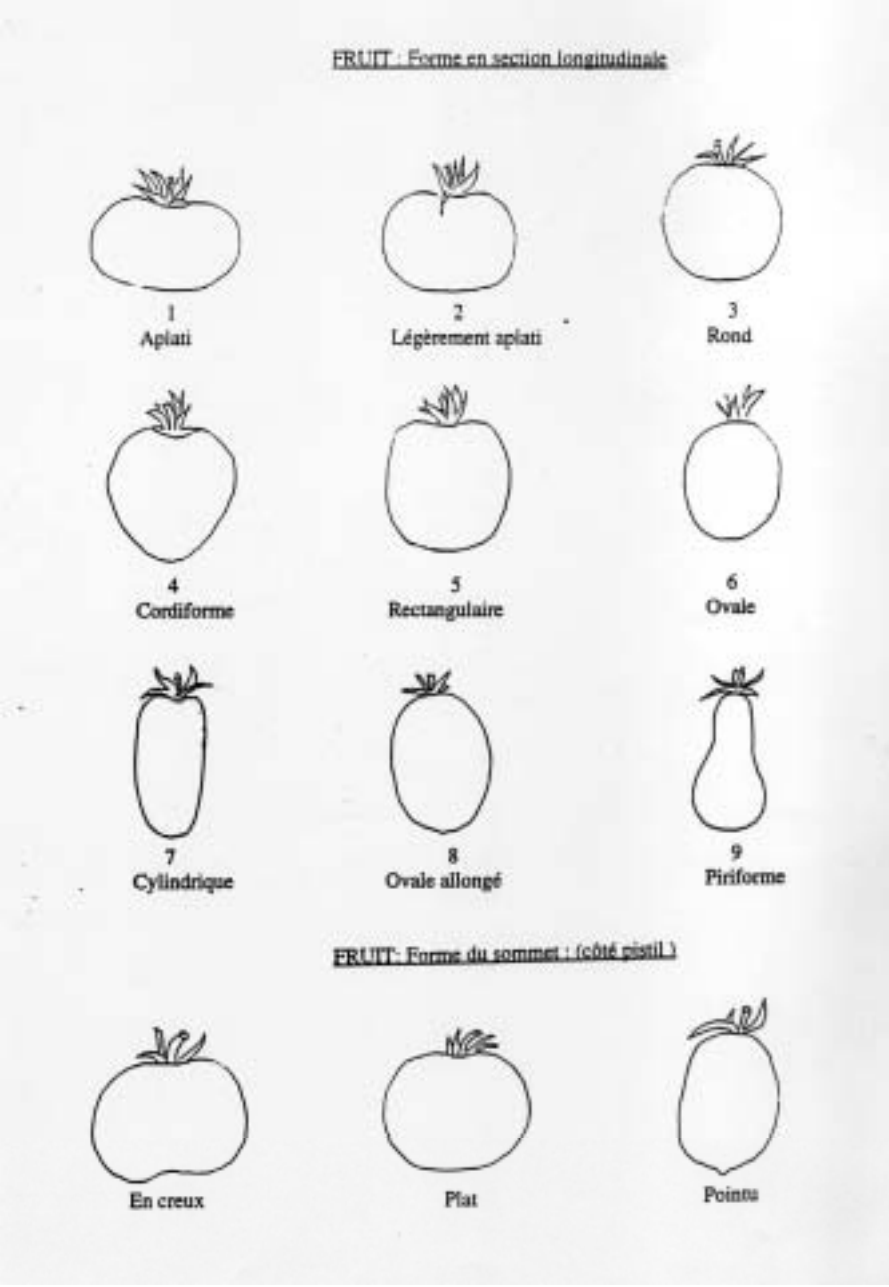

Fig. 2. Tomato types

EXTERNAL FEATURES

Fruit grooves (peduncle side)	absent few intermediate many very many
Size of pistil scar	very small small intermediate large very large
Fruit apex shape (Fig. 2, bottom)	depressed depressed to flat flat flat to protruded protruded

INTERNAL FEATURES

Number of carpels (average)	2 2-3 3-4 4-6 >6
Pericarp thickness	thin intermediate thick

FRUIT FIRMNESS

Firmness	very soft soft intermediate hard very hard

FRUIT MISCELLANEOUS

MISCELLANEOUS	any other description data

Partner 2 - Botanical and Experimental Garden, University of Nijmegen, The Netherlands

Gerard M. van der Weerden and Gerard W.M. Barendse
Botanical and Experimental Garden, University of Nijmegen, Nijmegen, The Netherlands

Status of the collections

Table 1. The pepper collection maintained at the University of Nijmegen

Genus/species	No. of accessions
Capsicum	
C. annuum (incl. subsp.)	47
C. baccatum (incl. subsp.)	11
C. cardenasii	1
C. chacoense	3
C. chinense	6
C. eximium	3
C. frutescens (incl. subsp.)	9
C. galapagoense	2
C. pubescens	5
Capsicum sp.	6
Total *Capsicum*	**93**

Table 2. The tomato collection maintained at the University of Nijmegen

Genus/species	No. of accessions
Lycopersicon	
L. cheesmanii	**2**
L. chilense	**2**
L. chmielewskii	**1**
L. esculentum	**25**
L glandulosum	**1**
L. hirsutum	**4**
L. parviflorum	**3**
L. peruvianum	**6**
L. pimpinellifolium	**5**
L. rickii (Solanum sitiens)	**1**
Lycopersicon sp.	**6**
Total *Lycopersicon*	**56**

Type of storage
Medium-term (5-20 years).

Regeneration protocol(s)
Regeneration every 5-10 years.

Evaluation data
No evaluation data available.

Database
SAS database / ITF (International Transfer Format) used.

Safety-duplicates
No safety-duplicates.

Partner 3 - Birmingham University Botanic Gardens, United Kingdom

Richard N. Lester
Birmingham University Botanic Gardens, Birmingham, United Kingdom

This collection was entirely moved to Montfavet and Nijmegen (EGGNET partners 1 and 2) in 2000 and 2001. It was endangered for many years in Birmingham, and is being saved (regenerated) thanks to the EGGNET group.

Partner 4 - CGN, Wageningen, The Netherlands

Willem van Dooijeweert and Ietje W. Boukema

Plant Research International (PRI), Centre for Genetic Resources, the Netherlands (CGN), Wageningen, The Netherlands

Introduction

The Centre for Genetic Resources, the Netherlands (CGN) is part of Plant Research International, one of the institutes 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 about its germplasm relevant to its users. All parties that use its germplasm for breeding, research or cultivation and have access to facilities needed to attain these objectives qualify as *bona fide* users.

The complete CGN collection holds about 22 000 accessions, distributed over 23 crops.

The Solanaceae collections

The Solanaceae collection can be divided in three groups: tomato, pepper and eggplant. They originate from the former Institute for Horticultural Plant Breeding (IVT). These collections can be considered as working collections for applied breeding research. The material has been characterized and partially screened for different properties such as pest and disease resistance. The collections include a large number of old cultivars received from Dutch and foreign seed firms and genebanks, but also wild species mainly received from the USDA Plant Introduction Stations and the University of Davis, USA and the University of Reading, UK (de Groot and Boukema 1997).

CGN adopted the collections in 1992. The quality and quantity of seeds of these collections have been assessed and accessions meeting our standards have been given a CGN accession number. The collections were rationalized by rejecting duplicates and hybrids. The taxonomic nomenclature needs to be further checked and revised. Most accessions still retain the name they had when they were received. Missing passport data such as population type and origin need to be added.

The status of the tomato and pepper collections is detailed below.

Tomato collection

The tomato collection contains 1125 accessions, including 1034 cultivated *L. esculentum* accessions (Table 1).

Pepper collection

The pepper collection includes 602 accessions mainly of *C. annuum* (488), but also other species (Table 2). The species *C. galapagoense* and *C. tovari* will be added to the collection as soon as enough seed has been obtained.

Table 1. The CGN tomato collection (*Lycopersicon* spp.)

Species	No. of accessions
L. cheesmanii	3
L. chilense	4
L. esculentum	1034
L. glandulosum	9
L. hirsutum	10
L. humboldtii	2
Lycopersicon spp.	9
L. minutum	3
L. pennellii	3
L. peruvianum	25
L. pimpinellifolium	23
Lycopersicon spp.	9
Total	**1125**

Table 2. The CGN pepper collection (*Capsicum* spp.)

Species	No. of accessions
C. annuum	488
C. baccatum	19
C. cardenasii	1
C. chacoense	7
C. chinense	59
C. eximium	1
C. frutescens	24
C. praetermissum	2
C. pubescens	1
Total	**602**

Regeneration

About 300 accessions of tomato and 400 of pepper will be added to the collection after they have been regenerated. Regeneration takes place in insect-free glasshouses on rockwool. For tomato, one stem per plant and for pepper, two stems per plant are grown along wires. Seven to ten plants per accession are regenerated. Exceptions are the outcrossing species such as *L. peruvianum* and *C. cardenasii* of which at least 10 plants per accession are hand-pollinated with a mixture of pollen collected from each of the 10 plants.

The Dutch breeding companies assist in the regeneration of tomato and pepper. Seven breeding firms have regenerated approximately 120 accessions each year.

Sample viability

The seeds are dried until their moisture content is about 5%. Sample viability is determined in germination tests conducted by NAK-AGRO, the official seed testing station of the Netherlands. In general the germination percentage should be at least 80% if samples are to be included in the collection. For wild species the germination percentage should be at least 60%. Five different types of samples for storage are distinguished: user sample (25 seeds), germination sample (200), regeneration sample (100), duplication sample (100 seeds) and a residual sample.

Storage

The 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:

- deep-freezer compartments each of 30 m^2
- cooler compartment of 30 m^2
- dryer compartment of 10 m^2
- 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 Horticulture Research International (HRI), Wellesbourne, UK. Every year the regenerated accessions are sent to HRI.

Characterization/evaluation

The tomato collection was characterized and evaluated by IVT for some 45 characters. Substantial parts of the collection were screened for resistance to TMV (tobacco mosaic virus), *Cladosporium*, *Fusarium*, *Phytophthora*, *Didymella*, *Oidium*, *Clavibacter* and for their relative growth rate.

The pepper collection was characterized and evaluated for about 30 characters. Parts of the collection were screened for resistance to different strains of tobamo viruses and *Phytophthora capsici*.

Utilization

Every year accessions are added to the collection after regeneration. Since 1998 more than 1200 accessions have been distributed to breeding companies and research institutions all over the world.

Collecting missions

A collecting mission was carried out to Uzbekistan in 1997and another one to Uzbekistan and Kyrgyzstan in 1999. These two missions resulted in 30 new accessions.

Research

Most of the accessions distributed over the last 6 years were requested for research purposes. In 3 years time results can be made public.

References

Groot, E.C. de and I.W. Boukema. 1997. Economisch belangrijke vruchtgroenten geconserveerd [Economical 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.

CGN Web site: http://www.genebank.nl

Partner 5 - UPV, Valencia, Spain

Jaime Prohens
Biotechnology Department (Genetics), Polytechnic University of Valencia (UPV), Valencia, Spain

Status of the collections

Table 1. The UPV pepper collection

Species	No. of accessions
Capsicum	
C. annuum	859
C. baccatum	13
C. chinense	5
C. furtescena	8
C. pubescens	28
Capsicum sp.	62
Total *Capsicum*	**975**

Table 2. The UPV tomato collection

Species	No. of accessions
Lycopersicon	
L. cheesmanii	18
L. chilense	25
L. esculentum	2011
L. hirsutum	154
L. parviflorum	11
L. pennellii	41
L peruvianum	105
L. pimpinellifolium	221
Lycopersicon sp.	40
Total *Lycopersicon*	**2626**

Type of storage

After the seeds have been extracted from the ripe fruits they are dried over filter paper in the laboratory. After 10-15 days seeds are placed with silica gel in hermetically sealed glass jars. They are kept with the silica gel 1 month or so (or more if the silica gel changes colour) and are then stored in a chamber at 3ºC.

Regeneration protocols

Regeneration is performed when the quantity of seeds is small (<50) or when the accession is characterized. For each accession 5 to 10 plants are grown and left under open pollination if grown in an insect-free greenhouse. If plants are grown in the open, artificial self-pollination is performed for pepper but not for tomato. In the case of incompatible wild accessions of tomato, artificial pollination is carried out to secure seeds.

Evaluation

Traits evaluated are listed below.

Pepper

Earliness of flowering
Earliness of ripening
Mean fruit weight
Shape of the longitudinal section
Shape of the transversal section
Capsaicin content
Width of flesh
Colour of flesh in the ripe fruit
Yield
Weight of 100 seeds

Tomato

Earliness of flowering
Earliness of ripening
Type of inflorescence
Fasciation of first flower
Type of leaf
Foliage density
Fruit weight
Shape of transversal section
Shape of longitudinal section
Type of growth
Colour of ripe fruit
Colour of unripe fruit
Greenback intensity
Ribbing of the fruit
Size of the peduncular scar of the fruit
Number of locules
Yield
Weight of 100 seeds

Databases
All passport and evaluation data are stored in separate Access databases for each genus.

Safety-duplicates
Safety-duplicates of accessions regenerated are sent to:
- Centro de Recursos Fitogenéticos, 28800 Alcalá de Henares, Madrid, Spain
- Banco de Germoplasma de Hortícolas, Servicio de Investigación Agraria, Montañana 176, 50080 Zaragoza, Spain.

Collecting missions
Missions are organized to collect tomato and pepper germplasm in Spain and South America in areas where considerable diversity remains to be collected.

Partner 6 - ARCMT, Thermi-Thessaloniki, Greece

Fotios Bletsos

Department of Vegetables, Agricultural Research Centre of Macedonia and Thrace (ARCMT), Thermi-Thessaloniki, Greece

Status of the collections

An extract of the passport data tables for the pepper and tomato collections held at ARCMT is given in Tables 1 and2.

Table 1. Passport data for pepper (*Capsicum annuum*)

COLLNO	ACCNO	COLLINST	MO	YR	PROVSTATE	LOCATION	ALTI	C	S	T
GR010/82	907	GRCFCPI	08	82	Halkidiki	N.gonia	160	3	4	2
GR040/82	937	GRCFCPI	09	82	Thessaloniki	Lagadas	93	3	4	2
VE001/83	5693	GRCTOBIN	08	83	Evros	Sofiko		3	4	2
VE002/83	5694	GRCTOBIN	06	83	Kavala	Krioneri		4	4	2
VE003/83	5695	GRCTOBIN	06	83	Evros	Sofiko		4	4	2
VE004/83	5696	GRCTOBIN	10	83	Rodopi	Organi		4	4	2
VE005/83	5697	GRCTOBIN	09	83	Evros	Agriani		4	4	2
VE006/83	5698	GRCTOBIN	09	83	Kavala	Amygdaleonas		2	4	2
VE007/83	5699	GRCTOBIN	09	83	Kavala	Amygdaleonas		2	4	2
VE008/83	5700	GRCTOBIN	09	83	Kavala	Amygdaleonas		2	4	2
VE009/83	5701	GRCTOBIN	09	83	Xanthi	Kotili		4	4	2
VE010/83	5702	GRCTOBIN	09	83	Evros	Sofiko		4	4	2
VE011/83	5703	GRCTOBIN	09	83	Kavala	Gravouna		4	4	2
VE012/83	5704	GRCTOBIN	10	83	Rodopi	Organi		4	4	2
VE013/83	5705	GRCTOBIN		83				4	4	2
VE014/83	5706	GRCTOBIN	09	83	Kavala	Gravouna		4	4	2
VE015/83	5707	GRCTOBIN	09	83	Evros	Agriani		4	4	2
VE016/83	5708	GRCTOBIN	09	83	Drama	A.paraskevi	55	2	5	2
VE017/83	5709	GRCTOBIN	09	83	Drama	Argiroupolis	90	2	5	2
VE018/83	5710	GRCTOBIN	08	83	Drama	Exohi	620	4	4	2
VE019/83	5711	GRCTOBIN	09	83	Kavala	Lydia		2	4	2
VE020/83	5712	GRCTOBIN	09	83	Evros	Sofiko		4	4	2
VG013/83	5670	GRCTOBIN		83	Serres	Monovrisi		3	4	2
VG014/83	5671	GRCTOBIN		83	Serres	Kato parroia		3	4	2
VG015/83	5672	GRCTOBIN		83	Serres	Krinida		3	4	2
VG016/83	5673	GRCTOBIN		83	Serres	Podopolis		3	4	2
VG017/83	5674	GRCTOBIN		83	Serres	Krinida		3	4	2
VG018/83	5675	GRCTOBIN		83	Serres	Kato porroia		3	4	2
VG019/83	5676	GRCTOBIN		83	Serres	Krinida		3	4	2
VG020/83	5677	GRCTOBIN		83	Serres			3	4	2

Legend:

COLLNO = Collector's number

ACCNO = Accession number

COLLINST = Collecting institute — GRCFCPI = Fodder Crops and Pasture Institute; GRCTOBIN = Tobacco Institute of Drama

MO = Month

YR = Year

PROVSTATE = Province/state

ALTI = Altitude

C = Collection source — 1 = wild; 2 = farm land; 3 = farm store; 4 = backyard; 5 = village market; 6 = commercial breeding company or seed shop; 7 = institute; 8 = other

S = Status of sample — 1 = wild; 2 = weedy; 3 = breeder's line; 4 = breeder's population; 5 = primitive cultivar/landrace; 6 = advanced cultivar (bred); 7 = other

T = Type of sample — 1 = vegetative; 2 = seed; 3 = pollen

Table 2. Passport data for tomato (*Lycopersicon esculentum*)

COLLNO	ACCNO	COLLINST	MO	YR	PROVSTATE	LOCATION	ALTI	C	S	T
GR008/82	905	GRCFCPI	08	82	Halkidiki	Ormylia	50	3	4	2
GR012/82	909	GRCFCPI	08	82	Halkidiki	Ormylia	50	3	4	2
VE021/83	5713	GRCTOBIN	09	83	Kavala	Amygdaleonas		2	4	2
VE022/83	5714	GRCTOBIN	10	83	Rodopi	Organi		4	4	2
VE023/83	5715	GRCTOBIN	09	83	Evros	Agriani		4	4	2
VE024/83	5716	GRCTOBIN	09	83	Evros	Sofico		4	4	2
VE025/83	5717	GRCTOBIN	09	83	Evros	Orestiada		5	4	2
VE026/83	5718	GRCTOBIN	09	83	Samothrak is	Therma		4	6	2
VE027/83	5719	GRCTOBIN	08	83	Thasos isl.	Theologos	350	4	6	2
VE028/83	5720	GRCTOBIN	09	83	Drama	Ag.paraskevi	55	2	6	2
VE029/83	5721	GRCTOBIN	09	83	Drama	Kalamonas	55	4	6	2
VE030/83	5722	GRCTOBIN	08	83	Thasos isl.	Potamia	50	4	6	2
VE031/83	5723	GRCTOBIN	08	83	Thasos isl.	Maries	300	4	6	2
VE032/83	5724	GRCTOBIN	09	83	Drama	Ftelia	75	4	6	2
VE033/83	5725	GRCTOBIN	09	83	Drama	Argyroupolis	90	2	4	2
VE034/83	5726	GRCTOBIN	09	83	Kavala	Amygdaleonas		2	4	2
VE035/83	5727	GRCTOBIN	09	83	Kavala	Lydia		2	4	2
VG001/83	5657	GRCTOBIN		83	Drama	Tholos		3	4	2
VG002/83	5658	GRCTOBIN		83	Serres	Monoklisia		3	4	2
VG003/83	5659	GRCTOBIN		83	Serres	Kato porroia		3	4	2
VG004/83	5660	GRCTOBIN		83	Serres	Nea zihni		3	4	2
VG005/83	5661	GRCTOBIN		83	Serres			3	4	2

Legend: see Table 1.

Management of the collections

The methods used for tomato and pepper conservation, regeneration, database management and organization of the safety-duplicates are similar to those used for eggplant.

Partner 7 - IDG, Bari, Italy

Giambattista Polignano
Istituto del Germoplasma (IDG), Consiglio Nazionale delle Ricerche, Bari, Italy

In Italy, plant genetic resources are managed in various places—research institutes, universities, regional genebanks, etc. The Bari Germplasm Institute is the only research institution that is fully involved in plant genetic resources activities with special reference to the germplasm of the most agriculturally relevant plants in the Mediterranean region: cereals, grain legumes, forage legumes and different vegetables.

As regards vegetable collections, the number of accessions is very variable from one collection to another. In particular, pepper and tomato collections comprise 167 and 561 accessions respectively. Most of the pepper accessions belong to *Capsicum annum* (116) while *Lycopersicon esculentum* (145) is the most represented species in the tomato collection.

Table 1 lists the number of accessions per genus/species for both collections. Wild species constitute only a very small proportion, especially for the pepper collection. Most of the accessions were collected in Italy and are represented by landraces. Both collections are stored in aluminium cans at –20°C for long-term storage; short- and medium-term storage is in aluminium foil bags under vacuum at 0°C and 30% air humidity.

Our long-term collection is not at risk, but we suggest considering the possibility of having at least one duplicate somewhere.

Conditions of regeneration are similar for both species. Stored accessions with a low germination rate or a small amount of seeds are subject to a regeneration programme: plants grown in greenhouses after being sown in paper pots are transplanted into the open field and seeds are extracted from fruits collected in the centre of each plot.

Characterization and evaluation are carried out when the collections are multiplied. For the moment no characterization and evaluation data are available for the tomato collection while an evaluation programme is in progress. Twenty quantitative and qualitative descriptors from the IPGRI *Capsicum* descriptor list are used for the characterization programme including capsaicin content, fruit colour and vitamin C content. At present characterization and evaluation data are not computerized.

All accessions of the different vegetable species are documented for minimum passport data in the information system for data management, PHP3. Access to the tomato and pepper passport data is now available through the Internet on IDG's Web site (www.ig.ba.cnr.it). A minimum of 10 descriptors is included with incomplete data for some accessions.

The small number of wild species and the absence of material from large geographical areas all around the world in both collections suggests the need to organize collecting expeditions not only in the centres of origin, but also in other underexploited regions. Each year the Bari Institute organizes at least one expedition to collect several vegetables in different Italian regions.

Table 1. Genus, species and number of accessions of the pepper and tomato collections maintained at the Bari Germplasm Institute

Genus/species	No. of accessions
Capsicum	
Capsicum spp.	30
C. annuum	116
C. chinense	5
C. frutescens or chinense (?)	1
C. esculentum	1
C. frutescens	12
C. luteum	1
C. pendulum	1
Total *Capsicum*	**167**
Lycopersicon	
Lycopersicon spp.	73
L. cheesmanii	11
L. chilense	4
L. chmielewskii	2
L. esculentum	145
L. glandulosum	11
L. hirsutum	29
L. parviflorum	2
L. pennelli	2
L. peruvianum	91
L. pimpinellifolium	190
Total *Lycopersicon*	**561**

Partner 8 - IPK, Gatersleben, Germany

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Overview of the collections

Table 1. Overview of IPK pepper and tomato collections

	Pepper	**Tomato**
Content	1439 accessions, 9 species	3588 accessions including 618 mutants, 4 species
Type of storage	-15°C	-15°C
Regeneration protocols	sowing mid-January in the greenhouse; planting mid-March in the greenhouse (8 plants per accession)	sowing mid-March in the greenhouse; planting mid-May in the field (12 plants per accession)
Characters evaluated	flowering time number of internodes flower colour fruit colour time of harvest (beginning, end)	flowering time fruiting time (maturity of first fruit) leaf shape fruit shape colour of fruit flesh and fruit skin fruit shoulder shape
Databases	IPK database (FoxPro)	IPK database (FoxPro)
Safety-duplicates	none so far	none so far
Collecting missions	none	none

Partner 9 - INH, Angers, France

Jean Yves Péron
Institut National d'Horticulture (INH), Angers, France

There are no pepper or tomato collections.

APPENDICES

Appendix I. European Solanaceae collections (eggplant, pepper and tomato)[11]

Number of species (Sp.) and number of accessions (Acc.) per country and institute (data updated October 2001 except for countries followed by (*) updated May 2003)

Country	Institute	Eggplant		Pepper		Tomato	
		Sp.	Acc.	Sp.	Acc.	Sp.	Acc.
Armenia (*)	Scientific Centre of Vegetables and Industrial Crops, Darakert	1	151	1	34	4	190
Austria (*)	3 governmental genebanks (Linz, Wies, Wien-Schonbrunn)	1	1	1	16	1	7
	Arche Noah (NGO)	9	26	1	190	1	580
Azerbaijan (*)	Genetic Resources Institute, Baku	1	500	1	300	1	2800
Bulgaria	IPGR, Sadovo	2	174	2	643	8	1134
	Maritza Vegetable Crops Research Institute, Plovdiv	0	0	1	437	1	350
Czech Republic	RICP Genebank, Olomouc	1	25	1	514	6	1604
	Palacky University, Olomouc-Holice	0	0	0	0	17	170
France	INRA, Montfavet	50	1202	10	1142	13	1360
Germany	IPK Genebank, Gatersleben	10	104	8	1433	3	2965
	BAZ Genebank, Braunschweig	4	13	3	71	4	459
Greece	ARCMT, Thermi-Thessaloniki	1	13	1	30	1	23
Hungary	ABI, Tápiószele	1	9	4	734	5	1644
	Vegetable Research Institute, Budapest	0	0	11	1400	0	0
Israel (*)	Volcani Center, Bet Dagan	1	62	3	169	3	34
	Hebrew University, Jerusaleme						3076[12]
Italy	IDG, Bari	3	53	6	167	11	560
	Universita di Torino, Facolta di Agraria, Torino	0	0	11	400	0	0
	Research Institute for Vegetable Crops, Montanaso Lombardo, Lodi	9	10	0	0	0	0
The Netherlands (*)	CGN, Wageningen	10	330	12	1048	11	1700
	Botanical and Experimental Garden, University of Nijmegen	81	383	12	90	10	50
Nordic countries	NGB, Alnarp (Sweden)	1	0	1	9	1	55
Poland (*)	RIVC, Skierniewice	1	10	1	189	1	917

[11] For other species (*Physalis* and *Cyphomandra*) the breakdown per country is not available. As of May 2003, the database records 77 accessions of *Cyphomandra* for 5 species and 243 accessions *Physalis* for 24 species. See text, page 8 for details on species.

[12] This number includes 76 *Lycopersicon pennellii* introgression lines and 3000 monogenic mutants (for details see text, page 32).

Number of species (Sp.) and number of accessions (Acc.) per country and institute (data updated October 2001 except for countries followed by (*) updated May 2003)

Country	Institute	Eggplant		Pepper		Tomato	
		Sp.	Acc.	Sp.	Acc.	Sp.	Acc.
Portugal (*)	BPGV, Braga	0	0	1	108	1	79
	EAN, Oeiras	0	0	2	51	0	0
Romania	Suceava Gene Bank	1	35	1	41	1	51
Russian Federation	VIR, St. Petersburg	2	681	3	2313	12	7250
Slovakia	Research Institute of Vegetables, Nové Zamky	1	4	1	58	1	81
Spain (*)	UPV, Valencia	4	190	6	907	8	1645
Switzerland	RAC, Changins	1	1	1	1	1	11
	Pro Specie Rara, Aarau (NGO)	0	0	0	0	1	80
Turkey (*)	AARI, Izmir	1	223	4	9980	1	603
Ukraine (*)	IVMP, Seletsijne	1	299	1	625	1	2433
United Kingdom	School of Biological Sciences, University of Birmingham	46	1200	0	0	0	0
	HRIGRU, Wellesbourne	0	0	0	0	2	129
	SASA, Edinburgh	0	0	0	0	1	94
	HDRA, Coventry (NGO)	1	2	1	7	1	148
Yugoslavia	Center for Vegetable Crops, Smederevska Palanka	1	44	8	352	1	345
Total no. of accessions			**5745**		**23459**		**32627**

Appendix II. Passport data fields for the Solanaceae inventory

This list was agreed in Nijmegen, Sept. 2001. It is based on the EGGNET database fields, which were defined on the basis of the *Standard Passport Descriptor list* (IPGRI/FAO 1996), the first version of the *Multi-Crop Passport Descriptors* (MCPD) (IPGRI/FAO 1997), the IBPGR *Descriptors for Eggplant,* and the ITF (International Transfer Format) database for Solanaceae at the Botanical Garden of the University of Nijmegen. *In italics, smaller font, other passport data used for EGGNET database, but not essential for the Solanaceae inventory.*

N.B. This list is given only for information and should not be used any more. It is now superseded by the second version of the Multi-crop Passport Descriptors (MCPDv2) released in Dec. 2001 (see Appendix III).

1. Institute code **INSTCODE** Code of the institute where the accession is maintained. The codes consist of the 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the Institute database that will be made available by FAO.
2. Accession number **ACCENUMB** This number serves as a unique identifier for accessions and is assigned when an accession is entered into the collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number should never be reused. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system.
3. Accession status ***ACCSTAT*** *The accession status indicates whether the current accession is present in the living collection (code C or Collection), not present in the collection due to death (code D or Death) or not present due to transfer to another record system, normally of another garden (code T or Transfer)*
4. Genus **GENUS** Genus name for taxon. Initial Uppercase required.
5. Subgenus ***SUBGENUS*** *Subgenus name for taxon. Initial Uppercase required.*
6. Section ***SECTION*** *Section name for taxon. Initial Uppercase required.*
7. Species **SPECIES** Specific epithet portion of the scientific name in lowercase letters plus authority. Following abbreviation is allowed "sp".
8. Subtaxa **SUBTAXA** Subtaxa can be used to store any additional taxonomic identifier plus authority. Following abbreviations are allowed "ssp." (for subspecies); "var" (for variety): "convar" (for convariety); "f" (for form) and Cultivar Group.
9. Accession name **ACCNAME** Either a registered or other formal designation given to the accession. First letter Uppercase. Multiple names separated with semicolon.
10. Donor name **DONOR** Name of the institution or individual responsible for donating the germplasm, or code for the donor institute.
11. Donor number **DONORNUM** Number assigned to the accession by the donor. Letters should be used before the number to identify the genebank or national system.
12. Other number(s) associated with the accession **OTHERNUM** Any other identification number known to exist in other collections for this accession. Letters should be used before the number to identify the genebank or national system. Multiple numbers can be added and separated with a semicolon.
13. Acquisition date ***ACQDATE*** *The date in which the accession was entered the collection.*

14. Date of last regeneration or multiplication ***GENDATE***
15. Type of maintenance ***MAINTNCE***
Vegetative, seed, both vegetative and seed, tissue culture.
16. Country of origin **ORIGCTY**
Name of country in which the sample was originally collected or derived. ISO code may be used.
17. Geographical area **GEOGAREA**
A subdivision of the country of origin, for use when needed.
18. Location of collecting site **COLLSITE**
Location below the country level that describes where the accession was collected starting with the most detailed information. Might include the distance in km and direction from the nearest town, village or map grid reference point.
19. Latitude of collecting site ***LATITUDE***
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10--S).
20. Longitude of collecting site ***LONGTUDE***
Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data (minutes) should be indicated with hyphen (e.g. 076 W).
21. Elevation of collecting site ***ALTITUDE***
Elevation of collecting site expressed in metres above sea level. Negative values allowed.
22. Collector's name **COLNAME**
Name of the person who collected the accession from the wild.
23. Collecting date of original sample [YYYYMMDD] **COLLDATE**
Collecting date of the original sample where YYYY is the year, MM is the month and DD is the day.
24. Collecting number **COLLNUM**
Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.
25. Collecting source **COLLSRC**
Wild habitat: forest/woodland, shrubland, grassland, or desert/tundra Farm: field, orchard, garden, fallow, pasture, or store Market: town, village, urban, or other exchange system Institute/Research organisation
26. Status of sample ***SAMPSTAT***
Wild, weedy, traditional cultivar/landrace, breeder's line, advanced cultivar, other
27. Characterization data ***CHARACT***
Availability of primary and/or secondary characterization data
28. Verification **VERIFIED**
Verifier's name; verification date; verification level (name not checked, name determined by competent taxonomist, etc).
29. Herbarium ***HERBAR***
Availability of specimen in a herbarium. Use letters (acronym) before the herbarium number to identify the herbarium were the specimen is held.
30. Received as ***RECEIVAS***
The name of the accession as which it was acquired.
31. Availability of germplasm of the accession ***ACCAVAIL***
Availability of germplasm of the accession as seeds, cuttings or otherwise, at genebank, institute or individual collections
32. Remarks **REMARKS**
The remarks field is used to add notes or to elaborate on descriptors. Prefix remarks with the field name they refer to and a colon (e.g. COLLSRC:roadside). Remarks referring to different fields are separated by semicolons.

Appendix III. Multi-crop Passport Descriptors[13]

FAO/IPGRI MULTI-CROP PASSPORT DESCRIPTORS

December 2001

The list of multi-crop passport descriptors (MCPD) is developed jointly by IPGRI and FAO to provide international standards to facilitate germplasm passport information exchange. These descriptors aim to be compatible with IPGRI crop descriptor lists and with the descriptors used for the FAO World Information and Early Warning System (WIEWS) on plant genetic resources (PGR).

For each multi-crop passport descriptor, a brief explanation of content, coding scheme and *suggested* fieldname (in parentheses) is provided to assist in the computerized exchange of this type of data. It is recognized that networks or groups of users may want to further expand this MCPD List to meet their specific needs. As long as these additions allow for an easy conversion to the format proposed in the multi-crop passport descriptors, basic passport data can be exchanged worldwide in a consistent manner.

General comments:

- If a field allows multiple values, these values should be separated by a semicolon (;) without space(s), (i.e. Accession name:Rheinische Vorgebirgstrauben;Emma;Avlon).
- A field for which no value is available should be left empty (i.e. Elevation). If data are exchanged in ASCII format for a field with a missing numeric value, it should be left empty. If data are exchanged in a database format, missing numeric values should be represented by generic NULL values.
- Dates are recorded as YYYYMMDD. If the month and/or day are missing this should be indicated with hyphens. Leading zeros are required (i.e. 197506--, or 1975----).
- Latitude and longitude are recorded in an alphanumeric format. If the minutes or seconds are missing, this should be indicated with hyphens. Leading zeros are required.
- Country names: Three letter ISO codes are used for countries. The ISO 3166-1: Code List and the Country or area numerical codes added or changed are not available on-line, but can be obtained from IPGRI [ipgri-mcpd@cgiar.org]
- For institutes the codes from FAO should be used. These codes are available from http://apps3.fao.org/wiews/ for registered WIEWS users. From the Main Menu select: 'PGR' and 'Download'. If new Institute Codes are required, they can be generated online by national WIEWS administrators, or by the FAO WIEWS administrator [Stefano.Diulgheroff@fao.org].
- The preferred language for free text fields is English (i.e. Location of collecting site and Remarks).

[13] Available at http://www.ipgri.cgiar.org/publications/pdf/124.pdf (French and Spanish versions are also available).

MULTI-CROP PASSPORT DESCRIPTORS
1. Institute code **(INSTCODE)** Code of the institute where the accession is maintained. The codes consist of the 3-letter ISO 3166 country code of the country where the institute is located plus a number. The current set of Institute Codes is available from the FAO website (http://apps3.fao.org/wiews/).
2. Accession number **(ACCENUMB)** This number serves as a unique identifier for accessions within a genebank collection, and is assigned when a sample is entered into the genebank collection.
3. Collecting number **(COLLNUMB)** Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This number is essential for identifying duplicates held in different collections.
4. Collecting institute code **(COLLCODE)** Code of the Institute collecting the sample. If the holding institute has collected the material, the collecting institute code (COLLCODE) should be the same as the holding institute code (INSTCODE). Follows INSTCODE standard.
5. Genus **(GENUS)** Genus name for taxon. Initial uppercase letter required.
6. Species **(SPECIES)** Specific epithet portion of the scientific name in lowercase letters. Following abbreviation is allowed: ‘sp.’
7. Species authority **(SPAUTHOR)** Provide the authority for the species name.
8. Subtaxa **(SUBTAXA)** Subtaxa can be used to store any additional taxonomic identifier. Following abbreviations are allowed: ‘subsp.’ (for subspecies); ‘convar.’ (for convariety); ‘var.’ (for variety); ‘f.’ (for form).
9. Subtaxa authority **(SUBTAUTHOR)** Provide the subtaxa authority at the most detailed taxonomic level.
10. Common crop name **(CROPNAME)** Name of the crop in colloquial language, preferably English (i.e. 'malting barley’, 'cauliflower', or 'white cabbage')
11. Accession name **(ACCENAME)** Either a registered or other formal designation given to the accession. First letter uppercase. Multiple names separated with semicolon without space. For example: Rheinische Vorgebirgstrauben;Emma;Avlon
12. Acquisition date [YYYYMMDD] **(ACQDATE)** Date on which the accession entered the collection where YYYY is the year, MM is the month and DD is the day. Missing data (MM or DD) should be indicated with hyphens. Leading zeros are required.
13. Country of origin **(ORIGCTY)** Code of the country in which the sample was originally collected. Use the 3-letter ISO 3166-1 extended country codes.

14. Location of collecting site **(COLLSITE)**

Location information below the country level that describes where the accession was collected. This might include the distance in kilometres and direction from the nearest town, village or map grid reference point, (e.g. 7 km south of Curitiba in the state of Parana).

15. Latitude of collecting site[1] **(LATITUDE)**

Degree (2 digits) minutes (2 digits), and seconds (2 digits) followed by N (North) or S (South) (e.g. 103020S). Every missing digit (minutes or seconds) should be indicated with a hyphen. Leading zeros are required (e.g. 10----S; 011530N; 4531--S).

16. Longitude of collecting site[1] **(LONGITUDE)**

Degree (3 digits), minutes (2 digits), and seconds (2 digits) followed by E (East) or W (West) (e.g. 0762510W). Every missing digit (minutes or seconds) should be indicated with a hyphen. Leading zeros are required (e.g. 076----W).

17. Elevation of collecting site [m asl] **(ELEVATION)**

Elevation of collecting site expressed in metres above sea level. Negative values are allowed.

18. Collecting date of sample [YYYYMMDD] **(COLLDATE)**

Collecting date of the sample where YYYY is the year, MM is the month and DD is the day. Missing data (MM or DD) should be indicated with hyphens. Leading zeros are required.

19. Breeding institute code **(BREDCODE)**

Institute code of the institute that has bred the material. If the holding institute has bred the material, the breeding institute code (BREDCODE) should be the same as the holding institute code (INSTCODE). Follows INSTCODE standard.

20. Biological status of accession **(SAMPSTAT)**

The coding scheme proposed can be used at 3 different levels of detail: either by using the general codes (in boldface) such as 100, 200, 300, 400 or by using the more specific codes such as 110, 120 etc.

100) Wild
- 110) Natural
- 120) Semi-natural/wild

200) Weedy

300) Traditional cultivar/landrace

400) Breeding/research material
- 410) Breeder's line
- 411) Synthetic population
- 412) Hybrid
- 413) Founder stock/base population
- 414) Inbred line (parent of hybrid cultivar)
- 415) Segregating population
- 420) Mutant/genetic stock

500) Advanced/improved cultivar

999) Other (Elaborate in REMARKS field)

21. Ancestral data **(ANCEST)**

Information about either pedigree or other description of ancestral information (i.e. parent variety in case of mutant or selection). For example a pedigree 'Hanna/7*Atlas//Turk/8*Atlas' or a description 'mutation found in Hanna', 'selection from Irene' or 'cross involving amongst others Hanna and Irene'.

[1] To convert from longitude and latitude in degrees (º), minutes ('), seconds ("), and a hemisphere (North or South and East or West) to decimal degrees, the following formula should be used:

dº m' s"=h *(d+m/ 60+s/3600)

where h=1 for the Northern and Eastern hemispheres and –1 for the Southern and Western hemispheres i.e. 30º30'0" S= –30.5 and 30º15'55" N=30.265.

22. Collecting/acquisition source **(COLLSRC)**

The coding scheme proposed can be used at 2 different levels of detail: either by using the general codes (in boldface) such as 10, 20, 30, 40 or by using the more specific codes such as 11, 12 etc.

10) Wild habitat
- 11) Forest/woodland
- 12) Shrubland
- 13) Grassland
- 14) Desert/tundra
- 15) Aquatic habitat

20) Farm or cultivated habitat
- 21) Field
- 22) Orchard
- 23) Backyard, kitchen or home garden (urban, peri-urban or rural)
- 24) Fallow land
- 25) Pasture
- 26) Farm store
- 27) Threshing floor
- 28) Park

30) Market or shop

40) Institute, Experimental station, Research organization, Genebank

50) Seed company

60) Weedy, disturbed or ruderal habitat
- 61) Roadside
- 62) Field margin

99) Other (Elaborate in REMARKS field)

23. Donor institute code **(DONORCODE)**

Code for the donor institute. Follows INSTCODE standard.

24. Donor accession number **(DONORNUMB)**

Number assigned to an accession by the donor. Follows ACCENUMB standard.

25. Other identification (numbers) associated with the accession **(OTHERNUMB)**

Any other identification (numbers) known to exist in other collections for this accession. Use the following system: INSTCODE:ACCENUMB;INSTCODE:ACCENUMB;… INSTCODE and ACCENUMB follow the standard described above and are separated by a colon. Pairs of INSTCODE and ACCENUMB are separated by a semicolon without space. When the institute is not known, the number should be preceded by a colon.

26. Location of safety duplicates **(DUPLSITE)**

Code of the institute where a safety duplicate of the accession is maintained. Follows INSTCODE standard.

27. Type of germplasm storage **(STORAGE)**

If germplasm is maintained under different types of storage, multiple choices are allowed, separated by a semicolon (e.g. 20;30). (Refer to FAO/IPGRI Genebank Standards 1994 for details on storage type.)

10) Seed collection
- 11) Short term
- 12) Medium term
- 13) Long term

20) Field collection

30) *In vitro* collection (slow growth)

40) Cryopreserved collection

99) Other (elaborate in REMARKS field)

28. Remarks **(REMARKS)**

The remarks field is used to add notes or to elaborate on descriptors with value 99 or 999 (=Other). Prefix remarks with the field name they refer to and a colon (e.g. COLLSRC:roadside). Separate remarks referring to different fields are separated by semicolons without space.

Appendix IV. Current status of seed stock management in different countries

(updated May 2003)

Country	Institute	Medium-term storage (working collection)	Long-term storage (base collection)	Endangered accessions / reasons	Regeneration frequency
Armenia		room temperature		yes / old, few seeds	frequent (1-3-5-7 years depending on age and amount of seeds)
Austria	Governmental genebanks		desiccation -20°C glass flasks	no	when germination rate < 60%
	Arche Noah (NGO)	desiccation air-tight glass flasks	desiccation -15°C	no	
Bulgaria	IPGR Sadovo	+6°C no limit	-18°C 5000 seeds	yes / seed quantity	depending on germination ability
Czech Republic	RICP Genebank Olomouc		-18°C 50 g	no	15 years
France	INRA Montfavet	4°C 30-40% RH >1000 seeds		yes / many	13-20 years
Germany	IPK Genebank Gatersleben		-15°C 15-30 g	no	15-20 years
Greece	ARCMT Thermi Thessaloniki	0-5°C 30% RH 5000 seeds		yes / old, few seeds	15 years
Hungary	ABI Tápiószele	0°C 10-20 g	-20°C 10-20 g		
Israel	Volcani Center Bet Dagan		-10°C	yes (no regeneration)	no regeneration
	Hebrew University Jerusalem		seeds stored at University of California, Davis (USA)	no	
Italy	IDG Bari		-20°C 1-10 g	few acc. / old, few seeds	not pre-fixed
Netherlands	CGN Wageningen	desiccation &4°C 35 seeds pre-packed	-20°C 1000 seeds (if regeneration)	no	depending on seed viability
	Botanical Garden Nijmegen	2-4°C silica gel 2500 seeds		few acc. / old, few seeds	5-10 years
Poland	National Centre for Plant Genetic Resources, IHAR Radzików	0°C	-18°C	no	variable according to age and amount of seed

Country	Institute	Medium-term storage (working collection)	Long-term storage (base collection)	Endangered accessions / reasons	Regeneration frequency
Portugal	BPGV Braga	0-5°C 40-50% RH	-20°C no humidity control	no	last regeneration in 2000
	EAN Oeiras	(48 acc.) +4°C aluminium foil packets under vacuum		no	last regeneration in 1990 there are approximately 500 seeds / accession
	"		(3 acc.) -16°C no humidity control	very few seeds	seeds were collected in 1982 and were never regenerated
Russian Federation	VIR St. Petersburg	10-15°C 10-14% RH 5-15 g	+4°C 6-9% RH 10-15 g	yes / old, few, germination	WC 3-10 years BC 25 years
Spain	UPV Valencia		-3°C 5-6%RH 200-5000 seeds	no	10-15 years
Turkey	AARI Izmir	desiccation 0°C	desiccation -18°C	yes / old, few, germination	according to germination
Ukraine	Institute of Vegetables and Melon Crops Selektsijne		-18°C		
United Kingdom	University of Birmingham	transferred to Montfavet and Nijmegen		yes / many	
Yugoslavia	Centre for Vegetable Crops Smederevska Palanka	8°C 5-20 g		yes / few, germination	10 years

Appendix V. EGGNET Guidelines for seed regeneration and seed storage (eggplant)[14]

Note: eggplant and related species are autogamous, but not strictly.

A. Seed regeneration

Regeneration frequency

Above 70% germination, there is no urgency to regenerate. Below this figure, then regeneration is needed urgently. For wild species, seed viability is a better criterion than seed germination, which is frequently inhibited by dormancy.

Botanical identification

For wild species or doubtful accessions, herbarium specimens should be prepared and sent to NIJ (= P2, Nijmegen). BI (= P3, Birmingham) will visit NIJ to identify the specimens there. If possible, slides or photographs should also be sent.

Number of plants for regeneration

A minimum of 5 plants per accession was agreed upon. For the wild species, 3 to 10 are needed, grown either in greenhouses or in the open field, depending on partners. At the time of sowing, when selecting seedlings, partners must be aware that hybrids resulting from cross-pollination are more vigorous and easily recognized. They have to be eliminated.

What to do in case of heterogeneity?

Off-types due to pollen pollution should be eliminated. Other acceptable heterogeneity should be recorded: a field "Remark" should be added to the database and documented with the nature of heterogeneity. NIJ will add this field to the database. Seeds can be kept together, but each partner remains free to manage the heterogeneity he encounters, according to his own policy. Genebanks usually keep the diversity whereas breeders tend to purify the material by successive selfings.

In vitro culture

Only *S. muricatum* is concerned. There are no specific problems. Living plants can also be maintained alive. The wild relatives are propagated by seed.

Place of culture

Partners have different facilities for seed production and accessions will be allocated accordingly.

Pollination

Open pollination in eggplant is risky since cross-pollination (= pollen pollution) may occur very often. Partners must have isolation conditions or carry out hand-pollination in order to avoid accidental cross-pollination.

Amount of seed harvested

The minimum is 1000 seeds, equivalent to roughly 4 g, but 2000 seeds (8 g) would be far preferable. For distribution, samples of 25-30 seeds are sufficient. Safety-duplicates should have 200 seeds (or 1 g). In case of a shortfall, further regeneration will be attempted, but only after all endangered EGGNET accessions have been regenerated.

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[14] Adapted from EGGNET first year report, June 2001, Annex 5.

Disinfection
Seeds should not be disinfected before storage. They may be disinfected before sowing according to the practices of the different institutes, e.g. trinitrium phosphate against TMV, thermotherapy against viruses, etc. For pepino, seed disinfection before sowing is important.

Control of uniformity after regeneration
It was decided that no control would be carried out.

Number of accessions multiplied yearly by each partner
The number of accessions multiplied yearly by each partner is planned in advance.

Recommended protocol for seed germination
See Appendix VI.

B. Seed storage

Desiccation
All partners must use appropriate desiccation protocols, according to their facilities (lithium chloride, silica gel, drying rooms). Duplicate samples and seeds in long-term storage must be very thoroughly dried and sealed in foil (aluminium + plastic) bags.

Storage temperature
- For medium-term storage +4 to +5°C
- For long-term storage –15°C to -20°C.

Containers
Different partners use different seed containers, all of them being appropriate.

Duplicates
The location of the safety-duplicates must be organized according to the facilities available to the partners.

Appendix VI. Recommended seed germination protocol[15]

- Cleaning the seed samples (if not done before).
- Samples taken out of the boxes in the cold chamber must acclimatize for at least several hours.
- For every accession we take another pot. The advantage is that possible infections can be eliminated easily. It decreases the risk of mixing up accessions and the risk of mislabelling. Not all accessions germinate at the same time. Using pots makes it possible to treat each accession individually.
- Using black pots has a positive effect on the soil temperature.
- Pots are placed underground (isolated from one another): never directly on concrete benches, etc. Bench heating is recommended under cold conditions.
- The soil mixture must have an open texture.
- A few days before sowing we fill the pots with the soil mixture to improve soil temperature, soil humidity and soil texture, etc.
- Labels are written or sorted beforehand.
- No seed treatment is given before sowing.
- After sowing, seeds are pressed down to assure contact with the soil mixture.
- The soil should be watered before sowing.
- The next step is to spray the seeds with gibberellic acid (GA_3) 10^{-4}M. When the seeds become moist that will be sufficient.
- Northern climatic conditions: in every pot, one half of the seeds is covered with river sand or a similar mixture. Our experience is that under optimal conditions most of the *Solanum* sp. accessions prefer to germinate under light conditions, but unfortunately not always. In particular, for wild *Solanum* species no risk is taken and both of the options are kept open. The pots are placed in "mini propagation houses". Day/night rhythm = 18/6 hrs. Above the pots, heating elements have been installed. The minimum temperature is 18°C at night. In the morning the heating elements automatically switch on. For a couple of hours the upper surface of the pots is warmed to above 30°C. At daytime the average temperature is 25°C. Artificial lighting (high-pressure mercury lamps) is used in the greenhouse department where the "mini propagation houses" are situated.
- Southern climatic conditions: cover the seeds with 1-cm soil mixture, water the pots and place them in the greenhouse.
- To keep sciara flies under control, yellow sticky traps are used and therefore placed between the pots.
- When the seedlings have at least two well-developed cotyledons, they normally no longer need to be kept in the "mini propagation houses".

Germination is a very complicated process, influenced by many factors. In some cases experience is only acquired by trial and error. Otherwise some guidelines may be helpful to get the best possible results.

Useful references

Ellis, R.H., T.D. Hong and E.H. Roberts, editors. 1985. Handbook of Seed Technology for Genebanks. Vol. II. Compendium of Specific Germination. Information and Test Recommendations. IBPGR, Rome. (Chapter 67, Solanaceae, pp. 591-611.)

Moçambique, Pedro A. 1994. Seed Conservation, Germination and Viability in the Birmingham Solanaceae Collection. MSc Thesis, University of Birmingham, United Kingdom.

[15] Adapted from EGGNET first year report, June 2001, Annex 4a.

Appendix VII. Acronyms and abbreviations

AARI	Aegean Agricultural Research Institute, Izmir, Turkey
ABI	Institute for Agrobotany, Tápiószele, Hungary
ARCMT	Agricultural Research Center of Macedonia and Thrace, Thermi-Thessaloniki, Greece
BAZ	Bundesanstalt für Züchtungsforchung und Kulturpflanzen (Federal Centre for Breeding Research on Cultivated Plants), Braunschweig, Germany
BPGV	Banco Português de Germoplasma Vegetal, Braga, Portugal
CBD	Convention on Biological Diversity
CCDB	Central crop database
CGN	Centre for Genetic Resources, Wageningen, The Netherlands
COMAV	Center for the Conservation and Breeding of the Agricultural Biodiversity, Polytechnic University of Valencia, Spain
COMECON	Council for Mutual Economic Assistance
EAN	Estação Agronómica Nacional, Oeiras, Portugal
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks
EPGRIS	European Plant Genetic Resources Information Infra-Structure
EU	European Union
EURISCO	European Internet Search Catalogue (EPGRIS project)
FAO	Food and Agriculture Organization of the United Nations, Rome, Italy
GIS	Geographic Information System
HBLVA	Höhere Bundeslehr- und Versuchsanstalt für Gartenbau, Wien-Schönbrunn, Austria
HDRA	Henry Doubleday Research Association, Coventry, United Kingdom
HRI	Horticulture Research International, Wellesbourne, United Kingdom
IBPGR	International Board for Plant Genetic Resources (now IPGRI)
IDG	Istituto del Germoplasma, Bari, Italy
INH	Institut National d'Horticulture, Angers, France
INRA	Institut national de la recherche agronomique, France
IPGR	Institute for Plant Genetic Resources, Sadovo, Bulgaria
IPK	Institut für Pflanzengenetik und Kulturpflanzenforschung (Institute of Plant Genetic and Crop Plant Research), Gatersleben, Germany
IVMP	Institute of Vegetable and Melon Production, Selektsijne, Ukraine
MCPD	Multi-crop Passport Descriptor List (FAO/IPGRI)
NCG	Network Coordinating Group (ECP/GR)
NGB	Nordic Gene Bank, Alnarp, Sweden
NGO	Non-governmental organization
PBAI	Plant Breeding and Acclimatization Institute, Radzików, Poland
PGR	Plant genetic resources
PRI	Plant Research International, Wageningen, The Netherlands
RAC	Station Fédérale de Recherches en Productions Végétales, Changins, Switzerland
RICP	Research Institute of Crop Production, Prague, Czech Republic
RIVC	Research Institute of Vegetable Crops, Skierniewice, Poland
SASA	Scottish Agricultural Science Agency, Edinburgh, United Kingdom
TMV	Tobacco mosaic virus
UPOV	Union internationale pour la protection des obtentions végétales (International Union for the Protection of New Varieties of Plants), Geneva, Switzerland
UPV	Universidad Politécnica de Valencia, Spain
USDA	United States Department of Agriculture
VIR	N.I. Vavilov Research Institute of Plant Industry, Russia
WIEWS	World Information and Early Warning System (FAO)

Appendix VIII. Workplan of the Working Group on Solanaceae

Note: the following table synthesizes the workplan agreed upon at the Nijmegen meeting in 2001 and its update at the Skierniewice meeting 2003.

Objectives agreed upon in Nijmegen, 21 Sept. 2001 (see pages 4-5)	To be carried out by	To be completed by	Status as of May 2003	Further actions agreed upon in Skierniewice, 22 May 2003	To be completed by
1. Establishment of the Working Group on Solanaceae	M.C. Daunay in consultation with the Informal group	October 2001	In October 2001, the ECP/GR Steering Committee approved the establishment of a formal Working Group on Solanaceae	(none required)	-
2. Inventory of European collections / databases		March 2002	In progress (details per crop below)	**High priority**	**May 2004**
	Eggplant (M.C. Daunay, INRA, France)	"	Almost all the lists of the participants attending the Nijmegen meeting have been received by the database manager Eggplant database available on Internet (see p. 7)	Merge all data using the MCPDv2 format	"
	Pepper (A. Kücük, AARI, Turkey)	"	(new curator: S. Mutlu, AARI, Turkey) Lists received have been compiled in a single file, provided to the Chair at the Skierniewice meeting	Merge all data using the MCPDv2 format Database to be made available on Internet	"
	Physalis and *Cyphomandra* (J. Prohens, UPV, Spain)	"	Compiled list produced	Merge all data using the MCPDv2 format Database to be made available on Internet	"
	Tomato (O. Dmitrieva, VIR, Russian Federation)	"	(new curator I. Khrapalova, VIR, Russian Federation)	As above but to be confirmed with db manager who was not attending the meeting	
3. Identification of the degree of duplication among the collections of the different partners	Database managers		Not started	Postponed until inventory of all collections is finalized	-
4. Development of standardized protocols for seed regeneration and seed storage	All Working Group members		Not started	**High priority** Each partner will send regeneration / storage protocols of their institute to Chair/Vice-Chair, who will compile all information in order to produce a proposed harmonized protocol for each crop	**May 2004**

Objectives agreed upon in Nijmegen, 21 Sept. 2001 (see pages 4-5)	To be carried out by	To be completed by	Status as of May 2003	Further actions agreed upon in Skierniewice, 22 May 2003	To be completed by
5. Development of standardized descriptors and protocols for primary characterization	Specific crop experts from the Group		Not started	**High priority** Each partner will send the descriptor lists used to the crop specialists (M.C. Daunay for eggplant; W. van Dooijewert for pepper; M.J. Díez for tomato; W. Palme for *Physalis* and *Cyphomandra*) On the basis of all descriptors used, the crop specialists will develop a proposed set of minimum descriptors	**May 2004**
6. Development of a standardized set of agronomic traits to be evaluated and of relevant protocols (secondary characterization)	Specific crop experts from the Group		Not started	Though evaluation data are of high interest to end users, the production of a standard list of agronomic traits to be evaluated is for the present a second priority	-
7. Clarification of issues related to international legislation on exchange of PGR	All Working Group members, with the collaboration of ECP/GR Secretariat	-	-	**High priority** Ongoing, on an *ad hoc* basis	
8. Identification of the wild species and use of the current taxonomy	All Working Group members, with the collaboration of EGGNET Coordination Board	-	Not started	**High priority** **Use of common taxonomy:** list of synonyms of species names to be established and proposed to all partners Action: M.C. Daunay and W. van Dooijeweert	**End November 2003**
				Lower priority **Identification of wild species:** specialized taxonomists to be identified and information sent to all partners Action: M.C. Daunay, W. van Dooijeweert and W. Palme	**End November 2003**
(9.)			**New objective defined: Saving endangered accessions in Israel and Armenia**	**High priority** WG Members from Israel and Armenia to send a list of the endangered accessions, for each crop, to the Chair. Chair and Vice-Chair will analyze the lists and propose a plan for safety-duplication in appropriate genebanks	**End November 2003**

Appendix IX. Agenda, Nijmegen meeting

Ad hoc *meeting on Solanaceae Genetic Resources*
held jointly with the Second Meeting of the Project GEN RES 113 (EGGNET)
21 September 2001, Nijmegen, The Netherlands

8:30-9:30 **Introduction**
- Opening remarks
- Introduction of the participants to the meeting
- Brief self-introduction of ECP/GR partners (Solanaceae genetic resources)
- Involvement of ECP/GR partners in EGGNET activities
- "Seed money"

9:30-10:30 **The ECP/GR Informal Group on Solanaceae**
- About ECP/GR
- Solanaceae genetic resources in Europe: general situation
- Proposed workplan for (eggplant), pepper and tomato

10:30-11:00 *Tea and coffee break*

11:00-11:30 **Mode of operation**
- Voluntary involvement; support from ECP/GR
- Selection of Chairperson
- Selection of focal persons for eggplant, pepper and tomato

11:30-12:30 **Proposal for a database**
- Best technical solution? (3 databases ? centralized DB ? …)
- Database managers
- The EPGRIS project

12:30-13:30 *Lunch*

14:00-14:15 **Establishment of a minimum primary descriptor list**

14:15-14:45 **Planning for safety-duplication of each collection**
- Current level of safety-duplication (what is safety-duplicated and where?)
- Who holds long-term conservation facilities?
- Who would be available to host safety-duplicates as "black boxes"?

14:45-15:30 **Identification of endangered collections and possible solutions**

15:30-16:00 **Regeneration, identification and storage guidelines**
- Eggplant: EGGNET guidelines
- Pepper and tomato guidelines: to be developed

16:00-16:30 *Tea and coffee break*

16:30-17:00 **Concluding remarks**

Appendix X. List of Participants, Nijmegen meeting

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Appendix XI. Agenda, Skierniewice meeting

Session of the Working Group on Solanaceae
held during the Vegetables Network Meeting
22 May 2003, Skierniewice, Poland

Introduction: presentation of historical background *(M.C. Daunay)*

- RESGEN project 1999-2004 (EGGNET)
- Meeting of the Vegetables Network Coordinating Group in Vila Real, Portugal, May 2000 / survey on European Solanaceae collections (eggplant, pepper, tomato, *Physalis* and *Cyphomandra*)
- Meeting of the informal group on Solanaceae in Nijmegen, the Netherlands, Sept. 2001, jointly with the Second full EGGNET meeting
- Establishment of the ECP/GR Working Group on Solanaceace approved by ECP/GR Steering Committee, Oct. 2001
- Chair and Vice Chair: M.C. Daunay and W. van Dooijeweert
- Report of the Nijmegen meeting (in preparation)

Self-introduction of the participants

Review of the workplan established in Nijmegen, Sept. 2001 – for each objective, presentation of progress made, discussion and identification of further actions

- (Establishment of the Working Group on Solanaceae)
- Inventory of European collections / databases
  - Status of national collections *(presentations/updates by all participants)*
  - Databases *(status and updates by DB managers present at the meeting: eggplant–EGGNET: M.C. Daunay; pepper: S. Mutlu;* Physalis *and* Cyphomandra*: M.J. Díez (on behalf of J. Prohens)*
- Identification of the degree of duplication among the collections of the different partners
- Development of standardized protocols for seed regeneration and seed storage
- Development of standardized descriptors and protocols for primary characterization
- Development of a standardized set of agronomic traits to be evaluated and of relevant protocols (secondary characterization)
- Clarification of issues related to international legislation on exchange of PGR
- Identification of the wild species and use of the current taxonomy

Presentation and discussion of the draft recommendations of ECP/GR task force on strategy for Phase VII of ECP/GR - identificatin of priorities for the Solanaceae WG

Presentation and discussion of new EU Regulation

Involvement of private breeders

Discussion based on the example of the French Solanaceae network *(M.C. Daunay)*

Conclusion / date of next meeting of the Solanaceae WG

Appendix XII. List of Participants, Skierniewice meeting

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