European Cooperative Programme for Plant Genetic Resources

ECP/GR

Report of a Working Group on *Prunus*

Sixth Meeting, 20-21 June 2003, Budapest, Hungary
Seventh Meeting, 1-3 December 2005, Larnaca, Cyprus

L. Maggioni and E. Lipman, *compilers*

Bioversity International

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Bioversity International is an independent international scientific organization that seeks to improve the well-being of present and future generations of people by enhancing conservation and the deployment of agricultural biodiversity on farms and in forests. It is one of 15 centres supported by the Consultative Group on International Agricultural Research (CGIAR), an association of public and private members who support efforts to mobilize cutting-edge science to reduce hunger and poverty, improve human nutrition and health, and protect the environment. Bioversity has its headquarters in Maccarese, near Rome, Italy, with offices in more than 20 other countries worldwide. The Institute operates through four programmes: Diversity for Livelihoods, Understanding and Managing Biodiversity, Global Partnerships, and Commodities for Livelihoods.

The international status of Bioversity is conferred under an Establishment Agreement which, by January 2006, had been signed by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mali, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

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The European Cooperative Programme for Plant Genetic Resources (ECPGR) is a collaborative programme among most European countries aimed at facilitating the long-term conservation and the increased utilization of plant genetic resources in Europe. The Programme, which is entirely financed by the member countries and is coordinated by Bioversity International, is overseen by a Steering Committee composed of National Coordinators nominated by the participating countries and a number of relevant international bodies. The Programme operates through nine networks in which activities are carried out through a number of permanent working groups or through *ad hoc* actions. The ECPGR networks deal with either groups of crops (cereals; forages; fruit; oil and protein crops; sugar, starch and fibre crops; vegetables, medicinal and aromatic plants) or general themes related to plant genetic resources (documentation and information; *in situ* and on-farm conservation; inter-regional cooperation). Members of the working groups and other scientists from participating countries carry out an agreed workplan with their own resources as inputs in kind to the Programme.

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In memoriam

"You CAN do it -
you only have to show people HOW to do it"

Fabrizio Grassi

CONTENTS

PART I. REPORT OF THE SIXTH MEETING, 20-21 JUNE 2003, BUDAPEST, HUNGARY **1**

PART II. REPORT OF THE SEVENTH MEETING, 1-3 DECEMBER 2005, LARNACA, CYPRUS **9**

PART III. PRESENTATIONS AND PAPERS **27**

APPENDICES **111**

INDEX OF AUTHORS **138**

PART I. REPORT OF THE SIXTH MEETING, 20-21 JUNE 2003, BUDAPEST, HUNGARY

A. Zanetto, K.R. Tobutt, F. Dosba, L. Maggioni and E. Lipman

Introduction 2

Updates on *Prunus* genetic resources activities in different countries 2

The European *Prunus* Database (EPDB): status of progress, accessibility on Internet, inclusion of new data, future development 3

Inclusion of data 3
Suggestions for queries 3
Proposals for further development 3
Catalogue of the European* Prunus *accessions 4

Molecular markers 4

Decentralized European *Prunus* Collection (DEPC) 4

Use of collections and relationship with the *Prunus* breeding sector 4

Phytosanitary status of collections 5

International agreements on access to genetic resources 5

***Prunus* Newsletter** 5

Attributes of European Forest Genetic Resources Programme (EUFORGEN) and EUFORGEN's Noble Hardwood Network 6

Wild cherry breeding in Flanders 6

Funding opportunities from the European Union 6

Perspectives for the future of the Working Group on *Prunus* 7

Next meeting 7

Proposal of new Chair and Vice-Chair 7

Introduction

Elisabeth Kallay, Director of the Research Institute for Fruitgrowing and Ornamentals, Budapest, welcomed participants at the sixth meeting of the ECP/GR[1] Working Group on *Prunus* to the Institute. She explained that the Institute is 50 years old and has particular experience of fruit and tree breeding and genetic resources conservation, for example in sweet and sour cherries, and walnut. Other work on fruit includes the distribution of virus-free propagating material, advising growers on the choice of sites, and nutrition, storage and physiology. There are offices and a laboratory at Budapest and a research farm with 600 ha at Erd, 13 km away from the Institute, where the stone fruit collections are located. E. Kallay concluded by introducing several colleagues.

Françoise Dosba, Chair of the Working Group, thanked E. Kallay and explained that on this occasion, Lorenzo Maggioni, ECP/GR Coordinator, was unable to attend. She asked the participants to introduce themselves. For the benefit of new members, F. Dosba then briefly introduced the recent activities of the Working Group by reporting on the extraordinary meeting of the ECP/GR Working Group on *Prunus* and the final coordination meeting of the EU project GEN RES 61 that was held in Gembloux in 2000, in conjunction with the Fruit Network Coordinating Group. An account had been presented of the successful GEN RES 61 project on *Prunus* genetic resources which had been funded by the EU and by ECP/GR for Community and non-Community countries respectively. It was the first example of such a jointly funded project. An update on Internet access to the European *Prunus* Database (EPDB) had been presented and opportunities for the integration of molecular markers had been discussed. The establishment of a Decentralized European *Prunus* Collection (DEPC) had been advocated, and the possibilities for amalgamating with the *Malus/Pyrus* Working Group and for more interactions with the Noble Hardwood Network of the European Forest Genetic Resources Programme (EUFORGEN) had been raised. Information about the Working Group had been presented in posters and oral presentations at various meetings. The report of GEN RES 61 was submitted in 2000 and a paper has been published.[2]

F. Dosba outlined the programme of the meeting. She explained that it would focus on updates of the status of national collections, improved accessibility to the EPDB, the constitution of the DEPC and the opportunities within the new EU programme on genetic resources.

Updates on *Prunus* genetic resources activities in different countries

Zsuzsanna Békefi (Hungary), Edite Kaufmane (Latvia), Vladislav Ognjanov (Serbia and Montenegro) and Costas Gregoriou (Cyprus) gave informative reports on recent activities in their countries concerning conservation, collecting, evaluation or characterization of *Prunus* genetic resources (see Part III).

Points arising from these presentations included the unreliable performance of some reference cultivars, for example with respect to flowering time, and the inadequate winter hardiness of some reference cultivars in Northern Europe.

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1 Following the decision of the 10th meeting of the ECPGR Steering Committee in September 2006, the name of the Programme was simplified to "European Cooperative Programme for Plant Genetic Resources" and the acronym was also modified to "ECPGR", removing the traditional slash of "ECP/GR".

2 Zanetto, A., L. Maggioni, K. Tobutt and F. Dosba. 2002. *Prunus* genetic resources in Europe: Achievement and perspectives of a networking activity. Genetic Resources and Crop Evolution 49:331-337.

The European *Prunus* Database (EPDB): status of progress, accessibility on Internet, inclusion of new data, future development

Anne Zanetto gave an update on the EPDB. A server has been purchased by the Institut National de la Recherche Agronomique (INRA), France for databases managed at Bordeaux which will also be used to host the EPDB. One INRA permanent staff member is dedicated to maintaining this server and one permanent person has been working part-time on the development of the EPDB from the beginning of 2003. Since then, it has been developed as an interactive database with a programme for the inclusion of data from MS-Excel files. Some draft requests had been proposed and more could be developed. User-friendly screens still needed development.

Inclusion of data

To include the data in the database, preformatted files on MS-Excel had been prepared. One file should be completed by curators for each crop-type. Files comprise 43 to 54 columns, depending on the crop-type, for passport data, common descriptors and specific descriptors. Reference tables were accessible directly from the files, for ease of use. A. Zanetto asked colleagues to respect the format. Data already sent to the database manager had been included in the appropriate MS-Excel files. Those files would be sent back to each curator for checking data by the end of July. Curators were asked to return them to A. Zanetto by mid-October. Those yet to send data would receive the preformatted MS-Excel files. During the autumn, the database would be open for testing to curators, upon use of an IP number. Public availability was planned for the end of 2003.

Suggestions for queries

A list of queries to be developed for the database was proposed by A. Zanetto and circulated so that the participants could add more. The agreed revised list was as follows:

- Accessions corresponding to any common descriptors
- Accessions corresponding to any specific descriptors
- Accessions from one country of origin
- Accessions included in the European Collection
- Names of institutes holding a particular cultivar
- Description of one accession
- List of accessions from one crop-type in one institute
- List of accessions in one institute whatever the crop-type
- List of institutes holding one crop-type
- List of institutes holding *Prunus* genetic resources collections
- Address of institutes and names of curators
- Synonyms
- Availability of material for exchange.

Proposals for further development

A new structure for a common dynamic database for different genetic resources networks was currently under development in France. The advantage was that any new descriptors such as molecular markers could be incorporated immediately. Trials would be conducted soon on the French *Prunus* National Collection. If the ECP/GR Working Group on *Prunus* wishes, it can be used for the EPDB.

The question of compatibility with EURISCO, the European Internet Search Catalogue, was raised by Fabrizio Grassi. Marc Lateur explained that EURISCO searches for passport data and the EPDB uses standard descriptors. A. Zanetto will investigate whether there may be a problem.

There was discussion about the inclusion of provisional names for unidentified accessions, but it was not thought necessary to include a provisional name as a descriptor. It was noted that the existing crop-types do not explicitly deal with the *Padus* and *Laurocerasus* groups of species.

Catalogue of the European Prunus *accessions*

A paper edition of the catalogue had been planned during the previous meeting. The catalogue would include accessions originating from Europe and belonging to the Decentralized European *Prunus* Collection. The accessions to be included should at least have passport data; so it is important that curators provide these. Funding would be needed to publish the catalogue. The response to the next call for proposals for the new EU Regulation for Genetic Resources should include the publication of the catalogue.

Molecular markers

Ken Tobutt gave a brief account of opportunities for using primers for microsatellites and for incompatibility (*S*) alleles for characterizing *Prunus* collections (see also p. 101). F. Dosba drew attention to work establishing syntony between the genomes of different *Prunus* species and possibilities of using sequence information from homologous sequences for exploiting *Prunus* genetic resources. In a brief discussion it was agreed that the incorporation of molecular data into the European *Prunus* Database would be an appropriate topic for the next meeting.

Decentralized European *Prunus* Collection (DEPC)

F. Dosba made a presentation on the plans for establishing a DEPC, a subject that may find favour with the future European Union genetic resources call. The document "Towards a definition and implementation of European *Prunus* Collection" (revised October 2001), which had previously been endorsed by the *Prunus* Working Group, had been circulated in advance of the meeting. Suggestions for revisions were invited, especially from new members of the Working Group.

It was agreed that the preamble should state that, in principle, each country is responsible for its own genetic resources. There was considerable discussion concerning the definition of material that would be eligible for the DEPC and several clarifications were agreed. A revision to the process by which the database manager analyzes the offers of material was agreed. A flexible expert group comprising the Chair, the Database Manager and approximately three other members will prepare lists of European accessions for decisions by the Working Group. A short section on the responsibilities of the ECP/GR *Prunus* Working Group was added (see Appendix I, p. 112).

Use of collections and relationship with the *Prunus* breeding sector

Rafael Socias i Company gave a short account of the use of the Spanish almond, peach and apricot collections in breeding programmes. Germplasm from overseas provide the sources of late blooming and self-compatibility in almond and Sharka resistance in apricot. However, local cultivars were important, e.g. in breeding for fruit quality in apricot. The Spanish genebank curators tended to be breeders as well, which facilitates the use of the genetic resources.

F. Dosba stressed the importance of ensuring availability of genetic resources. R. Socias i Company explained that he provided more material to other researchers than to breeders. It was recognized that the benefits of genetic resources could not be measured just in terms of numbers of samples distributed. Markus Kellerhals commented that European stone-fruit breeding programmes are diminishing. F. Dosba pointed out that more private organizations are becoming involved in fruit breeding. M. Kellerhals thought that integrating with private breeders would be an important challenge for curators in future years.

Phytosanitary status of collections

M. Kellerhals drew attention to the FAO/IPGRI guidelines on the transfer of stone-fruit material published in 1996[3] which detailed the various pests and diseases of phytosanitary concern. In general, material free of quarantine pests and diseases could be distributed within EU countries with a plant passport and between EU and non-EU European countries with a phytosanitary certificate. "Problem materials" might need quarantine. In discussion it was pointed out that some US collections were virus-free; however it was thought unrealistic to aim for complete freedom from pests and diseases in the European *Prunus* Collection.

International agreements on access to genetic resources

F. Grassi explained that the Convention on Biological Diversity (CBD) recognized the sovereign rights of states over their natural resources. One of the objectives of the Convention was *"the fair and equitable sharing of the benefit arising out of the utilization of genetic resources"*. More recently the Bonn guidelines on access to genetic resources and the fair and equitable sharing of the benefit arising out of their use, voluntary in nature, had been developed and approved by the VIth Conference of the Parties to the CBD. These had been circulated by ECP/GR to members in advance of the meeting. The guidelines established various principles for prior informed consent, including legal certainty, transparency and minimal cost. Mutually agreed terms should cover monetary and non-monetary benefits, e.g. royalties and capacity building respectively.

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) was approved in November 2001 by the FAO Conference. The Treaty, once it enters into force, will establish a multilateral system of facilitated access and benefit-sharing limited to the listed material included in Annex I of the Treaty, which does not include *Prunus*. In addition, the World Intellectual Property Organization (WIPO) had established the intergovernmental committee on intellectual property and genetic resources, traditional knowledge and folklore. Regarding access and benefit-sharing, the committee would discuss the issues linked to the role of intellectual property, in particular contractual agreements for access to genetic resources.

Prunus Newsletter

Mihai Botu reported on the fourth issue of the *Prunus* Genetic Resources Newsletter published in 1998. K. Tobutt explained that Manfred Fischer (former member of the Working Group on *Prunus*) had published a joint issue of the PGR Newsletter and EUCARPIA Fruit Group Newsletter in 2001, but that mention of *Prunus* Genetic Resources Newsletter had,

[3] Diekmann, M. and C.A.J. Putter, editors. 1996. Stone fruits. FAO/IPGRI Technical Guidelines for the Safe Movement of Germplasm. No. 16. FAO (Food and Agricultural Organization of the United Nations)/IPGRI (International Plant Genetic Resources Institute), Rome, Italy.

unfortunately, been omitted from the title page. It was agreed that several options for the Newsletter should be considered. These included a printed or electronic newsletter edited by M. Botu, or a joint publication with the EUCARPIA Fruit Group. Members of the *Prunus* Working Group were asked to send their contributions to M. Botu before the end of 2003.

Attributes of the European Forest Genetic Resources Programme (EUFORGEN) and EUFORGEN's Noble Hardwood Network

Bart De Cuyper, the Belgian attending member from EUFORGEN's Noble Hardwoods Network, gave an informative account of EUFORGEN and the Noble Hardwoods Network (see also p. 104). EUFORGEN had the mandate to coordinate conservation of European forest genetic resources. The Noble Hardwoods Network dealt with seven rosaceous species including wild cherry, and other species characterized by sporadic distribution and high quality timber. He drew attention to the history and remits of the Noble Hardwoods Network and the ECP/GR Working Group on *Prunus* and highlighted the similarities and differences. He also drew attention to the Network's activities. These include introductory country reports, yearly progress reports on associated projects, raising public awareness, a database of the grey literature and technical guidelines for gene conservation.

M. Lateur commented that certain descriptors developed by the *Prunus* Working Group (e.g. disease resistances) may be useful for the Noble Hardwoods Network. B. De Cuyper and his group would also like to develop descriptors for such silvicultural characters as tree form and wood colour. There was some discussion of the distinction between sweet and wild cherry. B. De Cuyper explained that the two forms differed with respect to frequency of certain incompatibility alleles and microsatellite alleles and that wild cherry had a tree form more amenable to timber production. There was also discussion about the setting of targets for the Network. B. De Cuyper explained that EUFORGEN encouraged the setting and monitoring of targets, and that responsibilities were shared around members of the Network.

Wild cherry breeding in Flanders

B. De Cuyper gave a comprehensive account of his work on the improvement of wild cherry in Flanders (see also pp. 105-106). In particular, he was concentrating on the need for new clonal seed orchards while paying attention to the need to maintain genetic diversity. The analysis of incompatibility alleles using PCR primers was proving very informative in the seed orchards.

Funding opportunities from the European Union

F. Dosba made a presentation concerning the European Union forthcoming calls for GEN RES-2 and circulated a recent draft. The draft directive indicated a budget of 7 to 10 million €, running from 2003 to 2006, of which 40% is intended for crops and 10% for forestry. Countries about to join the EU would be eligible from 2005. The draft directive specifically encouraged links with ECP/GR and EUFORGEN. Eligible actions were those on genetic resources taking place within Europe and related to crops of economic value; *in situ* as well *ex situ* activities are encouraged. No theoretical research can be undertaken. The EU would provide only 50% of the funds.

F. Dosba drew attention to possible components of a proposal that could be submitted to develop the DEPC in collaboration with ECP/GR. These included characterization and

evaluation of sanitary status, evaluation of descriptors including molecular markers, rationalization with a view to establishing a core collection, and the acquisition and collecting of additional genetic resources. She stressed that the proposal would need to specify its deliverables.

In the discussion that followed F. Grassi said the objectives should differ from those of GEN RES 61, and should perhaps emphasize better care for the environment and added value. R. Socias i Company suggested that pest and disease resistance might be a good focus. It was agreed that a small task force comprising F. Grassi, R. Socias i Company, M. Lateur and perhaps another expert should look into the possibility of a proposal. They would seek ideas from members of the group by October 2003 and propose a brief paper for circulation to members of the Working Group by December 2003. Funds could be sought for the task force to meet in December 2003.

Perspectives for the future of the Working Group on *Prunus*

F. Grassi pointed out the desirability of preparing a workplan. It was agreed that K. Tobutt would circulate a draft action plan and an agenda for the next meeting, inviting suggestions and comments from members of the *Prunus* Working Group. Actions proposed for the next five years were the following:

- To provide half-page updates on national collections for the meeting report;
- To develop the European *Prunus* Database by checking and revising datasets and preparing lists of accessions to be considered for inclusion in the Decentralized European *Prunus* Collection;
- To explore possibilities for funding from the next EC call on genetic resources, perhaps in collaboration with the *Malus/Pyrus* Working Group, to allow, e.g., development of database, further characterization, rationalization and publication of a catalogue;
- To send contributions to the editor of the *Prunus* Genetic Resources Newsletter;
- To meet again, in Cyprus, in order to endorse the workplan, review progress, share out responsibilities and discuss incorporation of molecular markers into the database.

Next meeting

The Group would ask the ECP/GR Secretariat about the possibility of organizing an annual (or biennial) meeting in order to increase the efficiency of the *Prunus* Working Group. An interval of three years was thought too long for good progress and interaction between partners. C. Gregoriou offered to host the next meeting in Cyprus, subject to the agreement of the Cyprus government.

Proposal of new Chair and Vice-Chair

Ken Tobutt was proposed by Françoise Dosba to be the new Chair and accepted by all the participants. Daniela Benediková was proposed as Vice-Chair and this was agreed. F. Dosba thanked the Research Institute for Fruitgrowing and Ornamentals for the good organization of the meeting and all the members for their efficient participation. K. Tobutt thanked F. Dosba on behalf of the Working Group for all her hard work over the past ten years.

PART II. REPORT OF THE SEVENTH MEETING, 1-3 DECEMBER 2005, LARNACA, CYPRUS

K. Tobutt, E. Balsemin, B. Lund, L. Maggioni and E. Lipman

Introduction 10

Welcome addresses and opening remarks 10
Briefing on ECP/GR – Phase VII 10

Updates on national and regional activities 12

Chair's report 13

The European *Prunus* Database (EPDB) 13

Progress of the EPDB 13
Discussion on further improvement of the EPDB 14

AEGIS (A European Genebank Integrated System) 15

Introduction to the AEGIS project and vision for the future 15
Update on activities of the AEGIS subgroup on Prunus 16
Demonstration of the use of the database for identification of AEGIS accessions 17
The Prunus *Working Group approach to AEGIS. Discussion on the proposed steps for the implementation of the AEGIS concept for* Prunus 18
Discussion on how to share tasks for the implementation of AEGIS 18
Wrap-up discussion on AEGIS 18

Molecular characterization of *Prunus* collections 19

Molecular markers for managing Prunus *collections* 19
Discussion on incorporation of molecular data into the EPDB 20
Planning of workshop on fingerprinting of Prunus 20
Opportunities to submit a project proposal (AGRI GEN RES 870/2004) 20

***Prunus* Newsletter** 20

Account of the preparation of issue 5 20
Plans for the preparation of issue 6 21

The International Treaty and the Material Transfer Agreement for *Prunus* germplasm exchange 21

Scientific contribution 23

Some new activities on Belgian Prunus *fruit tree genetic resources* 23

Updating the workplan of the *Prunus* Working Group 24

Network Coordinating Group 24

Closing session 24

Presentation of the report and adoption of recommendations 24
Selection of the Working Group Chair and Vice-Chair 24
Closing remarks 24

Introduction

Welcome addresses and opening remarks

Costas Gregoriou (Agricultural Research Institute (ARI), Nicosia, Cyprus), opened the meeting by welcoming all the participants to Cyprus for the Seventh Meeting of the ECP/GR Working Group on *Prunus*, including the observer representing European non-governmental organizations (NGOs).

Although Cyprus has been a member of ECP/GR since its foundation in 1980, this was the first time that a meeting of the Programme has been hosted in this country. The ARI participates in the ECP/GR Cereals Network (Barley and Wheat Working Groups) and in the Fruit Network (*Prunus* and *Vitis* WGs).

C. Gregoriou explained that the importance of agriculture in Cyprus had gradually declined, due to reasons such as severe shortages of water, excessive land fragmentation and severe competition from tourism for scarce fertile land and labour. However, Cyprus continues to ascribe great importance to agriculture, not only for its contribution to the economy but for its major roles in social development, the preservation of cultural identity and the improvement of the natural environment.

Thanks to the diversity of topography and climate, a wide range of microclimatic conditions exist which permit a diversified crop production. In the central plain the main crops are wheat and barley grown under winter rainfall. Potatoes, vegetables, legumes and fodder crops are widely distributed over the island, while citrus orchards are generally concentrated along the coasts. In narrow valleys at higher elevations in the Troodos mountains, deciduous fruits, nuts, vines and a wide range of vegetables are grown. In these areas *Prunus* crops are cultivated. Viticulture is very important in the hilly areas of Paphos and Limassol districts, where the grapes are mainly used for winemaking, while table grapes are grown in the south-west areas near the coast. Bananas are cultivated in the Paphos district.

Before concluding, C. Gregoriou suggested that the Working Group should pay tribute to the memory of their former colleague Fabrizio Grassi, and the Group observed a minute's silence.

In the hope that the Group's deliberations would be productive and the meeting successful, C. Gregoriou concluded by wishing everybody a pleasant stay in Cyprus.

Ken Tobutt, Chair of the *Prunus* Working Group, thanked the host, C. Gregoriou, and his colleagues and also the ECP/GR Secretariat. As about half of the Working Group members were "new" he then outlined what the Group is, why it exists, and how it operates. He explained that he and Daniela Benediková would share the chairing and encouraged all present to take part in the discussions.

After brief self-introductions by all the participants (see list in Appendix X, p. 133), the agenda was presented and adopted, with a few rearrangements (see Appendix IX, p. 131).

Briefing on ECP/GR – Phase VII

Lorenzo Maggioni described briefly the current status of the ECP/GR Programme. He explained that the ECP/GR had entered its Phase VII (2004–2008) with some modifications made to its structure and mode of operation by the Steering Committee at its last meeting in Izmir, Turkey, in October 2003.[4] The Steering Committee had endorsed four priority areas for Phase VII: 1) Characterization and evaluation (including use of modern technologies);

[4] See Report of the Ninth Steering Committee Meeting, also available on Internet at http://www.ecpgr.cgiar.org/SteeringCommittee/SC9.htm

2) Task sharing; 3) *In situ* and On-farm conservation; and 4) Documentation and Information. The Steering Committee also requested the Fruit Network Coordinating Group (NCG) to define two priority groups within the Network and to make proposals, in consultation with the Working Groups, for actions on the basis of a budget of about 83 000 euro allocated to the Fruit Network. As a result of this exercise, which was conducted during 2004, the Working Group on *Prunus* was included among the priority Working Groups for Phase VII. The following use of funds for *Prunus* activities had been approved:

- *Ad hoc* meeting for EU proposal (Belgium, February 2005) (4200 euro)
- Seventh meeting of the *Prunus* Working Group (Cyprus, December 2005) (18 000 euro)
- Network Coordinating Group meeting, Bonn, Germany, March 2006 (different budget)
- Fruit Network: *ad hoc* meeting on microsatellite markers and genotyping (East Malling, UK, December 2006) (9600 euro)
- Laboratory production of microsatellite fingerprints of five cultivars from each of 25 countries (3000 euro)
- Publication on the details of 10 microsatellites for *Prunus* (no budget)
- Newsletter (2005 and 2007) (no budget)
- *Ad hoc* meeting to resolve synonymy in *Prunus* cultivars (Brogdale, UK, 2006?) (3200 euro)
- Fruit Network *ad hoc* meeting on *in situ* and on-farm conservation (2008) (10 400 euro)
- Technical leaflets with protocols for *in situ* and on-farm conservation (2008) (2000 euro)
- Printed catalogues of the various crops (2008) (4000 euro)

For further information on ECP/GR, the ECP/GR Web site was recommended, where several reference documents are available, including the Network's budget and the Terms of Reference for the ECP/GR constituents. In addition, a specific Web page is dedicated to the Working Group on *Prunus* and this can be improved with the help of Group members and in line with the needs of the WG.

The recent developments of the EURISCO catalogue (http://eurisco.ecpgr.org), including the incorporation of 930 000 accessions' passport data from 32 European countries, and the overall mechanism of data flow in Europe were described. This on-line catalogue of passport data on *ex situ* collections maintained in Europe meets the CBD obligations to facilitate the exchange of information relevant to the conservation and sustainable use of biological diversity. Moreover, this central catalogue, which is maintained by IPGRI[5] on behalf of ECP/GR, is increasingly offering the possibility to the managers of the Central Crop Databases (CCDBs) to directly download all the relevant crops' passport data in one single operation, rather than having to request data from several curators. To be able to benefit from this opportunity, it is essential that the CCDBs harmonize the codes and states of their passport descriptors with those used by EURISCO (which are largely based on the FAO/IPGRI *Multi-crop Passport Descriptors*). This does not mean that each CCDB cannot make the specific choice of adopting only some of the EURISCO descriptors and/or adding more descriptors of interest. Since EURISCO is made of data provided by the National Inventory Focal Points, the completeness of the data available from EURISCO depends on the efficiency of data collection within each individual country. A role for the Working

[5] With effect from 1 December 2006, IPGRI and INIBAP operate under the name "Bioversity International", Bioversity for short. This new name echoes their new strategy, which focuses on improving people's lives through biodiversity research.

Group members, in order to make sure that all *Prunus* national data be channeled to EURISCO, would be to contact their respective national Focal Points and collaborate on data gathering from all available collections within their country. The full list of National Inventory Focal Points is available from:
http://www.bioversityinternational.org/networks/ecpgr/contacts/ecpgr_epgris_np.asp

The recommendation made by the Documentation and Information Network that the CCDBs should harmonize their structure with EURISCO was also reported. Although for the moment it is recommended that the specific CCDBS should continue to be developed in the traditional way (i.e. by gathering all the available data from any available sources), in the medium term it should become possible to download all the necessary passport data from EURISCO and to focus the attention of the CCDBs on characterization and evaluation data and on the analysis of the database in order to offer other services to the users of the specific crop genetic resources.

Updates on national and regional activities

Oral reports were given by representatives of seven countries (Anush Nersesyan, Armenia; Kalju Kask, Estonia; Lars Sekse, Norway; Margarida Oliveira, Portugal; Vladislav Ognjanov, Serbia and Montenegro; Rafael Socias i Company, Spain; and David Szalatnay, Switzerland). The full reports are included in Part III, which also includes all other country reports provided (pp. 27-109).

The summary of the presentation on the South East European Development Network (SEEDNet) is given below.

SEEDNet

V. Ognjanov presented the recent development of SEEDNet, which was established in 2004 for a duration of 10 years and financed by the Swedish International Development Cooperation Agency (SIDA). Partners in this network are Albania, Croatia, the Federation of Bosnia and Herzegovina, Kosovo, Macedonia F.Y.R., Montenegro, Republika Srpska, Serbia and Slovenia.

Activities to be carried out within SEEDNet are: the establishment and management of national plant genetic resources (PGR) programmes; PGR policy development; inventorying, collecting and exchange of PGR; characterization and evaluation of PGR; documentation of information on PGR and traditional knowledge related to plant use; development of infrastructure and the supply of equipment for PGR; conservation *ex situ, in situ, in vitro*, and on farm; and training, education and the raising of public awareness.

The governing body of SEEDNet is the Regional Steering Committee (RSC), consisting of the national coordinators on PGR from each partner. The RSC has established the following working groups: Cereals and Maize, Medicinal and Aromatic Plants, Vegetables, Fruit Crops and *Vitis*, Fodder Crops and Industrial Crops.

The SEEDNet Working Group for Fruit Crops and *Vitis* held its first meeting in Banja Luka (Bosnia and Herzegovina) on 8-9 September 2005, and established a strategy for *Malus* spp., *Prunus domestica*, *Pyrus* spp., *Prunus persica* and *Vitis vinifera.* The action plan includes an inventory of existing collections, education and training, collecting missions, and the establishment of regional databases.

Chair's report

K. Tobutt reported on developments since the previous meeting, held in Hungary in 2003, under ten headings.

There have been various changes in membership and 11 participants, including the ECP/GR staff members, had not previously attended meetings. The report of the Hungary meeting is available on-line and will be published, along with the report of the current meeting, in 2006. The workplan drafted at that meeting has been integrated into a document for the ECP/GR Steering Committee and will be discussed and revised later in the meeting. K. Tobutt and Marc Lateur, Chairman of the *Malus/Pyrus* Working Group, have drawn up a workplan for the three Working Groups on *Prunus, Malus/Pyrus* and *Vitis* in their role as members of the Fruit Network Coordinating Group and this too will be discussed. There has been a change of personnel at the European *Prunus* Database with Emilie Balsemin replacing Anne Zanetto; the database structure has been revised and the cherry accession files updated – and the EPDB went on-line in September 2005. Françoise Dosba and Anne Zanetto published a paper describing the activities of the Group.[6] The *Prunus* Genetic Resources Newsletter was compiled by Mihai Botu and distributed in September 2005; it includes reports on the workplan and the database and the paper by Dosba and Zanetto just mentioned, together with articles from nine countries. Lastly, *Prunus* was chosen as a model genus for the development of the concept of "A European Genebank Integrated System" (AEGIS), and a subgroup of the Working Group on *Prunus* attended briefing meetings in November 2004 and June 2005; their draft response to the AEGIS proposal was circulated to the WG members in the previous week and is an important item on the agenda.

The European *Prunus* Database (EPDB)

Progress of the EPDB

Emilie Balsemin, the new *Prunus* Database Manager, warmly thanked all the curators for their hard work in updating the cherry data. As agreed in June 2005, the Cherry Database was put on-line in September. It is accessible from http://www.bioversityinternational.org/links/selectcrop.asp or from http://www.bordeaux.inra.fr/urefv/base/.

The following freely available tools (non-Microsoft) were chosen for the development of the database: MySQL as the database management system, PHP as the application programming interface and Apache as the Web server program. The database is hosted by the INRA partner "Centre de Bioinformatique de Bordeaux" (Bioinformatics Platform of Bordeaux), France. Two permanent staff at the INRA institute worked part-time on the technical development of the EPDB. The *Prunus* Database Manager also imported data into the database.

Regarding the Web interface, there are three levels of access: "Public access", "Partner access" reserved to the ECP/GR *Prunus* Working Group members and "Private access" restricted to the *Prunus* Database Manager. E. Balsemin added that it is possible to keep some accessions and some protected data in the "Partner access" section. She explained the different accession codes used in the database. The accession code given by the curator institute is called the "Institute accession code", which is visible only in the "Partner access" section, and the Database Manager also assigns an internal code to each accession.

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[6] Dosba, F. and A. Zanetto. 2004. The *Prunus* European Cooperative Programme for Genetic Resources: a networking activity for the European *Prunus* Database and the challenge for European collections. Journal of Fruit and Ornamental Plant Research 12:77-85 (special ed.)

During the year, E. Balsemin was commissioned to develop the Cherry Database. Preformatted Microsoft Excel® files were sent to all curators known to the EPDB manager for updating the cherry data and a first test version of the new database was put on-line in September 2005. Subsequently, new updated cherry data and comments on the Web interface were received by the database manager, who could therefore further improve the database. A new version has just been put on-line which includes more than 2700 accessions (70% *Prunus avium*, 27% *P. cerasus*, 2% cherry-related species and 1% hybrids) (Table 1).

Table 1. Number of accessions registered in the new Cherry Database

Country	*P. avium*	*P. cerasus*	Hybrids	Other spp.	Total
Belgium	4	0	0	19	23
Czech Republic	219	90	0	1	310
France	75	25	10	0	110
Germany	235	103	0	0	338
Hungary	89	120	0	0	209
Italy	784	218	0	0	1002
Poland	0	120	1	2	123
Portugal	24	0	0	0	24
Slovakia	23	20	0	0	43
Spain	49	7	4	2	62
United Kingdom	384	24	18	38	464
Total	**1886**	**727**	**33**	**62**	**2708**

For the next two years, E. Balsemin suggested that she should work to improve the Cherry Database[7]. When it is ready, its structure will be copied and adapted to the databases for the other crops by changing the specific descriptors. As soon as possible she will send the preformatted files to the *Prunus* Working Group members and to curators for *Prunus* species, except for cherries and their related species. Then the updated data will be imported into each database.

Discussion on further improvement of the EPDB

During the sixth meeting of the *Prunus* Working Group, all the participants had agreed a list of "queries". In the current Cherry Database it was not possible to provide a list of institutes, but it was agreed that a complete list of the curator institutes be made available using a hypertext link from the home page of the database.

Regarding the compatibility with EURISCO passport descriptors, only 18 of them were in common with the EPDB descriptors. It was noted that the 2001 version of the FAO/IPGRI *Multi-crop Passport Descriptors* (MCPDs), which was subsequently used for EURISCO, had never been implemented in the EPDB. The question of harmonizing certain EPDB descriptors with EURISCO descriptors was addressed. L. Maggioni reiterated that EURISCO is a multicrop database of passport data compiled from national lists, which in due course may subsume the central crop databases at least for passport data. He explained that harmonization of the descriptors would aid transfer of data between databases. E. Balsemin circulated a list of the potential changes.

K. Tobutt pointed out that most members of the Working Group knew very little of EURISCO. Many of the potential changes seemed straightforward, e.g. from "1" to "100" for "Wild", and from "Primitive cultivars" to "Traditional cultivars". However, some of the descriptor states such as "Synthetic populations" were not appropriate for *Prunus* and he thought their inclusion with the preformatted Excel files circulated for completion by

[7] An improved version of the Cherry Database was already put on-line in February 2006, including new modifications that were suggested by the members of the ECP/GR *Prunus* Working Group during the Larnaca meeting.

curators might cause confusion. After discussion it was agreed that for the descriptors relevant to *Prunus* the new descriptor states and codes should be incorporated in the EPDB. It was also agreed that certain other revisions would be made to maintain consistency with the 2001 update of the FAO/IPGRI *Multi-crop Passport Descriptors*. However, regarding "Species authority", "Subtaxa authority", and "Common crop name", it was suggested that it would generally be simpler for those details to be entered by the EPDB manager rather than by the individual curators.

The style of the accession name should be standardized so that only the first letter of main words should be uppercase. A common "European accession code" was not considered necessary since the creation of an additional number attached to the accession would risk generating confusion.

A proposal that diacritical marks should be omitted from names in the EPDB to aid searching was discussed and it was agreed that the Chair would consult with the *Allium* Working Group. K. Tobutt subsequently reported that this Group indeed requested anglicized spellings and the proposal to omit diacritical marks from the EPDB was agreed.

To link better the synonyms and duplicates, the use of an additional descriptor called "Corrected name" had been proposed which would be a "consensus" name for a group of synonyms. M. Lateur reported that the *Malus/Pyrus* Working Group used the term "Patronym" for this. However a check in the dictionary after the meeting indicated this term was inappropriate and K. Tobutt suggested instead the term "Euonym" which was agreed.

Another possible way to improve the identification of duplicates is the concept of the "duplicate group". E. Balsemin showed how the Cherry Database could group identical accessions, especially those distributed from the same institute. The Group agreed that identification of duplicate groups should be pursued further. The importance of providing information, when available, on the donor institute of each accession, was stressed.

AEGIS (A European Genebank Integrated System)

Introduction to the AEGIS project and vision for the future

In a brief introduction, Birgitte Lund, AEGIS Coordinator, described the current situation of collection holdings and genebanks in Europe. It was noted that AEGIS concerns the region covering the geographically defined "Europe", including Russia and the Caucasus, with 44 potential member countries of which currently 38 contribute to the ECP/GR collaborative programme.

A proposal for a project on how to share conservation responsibilities within Europe was submitted to the ECP/GR Steering Committee in 2003. As a result, the ECP/GR Steering Committee decided to initiate and fund a two-year feasibility study on creating "A European Genebank Integrated System" (AEGIS). The AEGIS Project started mid-August 2004 and will be finalized in mid-August 2006. Four model crops within the project have been selected, namely *Prunus* and *Allium* (both non-Annex I crops of the International Treaty), *Avena* and *Brassica*. An AEGIS Steering Committee was appointed. Partners invited to join the AEGIS project represent a total of 25 countries (11 individual countries, the Nordic Gene Bank (5 countries), and SEEDNet (9 countries)). The objective of the project is to come up with a set of recommendations on how to develop an integrated genebank system in Europe based on the analysis of organizational, structural, technical, legal and financial aspects. Special emphasis was given to the tasks of the project partners during the project. Project partners are expected to: assess alternative models; propose models and discuss pros and cons of the models for the system; propose an organizational structure; analyze the concept of Most Original Accession/Most Appropriate Accession; draft guidelines on quality standards for

long-term conservation; and to consider application to other crops. These tasks will be addressed by the relevant crop subgroups and their reports will be compiled in a final report with recommendations for the attention of the ECP/GR Steering Committee. The recommendations are expected to be endorsed by the ECP/GR Steering Committee during its mid-term meeting in September 2006. Ideally, the implementation of an Integrated Genebank System could start in 2007, if the concept is endorsed by the ECP/GR Steering Committee.

The project partners will have three meetings during the project. A start-up meeting was held in November 2004, the mid-term meeting took place at IPGRI in Rome, June 2005 and the final meeting is planned for summer 2006. From our experience so far, it is apparent that there is a gap between the technical and political levels, which is a challenge. It is important to raise awareness of the benefits which will be conferred by a rationalized system and to disseminate the vision widely, lobbying, and convincing stakeholders in Europe.

A Local AEGIS Task Force has been set up at IPGRI and is developing a "Strategic Framework" paper on the opportunities for an integrated genebank system in Europe in collaboration with the AEGIS Steering Committee, the AEGIS Project Partners and several members of the ECP/GR Steering Committee. The Strategic Framework paper describes how existing genebanks in Europe can operate and collaborate more rationally by use of the best environmental and scientific conditions for conservation (e.g. regeneration and documentation), to define priorities and share resources to reduce gaps and duplication of efforts, and to improve quality of operations by applying agreed guidelines. The goal is to create a rational European plant genetic resources genebank system of genetically unique and important accessions (not restricted to the International Treaty Annex I crops), to ensure safe conservation in the long term, by maintaining genetic integrity and viability, to ensure continued use of the conserved germplasm and to facilitate easy access and standardized documentation via EURISCO and ECCDB.

The respective ECP/GR Crop Working Groups will set up criteria for AEGIS accessions to be accepted and designated in the system. Membership in AEGIS will be open to all ECP/GR member countries.

AEGIS member countries will sign a Collaboration Agreement and the countries will indicate genebanks/institutions voluntarily identifying and offering accessions to be part of AEGIS. It will then be the responsibility of the respective ECP/GR Crop Working Groups to identify AEGIS accessions, based on the "Most Appropriate Accession" (MAA) concept, to be accepted and designated to the system. ECP/GR National Coordinators will act as focal points within each country to facilitate the implementation of AEGIS. The ECP/GR Steering Committee will have overall responsibility for the system.

The benefits of AEGIS are transparency of information, agreed quality standards of operation, joint planning for rational conservation, sharing of resources (facilities and expertise) and building on existing structures in a flexible system. The strategy is to have a virtual genebank with a centralized documentation system based on the respective ECCDB and EURISCO databases and with the participation of all members. The system is expected to evolve during the process of implementation.

A project proposal was submitted to the European Commission by the ECP/GR Steering Committee in September 2005 for a "concerted action" to improve coordination during the process of endorsement of this initiative. The partners in this proposal include the ECCDB managers in the AEGIS project. For further information, see the AEGIS homepage (www.ecpgr.cgiar.org/AEGIS/AEGIS.htm).

Update on activities of the AEGIS subgroup on Prunus

K. Tobutt reported briefly on the activities of the subgroup, which comprised Anne Zanetto/Emilie Balsemin (EPDB managers), János Apostol/Zsuzsanna Békefi (Hungary),

Daniela Giovannini (Italy), Vladislav Ognjanov (SEEDNet), Victor Ryabchoun (Ukraine) and Kenneth Tobutt (United Kingdom and Chair of the *Prunus* Working Group). They met in Alnarp, Sweden in November 2004 and formulated an initial response to the AEGIS proposals, which was reported to the Working Group in the *Prunus Genetic Resources Newsletter* No. 5. They met again in Rome in June 2005 and drafted a more detailed response which was circulated to the full Working Group (attending and corresponding members) in November 2005. The subgroup had chosen cherry as a model to investigate how AEGIS accessions could be identified from the European *Prunus* Database and E. Balsemin had started to update the cherry accession lists accordingly.

Demonstration of the use of the database for identification of AEGIS accessions

E. Balsemin made a presentation of the use of the EPDB as a tool for identifying AEGIS accessions using cherry data as a model.

She reminded participants that, during the second AEGIS meeting in June 2005, the representative members of the *Prunus* Working Group proposed that ideally the MAA should be true to name, held in the country of origin, virus-free, accompanied by passport data and characterized morphologically or with markers. If none of the accessions of a given identity meets all these criteria, then the order of the criteria should be taken as approximately reflecting their order of importance.

Among the passport descriptors which are already in the EPDB, eight passport descriptors were identified as relevant for the designation of AEGIS accessions on the criteria just mentioned. Characterization and/or molecular marker descriptors will also be important.

During the second AEGIS meeting, E. Balsemin had proposed to the *Prunus* representative members that the following new AEGIS-related descriptors be added to the EPDB:

- Offered to AEGIS System? (Yes or No)
- Date of inclusion in AEGIS System (Year)
- Date of exclusion from AEGIS System (Year)
- AEGIS status: primary status, reserve status or undetermined status
- AEGIS reasons for accepting/rejecting the accession (Text)

Regarding the procedure for designation of a given accession to the AEGIS system, the flow diagram that had previously been circulated to the Group was presented by E. Balsemin. A revised version is included as Appendix II (p. 114). It was agreed that the flow diagram needed to be tested and *Prunus avium* should be the model species for this task.

Finally, E. Balsemin demonstrated how the EPDB could be used to designate AEGIS accessions. She also pointed out that this process is possible and effective only if the information provided for each accession includes sufficient passport data.

Discussion

The inclusion of the AEGIS descriptors in the Cherry Database as a test was approved by the Group. It was noted that the management of these descriptors will be a task for the database manager (or for a crop subgroup) to consider.

It was noted that some of the criteria to be considered for the identification of MAA cannot be derived from the database (such as trueness to name).

M. Lateur drew attention to the desirability of including evaluation data as well as passport data. However, the Group agreed it was not feasible to evaluate material before inclusion.

It was pointed out that some countries might decide not to offer any accessions to the system, since they would not be able to accept long-term responsibility for conservation. B. Lund explained that offering accessions to AEGIS could be a way to highlight the importance of the material, even though the specific country could not guarantee the long-term conservation. She agreed to bring these concerns to the attention of the AEGIS Steering Committee.

The Prunus *Working Group approach to AEGIS. Discussion on the proposed steps for the implementation of the AEGIS concept for* Prunus

K. Tobutt presented the "draft response" document which had been prepared at the meeting of the *Prunus* subgroup in Rome for discussion and revision. Changes were suggested regarding the advantages of the decentralized system, the aims of the system, the nature of the accessions to be included, the numbers of trees to be maintained per identity and the possible role of cryopreservation. The text was modified and a few minor points were corrected or clarified. Comments from corresponding members received by mid-December will be dealt with likewise. The revised text is presented in Appendix III (p. 115).

Discussion on how to share tasks for the implementation of AEGIS

On the first day of the meeting the participants had been asked to complete a table indicating the degree of expertise they possessed in each of the following crop groups: cherries and allies; apricots; almonds; peaches; plums; inter-crop hybrids; other *Prunus* species.

K. Tobutt explained that he had originally planned to identify which members of the WG had the strongest expertise in cherries, to form a cherry subgroup to collaborate with E. Balsemin for the identification in the EPDB of the cherry accessions to be selected for AEGIS and to advise on questions of naming. However it seemed useful to extend this exercise and record the expertise of the Group members in all crop groups, so that eventually several "crop subgroups" could be set up.

The table containing the data gathered was distributed and discussed during this session. It was agreed that it could be useful to include additional expertise, e.g. of colleagues of Working Group members who were not expert in certain crops themselves. The table will be circulated for revision (see Appendix IV, p. 119).

Regarding the cherry subgroup, K. Tobutt suggested that it should comprise those members of the Working Group who had indicated expertise in cherry and who had supplied data sets to the EPDB earlier in the year. Thus, initially, Jan Blažek, Emilie Balsemin, Monika Höfer, János Apostol, Zygmunt Grzyb and Ken Tobutt would be members. It was agreed that the recommendations of the subgroups should be circulated to all members of the Working Group for information.

M. Lateur stressed the importance of meetings for Working Groups and suggested that the ECP/GR Steering Committee should provide for each ECP/GR Crop Working Group to meet every two years. K. Tobutt endorsed this recommendation, pointing out that it is the meetings that drive the progress of the Working Groups.

Wrap-up discussion on AEGIS

V. Trajkovski supported the vision for an integrated genebank system in Europe. M. Lateur also stressed collaboration at the subregional level. V. Ognjanov recommended "starting small and building up".

J. Blažek explained that the susceptibility of some *Prunus* crops to virus diseases could hinder the operation of AEGIS for *Prunus*. High health status material free from viruses was desirable. R. Socias i Company commented that to keep fruit trees free of viruses is utopian, but cryopreservation is not a solution at the moment for *Prunus*. V. Ognjanov thought Serbia might be able to make 50 cultivars virus-free and if other countries did likewise, a virus-free

collection could be established. V. Trajkovski endorsed the possible role of cryopreservation for maintaining virus-free material and, indeed, as a backup. I. Hjalmarsson proposed that the *Prunus* subgroup report should mention the role of cryopreservation. She explained that techniques for certain *Prunus* were being developed in Finland.

Regarding quality standards M. Lateur mentioned the development in the Organisation for Economic Co-operation and Development (OECD) of quality standards for the management of plant genetic resources.

L. Sekse commented that the AEGIS strategy offered great opportunities for conservation of genetic resources to become more efficient, especially with regard to *Prunus*. He pointed out that, although this point is not included in the Strategic Framework paper, AEGIS could be considered a tool for reducing the number of trees to be conserved in Europe. Following on from this, he suggested that opportunities for replacing duplicates with useful novel material, i.e. broadening the genetic basis, should be stressed. B. Lund answered that it is not the intention of AEGIS to advise countries on how to deal with non-AEGIS accessions.

K. Tobutt commented that with a reduced number of accessions there could be an opportunity to spend more funding on characterization, though there was a risk that many governments would just reduce funding. M. Höfer commented that she saw AEGIS as a chance to increase the quality of the collections, e.g. by replacing newer varieties obtained from international collections with older varieties from the country of origin which would be more interesting to work with.

I. Hjalmarsson explained that in the Swedish National Programme currently, 50 varieties of *Prunus* are identified as being important for Sweden and will be offered to AEGIS. Each accession will be maintained in a central collection and as reserve/backups in local clonal archives around the country. Contracts are made with the local clonal archives. The intention is to keep the accessions virus-free.

M. Oliveira pointed out the benefits of cooperation with NGOs. This link with the public was supported by I. Hjalmarsson who explained that the local clonal archives in Sweden are maintained where the public can visit them. M. Lateur agreed about the importance of linking plants with people but stressed that good coordination is necessary. A. Braun-Lüllemann explained that people in some of the NGOs not only have knowledge on pomological subjects but also know the locations of old tree cultivars. D. Szalatnay explained that awareness among the public can be increased by having many collections spread around the country.

Molecular characterization of *Prunus* collections

Molecular markers for managing Prunus *collections*

K. Tobutt introduced the subject of the opportunities offered by microsatellite markers for managing *Prunus* collections. He explained briefly how microsatellite primers could be used to produce convenient numerical allelic data; typically a genotype of a diploid would comprise one or two 3-digit numbers which could easily be entered in a database. Surveys of cherry accessions in the collection at Brogdale, UK with 8 microsatellites and of peach accessions in Sicily with 13 microsatellites had indicated a substantial number of duplicates which could be discarded. Although microsatellites promised to prove very useful tools to inform decisions, various problems could be encountered. Some 200 *Prunus* primer pairs were available but maybe only 10% would work successfully in a range of crops. Results could vary from laboratory to laboratory. Some primers gave erratic results and should be avoided. Minor variation might occur within a cultivar. And scoring of polyploids could be tricky. If microsatellite data were to be included in the EPDB, consideration should be given

to the choice of primers, the harmonization of data sets, and the need for reference cultivars, as well as the consequences of intra-cultivar variation and the problems of polyploids.

Discussion on incorporation of molecular data into the EPDB

M. Oliveira said the presentation agreed with her own experience and stressed the need to use reference cultivars to harmonize data sets. She recommended that these reference genotypes should be provided conveniently in the database.

E. Balsemin demonstrated how fingerprinting data from an agreed set of microsatellites should be entered in the EPDB with the following fields: type of marker, name of marker, allele number. L. Maggioni pointed out that the *Vitis* Working Group had already discussed the incorporation of SSR markers in their database, and E. Balsemin agreed to check with the European *Vitis* Database manager for advice. She will prepare a proposal for the inclusion of a limited set of SSR markers into the EPDB and will circulate it to all the *Prunus* WG members for comments.

Planning of workshop on fingerprinting of Prunus

K. Tobutt explained that, as reported in the *Prunus Genetic Resources Newsletter*, the Fruit Network Coordinating Group had proposed that a workshop on microsatellites be held for some members of the *Prunus, Malus/Pyrus* and *Vitis* Working Groups. The intention was to hold this at East Malling Research, UK in the first week of April 2006 to discuss the issues raised in the presentation (above) and to identify a set of "universal" primers for *Prunus* (and for *Malus/Pyrus*). After the meeting, M. Lateur representing the *Malus/Pyrus* Working Group asked for the workshop to be postponed and it was rescheduled for December 2006.

Opportunities to submit a project proposal (AGRI GEN RES 870/2004)

The suggestion of L. Sekse that a small group should meet after the afternoon session, to see if an outline proposal could be formulated, was agreed. This group, under the leadership of M. Lateur, later reported that they had drafted an outline proposal entitled "Sustainable management of European Fruit Tree Biodiversity and Enhancement of its Utilization (BIODIFRUIT)". This would cover *Prunus, Malus* and *Pyrus*. There would be seven workpackages, covering the harmonization of fruit tree central databases, provision of national fruit passport data to the EURISCO catalogue, establishment of a common methodology for the use of molecular markers, implementation of the European collection concept according to the AEGIS strategy, improvement of utilization of fruit tree genetic resources on the basis of case studies, the increasing of interaction between institutes and NGOs, and dissemination of results and the improvement of public awareness.

The draft outline proposal will be circulated to the entire *Prunus* and *Malus/Pyrus* Working Groups for comments. M. Lateur and K. Tobutt will act as project coordinators. More information on the EC Regulation is available from:

http://europa.eu.int/comm/agriculture/envir/biodiv/genres/call_en.htm

Prunus Newsletter

Account of the preparation of issue 5

Mihai Botu gave a short report on the production and distribution of issue 5 of the Newsletter. He reported that he had received articles from 11 countries and various other reports. He thanked K. Tobutt for revising the Newsletter and the ECP/GR Secretariat for

ensuring its distribution. Some 300 copies were circulated in September 2005. The Group acknowledged the usefulness of the Newsletter and thanked M. Botu for his good work.

Plans for the preparation of issue 6

After discussion it was agreed that M. Botu and E. Kaufmane, assisted by D. Benediková, would coordinate the production of the next issue, and that IPGRI would take charge of the mailing distribution as for the previous issue. All members present agreed to provide contributions *by December 2006*.

The International Treaty and the Material Transfer Agreement for *Prunus* germplasm exchange

L. Maggioni gave a presentation on the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the international process for its implementation. This presentation, prepared by Gerald Moore, IPGRI, explained that the Treaty was adopted by the FAO Conference by consensus in November 2001 and entered into force on 29 June 2004. At present, 77 States and the EC are Parties. It was necessary to negotiate the Treaty, during a process that lasted seven years, since the CBD alone did not go far enough towards settling the problems of plant genetic resources for food and agriculture. However outstanding issues of PGRFA were left to be settled, including access to *ex situ* accessions collected prior to the entering into force of the CBD in 1993.

The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use, in harmony with the CBD, for sustainable agriculture and food security.

The main achievement of the Treaty is the establishment of a Multilateral System of Access and Benefit-Sharing, which will ensure facilitated access to genetic resources related to a list of crops (Annex I of the Treaty). For these crops, genetic resources under management and control of Contracting Parties and in the public domain are pooled, in the sense that there is no individual owner with whom individual contracts for access and benefit-sharing must be negotiated. This means that there are very low transaction costs, to the benefit of farmers, plant breeders and researchers, and ultimately of consumers. It also means that benefits must be shared in a pooled, multilateral way. In this way, the Treaty overcomes the situation created by the CBD, whereby bilateral agreements needed to be established between the Parties involved in germplasm transactions.

A Standard Material Transfer Agreement (SMTA) will be the unique document to use for germplasm exchange from the Multilateral System. This document will be finalized and approved by the Governing Body of the Treaty, possibly during its first meeting in June 2006.[8] The SMTA will permit the conditions of the Multilateral System to be brought into operation. This will include the provisions that the exchange of germplasm be made solely for purpose of utilization and conservation for research, breeding and training for food and agriculture, expeditiously with no need to track individual accessions, and that all available passport data and other non-confidential information should also be exchanged. It will not be possible to claim intellectual property or other rights that limit facilitated access to the plant genetic resources for food and agriculture, or their genetic parts and components, in the form received from the Multilateral System. Recipients shall continue to make the materials received available to other Contracting Parties.

[8] The first session of the Governing Body of the Treaty agreed on a text for the SMTA. This is available at http://www.fao.org/AG/cgrfa/gb1.htm

The Treaty includes ground-breaking, innovative provisions for monetary benefit-sharing; thus if a product that incorporates material from the Multilateral System is commercialized in such a way that it is not "available without restriction to others for further research and breeding", a mandatory payment will be made. On the other hand, if the product remains available without restriction to others, payment is voluntary. These funds will be used in the context of the Treaty's Funding Strategy, to implement activities under this Treaty, such as those related to the conservation and sustainable use of PGRFA, following the Global Plan of Action.

Unfortunately, *Prunus* is not listed among the Annex I crops and therefore germplasm exchange will continue to be subject to the provisions of the CBD. However, among the supporting components identified by the Treaty, an important role is assigned to international networks, such as ECP/GR, in order to achieve as complete a coverage as possible of plant genetic resources. This can be considered an opportunity offered to the Networks to extend the provisions of the Treaty to more crops than those listed in Annex I, on the basis of specific network agreements and on a regional basis.

A revised version of a learning module related to Law and Policy of relevance to the management of PGR is available on CD-ROM. It was published by IPGRI in October 2005 and can be requested from bioversity-publications@cgiar.org.

Discussion

In discussion, L. Maggioni pointed out that many of the implications of the documents were still uncertain. It was not entirely clear whether entering a new cultivar for plant breeders' rights would initiate benefit-sharing. And it appeared that purchasing genetic resources commercially would avoid MTAs and the consequent obligations. L. Maggioni agreed to seek clarifications from legal advisers. This was done after the meeting, and the reply from IPGRI legal expert, G. Moore, is reported below:

The Treaty provides for benefit-sharing only when there is commercialization of a product incorporating material obtained from the Multilateral System. The mere act of applying for Plant Breeders' Rights would therefore not be sufficient to spark off the benefit-sharing provisions of Article 13.2(d)(ii). It is however correct to say that, if the product were commercialized under Plant Breeders' Rights only, and not patents or other form of restriction that would limit further availability for research, breeding or training, then the benefit-sharing under Article 13.2(d)(ii) would be voluntary and not mandatory.

Regarding the MTA, two cases can be considered:

- If the PGRFA is in the Multilateral System, i.e. it is under the management and control of a Contracting Party and in the public domain, or has been put voluntarily in the Multilateral System, then there is no question of purchasing it commercially, since the material must be provided free of charge.
- If the material is not in the Multilateral System, then the provisions of Article 13.2(d)(ii) would not apply in any case. Normally, access to such germplasm would be subject to negotiation with the country holding such material, where it is the country of origin or where it has acquired the material in accordance with the CBD. This then would be under the CBD, even though the material is PGRFA of a crop listed in Annex I to the Treaty. For the most part landraces accessed from farmers' fields would not be in the Multilateral System, unless they were to be accessed via a Government genebank collection.

Scientific contribution

Some new activities on Belgian Prunus *fruit tree genetic resources*

M. Lateur described recent developments in Belgium on *Prunus*.

- **Commercial *Prunus* crops**

The following changes have occurred. The Fruitteelt Centrum, Katoliek Universiteit Leuven (Rillaar) has stopped its trials on sweet and sour cherry (cultivars, rootstock and pruning) and plum. The Proef Centrum Fruit (PCF) at Velm (+ Centre Fruitier Wallon at Merdorp) has taken over these activities, as well as pome fruit variety trials.

There is a significant decrease in plum growing, a small increase in sweet cherry ('Gisela 5'), and a small decrease in sour cherry.

- **Genetic resources**

The Boomgaarden Stichting (NGO) is planting plum and cherry standard tree orchards for landscape purposes and collection. At the Fruitstreek Museum (Borgloon), a collection is grown of old cherry cultivars and public awareness events are also held there ("Cherry Day"). At the Centre de Recherches Agronomiques (Gembloux), the cherry repository orchards of the former Fruit Growing Research Station (Dept. of Biotechnology) were merged with the peach orchards of the Dept. of Biological Control and Plant Genetic Resources (PGR). When the cherry collection (80 accessions) was grafted on 'Inmil' and 'Damil' rootstocks many incompatibility problems were encountered due to virus; these were resolved after grafting on 'Gisela 5'.

Activities of the Biotechnology Dept. (Magein, Druart) include: testing new commercial cherry cultivars (237 sweet cherry and 24 sour cherry); breeding dwarf cherry (hybrids of 'Damil') and plum rootstocks; and renewal of the 40-year old collection of botanical *Prunus* spp., with 120 accessions.

At the Biological Control and PGR Dept., characterization and evaluation on 140 old plum accessions has stopped after 15 years. A new evaluation orchard was planted for 36 new plum accessions, to allow characterization for nine descriptors and the setting up of a plum stone collection. A new evaluation orchard has been planted for sweet (25 accessions) and sour cherry (5 accessions + 5 breeding selections) and peach (10 accessions). The search for novel local material ("prospection") continues as does identification of old cultivars for the public (600 to 1000 samples of fruits/year). Public awareness activities include organization of open-door days for the collections (1/year), organization of or participation in horticulture and pomology exhibitions (25/year) and presentation of lectures (5/year).

- **Project on safety-duplication of a well evaluated *ex situ* collection by developing "on-farm" orchard networks**

At the moment, there are 19 orchards (42 ha) of standard trees of pome fruit genetic resources, which combine safety-duplicated material and local accessions.

This winter (2005-2006), an orchard duplicating part of the cherry and plum collection will be established; the goal is to duplicate 190 plum and 50 old cherry cultivars.

The aim is to involve local people in the management of their own local biodiversity, by lectures, by help in the organization of "prospections", by undertaking identification and selection work, by teaching people how to plant, how to graft and how to prune; and by collaborating with NGOs, environmental associations, farmers, schools, local administrations and the private sector.

This project is based on the following principles: a dynamic approach involving local people; giving the possibility to re-introduce lost cultivars to the original location; helping

the continuing dynamic genetic evolution of fruit tree genetic resources by interacting with the environment, animals and human activities; and developing environmental, pedagogic and economic approaches.

A well coordinated Network is an absolute necessity and a database for traceability of material should be developed. Moreover there is a need to establish legal collaboration agreements between partners to ensure long-term duration of the commitment and continuing access to material.

Updating the workplan of the *Prunus* Working Group

The workplan for the period 2006-2008 which had been developed from discussions during the meeting was summarized in the table attached as Appendix V (p. 120).

Network Coordinating Group

The Group discussed the composition of the Fruit Network Coordinating Group (NCG), keeping in mind that this Group will meet in Bonn in March 2006 together with all the other NCGs, to discuss progress and future developments of the Fruit Network. Considering the importance of documentation issues for the Group and the need to share experiences across groups, it was suggested that the Fruit database managers be represented in the NCG. Consequently, the Group requested that the EPDB manager, E. Balsemin, be included as a member of the Fruit NCG.

Closing session

Presentation of the report and adoption of recommendations

Following an enjoyable and interesting field excursion to the Experimental Station of ARI at Zyghi and to Lefkara, a typical Cypriot village, the draft report was circulated, discussed and adopted by the Working Group with minor modifications.

Selection of the Working Group Chair and Vice-Chair

The Working Group unanimously invited Ken Tobutt to continue in his role of Chair and he was pleased to accept this role until the end of the next Working Group meeting, together with Daniela Benediková, as Vice-Chair.

Closing remarks

It was noted that the next meeting of the Working Group could not take place before the next Phase (VIII) of ECP/GR, as this depended on the Steering Committee decisions on the continuation of the programme after 2008. An offer was made by E. Kaufmane to host the next *Prunus* Working Group meeting in Latvia and the Group gratefully welcomed this offer.

K. Tobutt addressed the Group with a few final remarks, saying that he had enjoyed the meeting and found it extremely useful, due to the importance of direct contact with the Group members in facilitating progress and decision-making. He thanked the Vice-Chair, D. Benediková, for her collaboration in managing the Group and the local organizers, Costas Gregoriou and his technical assistant Costas Eracleous, for the excellent support throughout the meeting. He also thanked the ECP/GR Secretariat, including in particular Lidwina Koop and Aixa Del Greco, who were not present at the meeting, but who had provided excellent support from the office in Rome. Overall, K. Tobutt felt that this meeting had significantly

advanced progress in the conservation of *Prunus* genetic resources in Europe and had opened promising opportunities for the near future.

C. Gregoriou thanked all the participants and said that he enjoyed hosting this meeting and thought it had been very fruitful.

PART III. PRESENTATIONS AND PAPERS

Note: In most cases the information provided at the time of the Sixth Meeting in Budapest was updated for the Seventh Meeting in Larnaca and/or at time of publication. In other cases, a footnote indicates that the information published here reflects the situation as of June 2003.

National collections

Status of* Prunus *germplasm in Albania **29**
Adriatik Çakalli, Ilir Çiçi, Endrit Kullaj and Arben Myrta
Wild plums in Armenia **32**
E.Tz. Gabrielian and A.A. Nersesian
Status of the* Prunus *collections in Bulgaria **35**
V. Dzhuvinov and V. Bozhkova
Conservation and utilization of* Prunus *genetic resources and evaluation of the fruit of ten cherry cultivars in Cyprus **36**
Costas Gregoriou
Status of the* Prunus *collections in the Czech Republic **42**
Jan Blažek
An inventory of plum and cherry cultivars of Estonian origin **45**
Kalju Kask and Heljo Jänes
Status of the* Prunus *collection in France **49**
Emilie Balsemin
Status of* Prunus *collections in Georgia **51**
Zviad Bobokashvili
New organization of the Fruit Genebank in Germany **53**
Monika Höfer
The Greek* Prunus *collection – Brief report on activities **54**
Ioannis Chatziharissis
Status of the* Prunus *collections in Hungary **55**
Zsuzsanna Békefi and János Apostol
Prunus *genetic resources in Israel* **58**
Doron Holland, Irit Bar-Yaakov and Kamel Hatib
Status of* Prunus *collections in Italy **61**
Daniela Giovannini and Petra Engel
Current situation of the Latvian* Prunus *collections – conservation, evaluation and characterization for the establishment of core collections **66**
Edite Kaufmane, Gunars Lacis and Laila Ikase
Prunus *germplasm status and investigation in Lithuania* **75**
Vidmantas Stanys and Audrius Sasnauskas
Prunus *genetic resources in the Nordic countries* **77**
Inger Hjalmarsson
Current status of* Prunus *resources in Norway **78**
Lars Sekse
The current status of the* Prunus *collections and their organization at the Research Institute of Pomology and Floriculture, Skierniewice, Poland **80**
Zygmunt S. Grzyb and Elżbieta Rozpara
Prunus *collections in Portugal – The almond situation* **82**
M. Margarida Oliveira and Vitor Cordeiro
Status of the* Prunus *collections in Romania **87**
Mihai Botu
Prunus *germplasm in Serbia and Montenegro* **89**
Vladislav Ognjanov

Status of the* Prunus *collections in the Slovak Republic **92**
Daniela Benediková
Research activities on* Prunus *germplasm in Spain – Status in 2005 **94**
Rafael Socias i Company
Swiss activities on* Prunus *genetic resources **97**
Markus Kellerhals and David Szalatnay
Prunus *genetic resources activities in Turkey* **99**
İlhan Özkarakas
UK* Prunus *genetic resources – an update on collections and characterization **100**
Kenneth R. Tobutt

Other communications

Molecular markers for* Prunus *genetic resources – some observations **101**
Kenneth R. Tobutt
Opportunities for cooperation between national institutes and NGOs – a chance to improve the conservation and protection of genetic biodiversity of fruit trees in Europe **102**
Annette Braun-Lüllemann
The EUFORGEN Noble Hardwoods Network **104**
Bart De Cuyper
Selection and breeding of wild cherry (*Prunus avium *L.) at the Institute for Forestry and Game Management - A new generation of clonal seed orchards of wild cherry in Flanders **105**
Bart De Cuyper and Marijke Steenackers
The European* Prunus *Database (EPDB) – Status in December 2005 **107**
Emilie Balsemin

Status of *Prunus* germplasm in Albania

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Introduction

Plant genetic resources are one of Albania's greatest reserves of natural wealth. They are very important for the Albanian people, not only on the material level but also at the ethno-cultural and spiritual levels.

Climatic conditions here are very favourable for the cultivation of many plant species and horticulture represents one of the main sectors of the agricultural economy.

Albania is the heartland of many cultivars belonging to *Prunus* in the South-East of the Balkans. These cultivars have been adapted to modern agroecosystems through continuous natural and human selection, and because of their productive and quality values they can compete with many introduced cultivars.

There is evidence for the very old tradition of cultivation in the terms used to designate different varieties (e.g: *dhamoshqime* or *vardare*, *pistilke* or *miraboliana* for plums, *ujse*, *krisje* or *belica* for cherries, etc.). This rich diversity of cultivars and biotypes is spread out over the country and many of the cultivars are particularly well adapted to local soil and climate conditions (Fig. 1).

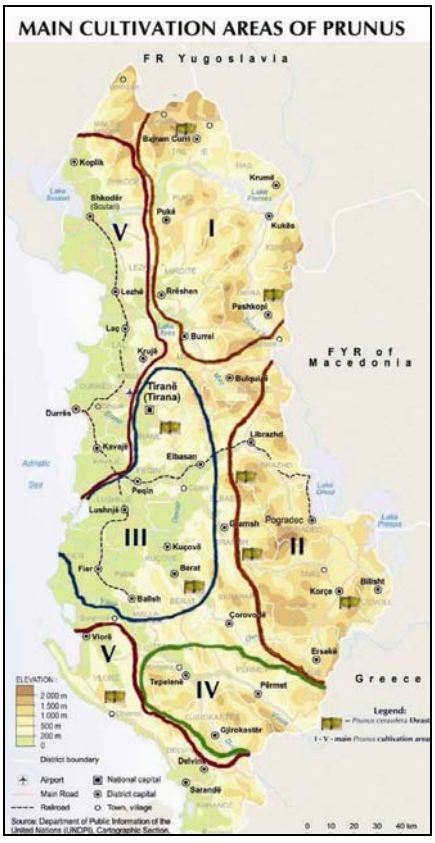

Fig. 1. Main cultivation areas of *Prunus* in Albania.

From this large number of cultivars, those with inferior qualities have not resisted the test of time and have consequently disappeared (or are gradually disappearing) because of the extraordinary amount of genetic erosion which took place during the transition period (1990–2000) and also because of virus diseases such as sharka (Myrta *et al.* 1996; Çakalli 1999), while others, those with superior qualities, are still in demand on the local market.

Prunus germplasm

Horticulture in Albania is based on the cultivation of both native and foreign varieties (Osmani *et al.* 1996). The stone fruit industry is characterized by a considerable number of native varieties, mainly of plum *(Prunus domestica)* and cherry *(P. avium)* but also peach *(P. persicae)*, apricot *(P. armeniaca)* and almond *(P. dulcis).* The cultivar 'Tropojane' alone represents more than 50% of plum trees and is cultivated both for fresh consumption and for dried prunes (Shqau *et al.* 1989). Other important native plum varieties are cvs. 'Kumbulla e Hasit', 'Shengjine', 'Çifte Elbasani', 'Kumbull Vlonjate', 'Vardare' (Dhamoshqine), 'Shqerake' (Miraboliana), 'Pistilka' and 'Gusie'. Some varieties' names refer to their particular fruit characteristics or to their geographical origin, e.g. cv. 'Tropojane' is named after the original area of cultivation.

Cherry accessions are mostly represented by 'Zhitoma', Zeza e Luznisë', 'Dollmas', 'Petrela', 'Ndroq', etc.

Among peaches, the most important local cultivars are 'Tapiza', 'Shklese Mishbardhë', 'Shklese Mishverdhë', 'Shatore', 'Sefa', 'Mishe', etc.; while for apricot, important accessions are 'Goxhasi', 'Ganiu', 'Fatmiri', etc.

Important accessions are also found for almond like 'Gujadëholla e Frakullës', 'Gujadëkuqja', 'Melçani', 'Nr.17', 'Çesku', 'Stambollesha', Zhitoma', etc.

Many of the native cultivars present in Albania (geographically distributed in all the *Prunus* areas of the country) call for attention because they constitute an essential genetic resource which is very precious for hybridization work and for stone fruit breeding.

The following species are found in Albania: *P. domestica*, *P. spinosa* L., *P. cerasifera* Ehrh., *P. cocomilia* Ten., *P. avium* L., *P. cerasus* L., *P. mahaleb* L., *P. persicae* (L.) Batsch., *P. armeniaca* L. and *P. dulcis.*

Because of the unjustifiable preference for foreign cultivars and the degraded sanitary status of *Prunus* at present, native cultivars are not currently very much appreciated and the percentage of native cultivars compared to the total number of varieties is decreasing. There is an immediate need for their preservation.

National collections

Prunus collections in Albania can be found both at research institutes and on private farms. Efforts to explore the *Prunus* native germplasm in Albania from the Fruit Science Institute in Vlora, which is responsible for the collection and maintenance of fruit trees in Albania, has found so far many important accessions (Table 1). This collection is made up of foreign cultivars only, while the native plum varieties are so far found only in private farmers' orchards. As yet there is no national collection of native varieties.

Despite the attempts of the Albanian genebank to collaborate with other research institutes to collect and maintain *Prunus* and other stone fruits in Albania, a great amount of work is still needed in this area. Attention should be given to the following problems:

- Degraded sanitary status of trees due to the presence of various viruses,
- Lack of adequate funds for the work of exploration, collecting and storage of native varieties,
- Unfair competition with other uncertified fruit tree seedlings entering the country at lower prices,

- Urban migration which decreases the care given on farms to the native cultivars,
- Lack of awareness at the farmers' level regarding the benefits of cultivating native cultivars or establishing new collections, difficulties in finding incentives for the farmers to maintain the local material, etc.

Table 1. The *Prunus* accessions in Albania

Section / germplasm	No. of accessions*
Section A: Plum	21
Shengjine 1, 2, 3, 4, 5, 6, Mirabolana L, Mirabolana G, Mirabolana B, Vardare Fatmirit, Vardare Xhevitit, Vardare Nikolles, Vardare Roze, Argjile, Mirabolan e kuqe, Mirabolan e verdhe, Çifte Elbasani, Oshafja, Shengjine Timit, Shengjine Ismailit	
Section B: Cherry	17
Petrela, Ndroqi, Zeza Fatmirit, Mezhdralle, Vishnja Ollges, Zhitome, Dollmasi, Kokermadhe zeze, Vonta tregut, Xhakrosa, Zeza Luznise, Ujse verdhe, Ujse kuqe, Ohje, Bukje, Ujse e zeze, E zeza	
Section C: Peach	8
Sefes, Tapiza No. 1, Qeraxhiasi, Pjeshka Nr. 1, 2, Qereka, Shpetimit, Shefqetit	
Section D: Apricot	7
Goxhasit, Fatmirit, Ganiut, Ajetit, Godoleshit, Mishe, Bajramit	
Section E: Almond	6
Stambollesha, Melçanit, Guackekuqja, Frakulles, Lapraka Nr.1, 2.	

* It should be noted that these accessions represent only part of the potential ones, as the exploration work is far from being considered as exhaustive.

Future efforts

More attention should obviously be given to the *Prunus* crops in preservation and utilization programmes, especially for the exploration and conservation of native varieties which should be undertaken immediately and be followed and sustained by on-farm conservation.

Major activities should include:

- Maintenance of the existing collections,
- Intensification of collecting missions for the best native varieties of plums, cherries and for other *Prunus* species (peaches, apricots and almonds),
- Undertaking of joint regional studies for clonal and phytosanitary selection,
- Breeding (sexual hybridization) especially with the Chinese-Japanese group and French Mirabelles in the case of plums,
- Establishment of new collections in the appropriate areas of cultivation, and
- Investment to solve the constraints due to the lack of funds.

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Wild plums in Armenia

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Armenia is a part of Transcaucasia (the Lesser Caucasus), which is well known as the site of active processes of plant speciation and has a long history of agriculture. Thus, Vavilov (1926) included Transcaucasia into the South-West Asian Centre of origin of cultivated plants. Armenia takes a special place among other countries of the Caucasian Region by the exceptional variability of its native plants. In spite of its small territory (about 30 000 km^2), this country possesses ca. 3500 plant species, more than half of all the species growing in the whole Caucasus. Almost all the main native crops of Southern Asia, the Mediterranean basin and the temperate regions of Europe grow in this country. This situation can be explained by a specific combination of geo-morphological features. Armenia is a mountainous country (average altitude is 1750 m above sea level) with extremely dissected relief, a high rate of seismicity, very steep slopes, and remoteness from oceans. This country lies on the junction of the mesophyllous Caucasian and the arid Armeno-Iranian floristic provinces, in the centre of the area (the Caucasus and Transcaucasus) that contributed significantly to the domestication of plants, particularly fruit crops, vegetables and spices (Gabrielian and Zohary 2004).

Armenia has a rich experience of horticulture, and plum cultivars are among the most well-known and widely cultivated fruit crops.

Garden plum (*Prunus domestica* L., 2n=6x=48), widely cultivated in Armenia, includes both the European plum cultivars (subsp. *domestica*), and the damsons, bullaces and greengages (subsp. *insititia* (L.) Schneid). Small-fruited wild-growing garden plum samples (spontaneous 6x *domestica* forms, fully inter-fertile with the crop) sporadically occur in this country. These are feral individuals which have escaped cultivation and grow mainly near human habitations. Garden plum has a hybrid origin. It is commonly accepted that garden plum is the result of complicated and repeated hybridization between cherry plum and sloe with further duplication of chromosome number, and that it never existed as wild forms (Kovalev 1955; Browicz 1969; and others). According to Zhukovsky (1971), the Caucasus is the centre of origin of garden plum, where wild cherry plum and sloe grow together and where wild hybrid individuals occur rather frequently. The areas of these two taxa often coincide even within the small territory of Armenia, although cherry plum has much broader distribution in this country (Figs. 1 and 2). Garden plum could not originate in Central Asia, because of the absence of wild sloe there (Zhukovsky 1971). If this theory is correct, then domesticated garden plum was probably introduced to the Mediterranean countries and Central Asia from the Caucasus. Farmers in the regions of introduction had very rich experience in cultivating figs, olives, etc., and managed to create many excellent cultivars of garden plum. According to recent data, sloe is not very close genetically to garden plum, although crosses are possible, producing mostly sterile F1 hybrids (Zohary 1992; Hanelt 1997; and others). Moreover, Zohary and Hopf (2000) recently suggested that sloe may contribute to the domestic genepool only through secondary hybridization.

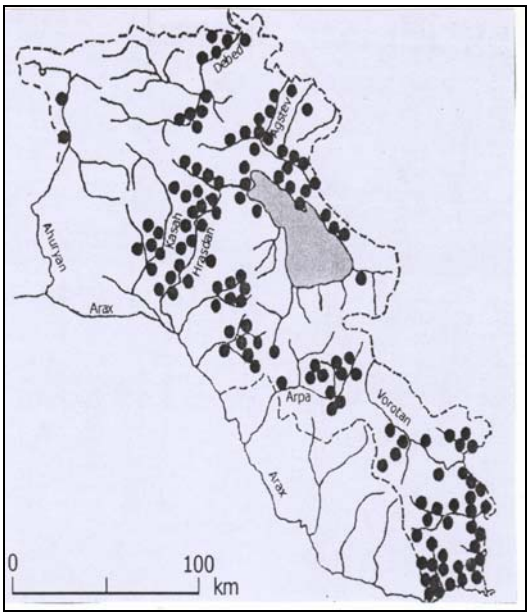

Fig. 1. Distribution of wild forms of cherry plum (*P. cerasifera*) in Armenia.

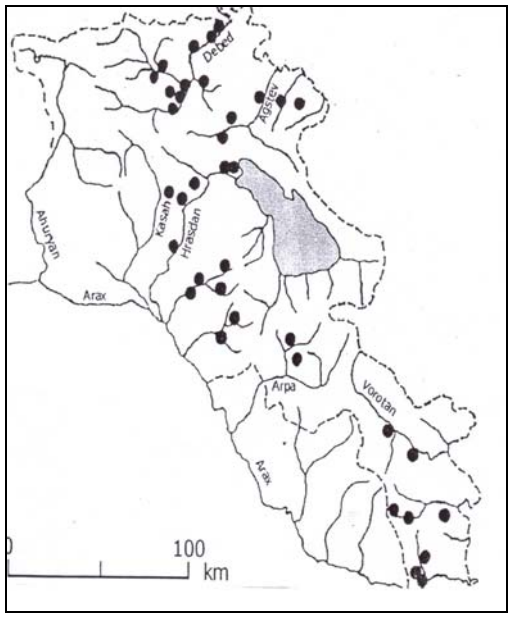

Fig. 2. Distribution of wild forms of sloe (*P. spinosa*) in Armenia.

Cherry plum [*P. cerasifera* Ehrh. (= *P. divaricata* Ledeb.), 2n=16, 32, 48] is a major fruit crop in the Caucasus. Hexaploid cherry plum cultivars cross easily with *P. domestica* (Beridze and Kvatchadze 1981). Wild forms of cherry plum are widespread in the South Balkan countries, the Caucasus, and South-Western and Central Asia (Browicz 1996). In Armenia, cherry plum is evidently native and is incredibly variable. It varies in the size of leaves (from 2 to 8-9 cm long), shape of leaves (ovate, obovate, elliptic, lanceolate, with obtuse, short-tapered, long-tapered apex), margin of leaves (crenulate, bicrenulate, serrate), degree of leaf pubescence (glabrous from both sides, pubescent along veins, densely or sparsely pubescent all over the surface), flower size (from 20 to 30 mm in diameter), shape of fruits (from round to ovoid-oblong), and fruit colour (yellow, red, pink, violet, black). These wild forms occur in almost all floristic regions of Armenia, on open rocky slopes, in broad-leaved oak, oak/hornbeam forests, bush thickets, in *shibliak*[9] formations and in oak and juniper open woodlands spreading from lower to upper mountain zones. Armenia, together with Iran and Azerbaijan, represents a primary centre of cherry plum breeding (Kovalev 1955) oriented mostly to sweet dessert cultivars. There is a series of very old Armenian cultivars of sweet cherry plum which can be consumed in the immature, green stage (for example, *black alycha* and *geogja* cultivars). According to data from chemical analysis (Demurian 1950) the highest content of sugars was found in *black alycha* (10.14%) and *geogja* (9.89%) cultivars. *Green alycha* cultivar showed the highest content of fructose (4.07%). The lowest acidity was established for *green alycha* and *geogja*. Such high contents of sugar and dry substance in Armenian cherry plum cultivars, as well as in other Armenian fruit cultivars, is explained by the climate conditions (very hot summer and an absence of precipitation during vegetative period across the greater part of the country).

Sloe (*P. spinosa* L., 2n=4x=32) is distributed in temperate parts of Europe, the Mediterranean basin, Caucasus, and Siberia (Meusel *et al.* 1965; Browicz and Zieliński 1990). Sloe is sparsely cultivated in central Europe and the Caucasus. Selected sloe clones with large, sweet and non-astringent fruits are cultivated in Armenia as well. Wild sloe forms are

[9] Shibliak: deciduous bush formation (usually secondary) in submediterranean regions, very common in Armenia.

quite widespread in Armenia (Fig. 2). For the wild forms of sloe in Armenia, we established great variability in leaf shapes (ovate, obovate, lanceolate), size of leaves (from 20 x 15 mm to 60 x 25 mm), leaf apex shape (acute, obtuse, tapered), length of petiole (5 mm, 12 mm, 18 mm) and fruit diameter (from 10 to 18 mm). They grow in bush thickets, at forest edges, and along rivers, and are found from low to high mountain zones.

Plum cultivars, as well as apricot cultivars, occupy a significant place in the everyday life of Armenians. Special cultivars bred for many centuries are used in certain soups and other dishes as fresh or dry fruits. They are added to sauces, gravies, jams, marinades, stewed fruits, liqueurs, etc. Plum *lavash* is a very specific and popular dish in Armenia: it is prepared as thin layers of sour or sweet dried fruit jelly.

Therefore, two native species of plum (*P. cerasifera* and *P. spinosa*) exist in Armenia which are widespread and extremely variable (particularly cherry plum). Obviously, these taxa contain a significant genepool which can be very valuable for the further breeding of plum cultivars.

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Status of the Prunus *collections in Bulgaria* [10]

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Fruit Growing Institute, Plovdiv, Bulgaria

The first statistical data on fruit growing in Bulgaria showed that in 1897, plum orchards represented 70% of all orchards in the country. Plum was the major fruit crop until 1965 when it became relatively less important in terms of planted areas and fruit production.

During the periods 1986–1995 and 1999–2000, *Prunus* species represented on average about 50% of the orchard areas and 40-50% of the fruit production in Bulgaria.

The first *Prunus* collection was established in 1929 at the Experimental Station for Fruit Growing in Dryanovo (Central Balkan Mountains).

Intensive work on the introduction of new cultivars of local and foreign origin was carried out in the 1960s and 1970s.

The major Bulgarian *Prunus* collections are located at the Fruit Growing Institute in Plovdiv and its Experimental Stations in Dryanovo, Silistra, Pomorie and Sliven, with a total of 1259 accessions, distributed as follows:

- *P. domestica, P. salicina* and *P. cerasifera* = 377 accessions
- *P. persica* = 228
- *P. avium* and *P. cerasus* = 176
- *P. armeniaca, P. dasycarpa* and *P. mume* = 359
- *P. amygdalis* = 119.

The Institute of Agriculture in Kyustendil also maintains 381 accessions of *Prunus* including *P. avium* (143), *P. cerasus* (147) and *P. domestica* (91).

This brings the total number of *Prunus* accessions at national level to 1640.

After political and economic changes in 1989 and owing to the subsequent economic crisis the maintenance of the collection has become very difficult. Dozens of samples die annually due to viral and bacterial diseases.

For the last 20 years there have been no expeditions to collect local resources, which risk being lost through changes in land ownership. In spite of the difficulties, the Fruit Growing Institute in Plovdiv has started the transfer of the old collections with the aim of preserving the remaining *Prunus* germplasm.

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Conservation and utilization of Prunus *genetic resources and evaluation of the fruit of ten cherry cultivars in Cyprus*

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Introduction

Prunus fruits are produced mainly for local consumption in Cyprus and only small quantities of cherries are exported. Since the liberalization of trade through the GATT Agreement, large quantities of *Prunus* fruits are imported from European countries. Imported products are sold at a lower price than those locally produced. This negatively affects the local market because the locally produced fruits, in many cases, have much higher production costs than the selling prices of similar imported commodities (Anonymous 2001).

Almonds have been cultivated in Cyprus since ancient times and are the most important nut crop in the country. They are grown, mainly rainfed, on 84% of the nut tree area and are found in compact plantations or mixed with other crops in all regions. They are also found scattered on uncultivated land. In 2000, the area cultivated with almonds was 3260 ha, the mean yield per ha was 0.6 t and the total production of in-shell almonds was 1422 t. In the same year, 300.9 t of shelled almonds were also imported to meet local demand (Markou and Mavrogenis 2002).

In 2000, the area cultivated with apricots was 220 ha, the mean yield per ha was 10 t and the total production was 2255 t. Cyprus is self-sufficient for fresh apricots and there are no imports of apricots or cherries from other countries. The consumption of fresh apricots in the country was 3.1 kg/head. The same year the area cultivated with peaches was 420 ha, the mean yield per ha was 8.3 t and the total production was 3485 t. In the same period 572 t of fresh peaches were also imported to meet local demand. The apparent consumption of fresh peaches in the island was 5.7 kg/head (Markou and Mavrogenis 2002).

In 2000, the area cultivated with plums was 240 ha, the mean yield per ha was 5.1 t and the total production was 1230 t. During the same period 81 t of fresh plums were also imported to meet local demand and the apparent consumption was 1.8 kg/head. The area cultivated with cherries in Cyprus was 260 ha, the mean yield per ha was 4.1 t and the total production was 1025 t. During the same year the apparent consumption of fresh cherries was 1.5 kg/head (Markou and Mavrogenis 2002).

Status of germplasm collections

Without exception, the *Prunus* germplasm collections in Cyprus are maintained as field collections in organized orchards or in screenhouses where they are grown in containers. These collections serve the multiple purposes of conservation and source of vegetative material for propagation. These genetic materials have been selected locally or imported from institutions of various countries. All the national *Prunus* germplasm collections belong to the Ministry of Agriculture, Natural Resources and Environment, and the Department of Agriculture has the responsibility for maintaining them in good and healthy condition by applying the proper cultural practices (Stavrides 1997).

- **Almond collections**

The almond tree has been well spread all over the country since very ancient times. Apart from the local almond biodiversity brought about by centuries of growers and nature interaction, many varieties have been introduced by the Ministry of Agriculture since 1930 (Argyrou 1998). In fact, the most two important fruit trees as far as biodiversity is concerned

in Cyprus are almonds and olives. Although the variability of the olive genetic resources in the island has been identified, characterized, conserved, evaluated and utilized (Gregoriou 1996, 1999a) unfortunately the same did not happen for almonds.

Table 1 shows the almond germplasm collections and the number of plants for each variety. The plants of basic planting material (BPM) are grown in an insect-proof screen house in plastic containers of 70 litres capacity whereas the plants of mother tree orchard (MTO) are grown in the open field. The variety 'Spanish' originates from Spain and is used only as pollinator for the variety 'Marcona', and 'Retsou' is a Greek variety (Argyrou 1998).

Table 1. Almond germplasm collections at Akhelia Station, Dept. of Agriculture

Variety	No. of plants	
	Basic Planting Material (BPM)	Mother Tree Orchard (MTO)
Ferragnes	18	36
Truoito	15	24
Spanish	24	12
Marcona	26	24
Retsou	-	12

An exploration and collection mission conducted during July–September 1996 in a village of Paphos District in Cyprus resulted in finding a total of 55 accessions of the local germplasm of almonds. The collection was jointly sponsored by the Agricultural Research Institute (ARI) and the Regional Office for the West Asia and North African Countries of the International Plant Genetic Resources Institute (IPGRI/WANA) and was organized in the framework of the IPGRI/WANANET project to collect and conserve wild and domesticated almonds of the region. Germplasm is conserved at the CYPARI Genebank at 0°C to 4°C. Duplicates were sent to the Regional Officer of IPGRI/WANA for characterization and long-term conservation at the Plant Tissue Culture Laboratory Just, Irbid-Jordan (Della and Gregoriou 1997).

- **Peach collections**

The germplasm of peach is listed in Table 2. There are 15 varieties in the BPM collection located at Saittas Station of the Department of Agriculture. The plants of this collection are grown in plastic containers (70 litres) in an insect-proof screenhouse. The MTO collection is located at Orites Station of the Department of Agriculture. In this collection there are 17 varieties grown in the open field.

Table 2. Peach germplasm collections at Saittas and Orites Stations, Dept. of Agriculture

Variety	No. of plants	
	Basic Planting Material (BPM) Saittas Station	Mother Tree Orchard (MTO) Orites Station
Florda King	3	14
Royal April	-	5
Royal Gold	-	5
Red June	-	5
Springtime	3	15
Swellen Crebel	3	12
Dixired	3	16
Flavorcrest	3	16
Springcrest	3	5
Fayet	3	15
J.H. Hale	3	16
Pullard	3	18
Independence	3	18
Flavortop	3	18
Fantasia	3	18
Fairlane	3	18
Armking	3	18
Redhaven	3	-

- **Apricot collections**

Table 3 shows the germplasm of apricot. There are 15 varieties in the BPM collection located at Saittas Station. The plants of this collection are grown in plastic containers (70 litres) in an insect-proof screenhouse. In the MTO collection there are 17 varieties grown in the open field. The collection is located at Orites Station. The variety 'Galatas' is a local one, whereas 'Pempekou' and 'Tyrinthou' are of Greek origin.

Table 3. Apricot germplasm collections at Saittas and Orites Stations, Dept. of Agriculture

Variety	No. of plants	
	Basic Planting Material (BPM) Saittas Station	Mother Tree Orchard (MTO) Orites Station
Tyrinthou	3	13
Galatas	3	13
Pempekou	3	14
Canino	3	13
Luizet	3	11
A226	3	14
Boccuccia Spinosa	3	14
Boccuccia Liscia	3	14
Gouro	-	15
San Castrese	3	-
Ninfa	3	-
Moniqui	3	-

- **Cherry and plum collections**

Table 4 shows the cherry germplasm conserved in Cyprus. There are two MTOs. The first one is located at Kyperounta Station with 18 varieties and the second one at Kouklia Station with 7 varieties. Both stations belong to the Department of Agriculture (Stavrides 1982).

Table 4. Cherry germplasm collections at Kyperounta, Orites and Saittas Stations

Variety	No. of plants		
	Mother Tree Orchard Kyperounta Station	Mother Tree Orchard Orites Station	Variety evaluation Saittas Experimental Station
Vista	4	-	-
Bigarreau Napoleon	9	-	-
Hedelfinger	7	-	-
Viva	4	-	-
Bigarreau Burlat	12	-	6
Divignola Prima	8	-	-
Vogue	4	-	-
Christobalina	2	-	-
Veronia	2	-	-
Malizia	1	-	-
Temprana de Soto	2	-	-
Bing	4	-	-
Black Tartarian	8	-	6
Moreau	4	-	-
Rainier	7	-	-
Hudson	7	-	-
Stella	11	-	-
Van	-	-	6
Utah Giant	-	4	6
Bigarreau Febrolus (Verdel)	-	4	6
Bigarreau Fercer (Arcina)	-	4	6
Bigarreau Summit	-	4	6
Bigarreau Reverchon	-	4	6
Griotte du Nord	-	3	6
Bigarreau Lapins	-	4	6

In 1999, a variety trial was established at Saittas Experimental Station of ARI with the aim of evaluating and choosing new cherry varieties for commercial cultivation. The fruit characteristics of those varieties are shown in Table 5. The variety 'Utah Giant' was introduced from Washington State University, USA. The Bigarreau varieties 'Ferbolus', 'Fercer', 'Summit', 'Reverchon', 'Lapins' and 'Griotte du Nord' were introduced from the Centre technique interprofessionnel des fruits et légumes (Ctifl, France). The varieties 'Ferbolus' and 'Fercer' were introduced under a special agreement signed between Ctifl and ARI (Gregoriou 1999b).

Table 5. Fruit characteristics of cherry varieties (Saittas, Limassol, Cyprus)

Variety	Weight of fruit (g)	Weight of stone (g)	Length of fruit stem (mm)	Fruit length (mm)	Fruit width (mm)	Flesh (%)	Colour	Harvest date	Ease of separation of flesh from stone
Bigarreau Burlat	6.02	0.31	24.12	21.30	23.84	92.94	Dark red	Middle of May	Yes
Black Tartarian	5.74	0.29	34.65	18.78	22.07	92.51	Dark red	End of May	Yes
Utah Giant	8.84	0.26	26.03	21.09	27.72	95.53	Red	End of May	Yes
Bigarreau Ferbolus (Verdel)	5.78	0.27	47.24	19.94	22.71	92.51	Red	Beginning of June	Semi-freed
Bigarreau Fercer (Arcina)	8.02	0.34	37.15	22.23	26.21	94.26	Red	Beginning of June	Yes
Bigarreau Summit	7.21	0.29	31.60	26.31	29.43	96.56	Dark red	Beginning of June	Yes
Bigarreau Reverchon	7.50	0.26	32.35	21.42	25.35	94.99	Dark red	Beginning of June	Yes
Griotte du Nord	2.74	0.17	30.87	14.09	15.92	90.75	Red	Beginning of June	No
Bigarreau Lapins	7.25	0.26	33.92	20.82	24.26	95.30	Dark red	Beginning of June	Yes
Van	7.15	0.21	28.28	20.25	24.92	95.81	Red	Beginning of June	Yes

The plum germplasm in Cyprus is shown in Table 6. There are 7 varieties in the BPM collection located at Saittas Station. The plants of the collection are grown in plastic containers (70 litres) in an insect-proof screen house. In the MTO collection there are 11 varieties grown in the open field. This collection is located at Orites Station.

Table 6. Plum germplasm collection at Saittas and Orites Stations

Variety	No. of plants	
	Basic Planting Material (BPM) Saittas Station	Mother Tree Orchard (MTO) Orites Station
President	3	10
Red Beauty	3	10
Santa Rosa	3	10
Formosa	3	10
May Grand	-	5
May Red	-	5
Stanley	-	10
Tente	3	7
Friar	3	10
Black Amper	3	10
A 547	-	2

Characterization, evaluation and documentation of *Prunus* germplasm collections

It is widely recognized that the value of germplasm collection is greatly increased when this collection is fully characterized, evaluated and thoroughly documented. A well-characterized, evaluated and documented collection clearly shows its potential for research and breeding, thus fulfilling one of the most important objectives of genetic resources activities: its utilization should obviously be done in a sustainable manner.

In Cyprus more work has to be done on these activities. Therefore, it is difficult to accurately state the current situation concerning the number of characters observed and the descriptor list used. Regarding documentation, although not much information is available especially on the origin of the cultivars and varieties, it can be said that much more attention has to be paid to the documentation of the *Prunus* collections and all the records must be computerized.

Propagation of *Prunus* in Cyprus and phytosanitary measures

The main rootstocks for cherries are seedlings of *P. avium* (mazzard), for apricots seedlings of the varieties 'Pempekou' and 'Galatas', for almonds seedlings of *P. communis*, for plums seedlings of *P. cerasifera* and for peaches seedlings of *P. persica*. After the stratification process the seedlings of the above species are raised in black plastic bags (35 cm x 20 cm) and are budded in June or July with mature buds of the new vegetative shoots (Kyriakou 1974; Stavrides 1982).

Propagation is mainly done by private or government nurseries. In both cases the source of propagating scion wood is the MTOs which are under the responsibility of the Department of Agriculture. The Plant Protection Section of this Department has the responsibility for maintaining the BPM and MTO collections free of pests and diseases and therefore of providing the nurseries and the farmers with healthy high quality and true-to-type propagating materials. There are also suitable institutional arrangements for the registration of nurseries and appropriate Legislation and Regulations on Plant Propagation Standards for assuring quality control and standards (truthful labelling).

Conclusions

With the increase of plant genetic resources awareness and the development of new concepts concerning the conservation, management and utilization of germplasm, more attention has to be devoted to *Prunus* genetic resources, especially to characterization, evaluation, conservation and documentation of *Prunus* germplasm in Cyprus. Special emphasis should be given to the almond biodiversity in the island. The almond genetic variability not yet lost, which was developed by farmers selecting the more promising trees among those produced by nature (through sexual crossing) should be identified, characterized, evaluated and saved for future generations, thus stopping genetic erosion, which is a high risk everywhere.

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Status of the Prunus *collections in the Czech Republic*

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Location of collections

In the Czech Republic *Prunus* species collections are included in the national programme of plant germplasm conservation, coordinated by the Genetic and Plant Breeding Division (Director: Dr L. Dotlačil, Research Institute for Crop Production – RICP, Prague-Ruzyne) and are fully funded by the Ministry of Agriculture. These funds are at present sufficient for the preservation of all accessions and their evaluation. However, they do not cover enough special projects, especially in the area of application of molecular markers or to fund the cleaning accessions from viruses and phytoplasmas.

As regards the particular collections of *Prunus* species, cherries and plums are kept at the Research and Breeding Institute at Holovousy (Curator: Dr F. Paprštein), while almonds, apricots and peaches are kept at the Mendel Agricultural and Forestry University, Brno, Faculty of Horticulture at Lednice na Moravě (Curators: Dr B. Krška for apricots and Eng. I. Ondrášek for almonds and peaches).

Status of *Prunus* collections

The status of the collections is shown in Table 1.

Table 1. Status of *Prunus* collections in the Czech Republic

Crop	Total no. of accessions	No. of accessions:		
		original from CZ	with passport data	with descriptions
Almond	9	2	0	0
Apricot	328	35	301	194
Cherry (sour)	108	11	104	98
Cherry (sweet)	343	33	323	294
Plum + Prune	276	45	255	0
Peach	145	6	135	99
Interspecific hybrids	18	7	2	2
Wild related *Prunus* spp.	7	5	2	0
Total	**1234**	**144**	**1122**	**687**

Recent results

In recent years all the accessions preserved in *Prunus* field collections were evaluated using national descriptors. Passport data and plant or fruit characteristics gathered from these evaluations were made publicly available through a national system developed for all plant species (EVIGEZ, Plant Genetic Resources Documentation in the Czech Republic, available at http://genbank.vurv.cz/genetic/resources/).

A range of collecting missions to different regions of the Czech Republic (mostly into the national parks and protected areas) was organized with the aim of collecting native varieties and landraces. Many unique tree specimens were described and located using GPS within this study. Subsequently, two on-farm orchards were established with the aim of preserving local varieties in specific areas. The first planting was established in the national park KRNAP Vrchlabí where 53 local varieties of fruit trees were planted, including 9 sweet cherries, 4 sour cherries and 3 plums. The second on-farm orchard was planted in Orlické hory mountains at Neratov and named the "Orchard of Reconciliation". There are 41 local varieties of fruit trees planted there, including 3 sweet cherries and 1 plum.

With sweet cherries a study of genetic diversity of 49 selected cultivars was done based on AFLP markers and subsequent cluster analysis of the resulting values (Fig. 1). At Holovousy 6 sweet cherry rootstock and 12 sweet cherry cultivars from the Czech Republic were evaluated in term of their resistance to biotic and abiotic stresses. Some of them were found more winter hardy than standard cultivars or rootstocks.

In the Mendel Agricultural and Forestry University, Brno, Faculty of Horticulture at Lednice na Moravě, activities were focussed on the search for the best donors of plum pox virus (PPV) resistance, frost resistance and self-fertility. Regarding apricots, local apricot types similar to the variety ´Velkopavlovická´ were collected in the region of South Moravia and carefully evaluated.

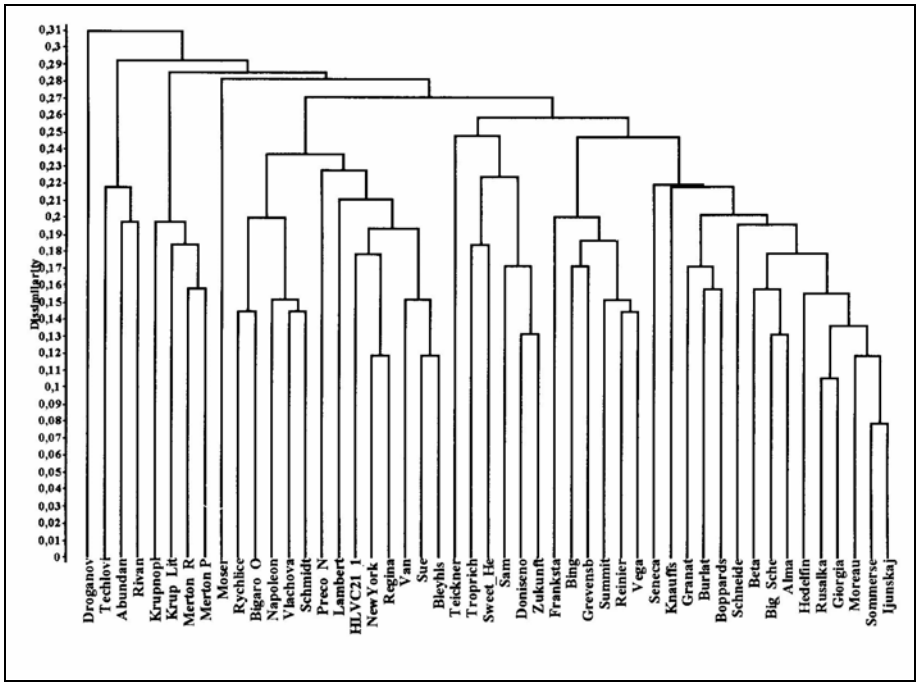

Fig. 1. Genetic diversity of 49 sweet cherry cultivars based on cluster analysis AFLP data (Blažková *et al.* 2003).

Main current constraints

Accessions that are preserved in the field collections are mostly infected by viruses or phytoplasmas. In some cases several different diseases are present in the same accessions. With plums and in some of the apricots and peaches the main problem is sharka (plum pox virus, PPV), while apricot accessions are frequently infected by European stone fruit yellow virus (ESFY), whereas *Prunus* necrotic ringspot virus (PNRSV) constitutes the greatest threat for cherries. For the time being only a small number of accessions have been tested for the presence of the diseases by ELISA (enzyme linked immunosorbent assay) or PCR (polymerase chain reaction). Symptomless trees, apparently still healthy, are growing in the same orchards close to heavily infected ones. Therefore the proportion of infected trees in these collections increases every year.

In the past several attempts were made at Holovousy to clean up some important cultivars using a combination of thermotherapy, chemotherapy and *in vitro* culture but hitherto the success of this approach has been rather limited. Only with plums, in a few cases, were healthy clones obtained. On the other hand with sweet cherries no positive results were recorded. It is obvious that cleaning of *Prunus* accessions will be a very

expensive and time-consuming process. Unfortunately, no funding is available in the Czech Republic for this purpose at present.

Activities planned for the near future

- Supply new data to the European *Prunus* database (EPDB) for apricots, peaches, plums and prunes;
- Renewal of virus testing in all field *Prunus* collections;
- Addition of more data regarding further characteristics (esp. fruit cracking susceptibility, firmness of flesh, tree habit, susceptibility to diseases) of cherry accessions into the EPDB;
- Development of more efficient techniques for the cleaning of *Prunus* accessions;
- Selection of the most important accessions in which cleaning from viruses and phytoplasmas should be applied as a priority;
- Selection of the accessions that will be proposed for AEGIS.

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An inventory of plum and cherry cultivars of Estonian origin

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- **Estonian plum cultivars**

Introduction

The oldest archaeological findings of plum and bullace seeds in Tartu, South Estonia, date from the 13th century (Tammet 1994). The first detailed records of plum growing on private estates date back to the 16th century.

The most severe winter in the last century occurred in 1939–1940 when the temperature dropped to -43.5°C in January, killing 86% of the 52 7400 plum trees. The following three winters of World War II were also very cold, and in 1945 only 7% of the plum trees remained from those present in 1939 (Anonymous 1970). After that, every new winter-hardy plum cultivar was eagerly awaited.

Plum breeding in Estonia

The first information on plum cultivars of Estonian origin can be traced back to the 19th century (Kask and Jänes 1998a). Detailed investigations of the three plum landraces 'Märjamaa', 'Noarootsi Punane', 'Pärnu Sinine' and two large-fruited bullace landraces 'Hiiu Sinine' and 'Tamme Sinine' were made in the 20th century.

Professional and amateur plum breeding flourished in Estonia in the second half of the 20th century. However, among amateur breeders only two obtained breeders' certificates. Nineteen plum cultivars were bred at the Polli Horticultural Research Centre, using one of these approaches: hybridization of certain female and male parents with the best winter hardiness and good quality of fruits; growing seedlings from seeds from open-pollination; and treatment with radiation (γ rays). The last-named method resulted in the creation of a very large-fruited cultivar 'Radiolus'.

The most winter hardy cultivars are 'Noarootsi Punane', 'Polli Munaploom' and 'Vilnor'.

The earliest-ripening are 'Kressu', 'Liisu' and 'Polli Varane'.

The cultivars with the biggest fruits are 'Ave', 'Liisu', 'Polli Munaploom', 'Radiolus' and 'Suur Tõll'.

Since 2002, a government project has been responsible for financially supporting the conservation of fruit tree and small fruit genetic resources in a collection maintained at the Polli Horticultural Research Centre. The aim is to devise a system that encourages research, conservation and sustainable use of landraces and old cultivars. The project also deals with the search for adaptability to local soil and climate conditions.

List of plum cultivars of Estonian origin

Table 1 lists all existing plum landraces and cultivars of Estonian origin.

The following criteria were used to define a cultivar: the cultivar is (1) one which has the breeder's certificate, or (2) it is included in the "List of fruit cultivars" officially recommended for growing in Estonia or other countries, (3) it was officially taken for testing in cultivar-testing farms (in the Soviet Union years), or (4) it is protected or registered as a new cultivar by the state authorities. The last of these criteria has been in use only since the late 1990s.

According to these criteria, there were 30 plum cultivars of Estonian origin in 2005 (Table 1). In addition, many original trees are certainly growing in home gardens, planted from a seed or grown from spontaneous seedlings. The owners never thought to register or

protect them. However, some of these selections have been grafted or transferred to other gardens and repeatedly propagated. These are not recorded as cultivars.

Table 1. Plum cultivars of Estonian origin

Cultivar	Parents	Beginning of breeding	Year of introduction	Breeder(s)	Breeder's certificate (at Moscow)	Registered (+) or protected (++)
Amitar	J.Aamisepa 5 x Tartu Kaunitar	1964	1982	A. Jaama, E. Jaama		+
Ave	Wilhelmine Späth x Tartu Kaunitar	1964	1981	A. Jaama, E. Jaama	1991	+
Esloni Varane	Skorospelka Kruglaja x Ruth Gerstetter	1954	1976	J. Eslon, A. Jaama		
Hiiu Sinine (bullace)	Not known	Not known	1951	landrace		
Julius	Duke of Edinburgh x ?	1946	1975	J. Eslon, A. Jaama		+
Kadri	Liivi Kollane Munaploom x Suhkruploom	1965	1981	A. Jaama, E. Jaama		+
Karksi	Liivi Kollane Munaploom x ?	1946	1957	J. Eslon		
Kressu	La Crescent x Suhkruploom	1969	2002	A. Jaama, E. Jaama		+
Liisu	Liivi Kollane Munaploom x Suhkruploom	1965	1984	A. Jaama, E. Jaama		+
Miku	Not known	1970s	2002	A. Kask		++
Märjamaa	Not known	Not known	1994	landrace		
Noarootsi Punane	Not known	Not known	1985	landrace		
Norgen	Noarootsi Punane x Agen	1965	(2004)	A. Jaama, E. Jaama		+
Polli Munaploom	Liivi Kollane Munaploom x Duke of Edinburgh	1946	1957	J. Eslon	1971	+
Polli Varane	Skorospelka Kruglaja x Ruth Gerstetter	1954	(1975)	J. Eslon, A. Jaama		+
Polli Viljakas	Skorospelka Krasnaja x Emma Leppermann	1951	(1981)	J. Eslon, A. Jaama		+
Pärnu Sinine	Not known	Not known	1957	landrace		
Radiolus	Liivi Kollane Munaploom (seeds irradiated)	1965	(2004)	A. Jaama, E. Jaama		+
Riina	Not known	1970s	2002	A. Kask		++
Sargen	Agen x Zarja	1965	2004	A. Jaama, E. Jaama		+
Suhkruploom	Wilhelmine Späth x ?	1948	1957	J. Eslon		+
Suur Tõll	Liivi Kollane Munaploom x ?	1965	(2004)	A. Jaama, E. Jaama		+
Tamme Sinine (bullace)	Not known	Not known	1957	landrace		
Tartu Kaunitar	Emma Leppermann x ?	1938	1957	A. Kurvits	1961	
Tartu Kollane	Liivi Kollane Munaploom x Reine-Claude de Oullins	1937	1951	A. Kurvits	1961	
Tartu Punane	Queen Victoria x ?	1937	1951	A. Kurvits	1961	
Tartu Värviline	Wilhelmine Späth x Queen Victoria	1938	1957	A. Kurvits	1961	
Vikana	Queen Victoria x *Prunus americana*	1964	(1981)	A. Jaama, E. Jaama		
Vilmitar	Wilhelmine Späth x Tartu Kaunitar	1964	1985	A. Jaama, E. Jaama		+
Vilnor	Wilhelmine Späth x Noarootsi Punane	1964	1981	A. Jaama, E. Jaama	1991	+

- **Estonian cherry cultivars**

In the most severe winter 1939–1940 (minimum -43.5°C), 81% of the 522 000 cherry trees were killed. After the following three severe winters, less than 10% of the cherry trees remained from those present in 1939 (Anonymous 1970).

The first information on cherry cultivars of Estonian origin dates back to the 20th century. However, there are three sour cherry cultivars which are evidently landraces. Table 2 lists all existing cherry cultivars and landraces of Estonian origin.

Table 2. Cherry cultivars of Estonian origin

Cultivar	Parents	Beginning of breeding	Year of introduction	Breeder(s)	Registered
Sour cherry					
Jagoli	Seeds of landrace 'Kose kirss' were treated with 0.1% solution of colchicine	1965	1987	A. Jaama, E. Jaama	
Kaali Must	not known	not known	1961	Landrace	
Kõljala Helepunane	not known	not known	1961	Landrace	
Nõmme Liivkirss	not known	not known	1951	Landrace	
Sweet cherry					
Arthur (initially Kristiina)	Krassavitsa x ?	1965	1988	A. Jaama, E. Jaama	+
Elle	Juku x ?	1977	2004	H. Jänes, A. Jaama, E. Jaama	+
Ene	chance seedling	1970	2004	H. Jänes, A. Jaama, E. Jaama	+
Johan	Leningradskaya Chernaya x ?	1955	2002	J. Eichfeld, K. Kask	+
Karmel	Norri x ?	1965	2004	K. Kask	+
Kaspar	Norri x ?	1981	2004	K. Kask	+
Meelika	Leningradskaya Chernaya x ?	1955	1994	K. Kask, J. Eichfeld	+
Mupi	Kati x ?	1976	2004	K. Kask	+
Norri	Leningradskaya Chernaya x ?	1955	1995	K. Kask, J. Eichfeld	+
Piret	Norri x ?	1976	2004	K. Kask	?
Polli Murel	Zorka x Zolotoja Loshichkaya	1965	2004	A. Jaama, E. Jaama	+
Polli 6-2 (Anu)	Leningradskaya Chernaya x ?	1984	2004	H. Jänes	+
Polli 10-8 (Irma)	Leningradskaya Chernaya x ?	1981	2004	H. Jänes, A. Jaama, E. Jaama	+
Polli Rubiin	Leningradskaya Chernaya x Zolotaya Loshichkaya	1965	2002	A. Jaama, E. Jaama	+
Tontu	Norri x ?	1978	2004	K. Kask	+
Tõmmu	Krassavitsa x ?	1965	2004	A. Jaama, E. Jaama	+

Professional breeding activity at the Polli Horticultural Research Centre started after 1945, but had no success for the first two decades. A sweet cherry breeding programme initiated in 1955 at the Estonian Academy of Sciences resulted in the creation of three cultivars, the first sweet cherry cultivars of Estonian origin. The next breeding period at the Polli Horticultural Research Centre started in 1965 and, five years later, the sweet cherry breeding programme of the Estonian Academy of Sciences was also transferred to Polli.

Only one sour cherry cultivar, 'Jagoli', was released by the Estonian breeding programme, but it is not planted in commercial orchards or in home gardens. Regarding sweet cherry, 16 cultivars have been registered by the state authorities so far (Table 2). Many of these are appreciated by growers and consumers in Estonia and Latvia. They are more winter-hardy than imported cultivars. However their fruits are soft and small: 3–4 g, sometimes 5–6 g. The colour is black or dark red, only very few are yellow. Their taste is good or very good (Kask and Jänes 1998b).

The scientist responsible for the *Prunus* collections is the second author, Dr Heljo Jänes.

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Status of the Prunus *collection in France*

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The French National *Prunus* Genetic Resources Network

The conservation of French *Prunus* genetic resources in France is included in a national network under the authority of the French National Board of Genetic Resources (Bureau des Ressources Génétiques, BRG). This network includes all the institutes involved in *Prunus* genetic resources conservation. The project described here is for *Prunus* genetic resources, but the same approach is applied to all plant, animal and microorganism genetic resource collections in France.

The main objective of the network is the rationalization of genetic resources conservation. For this purpose, a charter was created in 1999 to define the partners and establish the national genebank. Collections are distributed at different locations in France. Finally, 12 French curators agreed to take part, taking into account certain conditions of perenniality and sanitary status.

The operation of this network will include the management of the national collection, the setting-up of the national database, the coordination of the cooperative network, the definition of the core collection and coordination with international partnerships.

The National Collection

The French National *Prunus* Collection is maintained as trees planted in orchards and managed by several curators belonging to the cooperative network. It is managed in two ways: a long-term bank, used as the active genebank for the distribution of material, and a safety bank holding the duplicates.

Three research institutes are involved in the conservation of *Prunus* genetic resources: INRA-Bordeaux holds collections of cherries, plums, peaches and wild *Prunus*-related species; INRA-Avignon holds collections of apricots and almonds; and the Conservatoire Botanique National de Porquerolles mostly has collections of old French varieties of peaches and a few other *Prunus* species.

Other collections of *Prunus* are held by non-governmental organizations which include many of the groups of people in France concerned with conservation of genetic resources in plants. The main objectives of these associations are:

- the conservation of old and regional varieties, also considered as French cultural patrimony;
- the possible use of these varieties for scientific purposes;
- the promotion of local varieties at the local level for their economic value.

The *Prunus* National Collection comprises all the genotypes that come under France's responsibility for their conservation, especially French cultivars struck off from the French official catalogue of varieties; populations and old cultivars of French origin; and original material obtained from collecting trips in French territories. Currently there are 578 original accessions. The number of accessions per species is presented in Table 1.

Other collections of *Prunus* genetic resources

The major French *Prunus* genetic resource collections are now located at the National Institute for Agricultural Research (INRA) centres in Bordeaux and Avignon. These genetic resources comprise foreign standard accessions, *Prunus*-related species, interspecific hybrids and mapping populations (Table 1).

Table 1. Summary of holdings in France

Species	French accessions[1,3]	Other accessions[2,3]	Total no. of accessions[3]
Almond	41	33	74
Apricot	81	580	661
Cherry	174	600	774
Cherry-related species	-	80	80
Peach	117	1793	1910
Plum	144	411	555
Plum-related species	-	96	96
Interspecific hybrids	-	1070	1070
Total	**557**	**4663**	**5220**

[1] National Collection maintained by the 12 curators of the French National *Prunus* Genetic Resources Network.
[2] Foreign and National accessions held at the National Institute for Agricultural Research (INRA), stations of Bordeaux and Avignon.
[3] Excluding duplicates.

Activities planned for 2006-2008

- Recording of passport data, morphological and biological characters for *Prunus* accessions (starting with plums, cherries and their related species);
- Analysis of the efficiency of the characterization descriptors;
- Molecular characterization will be undertaken for *Prunus* accessions (starting with cherry species and *Prunus*-related species); and
- Development of a Quality Management System.

Status of Prunus collections in Georgia [11]

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The geographical location and environmental conditions of Georgia are favourable to the cultivation of *Prunus* species. Along with the other Caucasian countries Georgia can be considered as a primary centre of origin of plum, damson, sour and sweet cherry, and as a secondary centre of diversification for cultivated peaches (Khomizurashvili and Diasamidze 1978). *Prunus* genetic resources display a broad diversity. Both native and introduced varieties of *Prunus* are cultivated in Georgia.

Collecting and describing fruit varieties started in Georgia at the end of the 19th century. A large number of indigenous and introduced genotypes were investigated. Particular progress was made in the 1970s and 1980s, when a full pomological description of about 210 varieties of *Prunus* species was included in the monograph "Horticulture of Georgia" (*op. cit.*).

Since the beginning of the 1990s the existing collections have not been financed by the government and they are not developing. The orchards are old, basically established 20-30 years ago.

Field conservation of fruit crops was and still is carried out only by the Research Institute of Horticulture, Viticulture and Oenology in Tbilisi. The *ex situ Prunus* collections are located in Tbilisi, Galavani, Gori and Skra (East Georgia) and Sakara (West Georgia). The Department of Fruit Crops and Grapevine Germplasm Research, Genetics and Breeding manages the field collections.

The inventory lists 394 accessions, including 130 "original", but the field collections contain only 130 accessions, including 25 "original" (Table 1).

Table 1. *Prunus* collections in Georgia

Crop	Total no. of accessions		"Original" accessions	
	Inventory	Only in *ex situ* collections	Inventory	Only in *ex situ* collections
Almond	18	4	7*	1
Apricot	34	18	6*	1
Cherry (sour)	10	3	3*	2
Cherry (sweet)	71	18	8*	2
Damson (*P. cerasifera* var. *divaricata*)	52	5	43*	5
Plum + Prune	99	21	18*	3
Peach	104	61	30*	11
Wild relatives	6*	0	6*	0
Total	**394**	**130**	**121**	**25**

* = estimated

The material is not safety-duplicated or protected. The status of *in situ* collections is not known. Some material may have been lost.

Genotypes in active collections are evaluated according to the most important phenotypic and pomological characteristics to determine their importance for fruit production and breeding. This research is also being carried out without any financial assistance from the State.

Data about Georgian original fruit crop accessions are not included in the ECP/GR and GRIN databases, owing to the lack of computer facilities and technical support.

[11] June 2003

The protection, collection and evaluation of *Prunus* native genotypes adapted to different environmental conditions are very important, since they are potential sources of much useful genetic variability, especially for resistance and quality traits.

Reference

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New organization of the Fruit Genebank in Germany

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In Germany the collection of plant genetic resources of fruit species is the responsibility of the Federal Ministry of Food, Agriculture and Consumer Protection. In January 2003 the Fruit Genebank was integrated into the existing Federal Centre for Breeding Research on Cultivated Plants, Institute of Fruit Breeding. The new curator is Dr Monika Höfer.

As a first step in the newly integrated genebank operation, a concept for future work was defined. Its aim is the preservation of fruit genetic resources at a high and effective level within the framework of the "National Programme for the Conservation and Sustainable Utilization of Genetic Resources of Agricultural and Horticultural Crops" in Germany.

The first step in achieving this concept includes the selection of the fruit species and cultivars of interest. The selection of the species gives priority to those native to Central Europe and those important for fruit production in Germany either in the past or for the present. Cultivar selection focuses on cultivars of German origin; these include new breeding lines and those which have a social, cultural, local or historical connection to Germany plus those characterized by valuable and/or important pomological parameters. The genebank will be gradually rearranged according to these criteria.

The genebank's mandate is the collection, preservation and evaluation of fruit genetic resources of pome fruit, stone fruit and strawberries for breeding, fruit production, pomological, taxonomic and phytopathological purposes. The whole collection comprises 2480 accessions and covers 10 ha in the orchard. In addition to the cultivar collections of apple, pear, sweet and sour cherry, strawberry and plum germplasm including landraces, cultivars and advanced hybrids, there are collections of wild species accessions in *Malus*, *Pyrus, Prunus* and *Fragaria.*

For *Prunus*, the genebank includes 191 sweet cherry cultivars, 92 sour cherry and 165 plums. The indigenous *Prunus* collection has 85 accessions including 25 different species. The characterization of pomological traits in sweet and sour cherry is of great importance. Therefore an evaluation project was started in cooperation with the cherry breeders at the Institute of Fruit Breeding. This project will focus on the evaluation of morphological parameters of the tree, the fruit and the flowers and will include traits such as yield, disease resistance, fertility and fruit quality. The ultimate aim is a comprehensive evaluation of the material and an enlargement of the existing database for cherry (www.genres.de/eva/). The investigations will result in improved characterization of the cultivars, measurable progress in fruit breeding and better utilization of genetic resources.

Determination of the S-allele composition was done in cherry by using micro-satellites. Altogether 163 accessions were investigated and 29 different incompatibility groups were detected (Schuster, Flachowsky and Köhler, in preparation).

The Greek Prunus *collection – Brief report on activities*

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The status of the *Prunus* National Collection has not changed since 2002. It includes wild species, traditional cultivars, breeder's lines, advanced cultivars, clonal selections and rootstocks of *Prunus* species (almond, apricot, cherry, peach and plum), which are kept in *ex situ* collections of the Pomology Institute of the National Agricultural Research Foundation (NAGREF) and used by the Greek *Prunus* Gene Bank.

The status of the material in the collections is presented in Table 1.

Table 1. *Prunus* collections held at the Pomology Institute

Crop	Foreign varieties	Greek varieties	PI selections*	Total no. of varieties	Hybrids
Almond	11	6		17	2
Apricot	104	7		111	5
Cherry	79	27	5	111	13
Peach	257	11	91	359	95
Plum	30	2		32	

* PI = plant introduction

Accessions have been described for passport, collection and characterization data as shown in Table 2. As of December 2005 these descriptions are not yet included in the European *Prunus* Database (EPDB). No evaluation or agronomic data have yet been collected.

Table 2. Documentation of the *Prunus* accessions

Crop	Passport data	Collecting data	Characterization data
Almond	7	7	7
Apricot	5	5	5
Cherry	166	166	166
Peach	83	83	83
Plum	42	42	42

The Greek Gene Bank for Deciduous Fruit Trees did not carry out any other activities owing to lack of funding and staff.

Status of the Prunus *collections in Hungary* [12]

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Organization

The Institute for Agrobotany in Tápiószele supervises and coordinates genetic resources activities in Hungary. It maintains a National Database of germplasm collections of field crops and fruit species. The "Crop Gene Bank Council" is the body in charge of determining the principles of the national genebank work and harmonizing it with international regulations.

Genebank activities in Hungary are supported by the Ministry of Agriculture which has the overall task of supervision.

Maintenance

The Hungarian *Prunus* living germplasm collection is located at the research station of the Research Institute for Fruitgrowing and Ornamentals in Érd and covers 16 ha. At present our collection holds 2068 accessions (Table 1). Our *Prunus* species are cultivated ones; the most valuable items are local varieties and Hungarian landraces from our plum and cherry collections, among which a great variability can be observed.

Table 1. Summary of *Prunus* holdings in Hungary

Crop	Total no. of accessions	"Original"' accessions
Peach	227	180
Apricot	404	153
Plum	579	352
Sweet cherry	299	110
Sour cherry	295	221
Almond	264	80
Total	**2068**	**1096**

Our fruit trees are maintained in two kinds of plantations. The so-called "old genebank" was established in 1986 and holds only one tree per accession. Ecological problems and virus infections brought the plantation to rather a poor condition. The material was threatened with extinction; therefore transplantation to a more suitable site began in 1996. The new plantation or "new genebank" holds two trees (side-by-side) per accession. The transplantation of peach, apricot, sweet cherry and almond collection is finished; that of sour cherry and plum is still in progress and will probably be finished in 2004. This work is supported by the Ministry of Agriculture.

Unfortunately our accessions cannot be found at other growing sites, and safety-duplication is badly needed. Currently there is no cryopreservation of *Prunus* in Hungary.

At present no virus-free material is available from our germplasm collection; exchanging accessions between collections is not yet straightforward.

Collection enlargement

In the last few years, because of lack of manpower we were only able to enlarge our genebank with some 5-10 items yearly. With the financial support of the Ministry of

[12] June 2003

Environment and Water we were able to collect Hungarian landraces from the protected areas of our National Parks.

It is important to put greater efforts into collecting work in the future: there are still some unexplored areas in Hungary and in the whole Carpathian Basin where the optimal pedoclimatic conditions have resulted in a unique species diversity within the *Prunus* genus.

Characterization

Characterization started in 1996 and is being done according to IPGRI descriptors. The features described include phenological and morphological characters (mainly fruit characteristics) and resistance to pests and diseases (Table 2).

Blooming and ripening times of most accessions have been observed. Some fruit characters of nearly all plum and almond accessions have been recorded; for the other stone fruit species it has just started. Generally, we aim at characterizing one species every year. For instance, this year characterization of sweet cherry, which started last year, is going on.

In recent years we have focused on disease resistance: we have evaluated our sour cherry, apricot and almond accessions for tolerance to *Monilinia laxa*, and plum accessions for tolerance to plum pox virus. Tolerant accessions may serve as sources of resistance in breeding work.

Table 2. Characters recorded in the Hungarian *Prunus* germplasm collection

	Crop					
Character	**Peach**	**Apricot**	**Plum**	**Almond**	**Sweet cherry**	**Sour cherry**
Season of flowering*	x	x	x	x	x	x
Harvest maturity*	x	x	x	x	x	x
Tree habit	x	x	x	x	x	x
Fruit weight, length, width*	x	x	x	x	x	
Fruit shape	x	x	x	x	x	
Fruit skin colour	x	x	x	x	x	
Extent of over colour	x	x		marking of outer shell		
Juice colour					x	
Flesh colour	x		x		x	
Firmness of flesh	x			softness of shell	x	
Eating quality	x			x	x	
Stone weight, length, width*	x		x		x	
Stone shape			x	x		
Stone adherence to flesh	x		x			
Susceptibility to *Monilinia laxa**		x		x		x
Susceptibility to plum pox virus*			x			

* = according to local (not IPGRI) descriptors

During our characterization work we find it quite difficult to compare our cultivars with worldwide known reference cultivars because in our conditions they can behave differently: fruit parameters such as size or ripening time can vary. Thus in some cases we are not able to use reference cultivars as indicated in Table 2 (characters marked with *). Additionally, there is a lack of reference cultivars in our collection.

There has been no molecular characterization of our accessions, although an S-allele work project has been planned with our sweet cherry accessions.

Recently we started introducing genebank activity to those interested in horticulture through booklets, with a short description of our most interesting items.

Future plans

- Additional genebank items will be characterized and data will be added to the European *Prunus* Database.
- Some limited collection of new items is planned, which can be extended with support.
- Although a cooperative programme has been terminated with IPGRI we would very much like to continue our cooperation in the future.

Prunus *genetic resources in Israel*

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Introduction

Israel is not considered to be the area of origin of deciduous fruit species of the *Prunus* genus. However, local plums, apricots, peaches and almonds have been grown in Israel for centuries and are deeply embedded in the history and culture of the region. In addition, there are almond and plum species that grow wild in Israel. These include the almond species *Amygdalus orientalis* Miller, *A. arabica* Oliver, *A. ramonensis* Danin and *A. korschinski* (Hand.-Mazzetti) Bornm. and the plum *Prunus ursine* Kotschy (Feinbrun-Dothan and Danin 1991; Zohary 1972). The Israeli *Prunus* collection was established in 1987 as part of a larger collection of deciduous fruit trees that includes figs, pomegranates, vines, apples and pears (Assaf 1992; Zanetto *et al.* 2002; Holland *et al.* 2003). Since the establishment of the *Prunus* collection, new accessions have been introduced successively and today it contains 51 accessions. The criteria for including accessions into the collection are that they were grown in old traditional orchards or backyards for decades. In this update we report on the composition of the *Prunus* species present in the Israeli collection, some of their most interesting features and future plans for the collection.

Prunus species in the Israeli collection

The accessions in the collection are grown as living trees in duplicate in Newe Ya'ar Research Station located in the western Yizre'el Valley, lat. 32°42'N, long. 35°11'E. The accessions are grafted on to Marianna 2624 or GF.677 rootstocks. The trees are irrigated and are grown under intensive agrotechniques. As of December 2005, the *Prunus* collection contains 51 accessions: 25 accessions of almond (*Prunus amygdalus* (L.) Batsch. and *P. dulcis* [(Miller) D.A. Webb]), 17 accessions of apricot (*P. armeniaca* L.) and 9 accessions of plum: *P. cerasia* Bl. (3), *P. domestica* L. (2), *P. cerasifera* Ehrh. (1), *P. insititia* L. (1) and two accessions that were not yet fully identified (Table 1).

Table 1. Composition of the *Prunus* collection in Newe Ya'ar Research Center

Fruit tree	Species	No. of accessions
Almond	*Prunus amygdalus* (L.) Batsch.	25
Apricot	*Prunus armeniaca* L.	17
Plum	*Prunus cerasia* Bl.	3
	Prunus domestica L.	2
	Prunus cerasifera Ehrh.	1
	Prunus insititia L.	1
	Unidentified	2
Total		**51**

Fourteen accessions were added to the *Prunus* collection in the last five years. As far as we know, there are no records indicating that the accessions described above were introduced to Israel from abroad. We therefore assume that these *Prunus* accessions originate from Israel and its surroundings. Almonds are widely found growing in Israel as semi-wild seedlings under natural conditions. Thus, it appears that among the *Prunus* genus, almonds are the

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best adapted to the environmental conditions in Israel. This fact may also explain the larger number of almond species found in the collection. Some of the accessions found in the collection are still grown in commercial orchards. For example, the almond 'Um ElFahem' (accession P.Am.777-278) is the main commercial cultivar in Israel. Another example is the apricot 'Mustakawi' (accession P.A.706-207) which is still grown in small plots by traditional farmers. Despite its poor shelf-life and small fruit size, 'Mustakawi' is still cherished because of its appealing taste and aroma. The 'Sweet Kerasia' plum (accession P.657-158) is also grown in traditional plots and is sought as an aromatic and exotic fruit with an appearance resembling that of cherry. We found that several accessions initially collected under different names are similar in their phenotypes. For example the landrace 'Mustakawi' is also called 'Hamawi' or 'Baladi'. The genetic verification will require DNA fingerprinting techniques.

Establishment of the *Prunus* database and its publication

The Israeli collection of deciduous fruit trees was initially reported to IPGRI in 1995 (Zanetto 2002). The collection was funded at first by the Israeli Ministry of Science and is currently under the responsibility of the Israel Gene Bank for Agricultural Crops in the Agricultural Research Organization in Bet Dagan. All the accessions present in the Newe Ya'ar collection are documented in the Israel Gene Bank (IGB) database (http://igb.agri.gov.il/). In future years more details, including photographs, will be introduced into the database.

Current usage of the *Prunus* collection in Newe Ya'ar

In addition to its importance for preserving local Israeli fruit trees, the *Prunus* collection in Israel is used for several other purposes. These include apricot and almond breeding, virus distribution and evolution studies of *Prunus* necrotic ringspot virus (PNRSV) (Spiegel *et al.* 2004), apricot as rootstocks, and education. In apricot, 'Mustakawi' (accession P.A.706-207) was crossed with European and American apricot cultivars. Some of the F1 progenies have already given fruit and backcrosses of the F1 are now planned. In almond, the cultivar 'Um ElFahem' (accession P.Am.777-278) which is notable for its large sweet kernel was crossed with self-compatible cultivars. Some promising F1 self-compatible progenies that retained the kernel size and taste characteristics from 'Um ElFahem' were identified. Seedlings of apricot accessions P.A.639-140 and P.A.640-141 ('Klabi' landrace) are used as rootstocks for early ripening apricot cultivars. The *Prunus* collection is also a major source of propagation material used for establishing educational plots to demonstrate agriculture in biblical times.

Plans for the future

Judging by the Hebrew literature from the mid-20th century (Goor and Rapaport 1949; Goor *et al.* 1964, 1966) the collection in Newe Ya'ar does not yet completely represent all the *Prunus* varieties and landraces that were grown in Israel in the past. Some of these accessions have already been identified in deserted orchards or small plots of traditional farmers but are not yet grown in our orchards. Others should be searched out in the few remaining sites of traditional plots of deciduous fruit trees which are rapidly disappearing. In addition, it will be very important to determine the genetic similarity of the *Prunus* populations from Israel with those of other countries. Of particular importance are the relations with *Prunus* collections originating from the Middle East and among the individuals within the Newe Ya'ar collection. For this purpose, we will need to utilize AFLP or SSR markers which are already available for plum, apricot and almond but have not been applied to DNA fingerprinting in our collection yet. Development of international collaboration with other researchers in the world is of crucial importance for this purpose.

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Status of Prunus *collections in Italy*

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The first organized initiative at national level to trace, collect, characterize and evaluate accessions of the major woody crops present in Italy dates back to 1981, when it was coordinated and funded by the National Research Council (Consiglio Nazionale delle Ricerche, CNR). Thanks to this activity, extended up to 1993, some 8692 citrus, apricot, cherry, almond, apple, olive, pear, peach, plum and vine exotic and native accessions were traced, described and catalogued (CNR 1988, 1994). This work was extremely important, not only because of the impressive size and genetic richness of the material inventoried, but also because it highlighted the rapid process of genetic erosion threatening many old and indigenous varieties. The commercial use of these varieties has been or was about to be neglected in favour of modern cultivars (CNR 1994). Continuation and updating, at national level, of the inventory activities were afterwards funded by the Ministry of Agriculture and Forestry Policies (Ministero per le Politiche Agricole e Forestali, MiPAF), which entrusted the coordination of fruit tree genetic resources initiatives to the Istituto Sperimentale per la Frutticoltura (ISF) (Fideghelli *et al*. 2004).

In 1993 the ISF coordinated a new census of the accessions held in the several Italian field collections, in which 14 public Institutions collaborated. As far as *Prunus* is concerned, a total of 3952 accessions (6804 including duplicates) were listed and described, 45% of which originated in Italy ("original"). Results show that up to 70% of the "original" germplasm is safety-duplicated, i.e. collected in at least two sites (Grassi *et al*. 1996).

The most recent census on fruit tree genetic resources dates back to 1999. The ISF extended the investigation to a larger number of institutes than in 1993, including, together with 17 national scientific institutions, eight regional/local institutes (Table 1).

Curators of the field collections were asked to list and describe the accessions conserved according to a number of general and crop-specific descriptors of the FAO/IPGRI *Multi-crop Passport Descriptors* agreed by the ECP/GR Central Crop Databases Workshop and by the ECP/GR *Prunus* Working Group, respectively. Data on soil texture and climatic conditions of the field and standards of collection management were also requested.

Excluding duplicates, 7276 accessions of the most important fruit crops were listed and described, 3398 of which belonging to the *Prunus* genus (mainly cultivars but also selections, rootstocks, interspecific hybrids). Data were assembled and organized by ISF in two databases consultable on CD. Descriptive lists of the native Italian accessions (42% of the total) were also published as paper catalogues (Vitellozzi *et al.* 2001; Sartori *et al.* 2003). Since June 2006, this National Inventory (NI) is also consultable on-line (http://www.rgv-politicheagricole-cra.it), and, considerably updated and continuously enlarged, comprises at the moment more than 4000 *Prunus* accessions. The ISF, with its four Research Units (RU) located in Roma, Caserta (Lat. 41°N), Trento (Lat. 46°N) and Forlì (Lat. 44°N), is the institution contributing most to the *ex situ* conservation of the Italian fruit tree germplasm. Concerning *Prunus*, for instance, 73% of the total accessions catalogued in 1999 were conserved in the ISF field collections.

Table 1. List of the national and regional/local institutes collaborating in the National Germplasm Inventory coordinated by the ISF in 1999 (in bold, those contributing for *Prunus*)

Centre of Research in Agriculture	**Istituto Sperimentale per la Frutticoltura** **Roma Research Unit** **Caserta Research Unit** **Forlì Research Unit** **Trento Research Unit**
National Research Council	**Istituto di Fisiologia, Maturazione e Consumo del Frutto, Sassari** **Istituto di Propagazione delle Specie Legnose, Firenze**
University (Ministry of Scientific Research)	**Dipartimento di Biotecnologie Agrarie ed Ambientali, Università di Ancona** **Istituto di Coltivazioni Arboree, Università di Bari** **Dipartimento di Colture Arboree, Università di Bologna** **Dipartimento di Ortoflorofrutticoltura, Università di Firenze** Dipartimento di Produzione Vegetale, Università di Milano **Dipartimento di Arboricoltura, Botanica e Patologia Vegetale, Università di Napoli** **Dipartimento di Coltivazioni Arboree, Università di Palermo** **Istituto di Fruttiviticoltura, Università Cattolica di Piacenza** **Dipartimento di Agronomia Ambientale e Produzioni Vegetali, Università di Padova** **Dipartimento di Coltivazione e Difesa delle Specie Legnose, Università di Pisa** **Dipartimento di Colture Arboree, Università di Torino** Dipartimento di Produzione Vegetale e Tecnologie Agrarie, Università di Udine Dipartimento di Produzione Vegetale, Università della Tuscia, Viterbo
Regional /local administration	Centro Ricerche Produzione Vegetale, Forlì-Cesena **Ente Regionale per la Promozione e Sviluppo del Friuli Venezia Giulia, Gorizia** Agenzia Servizi Settore Agroalimentare Marche, Ancona Centro Sperimentazione Agraria Regionale, Laimburg (Bolzano) Veneto Agricoltura, Legnaro (Padova) **Associazione Archeologia Arborea, Città di Castello (Perugia)** **Servizio Sperimentazione, Informazione e Consulenza in Agricoltura della Campania** **Azienda Agricola Sperimentale Dimostrativa Pantanello, Metaponto (Matera)**

As shown by the inventory, most of the "original" accessions (71.5%) were not safety-duplicated, in other words at risk of erosion (Table 2). By comparing the data of the most recent inventory with those of the previous one, the number of total and "original" accessions recorded in 1999 was, respectively, 16% and 19% less than six years before. Also, the genetic erosion risk was much lower in 1993, when about 70% of the original accessions were safety-duplicated.

Table 2. Total and "original" *Prunus* accessions, duplicates excluded, in *ex situ* collections as recorded in the National Germplasm Inventory carried out in 1999, and updated in 2006

Prunus species	**No. of accessions**		**"Original" accessions**		
			Total no.	**Safety-duplicated**	
	1999	**update Oct. 2006**		**No.**	**%**
Prunus armeniaca	428	572	192	81	42.2
Prunus avium	536	752	329	133	40.4
Prunus cerasus	141	152	98	23	23.5
Prunus dulcis	135	346	61	13	21.3
Prunus webbii	14	14	11	0	0.0
Prunus persica	1382	1506	515	76	14.8
Prunus persica laevis	310	403	75	18	24.0
Prunus salicina	123	162	15	9	60.0
Prunus domestica	305	333	132	54	40.9
Prunus cerasifera	6	6	2	0	0.0
Prunus insititia	5	5	1	1	100.0
Prunus interspecific hybrids	13	13	0	0	0.0
Total	**3398**	**264**	**1431**	**408**	

The recent loss of material is largely due to damage caused by sharka (plum pox virus) which is spreading in Italy, in spite of the survey, eradication and quarantine protocols adopted in the areas where PPV infections are detected. Between 1993 and 1999, more than 1000 accessions had to be removed from the conservation fields of a number of institutions. In part, the existing safety-duplications buffered these removals (reducing, however, the percentage of accessions still held at two sites). The lost material is gradually being re-acquired from duplication sites, local farmers and/or certified garden centres.

Another reason for the reported decrease of collected (and/or duplicated) material originates in the abandoning or restructuring of existing collections.

The Conservation Collection of the National Centre of Fruit Germplasm Conservation in Rome

In order to preserve and make use of the impressive patrimony of Italian fruit genetic diversity, in 2000, the Ministry of Agriculture funded the establishment of the National Centre of Fruit Germplasm at ISF Rome: about 30 ha located within the National Park of the Ancient Appia Way (southeast of Rome) were acquired to be devoted to a Fruit Germplasm Conservation Collection (CC). Through the CC, the ISF aims at prioritizing the preservation of indigenous Italian germplasm, including most of the cultivars (and very few selections) inventoried in the 1999 census, totalling some 8000 accessions of different fruit species.

The first trees were planted in 2004. Table 3 reports the number of apricot, peach, plum and cherry cultivars planted or ready to be planted and the graftings planned for the near future, as well as the types of rootstock used and the planting spaces adopted for each crop. Each accession is represented by two contiguous trees.

The CC will also include accessions of other woody crop species: olive, table grape, woody ornamentals, etc.

Table 3. Current composition of the Conservation Collection of the National Centre of Fruit Germplasm Conservation in Rome for *Prunus*

Crop	Rootstock	Planting space	Plantings				Planned graftings
			2004	2005	2006	2004-2006	Jan-Feb 2006
Apricot	Mirabolan 29 C	4.5 x 4.5 m	-	-	140	140	500
Peach	GF677	4.5 x 3.5 m	342	66	315	723	370
Plum/Prune	Mirabolan 29 C	4.5 x 4.0 m	98	18	69	185	40
Cherry	Ma x Ma 14	5.0 x 5.0 m	239	61	286	586	36

Data provided by Giulio Della Strada, ISF-Roma Research Unit

Regional/local initiatives to conserve and use indigenous *Prunus* germplasm

Also, at a regional level, in the last 10-15 years, numerous initiatives have been registered, aimed at listing and preserving the local fruit germplasm in danger of erosion. As the local genetic patrimony is strictly tied to the traditions of a specific region, protecting it also means conserving the values inherent in the territory and the local culture including traditional knowledge and use of the existing species and varieties. As a consequence, many regions have established laws regarding the protection of local genetic material (plants as well as animals) of agricultural, scientific, or cultural interest. Specific projects, carried out by regional agencies in collaboration with experienced research institutions, are targeted at the identification, characterization and use of the local varieties which have been discovered and their inclusion in existing collections; results are disseminated in written and/or electronic formats.

A recent initiative worth mentioning is that carried out in Sicily (southern Italy, 38.5° lat. N) on almond germplasm. Being propagated by seed for centuries, Sicilian indigenous almond germplasm is characterized by a wide biodiversity, although progressively marginalized due to the increased development and utilization of few commercial varieties (Barbera *et al*. 2005). In 1997, with the financial support of the Sicilian Region and the Province of Agrigento, cultivars/accessions recovered from most of the traditional almond growing sites of Sicily were gathered in a 5-ha field collection. This collection, called 'Museo Vivente del Mandorlo' (*Living Almond Museum*), is situated in Agrigento, in the heart of the Valley of the Temples. About 300 cultivars (ca. 80% Sicilian germplasm and 20% germplasm from other parts of Italy plus exotic germplasm) were grafted onto GF677 peach x almond rootstock (5 trees/cultivar) and planted 6 x 6 m apart. In order to characterize this germplasm and, where necessary, to solve problems of synonymies and homonymies among accessions, data on flowering and fruiting phenology and fruit traits have been collected since 2000 (Sottile *et al*. 2005). During the coming years, these data will be integrated with molecular characterization.

Activities planned for 2006-2008 regarding *Prunus* genetic resources

- Enrichment of the conservation collection (re-acquisition of lost material, inclusion of new material);
- Continuation of the characterization of the accessions using the agreed passport data;
- Agronomic evaluation and evaluation for resistance/tolerance to different diseases in *Prunus* species (apricot, peach, cherry), followed by targeted breeding programmes;
- Characterization of inner fruit quality aspects by identification of nutraceutical values and antioxidant activities of 75 peach varieties present in the CC;
- Updating of the inventory of Italian fruit tree genetic resources; and
- Updating of the list of Italian accessions in the European *Prunus* Database (EPDB).

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Current situation of the Latvian Prunus *collections – conservation, evaluation and characterization for the establishment of core collections*

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Introduction

Stone fruits (*Prunus*) are one of the most important fruit crop groups in Latvia (Ruisa 1998; Lacis and Ruisa 1999; Kaufmane *et al.* 2002). The widest distribution, variety diversity in small gardens and importance in commercial growing is for cherries (sour cherries, *P. cerasus* L. and sweet cherries, *P. avium* L.) and plums (*P. domestica* L. and other species). These crops therefore also have high significance for breeding programmes and plant genetic resources activities (Rashal and Lacis 1999). Apricots (*P. armeniaca* L.) and peaches (*P. persica* L.) were introduced as minor crops with the main breeding goal of developing hardy varieties adapted to the local climate (Skrivele *et al.* 1995; Kaufmane 1998; Strazinska 1999). The only native species growing in Latvia are *P. spinosa* L. which is very rare and *P. padus,* but wild-growing seedlings of these species are also quite common.

The stone fruit (*Prunus*) landraces and varieties grown in Latvia represent an interesting result of the long-term introduction and hybridization of western European, Russian and lately also American varieties. The local climate demands a specific assortment of varieties, different from that of the southern and continental climate fruit growing areas. Such traits as winter hardiness, specific disease resistance and early maturing during cool summers are among the most important characteristics. The local genetic resources are a valuable source for the discovering and breeding of such varieties, as well as for the extension of the genetic basis of breeding work.

The present state funding for fruit crop genetic resource maintenance in Latvia allows only for the maintaining and renewing of the collections. More profound research requires the involvement of more scientific staff and laboratory equipment, therefore separate funding is necessary. For this reason, the main results so far have been achieved in cooperation with the Swedish University of Agricultural Sciences in Balsgård, Department of Crop Science (SLU-Balsgård).

The Latvia State Institute of Fruit-Growing (LIFG) and Pure Horticultural Research Station (HRS) hold extensive and valuable fruit crop genetic resources collections, including 399 accessions of stone fruits of different origin, which are used in research and breeding. Since the availability and informative value of germplasm are becoming more and more important for the future preservation and sustainable use of genetic resources, the constitution of the *Prunus* genetic resources core collections is very important for our country. When dealing with vegetatively propagated crops maintained in the field, it is not possible to duplicate whole collections due to the expense and time needed. Therefore conservation methods should be optimized and core collections are the most appropriate approach to ensure germplasm conservation without losing valuable breeding material and genetic diversity. This was one of the aims of the common Latvian-Swedish genetic resources evaluation programme.

Core collections in general are aimed at improving the management and effective use of plant genetic resources. They consist of a subset of the entire germplasm collection, chosen so as to represent maximal genetic diversity, with a minimal redundancy of the crop and its related species (Brown 1989; Ortiz *et al.* 1998). The creation of core collections can be done in several ways (Brown 1989). The most effective is by the application of descriptor–based characterization followed by statistical analysis. One such type of analysis is principal

component analysis (PCA), which enables researchers to perform simultaneous comparison of accessions for all traits, providing a general summary of variation and grouping of accessions according to characterization data (Broschat 1979; Iezzoni and Pritts 1991; van Hintum 1995; Noirot *et al.* 1996).

The establishment of representative core collections is largely dependent on the germplasm characterization level. Therefore in 1997 the characterization and evaluation of *Prunus* was started at Dobele. The goal of this paper is to describe the current situation in Latvian *Prunus* genetic resources evaluation, characterization and maintenance.

Material and methods

- **Plant material**

Prunus genetic resources in Latvia are stored at two major locations: the Latvia State Institute of Fruit-Growing (LIFG) and Pure Horticultural Research Station (Pure HRS) (Rashal and Lacis 1999). The collections there include the majority of the plum, cherry, apricot and peach varieties of Latvian origin, many breeding selections and foreign varieties. The priority accessions of Latvian origin at Pure and Dobele are duplicated according to the national genetic resources preservation programme (named cultivars and outstanding breeding hybrids). Smaller collections of Latvian apricot and peach varieties are kept at the Botanical Garden of the University of Latvia (LUBG), Riga (Table 1).

The *Prunus* evaluation and characterization programme included plant material held at the LIFG, Pure HRS and the LUBG collections (Table 1). The data used for the survey refer to the 399 accessions in total (318, 187 and 13 at the LIFG, Pure HRS and LUBG, respectively), represented by sweet and sour cherries, plums, apricots and peaches; 118 of them are duplicated, and these form the first priority group of Latvian origin in Table 1.

Table 1. *Prunus* genetic resources in Latvia

Crop	Group 1 (priority)					Group 2			
	Total	LIFG	Pure HRS	LUBG	Duplicates	Total	LIFG	Pure HRS	Duplicates
Sour cherry	22	22	22	0	22	23	16	14	7
Sweet cherry	23	23	22	0	22	57	35	30	8
Domestic plums	19	18	15	0	14	125	102	34	11
Diploid plums	9	5	9	0	5	70	59	19	8
Apricots	37	35	16	6	20	6	1	5	0
Peach	8	2	1	7	1	0	0	0	0
Total	**118**	**105**	**85**	**13**	**84**	**281**	**213**	**102**	**34**

Cherries

The cherry germplasm collection in Latvia includes accessions collected during expeditions within Latvia, foreign varieties (mainly from Estonia, Lithuania, Russia and Ukraine), advanced hybrids, and cultivars from other Latvian breeding programmes. It holds 80 accessions of sweet cherries and 45 of sour cherries.

The local sweet cherry accessions obtained by the breeder P. Upitis form the largest part of the collection. This material includes both samples from expeditions (mostly wild-growing and landraces) and hybrids from his breeding programmes. Unfortunately the information about the exact breeding and collection sources is lost. It is known only that local plant material was generally used both for the selection of advanced varieties and hybridization in the 1950s-1960s (Blukmanis *et al.* 1997).

Another group includes sweet cherry varieties and advanced hybrids which were created by other Latvian breeders using old traditional cultivars from Western Europe.

An important part of the Latvian collection is represented by foreign sweet cherry varieties developed in the former USSR (Estonia, Lithuania, Belarus, Russia, Ukraine), and characterized by good winter hardiness, disease resistance, but quite low fruit quality. There are also some high fruit quality varieties from Western Europe and North America.

The most widely represented and the most important sour cherry variety in Latvia is 'Latvijas Zemais', 18 different clones of which have been collected. The collection of sour cherries also includes some other local varieties and introduced cultivars.

Plums

Plum collections in Latvia include varieties and superior selections derived from *P. domestica,* crosses between *P. cerasifera, P. salicina* (including subsp. *ussuriensis*), *P. simonii* and *P. americana,* samples of *P. spinosa* and *P. brigantiaca.* These constitute the plum genetic resources collections at the LIFG and Pure HRS. A particular group is Eurasian plums, which were developed in Russia by crossing diploid and hexaploid plums which were subsequently backcrossed to get hexaploid material. The total number of plum accessions is 223.

The cultivars and superior selections in the collections are of many different origins (Latvia, Sweden, Lithuania, Estonia, Russia, Ukraine, Belarus, Italy, Germany, France, USA, Canada, Norway, etc.). For description and analysis, wild specimens growing in Latvia were also used.

Apricots and peaches

Apricot and peach (*P. armeniaca* L. and *P. persica* L.) breeding was carried out in a breeding programme at the LIFG and the Botanical Garden of the University of Latvia in the 1950s-1960s. The genetic resources include collections of apricot and peach cultivars and hybrids in both places – LIFG hybrids were obtained by the breeder P. Upitis using mostly material from the Central Asian Mountains, but at the Botanical Garden the breeder V. Varna used European peach and apricot varieties. There are 43 accessions of apricot and 8 of peach in the collections.

- **Characterization and evaluation**

Data acquisition was started in 1997 at the sweet cherry germplasm collection at the LIFG. The following quantitative traits were recorded for sweet cherries: fruit breadth, length, width, weight, skin colour; pit breadth, length, width, weight; length of fruit stalk; soluble solids in fruits; leaf blade area, width, length; leaf vein angles (apex, middle, base); leaf serrations per cm; gland number on the basal leaf edge; petiole length, thickness; gland number on petiole. The sour cherry germplasm was described using the same characters and analyzed at the LIFG in 2000. Leaf and fruit characters were measured in July-August. For each accession 25 random samples were evaluated (5 trees per accession and 5 samples per tree).

Afterwards during the data analyses these characters were converted to the IPGRI/UPOV descriptors and supplemented with additional ones.

All other analyses of cherry (1999-2001), plum (1998-2000) and apricot (2000-2001) germplasm were done based on morphology and phenology, fruit quality, disease resistance and hardiness data. In total 19 characters were used for sweet cherries, 21 characters for sour cherries, 18 for plums and 20 for apricots (Table 2). The characterization was based on descriptor lists approved by UPOV and IBPGR:

- IBPGR (Schmidt *et al.* 1985) and UPOV (TG/35/6, 1995) for cherries,
- IBPGR (Guerriero and Watkins 1984) and UPOV (TG/41/4, 1977) for plums, and
- IBPGR (Cobianchi and Watkins 1984) and UPOV (TG/70/3, 1979) for apricots,

supplemented by local reference cultivars.

The study of sweet and sour cherry genetic diversity is going on using molecular markers. For LIFG accessions, leaf samples were collected and DNA was extracted using the CTAB extraction protocol according to a modified Nybom and Schaal (1990) method. The estimation of genetic diversity was done using microsatellite (SSR) markers which had also been used for the characterization of the USDA cherry collection (Cantini *et al.* 2001).

Table 2. Descriptors used for *Prunus* genetic resources characterization

Descriptor	Sweet cherries	Sour cherries	Plums	Apricots
Tree vigour	X	X	X	X
Density of the head	X	X	X	X
Tree habit	X	X	X	X
Tree type	X	X		
Season of flowering	X	X	X	X
Fruit shape	X	X	X	X
Fruit size	X	X	X	X
Fruit firmness	X	X	X	X
Fruit juiciness	X	X		
Fruit separation from stalk	X	X		
Stone shape	X	X		X
Stone shape (lateral)			X	
Stone shape (ventral)			X	
Stone relative size in comparison with fruits	X	X		
Fruit skin colour	X	X	X	X*
Juice colour	X	X		
Harvest maturity		X	X	X
Leaf colour			X	
Shape of blade leaf			X	
Stone adherence to flesh			X	X
Sweetness				X
Acidity				X
Flesh colour				X
Extent of over colour				X
Susceptibility to fruit cracking	X	X	X	X
Length of stalk	X	X		
Crop type			X	
Resistance to *Pseudomonas syringae*	X	X		X
Resistance to *Monilia*	X	X	X	X
Resistance to *Blumeriella jaapii*	X	X		
Resistance to *Monilia frutigena*		X		
Resistance to *Clasterosporidium*				X
Winterhardiness			X	X

* = ground colour

- **Statistical analysis**

Relationships among accessions were evaluated by two multidimensional analyses: principal component analysis (PCA) and cluster analysis. The cluster analysis was performed using the group average, squared Euclidean method. PCA was used to find out the general grouping of accessions and the most important characters for grouping purposes. The cluster analysis allowed us to clarify the relationships inside specific accession groups. Reliability of accession choices was verified by ANOVA (analysis of variance).

Data analysis was performed using "Analysis of Variance and Multivariate Statistics modules of Statgraphics for Windows Version 3.3" (Anonymous 1997) and "ANOVA, Factor Analysis and Hierarchical Cluster Analysis functions of SPSS Version 8.0" (Norušis 1998) software.

Results and discussion

The establishment of *Prunus* core collections has some basic prerequisites: they should include (i) reference cultivars which must be the same from one collection to another to

ensure standardization of evaluation; (ii) specific cultivars and botanical varieties from each country, to preserve the local germplasm; and (iii) cultivars and genotypes with outstanding breeding value. In the first step of the constitution of core collections within the Latvian-Swedish programme the choice of actual accessions for inclusion in core collections was based on the representation of species and intraspecific taxonomic groups, geographic coverage and morphological characteristics.

Accessions outside this mandatory group were chosen based on characterization data. The procedure was aimed at identifying the more genetically diverse material, which is important for future breeding.

In the second phase of the constitution of core collections, PCA was used to study the correlation among varieties, species, inter- and intraspecific hybrids, which are necessary to establish the relationships between the different groups of accessions in the whole and core collections. It allowed checking the genetic diversity representativeness of a selected core collection compared to the whole collection.

Characterization was started for Latvian cherry genetic resources. Since this evaluation was done over several years (1997–1999), the detection of characters which are stable across the years (less variable environmentally) was possible. Very stable traits were found to be pit length, pit weight, fruit skin colour, leaf serration. Fruit characters such as width, breadth and weight were found to have low variability across years (Lacis and Rashal 2000). Therefore fruit characters were chosen as appropriate for germplasm characterization, a decision which agrees with the results of some other surveys (Vittrup-Christensen 1977, 1984). Results of sweet cherry data analysis from Sweden also came to similar conclusions, showing the high importance of fruit characters in accession grouping. Therefore the estimation of relatedness of sweet cherry accessions was based on the fruit characters.

According to the results of cluster and principal component analyses the cherry germplasm collection at the LIFG did not show strictly distinct groups based on phenotypic variance (Lacis 2001; Lacis and Rashal 2001). Nevertheless the coverage of genetic diversity by the core collection accessions was adequate (Fig. 1).

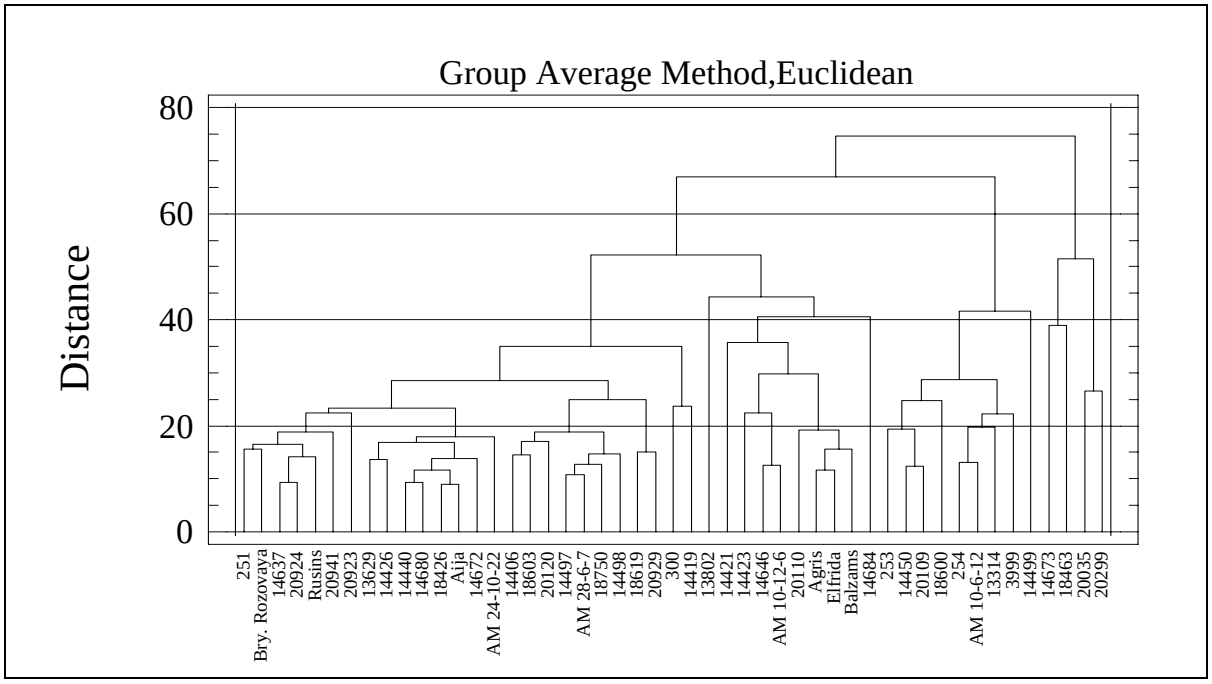

Fig. 1. Relatedness of sweet cherry accessions from the LIFG collection according to cluster analysis.

The grouping of sour cherry accessions gave two main groups with several escapers. Most of those selected as being reference varieties and valuable accessions, were included in the preliminary core set. Additional sour cherry accessions were included according to the grouping results to improve representativeness of the core collection.

Preliminary selection of Latvian sweet cherry accessions for a core collection gave 22 candidates. Latvian sour cherry germplasm is represented in the core collection by the two most common local varieties. Six sour cherry accessions and 16 sweet cherry accessions are assigned as reference varieties for further standardized evaluation (Table 3). The evaluation should be continued to ensure the correctness of these choices. The evaluation of cherry genetic diversity is being started using molecular marker (SSR) fingerprinting to verify the results of phenotypic analyses.

Table 3. Number of accessions selected from the Latvian collection for the Latvia–Sweden *Prunus* core collections

Origin	Sweet cherry	Sour cherry	Plum
Latvian	22	2	21
Reference cultivars	6	16	35
Total	**28**	**18**	**56**

The establishment of the plum core collection was performed in a similar way as for cherries, by choosing mandatory accessions and then following up with sample selection and reliability checking, using multivariate statistical approaches (Kaufmane *et al.* 2002). The results showed a clear separation of genotypes into two main groups: 1 = hexaploid; 2 = diploid plums and plums with other ploidy (3n, 4n, 5n, 7n) (Fig. 2). No such strict group formation was observed among *P. domestica* cultivar groups. Quite a good grouping was found in prunes, egg plums and the Eurasian group, but cultivars of gages were more diffuse between other *P. domestica* genotypes. A high degree of genetic variability together with intense recombination between genotypes and a broad genetic basis for breeding may be the reason for this finding (Ortiz *et al.* 1997). The preliminary list of core collection candidates includes 21 accessions. Additionally 35 accessions were marked out as reference cultivars for standardized evaluation (Table 3).

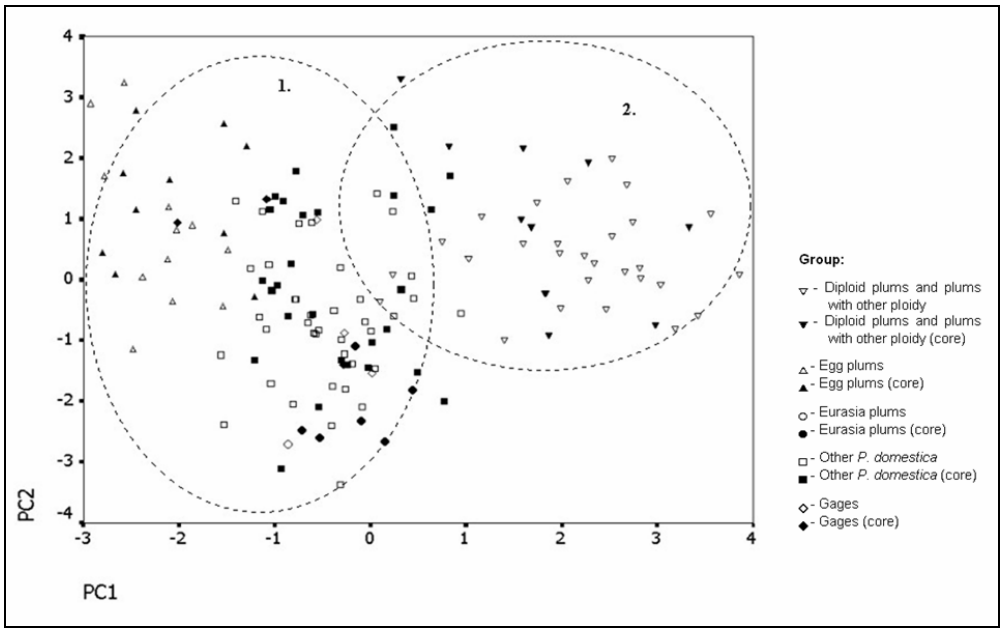

Fig. 2. Association among plum varieties in the LIFG collection revealed by PC value.

The comparison of accessions from the whole and core collections was also done by ANOVA, and showed high reliability of choice, because average values of most of the traits for accessions of the core collection were located in the range of the whole collection values (95% confidence level). Statistically significant differences, which were found for some traits, can be explained by the choice of superior representatives of the groups (e.g. fruit size). It also can be a result of the high representation of local, country-specific varieties, which are distinct for their adaptive traits (season of flowering, harvest maturity).

The main part of Latvian apricot collections used for the first round of description consists of accessions introduced to Latvia from the Caucasus Mountain area several decades ago and their seedlings.

The use of listed descriptors (IPGRI/UPOV) prevented the tracing of different origins for these accessions. Descriptors which better reflect botanical distinctiveness should be included in the further characterization, to get more precise germplasm grouping. It is necessary to continue characterization and character assessment, to work out proper criteria for a representative apricot core collection establishment.

A very important point is the choice of reference cultivars for standardized characterization. Since none of the proposed IPGRI/UPOV reference cultivars are available in our latitudes, 10 local apricot varieties were assigned as reference varieties for further characterization.

This survey is the first attempt at establishing *Prunus* core collections from genetic resources collections maintained in Latvia. The use of characterization and evaluation data for this purpose was found to be appropriate. The multivariate statistical analyses based on characterization data can lead to a better understanding of the genetic structure of the stone fruit collections and facilitate a proper core collection establishment. Development of locally adapted descriptor lists was done by introducing local reference varieties that will promote future evaluation.

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Prunus *germplasm status and investigation in Lithuania*

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The national plant genetic resources network in Lithuania is led by the Plant Gene Bank located at the Lithuanian Institute of Agriculture in Akademija (near Dotnuva, Kedainiai district). This genebank is responsible for collections of all kinds of crops. Other participating centres in the network include:

- the Lithuanian Institute of Horticulture (LIH) (all traditional horticultural crops);
- the Botanical Garden of Kaunas Vytautas Magnus University and the Botanical Garden of Vilnius University (wild small fruit and non-traditional horticultural crops);
- the Institute of Botany, the Botanical Garden of Kaunas Vytautas Magnus University and the Lithuanian Agricultural University (medicinal and aromatic plants);
- Vilnius University, the Botanical Garden of Vilnius University, the Botanical Garden of Kaunas Vytautas Magnus University, the Institute of Botany, the Flower Research Station and the Society of Dendrologists (ornamental plants); and
- the Lithuanian Forest Research Institute (forest genetic resources).

The main *Prunus* collections are maintained in fields (*in situ*) and some are also conserved *in vitro* at LIH (Table 1).

Table 1. Status of the *Prunus* collections in Lithuania

Crop	No. of accessions				
	Total	**Local**	**Introduced**	***In situ***	***In vitro***
Apricot	3	3	-	3	-
Cherry (sour and sweet)	160	19	141	160	5
Plum + Prune	131	10	121	128	24
Interspecific hybrids	3	2	1	2	1
Wild related *Prunus* species	1	1	-	1	-
Total	**298**	**35**	**262**	**294**	**30**

Since 1994 the Lithuanian government has financed the plant genetic resources programmes. The scientific investigations carried out on *Prunus* are as follows:

- Plant variability and stability during micropropagation, production of virus-free material and long storage *in vitro;*
- Evaluation of donor characteristics and their molecular markers. Investigation of S-allele distribution in local sweet cherry cultivars;
- Evaluation of complex resistance to frost and fungal diseases.

Prunus cultivars and lines which are the donors of desirable traits started to be introduced and used in the *Prunus* breeding programmes.

At the international level, Lithuania collaborates with IPGRI and the Nordic Gene Bank.

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Prunus *genetic resources in the Nordic countries*

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Plums and sour cherries are cultivated in all Nordic countries except Iceland. Additionally, sweet cherry is grown in Denmark, southern Sweden and along the Norwegian coast. Genetic resources of the above-mentioned *Prunus* species are preserved in national field genebanks. Maintaining the collections is a national responsibility, while the Nordic Gene Bank (NGB) is in charge of the documentation of the material. In this work NGB is assisted by a Nordic working group of national experts in pomology. In Denmark extensive variety collections of the three relevant species are held at the Royal Veterinary and Agricultural University (KVL), Copenhagen. Finland preserves some 150 local Finnish races of plums and sour cherry at Agrifood Research Finland (MTT), Pälkäne. In Norway minor variety collections of *Prunus* are found at four local Norwegian clonal archives. A more systematic inventory to complete the Norwegian collections is in progress. The situation in Sweden is similar to that in Norway. In addition each country is engaged in defining national lists of so-called "mandate" varieties of plums and cherries. According to the criteria used, a mandate variety should either originate in the actual country or be a foreign variety with a long growing tradition there. Both local varieties and varieties marketed from national breeding programmes belong to the former group.

In Sweden some 40 mandate varieties of plums and 30 mandate cherry varieties have been identified. Among the plums 53% are national varieties. Of these, five were developed at Swedish breeding institutes before 1950, while the remaining nine are of more recent date. In addition 11 varieties are considered to be local selections within the country. Considering the imported plum material, five varieties have been cultivated in Sweden since the 18th century, and 10 since the 19th century. England and France are the most important countries from which foreign plum material was introduced. As for sweet cherry, 67% of the varieties originate within Sweden, of which four are from breeding and eight are local selections. The corresponding figures for sour cherry are 64% national varieties, of which three are bred cultivars and four are local selections. The majority of the imported cherry material comes from France and Germany.

As of 1 January 2003, Sweden has for the first time allocated state funds to the establishment of a national genebank for fruits, berries and nuts. The measure is funded within the framework of the Swedish national programme for plant genetic resources, the Programme for Diversity of Cultivated Plants (POM = Programmet för Odlad Mångfald). When fully developed, the national genebank will consist of a national collection, in which all mandate varieties will be grown, along with a back-up system. In practical terms, this implies that each mandate variety of plum and cherry will be conserved as four trees – two in the national collection and two in a selected local clonal archive. An additional aim is to test and eliminate virus contamination in the Swedish mandate varieties. Similarly, national programmes are in the process of being developed in the other Scandinavian countries as well. Each country will choose its own relevant method for conservation. The Nordic countries will primarily offer their native mandate varieties to the European *Prunus* Collection.

Current status of Prunus *resources in Norway*

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Norway is located between 58°N and 71°N. Commercial fruit growing is carried out mainly in coastal districts as far north as 62°N. Apples, pears, plums and sweet and sour cherries are commonly grown, the last of these in smaller amounts. The temperature benefits of the mild Gulf Stream along the Norwegian coast allows fruit growing at such latitudes.

Norway has a programme for cultivar testing both in cherries and plums and a national breeding programme for plums. The institutions carrying out these activities have collections of both cherries and plums, but these collections are not primarily intended to act as collections as regards genetic resources.

In cooperation with the Nordic Gene Bank (NGB), a total of nine collections containing accessions of fruit trees (apples, pears, plums and sweet and sour cherries) have so far been established in Norway. A tenth collection containing only old *P. avium*, *P. cerasus* and *P. avium* x *P. cerasus* cultivars will be established in 2006, while an eleventh collection is planned as well. The collections are located in parks belonging to various public institutions such as museums and schools. One collection is located in the park of the Norwegian University of Life Sciences (UMB).

Regarding *Prunus* accessions, the collections contain 49 plum cultivars (mainly *P. domestica*, a few *P. salicina*) and 26 cherry cultivars (*P. avium*, *P. cerasus* and a few *P. avium* x *P. cerasus*). With the establishment of the 2006 collection 22 accessions will be added to the cherry list.

A database, including a Web site "Plantearven" ("the plant heritage") has been established and is under development. It records data on all the plant collections in Norway established within the National Genetic Resources Programme and the NGB system, including the fruit tree collections (Asdal 2005). The data are made accessible to the public through the Web site (www.plantearven.no). Here, data on the different accessions in the nine fruit tree collections can be found, together with some data on the collection sites. There are also links to related subjects. Further development and improvement of these tools are planned if resources are provided. This work is part of a strategic, long-term project, which also includes the establishment of a national network in this field, in which interested home gardeners are welcome to participate.

Prunus species have been grown commercially and in home gardens in Norway for several hundred years. Thus, a large variety of cultivars exists. For instance, in an overview of the commercial sweet cherry production in Ullensvang (the main area for sweet cherry production in Norway), the six largest fruit packing cooperatives received over the seasons 1970-1979, cherries of 86 different cultivars, of which 32 had local names (Meland 1982). It seems reasonable to anticipate that the total number of sweet cherry cultivars in Norway used to be considerably higher. Most likely the situation for plums was similar, and to a lesser extent for sour cherries. Many such potential accessions for genetic resource collections can still be found in both the former and present fruit-growing regions.

Wild-growing species in Norway include *P. padus* which is found all over the country and *P. spinosa,* spread along the coast in the very South. In addition, some other species have spread from gardens as well as the commonly grown fruit species.

The latitudes in which Norwegian fruit production is carried out limit this production in many ways; choice of cultivars and locations such as growing region and altitude are the most important limitations. This implies that many fruit trees that have been grown, and are

still found, outside the normal, present fruit-growing regions, have often faced unfavourable growing conditions, and have thus been naturally tested for different environmentally unfavourable conditions. This could add an extra value to such genetic resources. As an example, the northernmost forest population of *P. avium* is probably the one in Ørlandet, Trøndelag at approximately 64°N as reported by Schübler (1873-1875). It is still present (Professor A. Skogen, pers. comm. 2003).

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The current status of the Prunus *collections and their organization at the Research Institute of Pomology and Floriculture, Skierniewice, Poland*

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The field collections in Skierniewice are the largest in Poland. They cover 10 ha and contain almost 5000 fruit trees, small fruit and ornamental plant genotypes.

The fruit tree collections cover 8 ha and comprise 12 collections including apple, pear, plum, sweet and sour cherry, peach, apricot, walnut and hazelnut varieties, as well as rootstock clones and wild *Malus, Pyrus* and *Prunus* genotypes including old and local varieties collected from different regions of Poland (Grzyb 2004a, b; Grzyb and Hodun 2004).

The plum collection covers 0.6 ha and contains 245 varieties. Each variety is represented by three trees grafted onto *P. cerasifera* var. *divaricata* seedling rootstock.

The sweet and sour cherry collection covers 1.6 ha and contains 424 old and new Polish and introduced varieties (Grzyb and Hodun 1996). Each variety is represented by three trees. The sweet cherry varieties are grafted onto Mazzard F 12/1 rootstock, and the sour cherry varieties are grafted on *P. mahaleb* seedling rootstock.

The peach and apricot collection covers 1.0 ha and contains about 271 varieties (Jakubowski and Grzyb 2004). Each variety is represented by four trees. The peach varieties are grafted on *P. manchurica* seedling rootstock, and the apricot varieties are grafted on *P. cerasifera* var. *divaricata.*

The collections also include stone fruit rootstock clone collections and collections of wild *Prunus* genotypes (Sitarek and Grzyb 1999).

Sources of new genotypes

New genotypes come from several sources. Some are acquired from other collections in Poland and abroad. Some old and new varieties are collected during field expeditions in Poland and abroad, and can be included in the off-site collections. Some were developed during breeding programmes. Some were obtained from gardeners and amateur breeders.

Documentation of genotypes in the collection

Passport data are obligatory for each genotype. Each genotype has also been evaluated in accordance with UPOV and IPGRI descriptors. Other data included are on growth, vigour, crown habit, blossoming period, blossoming intensity, ripening period, yield, fruit size, skin colour, flesh colour, juice colour, stem length, stone size, and ease of separation of flesh from stone. For fruit plants, photographic records are also kept (Hodun and Grzyb 2000; Grzyb and Hodun 2002). Some of the data have been entered in the European *Prunus* Database maintained at INRA-Bordeaux, France.

Utilization of the collections

The main goals of the collections are to protect and preserve the genetic resources of horticultural plants, especially those endangered by age, poor health and the advances of modern civilization, and to maintain detailed information on them. The data acquired from the collections is very valuable because it is the result of long-term observations.

Some of the genotypes in the collections are used in special breeding programmes carried out at the Research Institute of Pomology and Floriculture in Skierniewice (Grzyb 2004a; Grzyb *et al.* 2004).

Historical background

The collections of fruit trees in Skierniewice were established in the late 1920s by Dr Włodzimierz Gorjaczkowski, lecturer at Warsaw Agricultural University. During and after World War II, the collections were taken care of by Dr Aleksander Rejman. In 1951 the fruit tree collections in Skierniewice became part of the structure of the newly established Institute of Pomology, which was founded by Prof. Aleksander Pieniążek. When collections of ornamental plants from a region near Warsaw (Plant Breeding and Acclimatization Institute at Radzików) were moved to Skierniewice in 1997, the Institute changed its name to the Institute of Pomology and Floriculture.

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Prunus *collections in Portugal – The almond situation*

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Prunus collections in Portugal

Being located in the most extreme western site in continental Europe, Portugal has strong Mediterranean and Atlantic influences. Portugal established several *Prunus* collections, mainly during the second part of the 20th century. The most important collection was maintained by the National Fruit Station (Estação Nacional de Fruticultura Vieira de Natividade, ENFVN) in Alcobaça; however, during the 1980s, this station did not received much support from the government and the quality of the collection has markedly declined since then. The other existing collections belong to Regional Agricultural Services (Direcção Regional de Agricultura, DRA) of Algarve (DRAAlg), Alentejo (DRAA), Beira Litoral (DRABL), Beira Interior (DRABI), Entre Douro e Minho (DRAEM) and Trás-os-Montes (DRATM). Only one collection, however, is a national collection (of apricot, at DRAEM). The collections are often made up of foreign cultivars, but some cultivars may now be considered Portuguese because they were introduced long ago.

- **Main problems**

Often the collections are not sufficiently characterized, although occasionally some phenotypic and molecular data have been recorded. Information on the number of duplicates at other sites available for each cultivar and on the presence of genetic variation among them is lacking. It is not known either whether the real genetic diversity existing in the country is represented in the collections. There may also be mislabelling problems.

- **Distribution**

Portugal maintains collections of five different *Prunus* species (Table 1) in a total of 13 collections. The most represented species is almond, one of the older fruit species in Portugal.

Table 1. Number of *Prunus* cultivars and their distribution in the different collections. Duplicates may be included

Species	Location	No. of cultivars	Total
Almond	DRATM	39	128
	DRAAlg	52	
	DRABI	5	
	ENFVN	32	
Sweet cherry	DRABI	39	68
	ENFVN	29	
Sour cherry	DRABI	8	16
	ENFVN	8	
Plum	DRABL	24	54
	ENFVN	30	
Apricot	DRAEM	32	73
	DRAA	13	
	ENFVN	28	

- **Needs and future development**

The present collections not only need support for maintenance, but also need to be characterized. Characterization is crucial so that decisions may be taken regarding increases or reductions of the number of trees/varieties to improve management. Recently the National Institute of Agronomic Research (Instituto Nacional de Investigação Agrária e Pescas, INIAP), obtained a project from the National Foundation for Science and Technology (Fundação para a Ciência e a Tecnologia, FCT) to establish a database of national collections. Contacts and collaboration between INIAP services and Regional Agricultural Services are now vital for the success of the project.

The almond situation

Almond accounts for 40% of all dry fruit production, covering an area of around 37 000 ha. The main production areas are in Trás-os-Montes, especially in the hot lands there, and in Algarve which is the traditional production area. In the past 15-20 years, Algarve has lost much almond area due to abandonment of cultivated land and to replacement by *Citrus* among other reasons.

In Trás-os-Montes, the soil is often poor and dry, usually acid and poor in organic matter, and nitrogen is supplied once every one or two years (Cordeiro 2000). In Algarve, almond is mainly found in the barrocal (a hilly and fertile zone parallel to the coastline), where the soils are calcareous and stony.

- **Traditional aspects and new developments in Trás-os-Montes**

In Trás-os-Montes almond trees have an increasing importance for tourism, since they are already an attractive feature for visitors to the region during blooming time (Cordeiro and Monteiro 2002).

Especially in the Upper Douro River valley, almond is a crop with a long tradition. However, because 50% of the orchards are older than 30 years, the productivity is quite low with only 100-120 kg/ha of kernels. However, in the hot lands of Trás-os-Montes recent introductions have been planted and the productivity is now much higher. About 50% of the orchards are younger than 10 years and production easily reaches 600-900 kg/ha of kernels.

In most cases almond trees are grafted onto almond seedlings (77% of the growers) and in a few cases hybrid rootstocks are used (INRA GF677 and almond seedlings: 8%; GF677: <4%) or other rootstocks (11%) (Cordeiro and Monteiro 2002). There are three local almond varieties in Trás-os-Montes, accounting for 45% of the total yield of the region, as shown in Fig. 1, although 80 local varieties were already identified, of which only a small number are represented in the collection of DRATM.

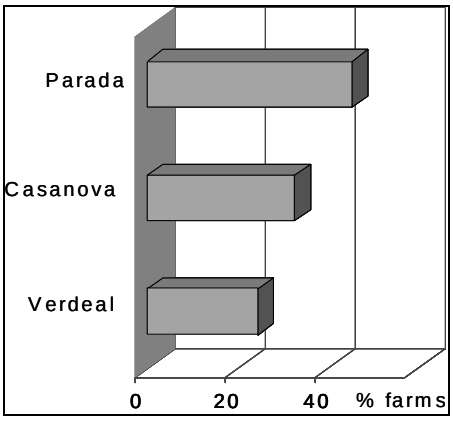

Fig. 1. Percentages of farmers growing the traditional varieties 'Parada', 'Casanova' and 'Verdeal' in the region of Trás-os-Montes.

The main foreign cultivars introduced into Portugal are French, 'Ferragnès' and 'Ferraduel' being the most representative (7.3% and 5.5%, respectively). Some farmers are also planting the Spanish cultivars 'Marcona' and 'Guara' and recently 'Masbovera', 'Glorieta' and 'Francoli' were also introduced (Cordeiro *et al.* 2005).

Considering the wide spread of 'Parada' in Trás-os-Montes, it might be interesting to determine if there is interesting variation to be exploited.

For some almond varieties and collections, data are available for morphological characteristics of the seed (shell and nut) and flowering. Moreover data about physical, chemical and organoleptic characteristics of the kernels are also available at DRATM for most varieties in the collection (Cordeiro *et al.* 2001). Additionally, molecular data are available for the collection in Tavira-DRAAlg, as well as in DRATM, on fingerprinting using various methodologies (including isoenzymes, RAPD (randomly amplified polymorphic DNA), AFLP (amplified fragment length polymorphism), ISSR (inter-simple sequence repeats) and self-incompatibility/compatibility alleles) (Fernandes *et al.* 2000; Martins *et al.* 2001, 2003).

- **The use of molecular markers in almond fingerprinting and management of collections**

The integration of RAPD and ISSR data to analyze traditional varieties maintained in Algarve and Trás-os-Montes collections, together with foreign commercial varieties, *Prunus webbii* and putative wild almond individuals collected from wild areas (with *P. persica* as outgroup), has provided interesting data. For instance, Algarve and Trás-os-Montes accessions of 'Boa Casta' are 93% similar. 'Bonita de São Braz' obtained from the two regions, although grouping together, are only 81% identical. 'Duro de Estrada Grado' and 'Duro de Estrada' are 95% identical and appear to correspond to the same variety (Martins *et al.* 2003).

Various samples collected from the wild (region of Foz Côa) appear to correspond to feral almond individuals, with only one eventually corresponding to a hybrid between almond and *Prunus webbii* (Martins *et al.* 2003). The different foreign commercial varieties analyzed were found interspersed among the Portuguese varieties.

The study of S-phenotypes (S-RNase proteins produced in pistils collected prior to blooming) and S-genotypes (DNA extracted from young leaves to analyze S-RNase genes) allowed us to characterize S-alleles in various Portuguese varieties, as well as to identify a number of new alleles (Ma and Oliveira 2001; Certal *et al.* 2002; Ma and Oliveira 2001a, b). Labelling mistakes were also detected using this technique and a putative new self-compatibility allele was found in the Portuguese variety 'Fura Saco'.

Molecular markers are also being developed for the early identification of tolerance or susceptibility to *Fusicoccum* canker (also known as constriction canker), a disease caused by the fungus *Phomopsis amygdali* (Martins *et al.* 2001; Martins and Oliveira 2004).

- **Phytosanitary status – viruses**

Almonds are commonly infected by viruses of the *Ilar* genus (Bromoviridae family), namely prune dwarf virus (PDV), *Prunus* necrotic ringspot virus (PNRSV), and apple mosaic virus (ApMV). In previous studies PDV and PNRSV were found to be present in all trees tested, including in the whole Algarve region (Nolasco *et al.* 1991), and in the central and northern region of the country (Raquel 1998; Raquel *et al.* 2002).

These viruses are known to spread through grafting and pollen. Virus dispersion through pollen was recently found to be intercellular and not due to virus location at the pollen surface. Viral particles accumulate around the nucleus of both the vegetative and the generative cells in pollen grains and are therefore easily preserved until they infect a new tree by honeybee-mediated cross-pollination (Silva *et al.* 2005). The plantation of new clean orchards is therefore not sufficient to ensure their good phytosanitary status and, naturally, cross-pollination cannot be prevented.

Germplasm for almond improvement

The economic and social importance of almond in Trás-os-Montes and its long tradition in Portugal and especially in Algarve justify the investment in the establishment of good collections. For these collections it is imperative to characterize the available germplasm still being used by the farmers as a strategic resource for the future development of new and improved varieties. At present the main targets for breeding are late flowering (to reduce frost damage and to promote good bee activity) and self-fertility. Besides breeding, another way to obtain good varieties is to select among local genotypes, searching for phenotypic variation possibly correlated with genotypic variation. The search for self-fertility, monitored by simple selfing performed in the field is another goal achievable by work conducted in collections.

Acknowledgements

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Status of the Prunus *collections in Romania*

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In Romania *Prunus* genetic resources collections are located mainly at the Research and Development Institute for Fruit Growing (Institutul de Cercetare-Dezvoltare pentru Pomicultura, ICDP) in Pitesti-Maracineni and in the Research and Development Stations for Fruit Growing (Statiunea de Cercetare-Dezvoltare pentru Pomicultura, SCDP) in Valcea, Iasi, Baneasa and Constanta.

The conservation of plant genetic resources in the framework of the National Plant Genetic Resources Programme is presently coordinated by the "Gheorghe Ionescu-Sisesti" Academy of Agricultural and Forestry Sciences (ASAS) and the Ministry of Agriculture, Water and Forestry (MAAP). Each collection and also the Suceava Gene Bank keep data regarding the accessions.

With the support of IPGRI, the Suceava Gene Bank published in 2003 a seven-volume Catalogue which includes the descriptions of *Prunus* genetic resources (Fascicle VI - Fruit Trees).

The *Prunus* collections have great importance for Romania because they are the basis of the plant breeding programmes for the most important fruit crops (plum and prune, peach, apricot, sweet and sour cherry).

During the last few years, Romania, which is in a transition period to the free market economy, has had to face numerous economic and research activity restructuring processes, which have greatly affected plant genetic resources conservation including of *Prunus*. Some of the Research and Development (R&D) Stations holding *Prunus* collections were restructured and, as a result, 703 accessions remained in those stations.

Besides all the transformations which took place at the social and economic levels, the number of *Prunus* accessions increased from 3460 to 5700 (Table 1). This increase was due to the collecting of new accessions or the obtention of bred material (selections and hybrids). Comparatively with the number of "original" accessions included in the European *Prunus* Database (EPDB) which was 583 in 2000, at this moment there are 1683 accessions in the *Prunus* collections. The most important increases were recorded for plum and prune (328 accessions), peach (271), sweet cherry (175) and apricot (174).

Concomitant with the increase in accession numbers due to the breeding programmes, introductions from abroad should also be mentioned.

Table 1. Status of *Prunus* collections in Romania

Crop	Total no. of accessions in collections	No. of accessions introduced from abroad	Duplicates and hybrids	"Original" accessions	No. of "original" Romanian accessions
Almond	186	94	25	67	57
Apricot	1276	447	675	230	56
Cherry (sour)	329	143	130	73	68
Cherry (sweet)	688	203	163	222	47
Peach	1862	941	670	310	39
Plum and Prune	1198	301	215	620	292
Interspecific hybrids	161	-	-	161	24
Total	**5700**	**2139**	**1878**	**1683**	**583**

The distribution of the *Prunus* collections among R&D institutions from different zones of the country is shown in Table 2. The main locations are in Pitesti-Maracineni, Valcea, Baneasa, Constanta and Iasi. These R&D stations and the Institute of Pitesti-Maracineni also have other fruit crop collections.

Table 2. Location of *Prunus* collections in Romania (see Table 3 for details of the institutes)

Crop	Total no. of accessions	ICDP Pitesti	SCDP Valcea	SCDP Iasi	SCDP Baneasa	SCDP Constanta	Others
Almond	186	-	-	-	-	-	186
Apricot	1276	-	-	-	580	531	165
Cherry (sour)	329	178	-	115	-	-	36
Cherry (sweet)	688	324	-	364	-	-	-
Peach	1862	-	110	-	651	855	246
Plum and Prune	1198	556	572	-	-	-	70
Interspecific hybrids	161	134	27	-	-	-	-
Total	**5700**	**1192**	**709**	**479**	**1231**	**1386**	**703**

ICDP = Institutul de Cercetare-Dezvoltare pentru Pomicultura
SCDP = Statiunea de Cercetare-Dezvoltare pentru Pomicultura

Table 3. Institutes holding *Prunus* collections in Romania

Institutions	Postal address	Curators	E-mail addresses
ICDP Pitesti-Maracineni	Str. Marului 402, Pitesti 117450, Jud. Arges	Dr Sergiu Budan (cherries) Dr Madalina Butac (plums)	icpp_mar@geostar.ro sergiubudan@yahoo.com www.icdp-m.com
SCDP Valcea	Str. Calea lui Traian 464, Rm. Valcea 240273, Jud. Valcea	Dr Mihai Botu (plums)	stpomvl@onix.ro
SCDP Constanta	Str. Pepinierei 1, Com. Valu lui Traian 907300, Jud. Constanta	Dr Elena Topor (apricot) Dr Liana Dumitru (peaches)	lianadumitru@yahoo.com eltopor@yahoo.com indieasalexandra@yahoo.com
SCDP Baneasa	Bd. Ion Ionescu de la Brad 4, Sector 1, Bucuresti	Dr Antonia Ivascu (peaches) Mr Valerica Tudor (apricot)	ivascu@scppbaneasa.ro office@statiuneabaneasa.ro www.statiuneabaneasa.ro
SCDP Iasi	Sos. Voinesti 175, Iasi, Jud. Iasi	Dr Ludovic Petre (cherries)	scdp22@rdslink.ro

The conservation of *Prunus* genetic resources in the medium and long term requires some actions which are necessary given the critical situation of the *in situ* collections:

- Reorganization and recovery of collections affected by the restructuring of research activities or by plant age (16-20 years);
- Completion of collections with new accessions, 'originals' and those introduced from abroad;
- New solutions for establishing *ex situ* collections (cryopreservation, *in vitro*), which may be more advantageous from the technical and economic points of view, in addition to the *in situ* collections;
- Completion of the evaluation of all accessions in accordance with the IPGRI descriptors and inclusion into the European *Prunus* Database;
- Use of modern DNA analysis methods for the identification of accessions.

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Prunus *germplasm in Serbia and Montenegro* [14]

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Over the past two decades, there has been an effort to collect, conserve, characterize and evaluate *Prunus* germplasm in the Balkan Peninsula. Thanks to its unique *Prunus* diversity, the Balkan Peninsula may be considered as a secondary centre of diversity for several species such as *P. domestica* L., *P. cerasifera* Ehrh., *P. avium* L., *P. cerasus* L., *P. mahaleb* L., *P. fruticosa* L., *P. armeniaca* L., *P. persica* L., *P. amygdalus* Batsch. and *P. nana* (L.) Stokes.

Five research institutes are involved in the conservation of *Prunus* genetic resources:

1. Faculty of Agriculture, Institute for Fruitgrowing and Viticulture, Novi Sad, Serbia
2. Faculty of Agriculture, Institute for Fruitgrowing and Viticulture, Belgrade, Serbia
3. Institute for Fruitgrowing, Čačak, Serbia
4. Institute for Fruitgrowing, Bijelo Polje, Montenegro
5. Institute PKB-Agroekonomic, Belgrade, Serbia

Collections are maintained as field collections in organized orchards, serving the multiple purposes of conservation, sources for vegetative propagation (nursery production and exchange) and field observations for morphological characterization and agronomic evaluation. The holdings in the collections are shown in Table 1. Accessions selected under the National Plant Genetic Resources Project in 1990-1994, held *in situ*, do not receive any professional support although all are fully characterized.

The total number of accessions held in all collections is 2372. A large number of selections from the breeding programmes are not included. A certain amount of duplication exists only in the apricot and cherry collections, more as a result of the exchange of material rather than because of any conscious decision on safety-duplication. Despite the emphasis on cultivar introduction from other countries, 44% of all cultivars and accessions are considered original, and were selected from the wild. *Prunus* collections, in general, are well characterized and evaluated. The objectives for their establishment were either breeding or clone collection or both, which entails a good knowledge of the material and a systematic characterization and evaluation. Only in peach and plum is virus status periodically checked. Much more attention needs to be paid to the documentation of the *Prunus* collections.

In former Yugoslavia *Prunus* species collections used to be included in the national programme of plant germplasm conservation and were fully funded by the Ministry of Agriculture. The restructuring of agricultural research at federal level left genetic resources without any financial support for maintenance and basic evaluation for over two years. However initial steps for the development of the national database have been made, resulting in a draft software version. Character descriptions have been done according to IBPGR descriptors. Only the collections held in Novi Sad are fully computerized; for the others data are recorded manually.

[14] June 2003

Table 1. *Prunus* germplasm collections in Serbia and Montenegro

Crop	Type of collection (*)	Holding institute (**)				
		A	B	C	D	E
P. persica	1	316	102	101	-	55
	2	457	-	12	-	25
	3	12	5	8	-	12
P. armeniaca	1	54	70	84	-	11
	2	28	3	8	-	3
	3	5	3	4	-	3
P. domestica	1	12	58	160	8	11
	2	-				
	3	2	6	11	-	7
P. cerasus	1	21	27	51	-	7
	2	3	12	12	-	-
	3	3	3	5	-	-
P. avium	1	42	51	111	-	14
	2	1	-	10	-	5
	3	5	4	4	2	3
P. amygdalus	1	15	-	-	-	4
	2	5	-	-	-	32
	3	2	-	-.	-	-
P. cerasifera	1	5	-	-	-	-
	2	14	-	10	-	14
	3	-	10	13	131	5
P. fruticosa	1	-	-	-	-	-
	2	4	-	-	-	-
P. nana	1	-	-	-	-	-
	2	4	.	.	.	
P. mahaleb	1	-	-	-	-	-
	2	4	-	-	-	-

(*) Type of collection:
1. *Ex situ*, cultivars
2. *Ex situ*, indigenous older cultivars and wild material originating in the country and region
3. *In situ* accessions

(**) Holding institute (curator):
A. Faculty of Agriculture, Institute for Fruitgrowing and Viticulture, Novi Sad, Serbia (V. Ognjanov)
B. Faculty of Agriculture, Institute for Fruitgrowing and Viticulture, Belgrade, Serbia (Evica Mratinić)
C. Institute for Fruitgrowing, Čačak, Serbia (D. Ogašanović)
D. Institute for Fruitgrowing, Bijelo Polje, Monte Negro (Đina Božović)
E. Institute PKB-Agroekonomic, Belgrade, Serbia (G. Zec)

Recent results of *Prunus* germplasm evaluation

- **Peach**

The Balkan Peninsula is considered a secondary centre of peach diversity thanks to a unique vineyard peach population. All the trees were grown from seed, so they provide a very rich source for selection studies. All the evaluations were carried out by teams of experts including agronomists, pathologists, botanists and technologists. A few large-fruited genotypes, highly tolerant to diseases and winter frost, with unique flavour, aroma and fragrance, have been submitted for registration as new cultivars. The existence of drought tolerance has been determined in genotype I 4/31 at the level of almond seedlings. Entire populations from the island of Pag, Croatia, and Riđica, northern part of Vojvodina, are immune to *Taphrina deformans*.

- **Apricot**

In recent decades, many apricot trees were grown from seed, resulting in great polymorphism. The most important characteristics used for evaluation were season of

flowering and maturing, cropping efficiency, fruit size and attractiveness. A few new varieties have been released out of that work, making them the leading varieties in our new plantations.

- **Myrobalan**

From 1995 to 2000 research was carried out on the natural populations in the Upper Polimlje Region, Montenegro, and Fruška gora, Vojvodina. The selection process was done in three stages. The first stage consisted of the study of the morphological and physiological characteristics of selections. The second stage studied the usability of fresh fruit for human consumption as well as in industrial processing. The most important selections are those with non-browning flesh after being defrosted at room temperatures for 24 hours. In the third stage, generative rootstocks, uniform, of medium vigour and compatible with standard plum and apricot cultivars, were selected. Field evaluations are in progress.

- **Cherry**

The main aim of the *P. fruticosa* evaluation programme is the selection of dwarfing rootstocks. Four distinctive genotypes have been collected *ex situ*. They respond well to micropropagation, grow well in the nursery and are compatible with the main cultivars of cherry.

- **Almond**

P. nana is a small shrub up to 1 m, very bushy and dense. The nut is small, flat and bitter. It is widespread in the southeastern part of Vojvodina, Deliblat desert, but is not very polymorphic. Four genotypes have been collected *ex situ*. All are not self-fertile but are highly compatible with peach.

Activities planned for 2003-2005

- Safety-duplication of vineyard peach collection, nearly 500 genotypes collected in all republics of former Yugoslavia. This is certainly a unique type of peach germplasm which it is not likely could be collected again. Trees are over 12 years old and poorly maintained. Financial help is needed.
- Agronomic and technological evaluations of new vineyard peach and myrobalan accessions.
- Evaluation for disease resistance in vineyard peach accessions, visual observations and artificial inoculations.
- Rootstock evaluations on dwarfing genotypes in *P. fruticosa* and *P. nana* x *P. persica.*
- Use of a small part of the genetic material in breeding programmes.
- Further improvement of database software.

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Status of the Prunus *collections in the Slovak Republic*

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Introduction

- **The National Programme on Plant Genetic Resources**

The Research Institute of Plant Production (RIPP) in Piešťany coordinates the National Programme on Plant Genetic Resources for Food and Agriculture in the Slovak Republic, funded and supported by the Ministry of Agriculture, and in which 18 other specialized institutions (research institutes, public and private breeding institutions, NGOs, universities, etc.) cooperate. The National Programme was formally established in 1991 and approved in February 2005. The mandate for coordination was provided by a new law No. 215/2001 "Conservation of Plant Genetic Resources for Food and Agriculture".

Action Plans for the implementation of the National Strategy for Biodiversity in the Slovak Republic for the years 2003-2010 were brought into being by the resolution of the Slovak Government No. 1209 of 6 November 2002.

- **The Genebank**

The Genebank was opened in November 1996. It is situated at RIPP Piešťany and has national responsibilities for plant genetic resources (PGR). It is a specific facility for the long-term conservation of genetic resources, especially seed. The capacity of the genebank is planned to be 50 000 accessions. The genebank has a basic seed collection for long-term conservation (-18°C) as well as an active collection serving for the distribution, regeneration and evaluation of plant characteristics. Each sample of the basic collection is safety-duplicated in the Research Institute for Crop Production (RICP) in Prague, Czech Republic.

Vegetatively propagated species (fruit trees, flowers, medicinal plants) are maintained in orchards established in the region of origin or in the region with the optimal ecoclimatic conditions for the plants. Altogether there are 15 orchards covering 127 ha.

- **The National PGR inventory**

The information system is oriented towards the creation or improvement of the structure of PGR databases both for passport data and general data (seed acquisition, storage management).

The inventory database is maintained at RIPP Piešťany. The total number of records (approximately 26 000) includes the working collection, active collection and base collection. The number of *ex situ* accessions is estimated to be more than 17 000. These represent 190 plant species. The largest collections are of cereals (24.1%), followed by fruit trees (19.9%), legumes (18.6%) and grasses (6.9%). Other collections are represented by less than 6% of the total.

All institutes cooperating within the National Programme use the National Information System on PGR (SISGEZ). It consists of three parts: passport, characterization/evaluation and storage data. Data are recorded using MSExcel or FoxPro; all data are computerized.

The *Prunus* collection

Prunus collections are included in the Slovak National Programme on Plant Genetic Resources. They are held at different sites and under the authority of different organizations:

private, state or NGOs. Funds for the maintenance and basic evaluation of vegetatively propagated species are inadequate at present. Financial resources cover only 60% of costs. There are no funds for special evaluation, documentation and regeneration of accessions.

Fruit trees rank second of all collections with a total number of 5176 accessions including cultivars, hybrids, local varieties, wild, interspecific hybrids and rootstocks of apples, pears, sweet cherry, sour cherry, peach, plums, strawberry, *Ribes, Sorbus* and other species. All are kept as plants in the field. All collections are well organized, with computerized lists of accessions, passport data and some with descriptive data.

The *Prunus* collections hold a total of 886 accessions including apricot (341), peach (237), almond (35), cherry (163) and plum (110) (Table 1). The European *Prunus* Database contains records of 222 accessions originating in the Slovak Republic.

Table 1. Overview of the *Prunus* collection in the Slovak Republic

Crop	Total no. of accessions (2003)	No. of accessions of Slovak origin (1996)	No. of accessions of Slovak origin (2003)
Almond	35	14	14
Apricot	341	11	15
Cherry	163	67	67
Peach	237	41	41
Plum	110	76	85
Total	**886**	**209**	**222**

The major *Prunus* collections are maintained at the following institutes:

- Research Breeding Station (RBS) Vesele (curator: Dr D. Benediková): apricot, almond, peach, plum and prune;
- Research Institute of Fruit and Ornamental Plants (RIFOP) Bojnice (curator: Dr S. Sojak): sweet and sour cherry, plum, inter-specific hybrids;
- Herbaton Klcov (curator: Dr S. Jurcak): sweet and sour cherry, plum and prune; and
- Slovak Agricultural University Nitra (curator: Dr J. Brindza): orchard for duplication of all species, education programmes, documentation systems.

The number of accessions per crop and per holder is shown in Table 3.

Table 3. Distribution of the *Prunus* collections in the Slovak Republic per crop and holder

Crops	RBS* Vesele (SVK0012)	RIFOP** Bojnice (SVK0010)	Herbaton Klcov (SVK0011)	Total no. of accessions	Passport data	Description data
Almond	14	-	-	14	14	14
Apricot	15	-	-	15	15	15
Cherry	-	31	36	67	67	67
Peach	41	-	-	41	41	41
Plum	14	64	7	85	85	76
Total	**84**	**95**	**43**	**222**	**222**	**213**
Not evaluated						9

* RBS = Research Breeding Station
** RIFOP = Research Institute of Fruit and Ornamental Plants

Research activities on Prunus *germplasm in Spain – Status in 2005*

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Since the inception of the Programme for Maintenance and Utilization of Plant Genetic Resources by the Spanish Ministry of Agriculture, Fisheries and Food by an order of 23 April 1993, the reference collections of all *Prunus* species were established as reported in 1996 at the fifth meeting of the ECP/GR Working Group on *Prunus* in Izmir, Turkey (Socias i Company 1996). All these collections are still maintained at present, as well as the others mentioned in that report, although the curators of some have changed.

Also, the Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA), transferred from the Ministry of Agriculture, Fisheries and Food to a newly created Ministry of Science and Technology, offers research proposals every year for plant genetic resource exploration, maintenance and evaluation. Some of these projects include new species, such as *P. spinosa*, *P. cerasus* and *P. salicina*, not considered previously, and the exploration of new regions, such as western Spain for cherry.

The ultimate objective of any germplasm collection is its utilization in breeding programmes. We shall review the minor changes in the previous collections, the developments in new activities and the *Prunus* breeding programmes related to the existing collections.

Network of *Prunus* collections

All the collections considered at Izmir remain as stated (Socias i Company 1996). Most of them have some new accessions. Some have reduced the number of accessions, but this has not occurred in any of the basic collections of the network. Most of them are also the reference collections for the Spanish register of fruit cultivars, and some, such as the peach collection of Zaragoza, for the European register. The changes to be taken into account are minor, such as:

- Almond: the only curator of the reference collection of Zaragoza is R. Socias i Company, due to the retirement of A.J. Felipe. The name of the institute has changed from SIA-DGA (Servicio de Investigación Agraria de la Diputación General de Aragón) to CITA (Centro de Investigación y Tecnología Agroalimentaria) at the same address.
- Cherry: the curator of the collection of Badajoz is now M. López Corrales instead of F. Toribio at the same address.
- Peach: the present curator at Zaragoza is J.M. Alonso due to the death of M. Carrera at the same address although the name of the institution is now also CITA.

New developments

Some new species, not considered previously in the Spanish *Prunus* Germplasm Network, have been included and receive support through research proposals from the INIA. The main activities carried out at present are:

- **Japanese plum (*P. salicina* Lindl. and other diploid cultivars of complex origin)**

This species was not considered for conservation previously because all the accessions in the Spanish collections were foreign. However, owing to the importance of this crop in some regions it was recommended to include it under the responsibility of Mª Luisa Badenes

(Instituto Valenciano de Investigaciones Agrarias, IVIA), Apartado Oficial, 46113 Moncada, Valencia).

- **Sour cherry (*P. cerasus* L.)**

Sour cherry was not considered because the few accessions in the Spanish collections were all foreign. However, although this species has not so far been a commercial crop in Spain, scattered trees were found in some orchards and at the borders of agricultural plots and roads inland. There is now a project for the collection, identification and maintenance of the sour cherries of eastern Spain, which also includes the local populations of sweet cherry. The person in charge is Mª Remedios Morales (University of Salamanca, Filiberto Villalobos 119, 37007 Salamanca).

- ***P. spinosa* L.**

This is a wild species, the fruits of which were utilized initially at a local level and later by industry to produce a liqueur after maceration. Fruits were traditionally gathered from the wild, without paying any attention to their size, colour, quality, composition, etc. Now work is in progress to identify the best genotypes in their natural habitats in order to recover and maintain them in safe collections. This work is under the guidance of Alvaro Benito (Instituto Técnico y de Gestión Agrícola (ITGA), Tudela, Navarra) and Valero Urbina (University of Lleida, Alcalde Rovira Roure 177, 25198 Lleida).

Some activities are directed towards prospecting for accessions of *Prunus* species in old orchards, aiming at their identification to ascertain whether or not they are present in the reference collections, and their ultimate incorporation into the Spanish Germplasm Network.

Pilar Errea (CITA de Aragón, Apartado 727, 50080 Zaragoza) is conducting a survey of fruit cultivars from mountain zones, often in abandoned orchards (because of depopulation). Her focus is mainly on pome fruits, but some plums (*P. domestica* L.) have also been surveyed and are now being identified and recovered.

Mª Angeles Moreno (EE Aula Dei, Consejo Superior de Investigaciones Científicas (CSIC), Apartado 202, 50080 Zaragoza) jointly with J.M. Alonso (CITA de Aragón), curator of the northern peach collection, has undertaken another survey of peach types and rootstock hybrids of the Ebro Valley in areas which have not previously been surveyed.

Local populations of cherry are being surveyed in Navarra by J.B. Royo (Universidad Pública de Navarra), in Aragón by M. Herrero (EE Aula Dei) and A. Wünsch (CITA de Aragón) and in Extremadura by M. López Corrales. European plum is also being surveyed by A. Arbeloa (EE Aula Dei) and J. Rodrigo (CITA de Aragón).

Through the specific germplasm proposals and also, more often, through other general research proposals, important work on identification is being carried out by molecular markers in many *Prunus* species, both in the institutions where the collections are maintained and in other laboratories, mostly utilizing the accessions present in these collections.

Recently there is growing interest in the sanitary status of some of the collections. As a consequence, the almond and peach collections of the CITA of Aragón and the apricot and peach collections of the Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario (IMIDA) of Murcia are being tested for the presence of viruses and other graft-transmissible diseases, in preparation for the eventual creation of new virus-controlled collections.

Breeding

Prunus breeding is carried out in Spain in breeders' collections which often coincide with germplasm collections. The utilization of local accessions, important from the germplasm point of view, is relevant for some specific objectives of these programmes.

- **Almond**

The two main objectives of the three breeding programmes were self-compatibility and late blooming, two traits not found in the Spanish almond diversity. As a consequence, foreign accessions were utilized as parents, although local cultivars were included seeking mainly adaptability to local conditions by the Institut de Recerca i Tecnologia Agroalimentàries (IRTA), Reus and by Centro de Edafología y Biología Aplicada del Segura (CEBAS). The traditional cultivars 'Desmayo Largueta' and 'Marcona' were also included due to their kernel quality and market recognition. Later, 'Bertina', a local seedling, was identified due to its late blooming and included in the breeding programme of the CITA of Aragón, where 'Forastero' is also being considered because of its resistance to diseases.

- **Apricot**

The main breeding objective is sharka resistance. The two coordinated programmes of IVIA and CEBAS have thus utilized foreign resistant parents together with local cultivars of high quality. Some new tolerant cultivars have already been released and others are under evaluation and close to being released.

- **Peach**

Both public and private breeding is carried out in peach. Practically all the private work and most of the public work is directed towards early ripening freestone peaches, types not really present in the traditional Spanish peach germplasm. The public programme of the late M. Carrera has been thorough, utilizing the local germplasm in order to obtain some specific peach types quite unusual for the world market, such as white clingstones and flat peaches for all seasons and yellow clingstones ripening in late August, all of them for table consumption.

The other public breeding programmes with *Prunus* species are minor, not having resulted so far in any releases. The breeding work by private companies is not publicized, although in most cases only foreign germplasm is involved in their crosses. To our knowledge, some local peaches and cherries have been involved in crosses by private companies, but the results are not yet known.

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Swiss activities on Prunus *genetic resources*

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There has been considerable progress in *Prunus* genetic resources activities in Switzerland over the past few years. The United Nations Conference on Environment and Development (Rio de Janeiro, 1992) gave a good basis for this work. One of the key agreements adopted at Rio was the Convention on Biological Diversity. The convention has fostered international activities for the conservation and sustainable use of plant genetic resources for food and agriculture. The convention establishes three main goals: the conservation of biological diversity, its sustainable use, and the fair sharing of the benefits from the use of genetic resources. In Switzerland, based on the Global Plan of Action, a national plan of action for the conservation and sustainable use of plant genetic resources for food and agriculture was adopted. It is implemented through the Federal Office of Agriculture by specific projects in collaboration with different organizations, mainly NGOs. In the first 4-year programme from 1999 to 2002 and during the current programme phase II (2003-2006), progress in the area of fruit genetic resources was considerable. The coordination of activities and projects in the plant genetic resources area is carried out through the Swiss Commission for the Conservation of Cultivated Plants (SKEK-CPC: www.cpc-skek.ch) with its headquarters at Changins-Nyon. There is a specific subgroup for fruit within this Commission and a coordinator. The fruit subgroup has established a concept and guidelines for the conservation of fruit genetic resources, a technical and a pomological working group.

The national genetic resources database is actually being established at the office of SKEK-CPC in Changins-Nyon (www.bdn.ch). There is still delay in the incorporation of the Swiss *Prunus* data that have already been collected from the individual organizations into the database. However, we are optimistic that the data will be incorporated in the near future and that exchange with the European *Prunus* Database will be possible.

National fruit inventory

The national fruit inventory on the genetic resources for all fruit and small fruit species was established by the NGO Fructus (www.fructus.ch) in collaboration with Agroscope Changins-Wädenswil (www.acw.admin.ch) and partner organizations (Table 1). The project started in 2000 and was completed in March 2005. Every year a specific area of Switzerland was inventoried. Questionnaires were sent to land owners who have fruit trees. About 12 000 land owners responded to the questionnaire and mentioned in total more than 195 000 trees (accessions) which were introduced into the project database. On average 17 trees or small fruit plants were listed per owner.

More than 2000 endangered accessions spotted in the course of the inventory are being saved in collections in the meantime.

Table1. Distribution of *Prunus* accessions mentioned in the Swiss fruit inventory per species

Crops	Accessions mentioned (%)
Apple	35
Pear	21
Cherry	14
Other stone fruit	13
Nuts and chestnuts	8
Small fruit	4
Others	5

Conservation of *Prunus* genetic resources

The work for the conservation of *Prunus* genetic resources was less intensive compared to that on *Malus* and *Pyrus*. NGOs have traditionally focused more on *Malus* and *Pyrus* mainly because harvest is easier and pome fruit varieties are better known to the public. However, during the last four years two main stone fruit collections have been established on the grounds of Agroscope FAW Wädenswil, at the stone fruit centre Breitenhof near Basel for cherries and at Wädenswil for plums. These collections are planted at high density and will only be left for fruiting for specific years when descriptions will be made. However, duplication is being considered in other collections at normal planting distances.

Description of *Prunus* genetic resources

Since 2004 a National Action Plan (NAP) project has been dedicated to the agronomic and pomological description of the fruit genetic resources. A preliminary project to describe *Prunus* genetic resources for agronomic and pomological characters was carried out in 2002. The current project is establishing the descriptors in coordination with the ECP/GR rules. Manuals are being established for the coordinated agronomic evaluation and pomological description of the fruit genetic resources in the German and French languages. Descriptions, characterizations and identification of the accessions in the different collections have already started.

There is scope for comprehensive conservation and evaluation of the *Prunus* genetic resources in Switzerland.

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Prunus *genetic resources activities in Turkey* [15]

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Prunus genetic resources activities are an important part of the work of the Fruit Genetic Resources Group of the Turkish National Plant Genetic Resources Programme. As coordination centre for the Genetic Resources Programme, the Aegean Agricultural Research Institute (AARI) also coordinates the *Prunus* genetic resources activities.

The objective of the Fruit Genetic Resources Project is to survey, collect, conserve, evaluate, multiply and document information gathered from these activities. Surveys are based on the breeders' requirements and threat factors.

Prunus germplasm is being maintained in several different research institutes. Each institute is involved with one or more *Prunus* species within this framework: AARI is responsible for plum, sour cherry and almond, the Atatürk Horticultural Resources Institute is responsible for sweet cherry and peach, and the Malatya Fruit Resources Institute for apricot. Genetic resources are conserved *ex situ* in field genebanks (conservation gardens). The institutes responsible for safety-duplicates are the Alata Horticultural Institute for apricot and almond, the Eğirdir Horticultural Institute for plum, sour cherry and sweet cherry, and AARI for peach respectively.

Up to date, a total of 1076 *Prunus* accessions have been maintained (227 plum, 203 cherry, 89 peach, 264 almond and 243 apricot) in the field genebanks of those institutes.

Within the framework of the project on "*In situ* conservation of Genetic Diversity in Turkey" in Kazdağ (Kaz mountains), 3 wild plum (*Prunus divaricata*) accessions were found at three different designated sites called Gene Management Zones (GMZs). A management plan has been prepared to manage and monitor the GMZs.

[15] June 2003

UK Prunus *genetic resources – an update on collections and characterization* [16]

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The important *Prunus* collections are still those at Brogdale, East Malling, Edinburgh, Kew, Westonbirt and Wisley. The cultivar collections of cherry and plum held at Brogdale have been repropagated and are being verified. East Malling published the UK *Prunus* Catalogue in 1999. It contains some 1500 taxa including 150 species held in these collections or available commercially. We have collected about 150 wild cherries from around the UK; these were chosen on the basis of tree form and are primarily a resource for our timber improvement programme. We have recently started a project on gene flow in wild cherry which should deliver information useful for conservation *in situ*.

Evaluation has concentrated on the determination of the incompatibility genotype in cherry cultivars and wild accessions. We have used techniques we have developed for ribonuclease analysis and for PCR with consensus and allele-specific primers. We have genotyped some 100 self-incompatible cultivars and have published a table incorporating recent results from other institutes, containing about 170 cultivars. There are 22 incompatibility groups, each with a different genotype, and a group O of cultivars with unique genotypes. This information is useful for growers choosing appropriate pollinators and breeders designing crosses. Work to determine the incompatibility genotypes of our wild cherry accessions is in progress. We have also determined the incompatibility genotypes of some 60 almond cultivars, and developed a set of cherry microsatellite primers, most of which work also in peach, which will be useful for studying collections and wild populations.

The UK Department of the Environment, Food and Rural Affairs is now formulating a national policy on genetic resources for food and agriculture.

[16] June 2003

Molecular markers for Prunus *genetic resources – some observations* [17]

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Microsatellite primers have been reported in e.g. peach, apricot and cherry and often reveal polymorphism in more than one species. Is it possible to establish a set of "universal" primers, say 10 or 20, which work in nearly all *Prunus* accessions – and perhaps in pome fruit as well? Multiplexing several primers simultaneously would help to reduce costs. The genotypes of accessions (diploid accessions at least) can be conveniently expressed numerically by giving the size in base pairs of the amplification products. However, the estimates of allele size can vary with the detection method used; so there is a case for nominating reference cultivars, as with morphological characters. Some studies report minor differences between sports. It is likely that similar differences occur within old cultivars.

Consensus primers and allele-specific primers have been developed at East Malling for the cherry incompatibility alleles S_1 to S_{16}. These are convenient for determining incompatibility genotypes of accessions. We would welcome liaison with groups who may be detecting "new" alleles to avoid confusion in allele numbering. For example, we have reserved S_{17} to S_{22} for new alleles recently detected in Belgian wild cherry. Incompatibility primers are also available in almond, mume and Japanese plum.

[17] June 2003

Opportunities for cooperation between national institutes and NGOs – a chance to improve the conservation and protection of genetic biodiversity of fruit trees in Europe

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NGOs (non-governmental organizations) concerned with conservation and protection of the genetic biodiversity of fruit trees in European countries are involved in many different activities. Using Pomologenverein (Germany) and ProSpecieRara (Switzerland) as examples, some of these activities are described below.

One of the most important goals of both organizations is to locate rare or forgotten ancient fruit varieties, particularly regional and local ones. Therefore, the first step is identification, the techniques for which have gradually been lost over the past hundred years, so that for certain species (e.g. cherries and plums) new identification methods have had to be developed. At present, several specialists in these two NGOs have acquired the necessary knowledge and experience to determine varieties of the different species.

The science of varietal features includes the description of not only morphological characteristics but also physiological ones, such as the variety's vitality, tree health and suitability for cultivation (usually under non-protected conditions). For an exact, traceable and reproducible determination of varieties, it is essential to set up reference collections of kernels and stones, against which accessions can be compared at any time.

Besides identifying varieties, the documentation of their properties and potential uses, traditional recipes, etc., is another important interest of the NGOs. With the economic varieties especially, conservation will only be successful if information on how to make use of them is also preserved.

Many NGO members take part in official and private orchard-mapping projects, identifying extant varieties. This has produced a comprehensive record of the tree locations of many old and rare varieties. These unusual and locally distributed varieties are thereafter maintained and safeguarded in decentralized private collections. Particular importance is attached to the old landraces and local varieties, many of which have never been described pomologically and are known only by their local names.

Another important goal of both NGOs is to raise the interest of the general public in the older fruit varieties. One way they do this is by organizing "Apple Days", usually in cooperation with other regional organizations. The public are invited to bring along fruit samples from their own orchards, which gives the experts a general indication of the regional and supraregional distribution of varieties and the locations of old and rare varieties. Apple Days also feature many other aspects around the fruits: exhibitions of varieties, a wide selection of fruit products, including culinary specialities such as jams, juices, spirits – consisting of one pure variety, pastries, vinegar as well as perfume, literature, kitchen utensils, garden tools, and information e.g. on orchard care and pest control. Last but not least, there is an attractive children's programme with fairy tales, handicrafts, competitions and riddles - all about fruits.

Important activities are also to disseminate information on the cultivation, care and pruning of fruit trees as well as knowledge on identification: the members conduct local seminars on these subjects in the various regions. Another main focus is making the rare old varieties better known and encouraging their reintroduction, especially the native and local

types that are particularly well adapted to a given area. This is done by organizing scion exchanges and by cooperating with nurseries that cultivate and distribute the local varieties.

Now the question must be raised, how can NGOs support the work of national institutes? Nowadays genebanks and public varietal collections are facing difficult times. With the lack of finance and shrinking staffs, critical verification of these accessions is often impossible because of the lack of qualified personnel to do the work. Even the usefulness of modern molecular methods (if at all fundable) is limited here, because in the case of rare and old varieties one first has to clarify which accession really represents the authentic variety described in the historical pomologies. Thus a reference accession has to be verified and established pomologically before others can be compared with it and duplicates can be identified.

As history shows, this problem is not new but has preoccupied many earlier generations. Over the last two centuries many old varieties have been lost, and with them the knowledge of their characteristics and of confirmed tree locations.

Nevertheless, the guaranteed authenticity of accessions, decentrally managed in the member countries, has to be the precondition for their integration in European genebank systems – e.g. in the Decentralized European *Prunus* Collection (DEPC), or in A European Genebank Integrated System (AEGIS) – because these systems are also used to distribute accessions. Therefore a cooperation of the national institutes with suitable specialists from the NGOs would be both appropriate and desirable. NGO members with specialized knowledge of variety determination could collaborate in the verification of accessions in genebanks and official collections. As they have a good knowledge of the distribution and historic origin of varieties, cooperation in selecting nationally significant varieties to serve as AEGIS accessions would be useful. They might also collaborate in revising the selection of specific descriptors (e.g. for cherries).

Another possible focus for cooperation could be the integration of decentralized private collections into national genebanks, e.g. in the form of duplicate locations, to minimize the danger of loss by decentralization, for example in the event of disease. An expansion of the national collections by supplying scion material, and support in locating varieties presumed to be lost, would also make sense. NGOs could also provide the characterization data (passport data and specific descriptors) needed for the European databases. Finally, one could envisage the joint organization of public information events such as the Apple Days, in which the NGOs already have experience.

To pool and make effective use of the knowledge and experience of the national institutes and the NGOs in this way would seem both feasible and desirable, and it would enable both parties to achieve their mutual goals.

The EUFORGEN Noble Hardwoods Network [18]

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The first Ministerial Conference for the Protection of Forests in Europe was held in Strasbourg in 1990. Resolution 2 of the Conference called for the creation of "an instrument for cooperation on conservation of the genetic diversity of European forests". The outcome was the establishment of the European Forest Genetic Resources Programme (EUFORGEN) in 1994.

EUFORGEN is coordinated by IPGRI in collaboration with FAO and is overseen by a Steering Committee, which is composed of the national coordinators of all participating countries. The main tasks of EUFORGEN are to coordinate and promote the *in situ* and *ex situ* conservation of Europe's forest genetic resources, to facilitate exchange of genetic material and information and to increase public awareness. The Programme operates through five Networks, among which is the Noble Hardwoods Network, established in 1996.

"Noble" hardwoods are marked by a reduced competition capacity in forest stands, especially in the higher age classes. They usually grow as scattered individuals or small clusters in mixed forests and represent a small proportion of the total forest cover (less than 5% on average in European countries). They require good ecological site conditions and thus are often edged out to specific habitats. Most of the noble hardwoods are characterized by high-quality timber. Up till now, 32 tree species are regarded as noble hardwoods; among them is wild cherry (*Prunus avium* L.).

Besides producing yearly progress reports, the introductory reports of newly attending countries and the reports on ongoing (European) research projects, the 34 member countries of the Network pursue a number of main goals:

i. Identifying research needs leading to initiatives and proposals for new joint research projects,
ii. Compiling and updating a database on grey literature,
iii. Raising public awareness through the creation of a set of 3 or 4 informative posters, the editing of an information leaflet and through compilation of a picture collection on a freely available CD-ROM covering all aspects of noble hardwoods, and
iv. Editing Technical Guidelines for gene conservation.

However, there still remain some further tasks to enhance the conservation of genetic resources of noble hardwoods, such as the compilation of national inventories leading to the construction of a European database, the drawing up of descriptor lists and the assessment of genetic diversity on a pan-European scale.

[18] June 2003

*Selection and breeding of wild cherry (*Prunus avium *L.) at the Institute for Forestry and Game Management [19] - A new generation of clonal seed orchards of wild cherry in Flanders [20]*

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Forest policy in Flanders strongly promotes the use of indigenous hardwoods for re- and afforestation and for stand conversion. For wild cherry, this option is even more motivated by the acknowledgement of its high silvicultural, ecological and economical importance. Furthermore, the species is often mentioned as a potential alternative for poplar in the afforestation of abandoned farmland. This line of policy generates a strong demand for high-quality forest reproductive material, which cannot be met by the currently available basic material. As wild cherry generally occurs as individual trees or small clusters scattered throughout mixed forest stands, the potential for selecting seed stands is limited. Seed orchards have been created in the past, yet are marked by a largely insufficient productive capacity, mainly due to their small size.

The current selection and breeding programme attempts to remedy the discrepancy between supply and demand by the creation of a new generation of clonal seed orchards, which are to be characterized by (i) a high yield and (ii) a high genetic quality and diversity of the offspring.

The basis consists of a collection of 168 phenotypically superior "plus trees", distributed over 27 different populations throughout Belgium and resulting from a scouting campaign which has been going on since the early 1980s. Vegetative copies of these plus trees, obtained by grafting or budding, were planted in seven experimental plots. These multiclonal plantations not only allow for the evaluation of the genetic background of the superior traits observed on the original mother trees, but also serve as a genepool from which the constituents of the new seed orchards can be selected.

The research strategy adopted pursues a threefold aim:

i. Identification of the very best clones within the above-mentioned collection, based on their general combining ability for a number of adaptive traits such as vigour, morphology, phenology and disease resistance. The general combining ability (GCA) values are determined through observation of the half-sib progenies evolving from the multiclonal plantations.
ii. Designing the layout of the seed orchard and establishment of the minimum isolation standards with regard to surrounding natural populations of wild cherry. Tracing the optimal spatial arrangement of the clones within the orchard will result from linking the understanding of the occurring mating patterns to the identification of the incompatibility alleles of the clones selected.
iii. Assessment of the genetic diversity of the offspring of the seed orchards, compared to the diversity of the progeny of naturally regenerated forest stands of wild cherry.

As the silvicultural use of wild cherry brings into focus its susceptibility to a number of pathogens, phytopathological research is an essential part of the selection and breeding programme and focuses on:

- Anthrachnosis, a fungal leaf spot disease caused by *Blumeriella jaapii*. A scoring system for assessing the level of natural infection has been optimized and is fully

[19] Now Research Institute for Nature and Forest (INBO)

[20] June 2003

operational. However, as natural infections are highly dependent on weather conditions in spring, the development of a technique for artificial infection is envisaged.

- Bacterial canker, caused by *Pseudomonas syringae* pv. *syringae* and *P. syringae* pv. *morsprunorum*. Molecular techniques (AFLP) are used for distinguishing between both pathovars, as well as for the assessment of the genetic diversity of the pathogen. In view of relating this diversity to differences in pathogenicity, a method for artificial infection will be developed.

The European Prunus *Database (EPDB) – Status in December 2005*

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Introduction

The European *Prunus* Database (EPDB) was created under the auspices of IPGRI 20 years ago and was first maintained in Sweden. In the 1990s, the EPDB was transferred to the INRA research centre of Bordeaux, France, but at the time it was not interactive. For this reason it was necessary to create a new database.

The EPDB structure consisted of 32 passport descriptors, of which 19 were derived from the first version of the FAO/IPGRI *Multi-crop Passport Descriptor list* (Lipman *et al.* 1997); the others were 13 *Prunus* common descriptors defined by the *Prunus* Working Group in 1997 (Zanetto *et al.* 1997). Characterization descriptors were also included for each crop species (Zanetto *et al.* 1997).

Most data were collected during the three years of the EU Project GEN RES 61 (1997-1999).

Before 2005, all updated data were stored in Microsoft Excel® files. The estimated total is of 14 410 *Prunus* accessions held in European countries (Table 1).

In 2005, the *Prunus* database manager was commissioned to develop the cherry component of the database which is currently available on-line.

Activities since January 2005

From January to September 2005, E. Balsemin, manager of the EPDB, assisted by Loïck Le Dantec, Bioinformatics specialist, proceeded to the adaptation of the French Cherry Database structure.

At the same time, pre-formatted files on Microsoft Excel® were prepared and sent to the curators (May and August). Cherry data were then included into the database and a first version was put on-line in September (http://www.bordeaux.inra.fr/urefv/base/).

Up to now, the *Prunus* curators have been able to test the Cherry Database and send in their comments in order to improve the database. Those who have not already provided cherry data to the database manager benefitted from an additional delay to send their updated data.

At the end of November, a new version of the Cherry Database was put on-line in order to be presented during the Seventh meeting of the *Prunus* Working Group.

New Cherry Database

Freely available tools were chosen for the development of the Cherry Database. The advantages of this new database are that it is easier to add new descriptors or delete some of them. In the current version, it is also possible to include a photograph for each accession. Moreover, it should be a useful tool for helping in the identification of duplicates and synonyms.

Inclusion of passport and characterization data in the Cherry Database

The Cherry Database currently holds data from 24 contributing institutes from 11 countries, with a total of 2708 records representing 67% of the estimated total of 4037 cherry accessions (and cherry related species) held in European countries. It also represents 19% of the estimated total of 14 410 *Prunus* accessions (Table 1).

Most data are for *Prunus avium* accessions (70%) and *P. cerasus* accessions (27%).

Table 1. Estimated numbers of accessions to be included into the EPDB as of December 2005 (accessions which have already been included in the Cherry Database are shaded)

Country	INSTCODE	Cherry		Plum		Peach		Apricot		Almond		Hybrids		Total per institute	Total per country
		No.	*Year*	No.	*Year*	No.	*Year*	No.	*Year*	No.	*Year*	No.	*Year*		
Belgium	BEL014	23	*2005*	11	*1999*					1	*1999*	35	*1999*	70	208
	BEL019			138	*1998*									138	
Switzerland	CHE009			372	*2003*									372	372
Czech Republic	CZE031	310	*2005*	128	*1997*									438	519
	CZE050							81	*2005*					81	
Germany	DEU202	338	*2005*	188	*2005*									526	526
Spain	ESP007	62	*2005*	93	*1999*	35	*1999*					21	*1999*	211	731
	ESP110	60	*1999*			246	*1999*			214	*1999*			520	
France	FRA011	0	*2005*	0	*2005*			90	*2005*	76	*2005*			166	451
	FRA046	0	*2005*			175	*2005*							175	
	FRA057	110	*2005*											110	
United Kingdom	GBR012	464	*2005*	32	*1999*	20	*1999*			1	*1999*	21	*1999*	538	538
Greece	GRC012	30	*1999*			26	*1999*	5	*1999*	7	*1999*			68	68
Hungary	HUN021	209	*2005*	421	*1999*	201	*1999*	408	*1999*	106	*1999*			1345	1345
Israel	ISR013	49	*1997*	105	*1997*	245	*1997*	169	*1997*	40	*1997*	13	*1997*	621	621
Italy	ITA001	609	*2005*							58	*1999*			667	1276
	ITA020	37	*2005*					77	*1999*					114	
	ITA026			87	*1999*									87	
	ITA027	19	*2005*											19	
	ITA032	28	*2005*											28	
	ITA045	97	*2005*											97	
	ITA052	32	*2005*					52	*1999*					84	
	ITA061	4	*2005*											4	
	ITA076	89	*2005*											89	
	ITA216	9	*2005*											9	
	ITA228	27	*2005*											27	
	ITA322	38	*2005*											38	
	ITA332	4	*2005*											4	
	ITA352	9	*2005*											9	
Norway	NOR016			21	*1997*			3	*1997*					24	24
Poland	POL029	123	*2005*	126	*2005*							1	*2005*	250	250
Portugal	PRT072	24	*2005*	0		0		0		0		0		24	24
Romania	ROM009	103	*1997*	190	*1997*	34	*1997*			49	*1997*			376	549
	ROM016			103	*1997*							14	*1997*	117	
	ROM030							30	*1997*					30	
	ROM035							26	*1997*					26	
Slovakia	SVK001					8	*2005*	15	*2005*					23	129
	SVK010	21	*2005*	32	*2005*									53	
	SVK011			5	*2005*					14	*2005*			19	
	SVK012	22	*2005*	7	*2005*									29	
	SVK018			5	*1998*									5	
Turkey	TUR001	203	*1998*	260	*1998*	85	*1998*	236	*1998*	253	*1998*			1037	1037
Ukraine	UKR001	884	*2004*	1189	*2004*	1532	*2004*	963	*2004*			1174	*2004*	5742	5742
18 countries	**43 institutes**	**4037**		**3513**		**2607**		**2155**		**819**		**1279**		**14410**	**14410**

INSTCODE = FAO institute code
No. = Number of accessions
Year = last update

3. Improvement of the Cherry Database and extension to the other crops

Before creating the whole *Prunus* database with all crop species, it is necessary to improve the Cherry Database first, particularly the Web interface. In other words, the cherry component of the database should be used as a test. When the final improved version of the Cherry Database is approved by the whole Working Group, it will be easier to copy and adapt the Cherry Database structure for the other crops by changing the specific descriptors.

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APPENDICES

Appendix I. Towards a definition and implementation of a Decentralized European *Prunus* Collection (DEPC) **112**

Appendix II. Procedure for the inclusion of accessions into AEGIS **114**

Appendix III. Responses of the ECP/GR Working Group on *Prunus* regarding AEGIS Activities 4.1-4.5, 4.7 and 4.9 **115**

Appendix IV. Crop expertise readily available to participants **119**

Appendix V. Workplan of the ECP/GR Working Group on *Prunus* for 2006–2008 **120**

Appendix VI. Acronyms and abbreviations **122**

Appendix VII. Agenda of the Sixth Meeting **124**

Appendix VIII. List of participants in the Sixth Meeting **126**

Appendix IX. Agenda of the Seventh Meeting **131**

Appendix X. List of participants in the Seventh Meeting **133**

Appendix I. Towards a definition and implementation of a Decentralized European *Prunus* Collection (DEPC)

(Revised June 2003)

Purpose

To coordinate efforts of individual European countries to conserve, and make available for propagation and research, *Prunus* accessions originating in Europe or otherwise important to European horticulture, silviculture, cultural heritage or science. Each country remains responsible for its own *Prunus* genetic resources.

Composition

The European *Prunus* Collection should be a decentralized *ex situ* collection comprising appropriate accessions held by participating genebanks and available for distribution.

Accessions to be regarded initially as the European Collection accessions are those held in various European countries and accepted formally as European Collection accessions by the ECP/GR *Prunus* Working Group.

Accessions should be accepted as European Collection accessions if they are:

- important accessions from the wild, collected in Europe, representing the genetic diversity of the species
- landraces, cultivars or, exceptionally, certain selections with outstanding traits raised in Europe.

In addition there may be included from non-European origin:

- other wild accessions, cultivars and selections important for horticulture, silviculture, cultural heritage or research in one or more European countries.

Cultivars protected by Plant Breeders' Rights and items not free from quarantine pests and diseases should be included even if they cannot be distributed freely at present.

Subsequently, if several accessions of the same genotype are held, a limited number may have the European Collection designation confirmed by the ECP/GR *Prunus* Working Group, to reduce duplication of efforts.

Implementation of the decentralized collection

1. Curators to offer accessions by sending a list to the Central Database manager.

2. Central Database manager and a sub-group analyze the offers and propose them for agreement by the *Prunus* Working Group, before notify the participating genebanks concerned of the accessions that will be regarded as European Collection accessions.

3. Central Database Manager identifies European accessions held at only one site that need to be safety-duplicated in a second site and provides the list to the Working Group and the ECP/GR Secretariat for action.

Responsibilities of participating genebanks

- To provide the names (i.e. species, cultivar etc.) of the accessions they are offering as European accessions, with identification numbers where appropriate, to the European *Prunus* Database Manager.

- To endeavour to provide additional passport data, such as country of origin and status with respect to quarantine pests and diseases.

For accessions accepted into European *Prunus* Collection:

- To maintain the trees, ideally at least two per accession, or give at least two years' notice *via* the European *Prunus* Database Manager before grubbing.

- To endeavour to provide characterization data to European *Prunus* Database in accord with agreed descriptors.

- To make scion wood (e.g. two sticks) available in response to reasonable requests from within Europe, subject to the constraints of Plant Breeders' Rights and Plant Passports.

Responsibilities of European *Prunus* Database Manager

- To obtain the lists of available *Prunus* accessions and their locations from participating genebanks, together with passport data, and to make them available in a computerized version.

- To produce a list showing the number and location of accessions of each genotype. To draw attention to genotypes held at only one site (needing safety duplication).

- To cross-check and confirm with the ECP/GR *Prunus* Working Group and the participants which accessions are regarded as European Collection accessions and to annotate the database by inserting 'yes' in the field 'European *Prunus* Collection'.

- To seek characterization data of accepted accessions.

- To notify each country of any genotypes originating in that country but not held there so that the country can consider acquiring them.

- To receive and disseminate information about European Collection accessions threatened by grubbing with a view to arranging propagation and replanting.

- To update the database when informed by collection holders.

Responsibilities of the ECP/GR Working Group

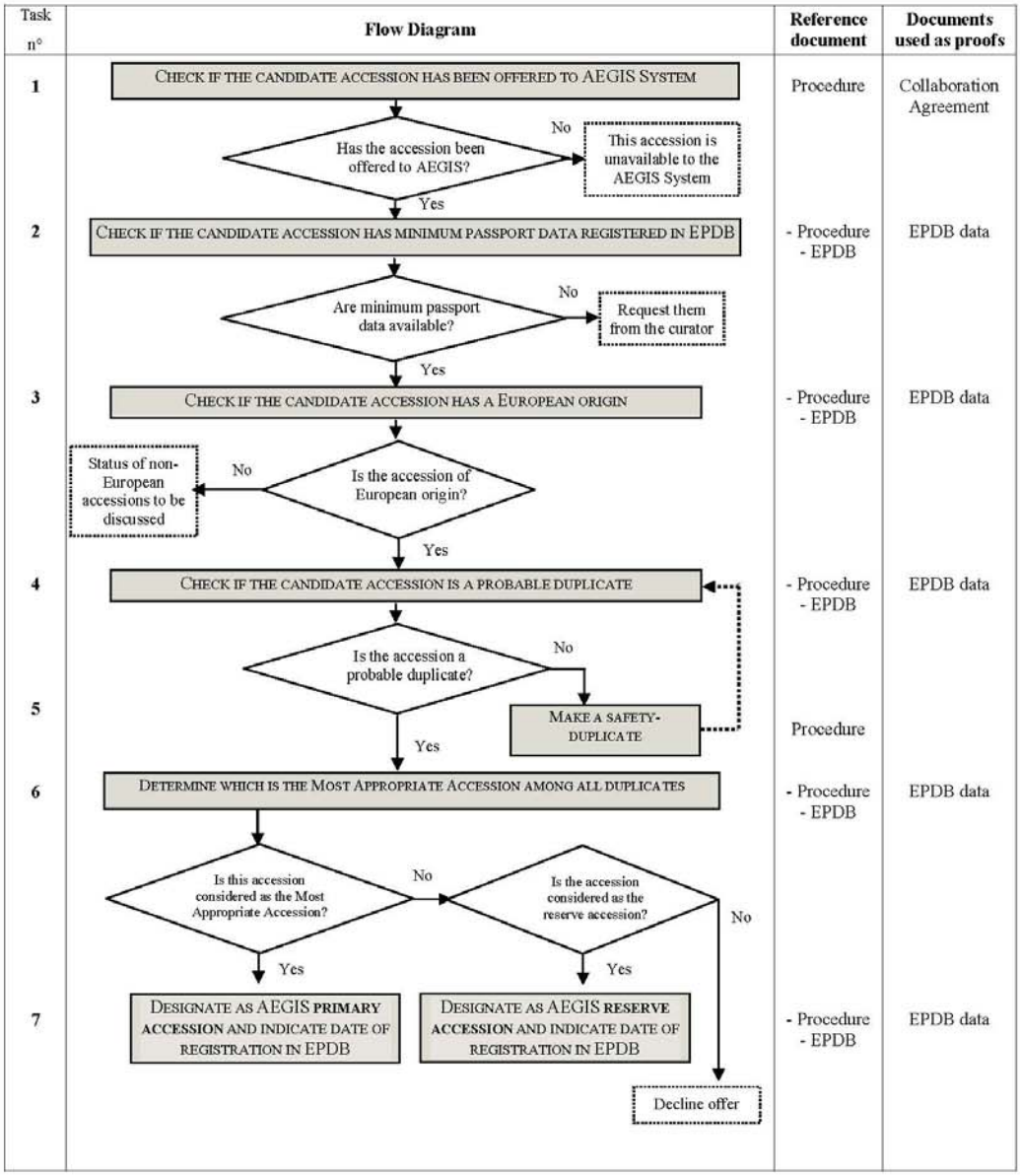
- To determine the composition of the European *Prunus* Collection.

- To reexamine the Collection regularly and if needed, to update or adjust its composition.

Appendix II. Procedure for the inclusion of accessions into AEGIS

The ECP/GR *Prunus* Working Group
Accession Registration Procedure for acceptance into the AEGIS System

This diagram indicates how to identify the material to be included in the AEGIS System, using the European *Prunus* Database as a tool.



	Drafted by	Checked by	Approved by
Name	Emilie Balsemin Ken Tobutt	The ECP/GR *Prunus* AEGIS project partners	The ECP/GR Working Group on *Prunus*
Date	November 2005	November 2005	December 2005

Appendix III. Responses of the ECP/GR Working Group on *Prunus* regarding AEGIS Activities 4.1-4.5, 4.7 and 4.9

(Revised and agreed by the ECP/GR Working Group on Prunus *at its Seventh Meeting, 1-3 December 2005, Larnaca, Cyprus, and revised after discussion with* Malus/Pyrus *and* Vitis *Chairs, Vice-Chairs and Database Managers at the Network Coordinating Groups' Meeting, 29-31 March 2006, Bonn, Germany).*

4.1 and 4.2 - Scope and structure of AEGIS *Prunus* system/collection

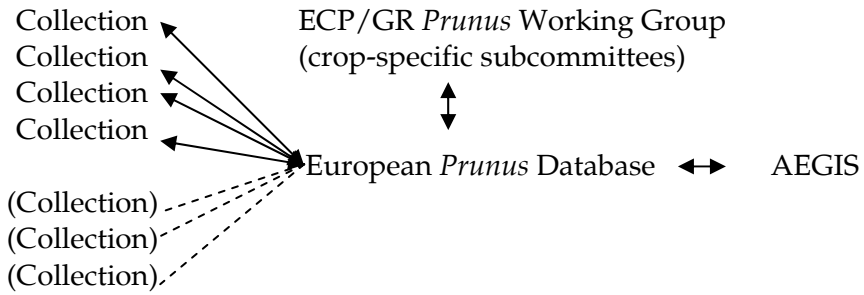
- This should be a decentralized system/collection building on the current plans of the ECP/GR *Prunus* Working Group to develop a European *Prunus* Collection.

- Such a decentralized system has the advantages of building on existing collaborations, requiring minimal changes in infrastructure, maintaining genetic resources in the country of origin and maintaining local expertise and collections, features which would not be achieved by a centralized system. Potential disadvantages include more complex management.

- The aim, briefly, is to enhance the conservation of *ex situ Prunus* accessions, especially those of European origin but also others of importance to European horticulture, breeding programmes or research, via collaborations and agreements that will e.g. minimize barriers to exchange material, encourage adequate documentation and standards, and reduce duplication.

- Important elements in the AEGIS *Prunus* system/collection would be the various collections holding *Prunus* and willing to participate, the European *Prunus* Database currently managed at INRA, Bordeaux, the ECP/GR *Prunus* Working Group (or crop-specific sub-committees of it) and the AEGIS Secretariat.

- Provisionally the relationships could be as shown below:



- Regarding accessions, the European *Prunus* Database would receive accession data from the collections and collate it for decision-making by the ECP/GR *Prunus* Working Group. The Database would implement the decisions and notify them to all parties including AEGIS.

- Regarding policy, this is perhaps best developed by the ECP/GR *Prunus* Working Group in collaboration with the AEGIS Secretariat and in consultation with the Collections.

- In the diagram above are indicated collections that may have important holdings of *Prunus* that are unknown to, or not in contact with, the European *Prunus* Database. Encouraging involvement of these collections may be a job for members of the ECP/GR *Prunus* Working Group or perhaps of the national representatives on the ECP/GR Steering Committee.

4.3 - Legal issues in developing AEGIS *Prunus* systems/collection

- Legal issues are rather matters for AEGIS to raise than for the *Prunus* group to concern itself with. However, clarification on several points would be useful.

- Does the status of non-European material received after the Convention on Biodiversity in 1993 differ from that of non-European material received before 1993?

- Will any of the agreements concerning AEGIS amount to contracts, with penalties for breach of contract?

- Should Material Transfer Agreements apply only to non-commercialized genetic resources or to cultivars too?

- In what sense can European countries "take responsibility for" genetic resources of non-European origin and genetic resources not known to be of European origin?

4.4 – "Most Appropriate Accession" and identification of material for inclusion in AEGIS *Prunus* system/collection

- The emphasis will be on accessions held in, or under the control of, European collections.

- The range of non-European material to be included needs further consideration but might include, e.g., cultivars or wild species accessions important in European horticulture, breeding programmes or research.

- Unnamed breeders' selections would generally be excluded unless they are particularly important in breeding or research and freely available.

- Items to be considered for inclusion in AEGIS need to be in the European *Prunus* Database and to be offered for inclusion by the holding institute.

- Items that meet the above criteria and appear to be unique can be accepted straightaway for inclusion in AEGIS.

- For items held by several institutes the concept of "Most Appropriate Accession" comes into play.

- The "Most Appropriate Accession" is a variation of the "Most Original Sample", which was developed for crops maintained as seed lots. Ideally the "Most Appropriate Accession" should be true to name, held in the country of origin, virus-free, accompanied by passport data, and characterized morphologically or with markers. If none of the accessions of a given identity meets all these criteria then the order of the criteria should be taken as approximately reflecting their order of importance in choosing the "Most Appropriate Accession" for AEGIS.

- For AEGIS collections there should be one primary accession per identity and one reserve.

- The extent to which the criteria are met should be apparent from the European *Prunus* Database.

- In nominating the initial AEGIS accessions the first step would be for the European *Prunus* Database manager to update the current accession database, contacting current participants for revisions and seeking new contacts. The second step would be for the Database manager to collate the data relating to the accessions offered so that, for the different identities, it can be seen at which sites they are held and what data are available. The third step would be for the Database manager and the ECP/GR *Prunus* Working Group (or crop-specific sub-committees) to review the data with a view to nominating the primary and reserve AEGIS accessions and for the Database manager to register the AEGIS status of the chosen accessions and the reasons for choosing them. The fourth step would be for the Database manager to notify the collection holders and AEGIS Secretariat of the decisions.

- There would need to be periodic updates.

- As indicated above there may be important collections not in contact with the European *Prunus* Database. If these become involved at a later date there may be consequences regarding the re-nomination of AEGIS accessions.

4.5 - Draft horticultural and documentation standards for AEGIS *Prunus* accessions

- For some crops and genebanks it may be appropriate to consider 'quality management systems' and 'accreditation'. For *Prunus* field collections, the emphasis should be on guidelines that are realistic, adequate and generally acceptable.

- Receipt of material. New accessions should be received with passport data and with phytosanitary documents and Material Transfer Agreements where appropriate. During propagation care should be taken to ensure correct labelling and any characterization and to avoid virus-infected rootstocks.

- Maintenance. The trees should be grown on an appropriate rootstock – e.g. to minimize problems of incompatibility. Ideally four trees of each accession should be maintained preferably two at the primary site and two at the reserve site. AEGIS accessions need not be kept apart from other accessions. The trees should be adequately labelled and/or a plot plan maintained. The trees should be managed well enough to provide scion wood for distribution and/or re-propagation and

should be maintained free of quarantine pests and diseases. Ideally, characterization data sets should be completed and molecular fingerprints obtained.

- Re-propagation. When trees are re-propagated care should be taken to ensure correct labelling and to avoid virus-infected rootstocks. It is highly desirable that the new plants should be authenticated by morphological inspection or by molecular fingerprinting.

- Despatch and disposal. Efforts should be made to meet reasonable requests for small quantities of scion wood. Propagating material should be despatched with labels and passport data, together with appropriate phytosanitary paperwork and, if necessary, a Material Transfer Agreement. Before any AEGIS accessions are grubbed, two years' notice should be given to the European *Prunus* Database manager or the AEGIS Secretariat.

- Other. Ideally accessions would be maintained as "virus-free" and cryopreservation could be useful in maintaining virus-freedom. Separate guidelines would need to be developed.

4.7 - Application to other crops

- The general principles developed for *Prunus* should be relevant to the other ECP/GR fruit crops *Malus, Pyrus* and *Vitis* that are likewise temperate and clonally propagated on to rootstocks. A draft of this document was presented to the Chairs, Vice-Chairs and Database Managers of the *Malus/Pyrus* and *Vitis* Working Groups and some minor revisions made in response to their comments. Indeed, with minor adjustments, they could be applied to most other fruit crops and to vegetatively propagated timber trees.

4.9 - Draft cooperation agreement

- Maybe formal agreements are not essential. If agreements are to be signed it is advisable to keep them short, e.g.:

  "My institution is willing to participate in the AEGIS system for *Prunus*, offering accessions to be considered for inclusion, holding AEGIS accessions and providing scion wood in response to reasonable requests. I agree to give two years' advance notice to the European *Prunus* Database manager or the AEGIS Secretariat of grubbing of any AEGIS accessions or of withdrawing from AEGIS".

Other considerations

- The Group noted the desirability of members of the ECP/GR Steering Committee, who may have the necessary resources available, advertising AEGIS, and encouraging participation, at the national level.

Appendix IV. Crop expertise readily available to participants

Country	Participant	Crop						
		Cherries and allies	**Apricots**	**Almonds**	**Peaches**	**Plums and allies**	**Inter-crop hybrids**	**Other *Prunus* species**
Armenia	Anush Nersesyan	** (wild)	** (wild)	** (wild)		***		**
Belgium	Marc Lateur	**			*	***		
Cyprus	Costas Gregoriou	***		*	**			
Czech Republic	Jan Blažek	***	*			***	*	
Estonia	Kalju Kask	***	*			**		*
France	Emilie Balsemin	***			*	***		
Germany	Monika Höfer	***				*		
Greece	Ioannis Chatziharissis	**	**	*	***	*	*	*
Hungary	János Apostol	***	**	*	**	**		
Italy	Daniela Giovannini				**	*		
Latvia	Edite Kaufmane	**	*	-	*	***	*	
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Norway	Lars Sekse	**				*		
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Slovakia	Daniela Benediková	**	***	*	**	**		
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Sweden	Inger Hjalmarsson	**				***		
Sweden	Viktor Trajkovski	**	*		*	***	*	
Switzerland	David Szalatnay	***				**		
United Kingdom	Kenneth Tobutt	***				**		*
NGO	Annette Braun-Lüllemann	***				***		

Legend:
* = Some expertise
** = Medium expertise
*** = High expertise

Appendix V. Workplan of the ECP/GR Working Group on *Prunus* for 2006–2008

(Discussed and approved at the Seventh Meeting of the Working Group on Prunus*, 1-3 December 2005, Larnaca, Cyprus).*

Action	**Carried out by**	**Date by when action should be initiated**	**Date by when action should be completed**
Production of the proceedings of the Budapest and Larnaca meetings	ECP/GR Secretariat with contributions from all WG members	Jan. 2006	April 2006
Raising awareness / profile of the WG in international events and fora (posters, etc.)	Members attending international meetings such as:	- EUFRIN Plum and Prune (Hradec Kralove, Czech Republic, 31 July-2 August 2006) - EUCARPIA Fruit Section (Zaragoza, Spain, 23-28 September 2007) - EUCARPIA Genetic Resources (Piešťany, Slovakia, May 2007) - ISHS Symposium on Plum and Prune (Palermo, Italy, April 2008)	
EURISCO			
Interactions with EURISCO / EPGRIS2	ECP/GR Secretariat and DB manager	Ongoing	
Contact respective national Focal Points and collaborate for data gathering from all available collections within their country, with the aim of providing *Prunus* passport data to EURISCO	All WG members	Jan. 2006	Dec. 2006
Interaction with Global Crop Diversity Trust	ECP/GR Secretariat	Ongoing	
Interactions regarding legal issues	ECP/GR Secretariat	April 2006	June 2006
European *Prunus* Database (EPDB)/AEGIS			
Revising the database and data sets as agreed during the Seventh Meeting of the WG	DB manager	Dec. 2005	Jan. 2006
Incorporation of molecular descriptors	Fruit Network Coordinating Group + DB managers	March 2006 (Meeting in Bonn)	
Update of cherry data and response to DB manager	WG members and curators	Jan. 2006	July 2006
Checking the meaning of the term 'patronym' for possible use as an additional descriptor	K. Tobutt and M. Lateur	Dec. 2005	
Identification of cherry "patronym" names	DB manager in collaboration with cherry expert subgroup	Jan. 2006	July 2006
"Designation" of cherry accessions for the AEGIS feasibility study	Cherry expert subgroup	July 2006	
Re-designation of cherry accessions for AEGIS	Cherry expert subgroup	Beginning 2007	

Action	**Carried out by**	**Date by when action should be initiated**	**Date by when action should be completed**
Preparation of preformatted Excel files for other crops and distribution to WG members and curators for filling in	DB manager	March 2006	April 2006
Update of data and response to DB manager	WG members and curators	March 2006	Dec. 2006
Creation of other databases for other crops	DB manager	Jan. 2007	Dec. 2007
Inclusion of updated data into each DB	DB manager	Jan. 2007	Dec. 2007
Definition of guidelines for inclusion of photographs in EPDB	Task force (D. Szalatnay, E. Balsemin, J. Blažek, M. Höfer, M. Lateur, C. Gregoriou)	April 2006	
Informing AEGIS of the problems of the important collections not entered in EPDB or unable to join AEGIS	B. Lund		Feb. 2006
Participation in AEGIS final meeting	AEGIS subgroup		July 2006 (to be confirmed)
Ad hoc Workshop on fingerprinting of *Prunus, Malus/Pyrus* and *Vitis*	K. Tobutt (East Malling, UK)		Oct. 2006
Ad hoc Workshop on synonymy of *Prunus, Malus/Pyrus* and *Vitis*	M. Lateur (BEL) / UK		2007
Ad hoc Workshop on *in situ* and on-farm conservation of *Prunus, Malus/Pyrus* and *Vitis*	M. Lateur (BEL), M. Höfer (Dresden, Germany) (?)		2008?
Informal meeting at EUCARPIA, Zaragoza	All members attending the EUCARPIA meeting		Sept. 2007
Consideration of feasibility of project proposal to EU	M. Lateur, L. Sekse, M. Oliveira, D. Giovannini, E. Balsemin, K. Tobutt, R. Socias i Company, M. Höfer	Dec. 2005	
EU Proposal preparation	Coord. M. Lateur and K. Tobutt		Feb.- March 2006?
Compilation of *Prunus* Newsletter, issue 6	M. Botu, E. Kaufmane and D. Benediková, with contribution from all members	Dec. 2006	March 2007

Appendix VI. Acronyms and abbreviations

AARI	Aegean Agricultural Research Institute, Menemen, Izmir, Turkey
ACW	Agroscope Changins-Wädenswil, Switzerland
AEGIS	A European Genebank Integrated System
AFLP	Amplified fragment length polymorphism
ANOVA	Analysis of variance
ApMV	Apple mosaic virus
ARI	Agricultural Research Institute, Nicosia, Cyprus
ARO	Agricultural Research Organization, Israel
ASAS	Academy of Agricultural and Forestry Sciences, Romania
BRG	Bureau des Ressources Génétiques (Genetic Resources Board), France
CBD	Convention on Biological Diversity
CCDB	Central Crop Database
CEBAS	Centro de Edafología y Biología Aplicada del Segura (Center for Edaphology and Applied Biology of Segura), Spain
CIHEAM	Centre International de Hautes Etudes Agronomiques Méditerranéennes (International Center for Advanced Mediterranean Agronomic Studies)
CITA	Centro de Investigación y Tecnología Agroalimentaria (Center for Agro-Food Research and Technology), Spain
CNR	Consiglio Nazionale delle Ricerche (National Research Council), Italy
CSIC	Consejo Superior de Investigaciones Científicas (Spanish Council for Scientific Research), Spain
DEPC	Decentralized European *Prunus* Collection
DRA	Direcção Regional de Agricultura (Regional Agricultural Service), Portugal
EC	European Commission
ECP/GR	European Cooperative Programme for Crop Genetic Resources Networks *(now ECPGR)*
ECPGR	European Cooperative Programme for Plant Genetic Resources *(formerly ECP/GR)*
ELISA	Enzyme linked immunosorbent assay
ENFVN	Estação Nacional de Fruticultura Vieira de Natividade (National Fruit Station Vieira de Natividade), Alcobaça, Portugal
EPDB	European *Prunus* Database
ESFY	European stone fruit yellow virus
EU	European Union
EUFORGEN	European Forest Genetic Resources Programme
EURISCO	European Internet Search Catalogue (EPGRIS project)
FAO	Food and Agriculture Organization of the United Nations
FCT	Fundação para a Ciência e a Tecnologia (National Foundation for Science and Technology), Portugal
GATT	General Agreement on Tariffs and Trade
GPS	Global positioning system
GREMPA	Groupe de Recherches et d'Etudes Méditerranéen pour le Pistachier et l'Amandier (Mediterranean Research Group for Almond and Pistachio)
HRS	Horticultural Research Station, Pure, Latvia
IBET	Instituto de Biologia Experimental e Tecnológica (Institute for Experimental Biology and Technology), Oeiras, Portugal
ICDP	Institutul de Cercetare-Dezvoltare pentru Pomicultura (Research and Development Institute for Fruit Growing), Pitesti-Maracineni, Romania
IGB	Israel Gene Bank
IMIDA	Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario (Institute of Agrarian and Alimentary Development of Murcia), Spain
INBO	Instituut voor Natuur- en Bosonderzoek (Research Institute for Nature and Forest), Belgium
INIA	Instituto Nacional de Investigaçao Agraria (National Institute of Agricultural Research), Portugal
INIA	Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (National Institute for Agrarian and Food Technology Research), Spain
INIAP	Instituto Nacional de Investigação Agrária e Pescas (National Institute for Agricultural Research and Fisheries), Lisbon, Portugal

INRA	Institut National de la Recherche Agronomique (National Institute for Agricultural Research), France
IPGRI	International Plant Genetic Resources Institute *(now Bioversity International)*
IPGRI/WANA	Regional Office for the West Asia and North African Countries of the International Plant Genetic Resources Institute
ISF	Istituto Sperimentale per la Frutticoltura (Fruit Tree Research Institute), Italy
ISSR	Inter-simple sequence repeats
ITGA	Instituto Técnico y de Gestión Agrícola (Technical Institute of Agricultural Management), Tudela, Spain
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
ITQB	Instituto de Tecnologia Química e Biológica (Institute of Technology for Chemistry and Biology), Oeiras, Portugal
IRTA	Institut de Recerca i Tecnologia Agroalimentàries (Institute for Food and Agricultural Research and Technology), Spain
IVIA	Instituto Valenciano de Investigaciones Agrarias (Agricultural Research Institute of Valencia), Spain
KVL	Kgl. Veterinær- og Landbohøjskole (Royal Veterinary and Agricultural University), Copenhagen, Denmark
LIFG	Latvia State Institute of Fruit-Growing, Dobele, Latvia
LIH	Lithuanian Institute of Horticulture, Vilnius, Lithuania
LUBG	Botanical Garden of the University of Latvia, Riga, Latvia
MAA	Most appropriate accession
MCPDs	Multi-crop Passport Descriptors (FAO/IPGRI)
MiPAF	Ministero per le Politiche Agricole e Forestali (Ministry for Agricultural and Forest Policies), Italy
MTT	Agrifood Research Finland, Pälkäne, Finland
NAGREF	National Agricultural Research Foundation, Greece
NCG	Network Coordinating Group (ECPGR)
NGB	Nordic Gene Bank, Alnarp, Sweden
NGO	Non-governmental organization
NI	National Inventory (EURISCO)
OECD	Organisation for Economic Co-operation and Development
PCA	Principal component analysis
PCR	Polymerase chain reaction
PDV	Prune dwarf virus
PGR	Plant genetic resources
PGRFA	Plant genetic resources for food and agriculture
PNRSV	*Prunus* necrotic ringspot virus
PPV	Plum pox virus
RICP	Research Institute for Crop Production, Prague-Ruzyne, Czech Republic
RIFOP	Research Institute of Fruit and Ornamental Plants, Bojnice, Slovak Republic
RIPP	Research Institute of Plant Production, Piešťany, Slovak Republic
SARC	Slovak Agriculture Research Centre
SCDP	Statiunea de Cercetare-Dezvoltare pentru Pomicultura (Research and Development Stations for Fruit Growing), Romania
SEEDNet	South East European Development Network
SIDA	Swedish International Development Cooperation Agency
SLU	Sveriges lantbruksuniversitet (Swedish University of Agricultural Sciences), Uppsala, Sweden
SMTA	Standard Material Transfer Agreement
SSR	Simple sequence repeat
UMB	Universitetet for miljø- og biovitenskap (University of Life Sciences), Norway
UPOV	Union internationale pour la protection des obtentions végétales (International Union for the Protection of New Varieties of Plants), Geneva, Switzerland
USDA	United States Department of Agriculture
WIPO	World Intellectual Property Organization of the United Nations

Appendix VII. Agenda of the Sixth Meeting

20-21 June 2003, Budapest, Hungary

Thursday 19 June 2003

Arrival of participants

Friday 20 June 2003

8:30–9:30 **Introduction**

- Introductory welcome from local organizers (*J. Apostol*)
- Chair's report and outline of *Prunus* WG activities (*F. Dosba*)

9:30-10:30 **Reports on status of National Collections**

- Update on National Collections – conservation, collecting, evaluation or characterization (*7-10 min. presentations from a few selected countries: Cyprus, Hungary, Latvia, Serbia and Montenegro)*

10:30–11:00 *Coffee break*

11:00–12:30 **The European *Prunus* Database**

- The European *Prunus* Database, status of progress and future development, accessibility on Internet, inclusion of new data (*introduced by A. Zanetto*)
- Molecular markers for *Prunus* genetic resources - some observations (*K. Tobutt*)

12:30–14:00 *Lunch*

14:00–15:30 **International cooperation**

- Status of international agreements on access to genetic resources for food and agriculture (*introduced by F. Grassi*)
- Sharing of responsibilities: progress in the establishment of the decentralized European *Prunus* collection (*introduced by F. Dosba*)

15:30–16:00 *Coffee break*

16:00–17:30

- Use of the collections - relationship with the breeding sector (*introduced by R. Socias i Company*)
- Phytosanitary status of the collections (maintenance of quarantine pest-free material) (*introduced by M. Kellerhals – to be confirmed*)

Saturday 21 June 2003

8:30–12:30 **Report drafting / Excursion**
Drafting of the report. For those not involved in the drafting, a visit will be organized to a commercial orchard of *Prunus* species in Agard and the national *Prunus* genebank collection of the institute in Érd

12:30–14:00 *Lunch*

14:00–14:45 **Inter-network collaboration**
- Activities of the EUFORGEN Noble Hardwood Network (*B. de Cuyper, 15 min.*)
- Selection and breeding of wild cherry in Flanders (*B. de Cuyper, 30 min.*)

14:45–15:30 **The way ahead**
- Opportunities for funding the groups activities (EC programmes; support for new countries entering the EU)
- Perspectives for the future of the Working Group on *Prunus*

15:30–16:00 *Coffee break*

16:00–18:00 **Conclusion**
- Presentation of the report and adoption of recommendations
- Selection of the Working Group Chair and Vice-Chair
- Closing remarks

Evening *Social dinner*

Sunday 22 June 2003

Departure of participants

Appendix VIII. List of participants in the Sixth Meeting

20-21 June 2003, Budapest, Hungary

N.B. The composition of the Working Groups is subject to changes. The latest update for the *Prunus* Working Group can be found on the Web page (http://www.bioversityinternational.org/networks/ecpgr/Contacts/ecpgr_wgpr.asp).

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Appendix IX. Agenda of the Seventh Meeting

1-3 December 2005, Larnaca, Cyprus

Wednesday 30 November 2005

Arrival of participants

Thursday 1 December 2005

8:30 – 9:40 **Introduction**

- Introductory welcome from local host, ARI, Nicosia (*C. Gregoriou*)
- Opening remarks (*K. Tobutt*)
- Self-introductions by the participants
- Presentation of the agenda and adjustments (*K. Tobutt)*
- Briefing on ECP/GR Phase VII (*L. Maggioni*)

9:40 -10:30 **Updates on national activities**
Presentations:
Armenia (*A. Nersesyan*), Estonia (*K. Kask*), Norway (*L. Seske*), Portugal (*M. Oliveira)*

10:30 – 11:00 ***Coffee break***

11:00 - 11:30 **Updates on national activities (cont.)**
Spain (*R. Socias i Company*), Switzerland (*D. Szalatnay*), SEEDNet (*V. Ognjanov*)

11:30 - 11:50 **Chair's report (*K. Tobutt and D. Benediková*)**

11:50 -13:00 **The European *Prunus* Database**

- Progress of the EPDB (*E. Balsemin*)
- Discussion on further improvement of the EPDB

13:00 – 14:00 ***Lunch***

14:00 - 14:20 **The European *Prunus* Database**

- Discussion on further improvement of the EPDB (cont.)

14:20 – 15:30 **AEGIS (A European Genebank Integrated System)**

- Introduction on the AEGIS project and vision (*B. Lund*)
- Update on activities of the AEGIS subgroup on *Prunus* (*K. Tobutt*)

15:30 – 16:00 ***Coffee break***

16:00 – 18:00 **AEGIS (continued)**

- Demonstration of the use of the database for identification of AEGIS accessions (*E. Balsemin)*
- The *Prunus* Working Group approach to AEGIS. Discussion on the proposed steps for the implementation of the AEGIS concept for *Prunus*

Friday 2 December 2005

8:30 – 9:30 **AEGIS (continued)**
- Discussion on how to share tasks for the implementation of AEGIS
- Wrap-up discussion on AEGIS

9:30 – 10:30 **Molecular characterization of *Prunus* collections**
- Molecular markers for managing *Prunus* collections (*K. Tobutt*)
- Discussion on incorporation of molecular data into the EPDB
- Planning of workshop on fingerprinting of *Prunus*

10:30–11:00 ***Coffee break***

11:00 – 12:30 **Opportunities to submit a project proposal (AGRI GEN RES 870/2004)**
Discussion introduced by M. Lateur

12:30 – 14:00 ***Lunch***

14:00 – 14:30 ***Prunus* Newsletter**
- Account of the preparation of issue 5 (*M. Botu*)
- Finding volunteers for the preparation of issue 6

14:30 – 15:30 **The International Treaty and the Material Transfer Agreement for *Prunus* germplasm exchange**
Discussion introduced by L. Maggioni

15:30 – 16:00 ***Coffee break***

16:00 -16:30 **Technical contribution**
New activities on Belgian *Prunus* Fruit Tree Genetic Resources *(M. Lateur)*

16:30 – 18:00 **Updating the workplan of the *Prunus* Working Group**

Saturday 3 December 2005

9:00 - 15:00 **Drafting of the report / Field excursion for delegates not involved in drafting (**Experimental Station of ARI at Zyghi and Lefkara, a typical Cypriot village)

18:00 – 19:00 **Closing session**
- Discussion on EURISCO descriptors *(introduced by L. Maggioni/K. Tobutt)*
- Presentation of draft project proposal (*M. Lateur*)
- Presentation of the report and adoption of recommendations
- Selection of the Working Group Chair and Vice-Chair
- Closing remarks

20:00 *Social dinner*

Sunday 4 December 2005

Departure of participants

Appendix X. List of participants in the Seventh Meeting

1-3 December 2005, Larnaca, Cyprus

N.B. The composition of the Working Groups is subject to changes. The latest update for the *Prunus* Working Group can be found on the Web page (http://www.bioversityinternational.org/networks/ecpgr/Contacts/ecpgr_wgpr.asp).

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INDEX OF AUTHORS

Apostol, J. 55
Balsemin, E. 9, 49, 107
Bar-Yaakov, I. 58
Békefi, Z. 55
Benediková, D. 92
Blažek, J. 42
Bobokashvili, Z. 51
Botu, M. 87
Bozhkova, V. 35
Braun-Lüllemann, A. 102
Çakalli, A. 29
Chatziharissis, I. 54
Çiçi, I. 29
Cordeiro, V. 82
De Cuyper, B. 104, 105
Dosba, F. 1
Dzhuvinov, V. 35
Engel, P. 61
Gabrielian, E. Tz. 32
Giovannini, D. 61
Gregoriou, C. 36
Grzyb, Z. 80
Hatib, K. 58
Hjalmarsson, I. 77
Höfer, M. 53
Holland, D. 58
Ikase, L. 66
Jänes, H. 45
Kask, K. 45
Kaufmane, E. 66
Kellerhals, M. 97
Kullaj, E. 29
Lacis, G. 66
Lipman, E. 1, 9
Lund, B. 9
Maggioni, L. 1, 9
Myrta, A. 29
Nersesyan, A. 32
Ognjanov, V. 89
Oliveira, M.M. 82
Özkarakas, I. 99
Rozpara, E. 80
Sasnauskas, A. 75
Sekse, L. 78
Socias i Company, R. 94
Stanys, V. 75
Steenackers, M. 105
Szalatnay, D. 97
Tobutt, K. 1, 9
Tobutt, K.R. 100, 101
Zanetto, A. 1

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