

Report of the Working Group on *Prunus*

Fifth meeting
1-3 February 1996
Menemen-Izmir, Turkey

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

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Discussions and Recommendations

Introduction

Welcoming address

The meeting was opened by Dr Ertug Firat, Director of the Aegean Agricultural Research Institute (AARI), who welcomed the participants and expressed his pleasure at hosting the fifth meeting of the *Prunus* Working Group. Dr Firat briefly outlined the history and role of AARI which has, since its establishment in 1963, worked to apply scientific methods to obtaining better yields and food quality. The genetic resources programme at AARI was established in 1963 through a special agreement between FAO and the Turkish Government. The Institute has recently initiated activities in *in situ* conservation to complement the traditional *ex situ* conservation.

Dr Firat emphasized the importance which Turkey attributes to cooperation between countries when dealing with plant genetic resources. The country has collaborated closely with IPGRI since its establishment in 1974. In 1984 Turkey joined ECP/GR and in 1993 the West Asia and North Africa Plant Genetic Resources Network (WANANET). This collaboration is of particularly high value in the labour-intensive and often complicated conservation of fruit trees. On behalf of the Turkish Ministry of Agriculture and of AARI, he wished the participants fruitful discussions and continued cooperation within ECP/GR.

Dr Gass, ECP/GR Coordinator, then welcomed the participants on behalf of IPGRI and thanked AARI, Dr Firat and his staff for hosting the meeting. Dr Gass recalled the fundamental principles that have made ECP/GR a model of international cooperation, namely: the commitment of countries to supporting the programme, the commitment of individual scientists to the conservation of plant genetic resources, and the firm will of all to collaborate despite differences in culture, in approaches and in methods. Finally, he emphasized the role of delegates, asking them to represent the interests of the *Prunus* genetic resources communities in their respective countries and to facilitate the implementation of the common workplan on return to their countries.

The meeting appointed Dr F. Dosba chairperson; K.R. Tobutt and A. Zanetto agreed to act as recording secretaries.

Report of the Chairperson

F. Dosba reviewed activities of the Working Group since the fourth meeting, held at INRA Bordeaux in December 1992.

The main development concerned the European *Prunus* Database (EPDB) which the Institut National de Recherches Agronomiques (INRA) Bordeaux took over from the Nordic Gene Bank in July 1993; Anne Zanetto, the INRA officer responsible for the management of the EPDB, was recruited in January 1994.

The EPDB was on dBase IV in 1994. After discussions with different managers of other databases, the choice was made to transfer the EPDB to MS-Access software. To update and amend the EPDB, Anne Zanetto sent a questionnaire in May 1994 to all the *Prunus* curators and liaison officers; some answers were received and allowed a partial updating.

Concerning the revision of the EPDB, it appears that the passport data need to be harmonized and re-examined, particularly for the cultivar names in

accordance with the international nomenclature for cultivated plants. It is also important that the descriptor lists should be developed to allow secondary characterization based on genetic and agronomic characters.

Particular attention should be paid to nominating new standard cultivars. A restricted list was established at the last meeting at INRA, Bordeaux which should be very useful for phenological studies.

Since the last meeting, there have been developments in the definition and constitution of the national *Prunus* collections in some countries. The national organizations are mainly based on the most representative and long-term collections, and need national coordination and management. They are often concerned mainly with the characterization, evaluation and conservation of original and/or indigenous accessions.

At the last meeting, it was also pointed out that some collections are threatened. A transfer of collections to a safer place in Belgium was proposed as was the reorganization and selection of the most valuable material in the former Czechoslovakia. This is currently being organized by the Czech Republic and Slovakia.

Some collections are also endangered in the former USSR. The help of national or international organizations is needed. IPGRI coordinated a project proposal for the maintenance of the *Prunus* collections of the Botanical Gardens in Yalta. An INRA/BRG project was not successful.

From the national collections, the definition of the European *Prunus* collection can be envisaged as recommended by the fourth, fifth and sixth meetings of TCC. Priority in conservation would be given to the European indigenous accessions and to wild species originating in Europe. The long-term conservation and safety-duplication have to be done either *ex situ* or *in vitro* and could be based not only on the national organizations but also on the European cooperation coordinated by IPGRI. The participation of nine countries in a new EU project to develop the international network on *Prunus* genetic resources, coordinated by France, could promote such an organization. It will be important to take into account this opportunity in the development of the *Prunus* ECP/GR group.

Another important development was the establishment of the *Prunus* Genetic Resources Newsletter to provide regular information to the whole group as recommended at the last meeting. The first issue was compiled by K.R. Tobutt and the second one by N. Gönülse.

At its last meeting, the Working Group recommended that guidelines for the safe movement of *Prunus* germplasm be developed. Guidelines for the safe movement of stone fruits germplasm have been prepared in collaboration with experts from a number of countries and FAO. Publication of these guidelines is expected in summer 1996.

At Bordeaux, priorities for research in the area of *Prunus* genetic resources were discussed. The recommendations of the Working Group were to encourage *Prunus* cryopreservation, molecular characterization and evaluation of the germplasm resistance to biotic and abiotic factors. Cryopreservation could be a very important way to maintain material, in the long term, free of quarantine pests and to allow the safety-duplication of national or European resources.

Molecular markers are increasingly studied for the characterization and identification of *Prunus* accessions and cultivars. The results of the research look very promising, but it is necessary to think about the reliability, suitability and cost of such an approach before using it for identification and characterization of the material.

Evaluation of the germplasm for resistance to biotic and abiotic factors is already in progress, particularly in eastern European collections. To integrate all the collected data into the database, it is now essential to define precisely the

corresponding descriptors. This is one of the main tasks of the European project on *Prunus* genetic resources and it is also the right time to do this work in the context of the *Prunus* ECP/GR group.

Thus, the activities of the *Prunus* Working Group have continued, through informal contacts between all the curators during the last 3 years. The main objectives for the beginning of Phase V of the programme could focus on:

- improvement and updating of the EPDB, including its accessibility through an international network
- definition of agronomic characters and evaluation of the accessions
- elaboration of a real strategy for the European Collection based upon the national genetic resources.

Prunus genetic resources collections in Europe

The national delegates presented reports on the collections maintained in their countries (see **Review of National Collections**). National coordination structures for *Prunus* genetic resources conservation were briefly introduced and the status of collections reported. Delegates outlined the needs and challenges encountered by *Prunus* collections in their country and presented an overview of the activities envisaged for the next 3 years.

Reports received from Z. Grzyb, Poland and V. Vitovsky, Russia, both unable to attend, were presented by T. Gass. The Group expressed its thanks for receiving these reports and looks forward to a close collaboration with the national programmes in Poland and Russia.

The European *Prunus* Database (EPDB)

Status of the Database

A. Zanetto, manager of the EPDB, presented the status and current structure of the database. Since the transfer of the database from the Nordic Gene Bank to the Institut National de Recherches Agronomiques (INRA) Bordeaux in 1993, the following activities have been carried out:

- A call for revision of national records was sent out to the 95 institutes in early 1994. This included a questionnaire regarding the status of the collection, computer facilities available to curators and, in the case of the EU countries, an invitation to participate in the formulation of a project proposal to be submitted to the European Commission under the new programme on genetic resources (EC 1467/94). A total of 33 replies to the questionnaire were received.
- A new structure and interface has been developed for the database. A. Zanetto demonstrated a draft version of the software, based on MS-Access, that was developed at INRA Bordeaux. The first screen gives a menu offering Fruits, Institutes, Ecoclimates, Rootstocks or Collections, or an option for printing address labels. Thereafter, navigation through the database is straightforward, requiring minimal computer skills. All present were very impressed by this improvement of the database. The runtime version of the software will be available free of charge at the end of 1996. A. Zanetto will modify the software to allow more rapid listing of, for example, late-ripening peaches, or institutes holding 'Bigarreau Napoleon', and perhaps also to allow parentages to be entered. At the moment it is not possible to 'click' on a certain accession in a list and thereby call up more details. In due course it may be possible to include pictures on the database.
- A. Zanetto attended a meeting on the standardization of PGR documentation systems in Poland in November 1995 and has worked closely with H. Case, manager of the European *Malus* Database, to ensure a high level of compatibility between the two databases.

The EPDB currently records 12 910 accessions, from 95 institutes in 23 countries. For each crop the number of accessions is as follows (with the number of accessions considered as original by each country in brackets): almond 625 (292), apricot 1868 (454), sweet cherry 2811 (1 058), sour cherry 817 (286), peach 3259 (914), plum 2466 (938) and hybrids 1064 (125).

The Working Group thanked A. Zanetto and INRA for hosting the EPDB and taking steps to improve its quality and accessibility. In view of the recently initiated EU-funded project (see next section), it will be necessary to carry out a further update of the data and make efforts to receive data from the collections not yet included in the EPDB. The following workplan was agreed on:

- T. Gass will provide A. Zanetto with an output of the FAO/IPGRI database including addresses and institute codes of all the European institutions that have reported having *Prunus* accessions (before end of February 1996).
- A. Zanetto will contact these institutions and ask them to send data on the current status of their collections. This request will include a diskette containing the information held on collections already included in the database, a guide to the new structure of the database and instructions on how to carry out the update. The covering letter will be copied to the national members of the *Prunus* Group and to the National Coordinator together with a list of the institutions from which data were requested

(before 15 March 1996).

- Members of the Working Group will encourage collection holders in their country to return the updated information to the EPDB (by the end of June 1996).
- A. Zanetto will update the EPDB and send a runtime version of the updated database to all contributing institutions (by the end of December 1996).

The Group agreed on the importance of coordination with other ECP/GR databases to improve their standardization. They welcomed the information that ECP/GR would organize a meeting of database managers in autumn 1996 with the Dutch-funded documentation project for east European countries. It was agreed that A. Zanetto should represent the group at this meeting.

The occurrence of duplication was discussed. It was agreed that the donor number should be included in the EPDB to facilitate the identification of duplicates. Responsibility for checking synonyms, and correcting where necessary, lies with the respective crop coordinators to whom A. Zanetto would send queries. Each data provider should include only those synonyms used in their own country.

Regarding special characters, it was agreed that variety names and synonyms should be sent in their original spelling. Electronic files should, however, be accompanied by a paper copy through which the right spelling of the name can be determined if special characters are lost during the conversion procedure. It may yet be decided to omit special characters from the database. With the exception of names, all data should be provided to the EPDB in English.

Descriptors

In accordance with the recommendations of the previous meeting, the new structure of the database now includes the following possibilities to describe the virus status: virus free, virus present, untested and Sharka free. Further discussion is needed on these issues.

There are sometimes problems in recording country of origin, especially in the case of countries whose borders have moved, or whose histories have been closely interwoven. The database manager could consider retaining old country codes for countries that have split, entering more than one country code, inventing new three-letter codes for certain subregions, e.g. Fennoscandinavia or Balkans, using question marks for doubtful cases, or EUR for Europe. It was pointed out that the country of origin may have legal significance in international negotiations on access to PGR. It was suggested that this issue be discussed at a future meeting of the ECP/GR Documentation and Information Network which may then make general recommendations. Curators should be asked to draw 'difficult cases' to the attention of the database coordinator. Curators should be reminded that country of origin refers to the country in which the accession originated, whether as a seedling or from controlled crossing, as a mutation, or from seed imported from abroad.

- A field should be entered for donor institute.
- A field should be entered for protection status.
- The descriptor 'weedy' is inappropriate.

For crop types it was agreed that the definition "other related wild species and hybrids" should be changed to "other related wild species and hybrids excluding those related to cherries".

The minimum descriptors currently used in the EPDB were briefly reviewed. It was agreed that juice colour (Descriptor number 6.2.5) should be added to the

descriptors for cherry and that cropping efficiency should be deleted. Leaf shape should be replaced by stone adherence (Descriptor number 6.3.3.) in the minimum descriptors for plum and length of peduncul and hairiness of ovaries should be omitted.

List of descriptors included in the database

Passport data

ECP Number
Country
Institute number
Species
Crop type
Inventory number
Accession designation
Accession synonym
Donor institute
Protection

Common descriptors

Fruit use
Plant use
Country of origin
Indigenous to Europe
Status of sample
Virus disease status
Use as rootstock

Descriptors specific for each crop

Almond

Harvest maturity
Season of flowering
Kernel shape
Marking of outer shell
Softness of shell
Kernel taste
Nut shape

Apricot

Harvest maturity
Season of flowering
Flesh colour
Kernel taste

Separation of stone

Cherry

Harvest maturity
Fruit skin colour
Juice colour

Peach

Harvest maturity
Peach or nectarine
Flower type
Flesh colour
Petiole gland shape
Stone adherence to flesh

Plum

Harvest maturity
Fruit size
Ground colour
Stone shape
Stone adherence to flesh
Colour or over colour of the skin

The Group noted that the reference varieties recommended in the descriptor lists needed to be revised as they were no longer widespread among European collections. A revision of the reference varieties for the minimum descriptors will be undertaken at the next meeting of the Group, taking into account the UPOV testing guidelines. The following workplan was agreed upon.

In preparation for the next meeting of the Group, members have agreed to prepare draft descriptor lists, including scales and reference varieties for agronomic characterization. Names of persons who will prepare these descriptors for proposal to the meeting in September 1996 are listed below.

Almonds

Twin kernel
Resistance to pest and diseases

R. Socias i Company, H. Duval
R. Socias i Company, H. Duval

Alleles of incompatibility, self-compatibility R. Socias i Company, K.R. Tobutt

Apricots

Fruit quality	N. Gönülse
Resistance to Sharka, <i>Monilia</i>	D. Benedikova

Sweet cherries

Cracking	M. Lateur, M. Kellerhals
Alleles of incompatibility	K. R. Tobutt
Bacterial canker, black fly	K. R. Tobutt
Resistance to <i>Pseudomonas</i>	M. Fischer
Resistance to <i>Monilia</i> , ring spot	J. Apostol, J. Blazek
Resistance to frost for flowers and plants Trajkovski	E. Bratberg, M. Hulden, V.

Sour cherries

Resistance to <i>Monilia</i> , ring spot	J. Apostol
Juice colour, percentage of juice	N. Gönülse
Resistance to frost for flowers and plants Trajkovski	E. Bratberg, M. Hulden, V.

Peaches

Fruit quality	I. Hatziharissis, F. Grassi
Resistance to Sharka	I. Hatziharissis
Resistance to curl leaf, <i>Monilia</i> , green aphid	F. Grassi

Plums

Fruit quality	M. Lateur, I. Botu
Resistance to Sharka	M. Fischer, I. Botu
Resistance to <i>Monilia</i>	M. Lateur, J. Blazek
Resistance to <i>Taphrina pruni</i>	M. Lateur, J. Blazek, D. Ogasanovic
Resistance to cracking	M. Lateur
Resistance to frost for flowers and plants Trajkovski	E. Bratberg, M. Hulden, V.
Fruit shape	M. Lateur

Prunus salicina* and *Prunus cerasifera

Fruit quality	N. Gönülse, H. Duval
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Hybrids

Resistance to drought	R. Socias i Company
Resistance to chlorosis and soil biotic factors	R. Socias i Company

Development of the European *Prunus* collection

This session was based on A. Zanetto's presentation of the EPDB. She went on to emphasize the need for collaboration on the conservation of genetic resources, the need for well-organized safety-duplication and the need to exchange information and plant material. She suggested the rationalization of efforts by concentrating on material of European origin as a priority.

It was agreed that names of all accessions, European and non-European, should be included in the EPDB, accompanied by passport data when possible. For characterization, priority should be given to European accessions. For this purpose European accessions were considered to be those that originated in European countries. It was recognized that the current international negotiations

in the framework of the Convention on the Conservation of Biological Diversity (CBD) and that of the revision of the International Undertaking may have a bearing on what material can actually be defined as European.

It was suggested that the accessions native to Europe be deemed to constitute the 'European Collection', a concept, rather than a physical collection established on one or two sites. In due course, this collection could be rationalized to reduce duplication, with particular accessions being designated as 'European Collection Accessions'. Where possible, each country would take the responsibility for its indigenous accessions.

A further suggestion was that the European Collection would be constituted on the basis of an agreed charter which could be drafted following a number of existing national models (France, Spain). Under certain conditions, accessions originating from outside Europe would be included in this collection, if their conservation is not guaranteed elsewhere. A country including its accessions in this European Collection would take responsibility to maintain it on behalf of the other countries of the region. Here again, it was recognized that the current international negotiations on access to genetic resources would need to advance further before such a European Collection can be fully implemented.

The Group agreed that the further development of the concept of 'European *Prunus* Collection' should be pursued and could serve as a model for other crops.

It was agreed that the drafting of a 'charter' for consideration at a future meeting would be useful. This charter should describe the role of the European *Prunus* Collection, the criteria for inclusion and exclusion of material, and obligations to maintain native accessions.

It was recognized that national collections are likely to retain accessions from other European countries and from other continents.

EU-funded project on *Prunus* genetic resources

F. Dosba reported that the collaborative shared-cost project she had formulated, to establish a *Prunus* Genetic Resources Network, has been approved by the European Commission, as GENRES61. Eleven partners from nine countries will participate: France (two partners), Belgium, Germany, Greece, Italy (seven complementary partners), Spain (two partners), Sweden, Switzerland and the UK.

The project is to last for 3 years and should start in spring 1996. The objectives include evaluating genetic resources with a view to better characterization and use by farmers and foresters, generating a computerized inventory and diffusing results. Tasks include updating the existing database structure, recording and entering passport data and primary descriptors, principally for accessions of European origin, and, very importantly, evaluating and entering data for agronomic characters.

It was agreed that this opportunity should be seized to benefit the entire ECP/GR Working Group of EU and non-EU countries. T. Gass informed the group that ECP/GR could provide funds to ensure that all Working Group members would be able to attend the meetings of the EU-funded group and participate in discussions. As two to three meetings of the EU project are foreseen before the end of Phase V of ECP/GR, the Working Group could formally convene in conjunction with these meetings.

F. Dosba confirmed that the EPDB should continue to receive data from the whole of Europe, although the EU is primarily interested in the collections of EU countries.

Developments in conservation of *Prunus in situ* and *ex situ*

N. Gönülşen described and illustrated work to survey *Prunus divaricata* in the Kazdagi region of Turkey, and wild almond in southern Anatolia. This includes the inventory of selected sites by recording species incidence along transects, collecting herbarium specimens, and sampling for genetic analyses of target species by isoenzyme analyses due to start in 1996.

A. Tan described the establishment of Gene Management Zones in which the native vegetation, including *Prunus*, will be protected within the framework of the prospects *in situ* conservation of the Genetic Diversity. She illustrated the differences between this form of conservation and ecosystem conservation.

R. Socias reported the surveying of *Prunus webbii* (Spach) Vierh. and *Prunus ramburii* Boiss. from central Spain.

In the UK, East Malling is collecting wild *Prunus avium* with good tree form and vigour, for clonal trials for timber production and for possible use in the timber cherry breeding programme.

In Belgium, M. Lateur reported that the Centre de Recherches Agronomiques (CBA) of Gembloux is similarly prospecting for wild *P. avium*. The group noted the practical way in which *in situ* conservation is being promoted in Belgium: owners who provide graft wood of endangered trees to the nursery of the Station de Phytopatologie are later offered a young tree of the same genotype to be replanted near the original collection site.

Research activities relating to *Prunus* conservation

Progress in cryopreservation

F. Dosba outlined work at INRA Bordeaux on the cryopreservation of peaches, plums and hybrids, using embryonic axes, shoot tips or somatic embryos. Topics studied included the effects of acclimatization of the source material to cold, the effects of cryoprotectants such as dimethyl sulphoxide, the role of proline, the effects of virus infection, and the genetic stability of regenerated plants. She reported that peaches had successfully been regenerated after cryopreservation.

The consensus view was that cryopreservation is potentially a helpful back-up, but more needs to be known about the length of time for which preserved material can be stored, and the trueness-to-type of regenerants. The group agreed that it was very important that research in cryopreservation be continued, as this conservation can offer valuable alternatives for safety-duplication under conditions that prevent re-infection through quarantine diseases and pests.

It was pointed out that *in vitro* cultures can be stored at ca. 4°C on minimum growth medium up to 2 years and that mother plants for propagation are frequently maintained in pots in screenhouses.

Progress in molecular markers

K. Tobutt reported the following number of research papers dealing with molecular markers in *Prunus* (the numbers dealing more or less with varietal identification or biodiversity are given in brackets): isozymes 54 (33), RFLPs 9 (3), RAPDs 10 (5) and microsatellites 1(0). For diversity studies, isozymes are relatively cheap and informative, RFLPs are expensive, RAPDs are not very informative and microsatellites promise to be very informative but expensive. EU-funded projects of interest to the Working Group are led by P. Arus, IRTA, Cabrils, Spain, on molecular markers for mapping in *Prunus* and Angela Karp, IACR, Long Ashton UK, on molecular markers in plants and animals for genetic diversity studies.

Other forums of likely interest are the UPOV Working Group on Molecular Techniques for cultivar identification (contact UPOV, Geneva, Switzerland) and the Biotechnology for Biodiversity Platform to increase understanding of molecular markers for genetic resources and other applications, led by James Reeves, NIAB, Cambridge, England.

For future *Prunus* studies, important considerations are: inclusion of reference cultivars, harmonization of laboratory protocols, the desirability of genetic interpretation of banding patterns, standardized scoring for loci and alleles and collaboration between collections and laboratories and between countries.

East Malling research has focused on cherry, analyzing interspecific progenies and 14 cultivars of *Prunus avium* for 48 enzyme systems: 68 loci segregate in the interspecific progenies and 44 have proved to be linked; the cultivars were polymorphic for 25 loci. The progenies and cultivars are now being analyzed for RAPD and RFLP markers.

As part of the EU-funded *Prunus* mapping project, IRTA, Cabrils, CIMA Arkaute, INRA Bordeaux, INRA Orleans, ISF Rome and HRI East Malling will analyze 30 cultivars of each of almond, apricot, cherry, peach and plum for the same 10 enzymes, 30 RAPDs and 30 RFLPs. K. Tobutt was willing to help coordinate future efforts.

Sources of resistance and tolerance to biotic and abiotic stresses

M. Fischer described work carried out at Dresden-Pillnitz to assess the resistance of some 30 cherry cultivars to *Cytospora* and *Pseudomonas*. For the two diseases, year-to-year variation was very great and only the very susceptible cultivars could be distinguished from the very resistant. There was no correlation with frost resistance.

M. Fischer also mentioned work to identify resistance to Plum Pox Virus. All plums in the Dresden collection showed some symptoms.

R. Socias pointed out that for several crops and several regions, lime-induced chlorosis is a problem, so more research would be welcome.

M. Lateur pointed out that good descriptors are needed for pest and disease resistance evaluation and offered the descriptors he uses for plum diseases at Gembloux as a starting point for discussion.

N. Gönülse identified *Fusarium* resistance as a priority for apricot.

F. Grassi pointed out that apart from the efforts of genebank curators, *Prunus* breeders are trying to obtain resistance for a range of pests and diseases.

It was recognized that some countries have good facilities for resistance testing and might be willing to help others.

International collaboration

Negotiations on access to genetic resources

T. Gass gave a presentation on the current international negotiations within the framework of the FAO Global System on Plant Genetic Resources. He gave an overview of the context of these negotiations and how international agreements such as the Convention on the Conservation of Biological Diversity (CBD) and the Trade Related Intellectual Property (TRIPS) agreement influenced these negotiations. Finally T. Gass briefly described a proposal for a multilateral system which IPGRI has prepared for the FAO Commission on Genetic Resources for Food and Agriculture.

Links with other groups and networks and with the non-formal sector

The Group thanked K. Tobutt and N. Gönülşen for their excellent work in preparing the first two issues of the newsletter. It was agreed that this publication is of great value to diffuse information and strengthen the cohesion of the Group. It was pointed out that the newsletter could also be valuable for the spread of information regarding the EU-funded project and for increasing international interest outside Europe.

- T. Gass informed the group that members would be included on the mailing list of the IPGRI Newsletter for Europe. He invited participants to submit short news articles to this newsletter.
- The *Prunus* Genetic Resources Newsletter will be produced within 1 year by D. Ogasanovic.
- T. Botu will produce the subsequent issue.
- All members agreed to contribute articles and news to the editor. F. Dosba will contribute a paper on the Sharka project (EU-funded).
- Links with other groups:
 - GREMPA, Groupe de recherches et d'études Méditerranéennes pour l'amandier will meet in Morocco in October 1996
 - EUCARPIA (Fruit symposium at Oxford) will be held in the first week of September 1996.

The establishment within ECP/GR of a *Malus/Prunus* Working Group was welcomed and close collaboration recommended. *Ad hoc* support for collaboration on other fruit crops is also possible within the ECP/GR Fruit network.

The group asked Dr Gönülşen to give regular reports on the activities of the WANANET Programme. A regular report should also be given on the status of the IPGRI *in situ* projects in which Hungary and Turkey are participating.

Next extraordinary meeting

Objectives:

1. Agreement on the descriptor lists for agronomic evaluation.
2. Discussion of a first draft for a charter of a European *Prunus* collection.

Venue:

Istituto Sperimentale per la Frutticoltura, Rome (Local organizer: F. Grassi).

Tentative Date:

27-29 October 1996.

Conclusion

Members of the Working Group were shown around AARI and saw not only well-maintained almond, apricot, peach and plum collections but also an excellent herbarium and well-equipped laboratories.

The participants reviewed the discussions and recommendations section of the meeting's report and approved it. F. Dosba was re-elected unanimously to chair the group until its next ordinary meeting.

Review of National Collections

Status of *Prunus* collections in Belgium

M. Lateur

Station de Phytopathologie de l'Etat, Chemin de Liroux, 5030 Gembloux, Belgium

During the late 18th and early 19th centuries Belgian fruit-tree breeders were famed throughout the Western hemisphere for their excellence and energy, especially in the area of pear breeding where over 1100 cultivars were produced.

In 1921, the great American pomologist U.P. Hedrick wrote emphatically, "Providence ordained Belgium to produce the modern pear. The pear was improved more in one century in Belgium than in all the centuries that had passed...". Although interest shown was less for other fruit species, a considerable heritage was left. However, during this century, as in neighbouring countries, it was gradually neglected along with other numerous and often little-known landraces.

Over the past two decades there has been an effort to collect, conserve and where possible characterize and evaluate what is left of the previous diversity. Other collections in the country are either of botanic interest or were set up for testing rootstocks and modern commercial cultivars, or for keeping virus-free material.

Data are approximate, mainly because curators are absorbed by other and more practically oriented tasks. There is a lack of information on duplications both within and between most collections. There may also be identification problems. As the impending restructuring of agricultural research at the Federal level should provide for a clear plant genetic resources programme, the initiation of appropriate coordination may be expected in the coming months. Table 1 shows a summary of all Belgian collections while Tables 2-7 shown the status of collections by institution.

Activities planned for 1996-98

- characterization of passport data for 591 accessions including three species
- biological characterization of 111 accessions (one species)
- agronomic evaluation of 376 accessions (three species)
- evaluation for resistance on 111 accessions (one species)
- characterization data of 366 accessions (three species) will be introduced into the European *Prunus* Database
- 10 accessions (two species) will be safety-duplicated
- 30 accessions (three species) will be regenerated and multiplied for exchange and distribution.

Table 1. Summary of holdings, Belgian *Prunus* collections.

Crop	Total no. accessions¹		'Original'² accessions		
	Cvs.	Seedlings	Number	Safety-duplicated	% in EPDB
Almond	7	–	1	1	–
Apricot	7	–	4	4	1
Cherry (sour)	45	717	8	6	–
Cherry (sweet)	666	200	145	140	35
Cherry (related spp.)	57	–	3	0	51
Plum + prune	616	1565	280	189	20
Peach	40	–	28	9	–
Interspecific hybrids	157	–	0	–	9
Wild related <i>Prunus</i> spp.	24	200	14	8	20
Total	1619	2682	483	357	

¹ Excluding known duplicates

² Original material. According to the Fourth Meeting of the TCC and the Fourth Meeting of the *Prunus* Working Group, priority for conservation in each country should be to "...indigenous older cultivars and wild material - originating in the country". Report of a Working Group on *Prunus*. IPGRI, Rome. 1993.

Collections and their locations

National plantentuin / Jardin botanique national, Ministry of Middle-classes and Agriculture

Location: B-1860 Meise

Curator: E. Lammens

- Field collection of wild *Prunus* spp., mostly introduced from abroad.

Table 2. Nationale plantentuin / Jardin botanique national (Meise).

Crop	Total no. accessions¹		'Original' accessions	
	Cvs.	Seedlings	% in EPDB	% identified
Almond	0	–	–	–
Apricot	1	0	100	–
Cherry (sour)	1	–	–	–
Cherry (sweet)	1	–	–	–
Cherry (related spp.)	31	3	93	100
Plum + prune	0	–	–	–
Peach	1	0	–	–
Interspecific hybrids	17	0	35	–
Wild related <i>Prunus</i> spp.	6	2	83	100
Total	56	5		

¹ Excluding known duplicates.

Station des Cultures Fruitières et Maraîchères (Gembloux), Ministry of Middle-classes and Agriculture

Location: B-5030 Gembloux

Curator: P. Druart

- Working collection of wild *Prunus* spp. and interspecific hybrids, tested as rootstocks for sweet cherries and plums. Breeding work with same purpose.
- Trials with commercial sweet cherry cultivars.
- Collaboration with the Station de Phytopathologie.

Activities planned for the period 1996-98

- Agronomic evaluation of 10 accessions representing one species.

Table 3. Station des Cultures Fruitières et Maraîchères (Gembloux).

Crop	Total no. accessions ¹		'Original' accessions		
	Cvs.	Seedlings	Number	% in EPDB	% identified
Almond	0	–	–	–	–
Apricot	0	–	–	–	–
Cherry (sour)	11	–	–	–	100
Cherry (sweet)	140	–	2	–	100
Cherry (related spp.)	0	–	2	–	–
Plum + prune	25	340	7	–	100
Peach	0	–	–	–	–
Interspecific hybrids	140	–	0	6	–
Wild related <i>Prunus</i> spp.	0	200	–	–	–
Total	316	540	11		

¹ Excluding known duplicates.

Station de phytopathologie

Location: B-5030 Gembloux

Curator: M. Lateur

- Research project on "Fruit-tree genetic resources and resistance to diseases"; collecting conservation and evaluation of old fruit-tree cultivars; release of the better-performing cultivars to the nursery trade and for use in breeding work.
- Partner 3 in project 61 "*Prunus* genetic resources" of the EC Programme on the conservation, characterization, collecting and utilization of genetic resources in agriculture - Council Regulation (EC) 1467/94 of 20.06.94.
- Collaboration with Station des Cultures Fruitières et Maraîchères occasionally also with National Plantentuin/Jardin Botanique National, Koninklijk Opzoekingsstation van Gorsem, V.Z.W., Fruitteeltcentrum K.U. Leuven and Nationale Boomgaarden Stichting V.Z.W.

Activities planned for the period 1996-98

- Passport and biological data will be characterized and agronomic qualities and resistance will be evaluated for 111 accessions (one species). These data will be included in the European *Prunus* Database.
- Ten accessions (two species) will be safety-duplicated and five accessions (two species) will be regenerated and multiplied for exchange and distribution.

Table 4. Station de phytopathologie (Gembloux)

Crop	Total no. accessions ¹		'Original' accessions		
	Cvs.	Seedlings	No.	% in EPDB	% identified
Almond	0	–	–	–	–
Apricot	1	–	1	1	–
Cherry (sour)	6	687	6	6	100
Cherry (sweet)	45	–	40	40	100
Cherry (related spp.)	3	–	–	–	–
Plum + prune	283	400	220	139	40
Peach	29	–	20	1	80
Interspecific hybrids	0	–	–	–	–
Wild related <i>Prunus</i> spp.	7	–	7	3	100
Total	374	1087	294		

¹ Excluding known duplicates.

Koninklijk opzoekingsstation van Gorsem, v.z.w.

Status: Non-profit-making association, partly public-funded

Location: B-3800 sint-truiden

Curator: C. Verheyden

- Collection of virus-free commercial cultivars of plums and cherries.

Table 5. Koninklijk opzoekingsstation van gorsem (Gorsem), Non profit association (partly public-funded).

Crop	Total number of accessions (cvs.) excluding known duplicates
Almond	2
Apricot	0
Cherry (sour)	8
Cherry (sweet)	41
Cherry (related spp.)	23
Plum + prune	43
Peach	0
Interspecific hybrids	0
Wild related <i>Prunus</i> spp.	6
Total	123

Fruitteltcentrum K.U. Leuven

Status: A branch of the Catholic University of Leuven

Location: B-3202 Rillaar

Curator: J. Keulemans

- Working collection of plum and cherry cultivars from a previous breeding project.
- Trials with commercial plum and cherry cultivars and dwarfing rootstocks.

Activities planned for the period 1996-98

- Agronomic evaluation of 255 accessions of three species, which will be

entered into the European *Prunus* Database.

Table 6. Fruitteeltcentrum k.u. leuven (Rillaar), Catholic University of Leuven.

Crop	Total number of accessions excluding known duplicates		
	Cvs.	Seedlings	'Original' accessions (cvs.)
Almond	0	–	–
Apricot	0	–	–
Cherry (sour)	20	30	–
Cherry (sweet)	150	200	3
Cherry (related spp.)	0	–	–
Plum + prune	75	825	3
Peach	0	–	–
Interspecific hybrids	0	–	–
Wild related <i>Prunus</i> spp.	0	–	–
Total	245	1055	6

Nationale boomgaarden stichting v.z.w. (National Orchards Trust)

Status: Non-profit association

Location: dispersed, mostly in Limburg Province; B-3724 Vliermaal-Kortessem

Curator: L. Royen

- Collection and conservation of old fruit-tree cultivars, predominantly in standard-tree orchards.

Activities planned for the period 1996-98

- Characterization of passport data of 480 accessions representing three species
- 25 accessions will be regenerated and multiplied for exchange and distribution.

Table 7. Nationale boomgaarden stichting (Vliermaal), NGO.

Crop	Total no. accessions (cvs.) ¹	'Original' accessions			
		Number	Safety- duplicated	% in EPDB	% identified
Almond	5	1	1	–	100
Apricot	5	3	3	–	60
Cherry (sour)	0	–	–	–	80
Cherry (sweet)	290	100	100	80	–
Cherry (related spp.)	0	–	–	–	65
Plum + prune	190	50	50	65	80
Peach	10	8	8	–	–
Interspecific hybrids	0	–	–	–	100
Wild related <i>Prunus</i> spp.	5	5	5	0	–
Total	505	167	167		

¹ Excluding known duplicates.

Status of the *Prunus* collection in the Czech Republic

J. Blazek

Research and Breeding Institute of Pomology, 50751 Holovousy, Czech Republic

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. Dotlacil, Research Institute for Crop Production, Drnovská 507, 16106 Prague 6, Ruzyně) and is fully funded by the Ministry of Agriculture. Funds for maintenance and basic evaluation are presently sufficient, but do not cover sophisticated research or special projects, for example cryo-preservation or molecular markers.

In regard to particular collections of *Prunus* species, cherries and plums are kept at the Research and Breeding Institute at Holovousy (Curator: Eng. F. Paprstein, Csc.); plums and prunes at the Mendel Agricultural and Forestry University, Brno (Curator: Doc. Eng. V. Rezníček, Csc.), and almonds, apricots and peaches at Mendel Agricultural and Forestry University, Brno, faculty of horticulture at Lednice na Morave (Curators: Prof. Eng. Z Vachún, CSc. (apricots) and Eng. I. Oukropec (almonds and peaches))

There are rather severe quarantine regulations in the Czech Republic. The following restrictions are applied to all *Prunus* spp. (imports).

Budwood from European countries: must be from nurseries under regular phytoquarantine supervision, in which no occurrence of *Leucaspis japonica* and *Quadraspidiotus perniciosus* has been found during the last 2 years. The area also has to be free of *Popilia japonica*. The material has to be free from all dangerous virus, mycoplasma and rickettsia diseases. This has to be stated in the phytocertificate or substituted by a general statement that the material is virus free or virus tested.

Budwood from non-European countries: the same conditions as in the previous item, but the statement that the material is virus free or virus tested is obligatory.

Rootstocks from European countries: an additional statement is needed that the fields are free from *Clavibacter michiganensis* subsp. *sepedonicus*, *Globodera rostochiensis*, *Globodera pallida*, *Ditylenchus destructor*, *Meloidogyne* spp. and *Synchytrium endobioticum*. An absence of nematodes from genera *Globodera* must be supported by soil analysis and the field must also be free of aggressive pathotypes of *S. endobioticum*.

Rootstocks from non-European countries: The same conditions as in the previous item, but the roots have to be exceptionally clean of soil.

Activities planned for 1996-98

- characterization of passport data of 1334 accessions of 11 species
- 805 accessions (10 species) will be characterized for morphological and biological characteristics
- 10 accessions (five species) will be characterized for other characteristics
- agronomic evaluation will be made of 1125 accessions (eight species)
- resistance evaluation of 35 accessions (23 species)
- 40 accessions will be safety-duplicated
- 130 accessions (3 species) will be regenerated and multiplied for exchange and distribution.

Table 1. The status of *Prunus* collections in the Czech Republic.

Crop	Total no. accessions ₁	'Original' accessions				
		Number	Safety- duplicated	% in EPDB	% identified	% for quarantine ²
Almond	13	–	–	–	–	–
Apricot	358	11	–	36	36	–
Cherry (sour)	108	11	–	100	11	10
Cherry (sweet)	323	29	–	90	29	5
Cherry (related spp.)	–	–	–	–	–	5
Plum + prune	395	39	4	95	37	20
Peach	269	–	25	–	–	–
Interspecific hybrids	28	7	2	0	60	35
Wild related <i>Prunus</i> spp.	7	5	2	0	50	20
Total	1501	102	33			

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Status of the *Prunus* collection in France

Anne Zanetto

INRA, Centre de Bordeaux, Unité de Formation et de Recherches d'arboriculture fruitière, 2, Place Pierre Viala, 34060 Montpellier, cedex 1, France

The national collection

The French national collection of *Prunus* is at present held in different collection sites and under the authority of different organizations. 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. The Association Française pour la Conservation des Espèces Végétales (AFCEV) is an association which includes most of the people in France concerned with conservation of genetic resources in plants and they have a fruit group. The main objectives of this association are:

- the conservation of old and regional varieties, also considered as cultural patrimony
- the possible use of those varieties for scientific purposes
- an economic interest for local varieties at the local level.

Eleven French conservatories have an agreement with AFCEV including INRA and CBN, and other local conservatories are ready to apply. To obtain this agreement from the association, the conservatories need to take into account certain conditions of perenniality and sanitary state.

The Comité Technique Interprofessionnel des Fruits et Légumes (CTIFL) also has collections of *Prunus* genetic resources mostly representing varieties under certification or patent.

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 (BRG). This network includes all those involved in *Prunus* genetic resources conservation. The project presented here is for *Prunus* genetic resources, but the same applies, or will apply, to all plants, animals and microorganism genetic resources collections in France.

The main objective of the network is the rationalization of genetic resources conservation. For this purpose, a charter has been created defining the partners and establishing the national genebank. Collections can now be spread over different locations in France but still be considered as belonging to the national collection. An inventory of exchangeable resources will have to be made.

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

Table 1. Summary of holdings in France.

Crop	Total no. accessions ₁	'Original' accessions			% for quarantine ²
		Number	Safety- duplicated	% in EPDB	
Almond	252	20	–	70	50
Apricot	656	70	20	70	50
Cherry (sour)	193	30	–	70	95
Cherry (sweet)	400	60	–	70	95
Cherry (related spp.)	75	–	–	80	95
Peach	932	200	94	70	90
Plum + prune	607	73	–	70	90
Interspecific hybrids	640	50	–	40	90
Wild related species	150	15	–	50	90
Total	3905	338			

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Activities planned for 1996-98

- characterization of passport data, morphological and biological characters will be made of 100% of all *Prunus* accessions
- molecular characterization will be made of 5% of *Prunus* accessions (2 species)
- agronomic evaluation and evaluation for resistance (visual observation) will be made of 10% of the accessions (5 species)
- characterization data and evaluation data for 100% of *Prunus* accessions will be introduced into the *Prunus* database.

Safety-duplication

Depending on funds available for this purpose, some of our collections are duplicated on an island. Some tests are made to store the duplicates *in vitro* and by cryopreservation. There are no funds for regeneration and multiplication of accessions for exchange and distribution.

Status of the *Prunus* collection in Germany

M. Fischer

IPK Gatersleben, Fruit Genebank Dresden-Pillnitz, Dorfplatz 2, 01326 Dresden, Germany

The Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK) Gatersleben is the central institute for the conservation of genetic resources in Germany. When fruit research was reorganized in Germany in 1991, the fruit genebank, Genbank Obst Dresden-Pillnitz, was established as an external branch of IPK. The fruit genebank originated as part of the department of breeding of the former Institut für Obstforschung Dresden-Pillnitz. The Genbank Obst represents fruit genetic resources in Germany and coordinates all activities with local institutes and NGOs working with fruits.

The Genbank Obst has the task of conserving and evaluating the genetic resources of pome, stone, small and wild fruit and of supporting projects for breeding, fruit-growing, landscape-shaping, pomology, taxonomy and phytopathology. Apart from tasks in landscape development and the conservation of old German cultivars and indigenous wild fruit species, the collections of the genebank serve as a stock and a source of basis material for fruit breeding. A special emphasis is given to the selection and conservation of donors of resistances.

At present the entire stock of the Genbank Obst Dresden-Pillnitz amounts to 2657 accessions (cultivars, varieties, clones). This includes cultivars and hybrids of apples, apple rootstocks, sweet cherries, sour cherries, plums, pears, pear rootstocks, strawberry cultivars and species, *Malus* species, *Pyrus* species, *Prunus* species and hybrids, *Ribes* cultivars, *Rubus* cultivars, *Sorbus* species and other accessions (Table 1). All are kept as plants in the field.

Moreover, lists of collections from numerous German institutions and experimental stations are published in the Federal Fruit Species Cultivar List. These collections, together with the Pillnitz collection and the temporary ones of the 'Bundessortenamt', can be regarded as the German stock of fruit species and cultivars. The periodic presentation of this list, in electronic format, will begin in 1996. Data will be available for national and international use in 1997.

Passport data are available for cultivars in the collections established at Pillnitz. Furthermore, there are results for numerous cultivars and whole collections of apples (regarding pollen fertility, apomixis, resistance to mildew, scab, fire blight, woolly aphids) and especially virus resistance in plums, apples, pears and cherries. Results also include information on regularity of yield, fruit quality, phenology, morphology, frost resistance of shoots and flowers and resistance to *Valsa* (pathogen) and *Pseudomonas* for sweet cherries.

The main task at hand is the consolidation of this evaluation data through observation over several years.

The direct result of evaluation of the collections at the Genbank Obst led to the publication of a catalogue including various cultivars recommended for further use by breeding institutions. These include apple cultivars of the Pi-series: 'Piros', 'Pinova', 'Pilot', 'Pikant', 'Pirol'; resistant apple cultivars of the Re-series: 'Retina', 'Remo', 'Reglindis', 'Reanda', 'Renora', 'Rewena'; apple rootstocks: 'Pillnitzer Supporter 1, 2 and 3'; sweet cherry cultivars of the Na-series: 'Nadino', 'Nalina',

'Namare', 'Namosa'; sour cherry cultivars: 'Karneol', 'Korund', 'Topas'; and strawberry cultivars: 'Fratina' and 'Fracunda' which are suitable for mechanical harvesting. Additional breeding material will soon be added to this catalogue.

Table 1. IPK Gatersleben, Genbank Obst Dresden - Pillnitz (December 1995).

Crop	Stock	No.	Accession type
<i>Malus</i>	379 accessions (spp., subsp., hybrids)		
	971 cultivars	189	currently regist. cultivars
		26	Pillnitz cultivars
		89	old German cultivars
		106	local cultivars
		148	breeding clones, mutants, donors
		389	others
		24	apple rootstocks
<i>Pyrus</i>	75 spp., subsp., hybrids		
	163 cultivars	35	currently regist. cultivars
		9	Pillnitz cultivars
		10	Japan-pears (Nashi)
		69	breeding clones, donors
		28	others
		12	pear rootstocks
<i>Prunus</i>	41 spp., subsp., hybrids		
<i>P. avium</i>	288 cultivars	55	currently regist. cultivars
		11	Pillnitz cultivars
		43	breeding clones, donors
		179	others
<i>P. cerasus</i>	115 cultivars	16	currently regist. cultivars
		5	Pillnitz cultivars
		16	breeding clones
		78	others
<i>P. domestica</i>	198 cultivars	34	currently regist. cultivars and mutants
		18	Pillnitz cultivars and clones
		146	others
<i>Fragaria</i>	15 species		
	315 cultivars	58	currently regist. cultivars
		5	Pillnitz cultivars
		252	others
<i>Ribes</i>	20 species		
<i>Rubus</i>	52 species		
<i>Sorbus</i>	17 species and hybrids		
Other	8 accessions		
Total	2657 accessions		

National conservation projects concerned with cultivar collection on the regional level are worked on in cooperation with the Federal States. Non-orchard fruit growing and *in situ* preservation receive professional assistance. Furthermore, indigenous wild fruit species from different origins are collected and incorporated into the Pillnitz collections. Currently, in Mecklenburg, registration is made of single, very old special cherry and apple trees which are worth

protecting and support is given for special programmes of nature and landscape preservation.

Table 2. Stock of the Central Fruit Genebank at 42 different locations in Germany.

Crop	No. of accessions	Accession type
<i>Malus</i>	112	species
	780	cultivars
	135	breeding clones and others
<i>Pyrus</i>	170	cultivars
	20	Japan pears (Nashi)
<i>Cydonia</i>	10	cultivars
<i>Prunus</i>		
<i>P. avium</i>	295	cultivars
	35	breeding clones and others
<i>P. cerasus</i>	135	cultivars
	15	breeding clones
<i>P. persica</i>	45	cultivars
<i>P. armeniaca</i>	22	cultivars
<i>P. domestica</i>	210	cultivars
	30	breeding clones
<i>Rubus</i>		
<i>R. fruticosus</i>	30	cultivars
<i>R. idaeus</i>	80	cultivars
	10	breeding clones
<i>Ribes</i>		
<i>R. rubrum</i>	30	cultivars, red
	70	cultivars, black
	15	cultivars, white
<i>R. uva crispa</i>	50	cultivars
<i>Juglans regia</i>	15	cultivars
	30	clones (number-cultivars)
<i>Corylus avellana</i>	45	cultivars
<i>Fragaria</i>	300	cultivars

Analyses and identification were completed on resistance donors within the sweet cherry collection including assessment of the interaction with Valsa infection, *Pseudomonas* and winter frost resistance. All three characters are independently expressed, requiring evaluation of all three characters. Donors for breeding work were indicated as follows: Valsa resistance: 'Burlat', 'Bianka', 'Nalina', 'Valerij Tschkalov'; frost resistance: 'Altenburger'; and 'Vinka' and the clone 'Pi-Na 1032' for *Pseudomonas* resistance. Methods developed indicate that evaluation of larger collections will be possible within the next few years.

In the future, priority will be given to supporting the evaluation of sweet cherries through HPLC-techniques, characterization of the resistance characters and finding sources of resistance. Also, a project will be initiated to identify sweet cherry cultivars through PCR techniques. The first tests for cultivar identification in *Malus* and *Prunus* through PCR techniques have been completed successfully. The tests were made in cooperation with laboratories at IPK Gatersleben and Technical Universities München. It has been shown that it is extremely costly to identify differences in near relatives. To date no relationship has been found between band patterns and prominent characters.

Resistance reactions in plum cultivars to Plum Pox Virus were observed under natural conditions. No symptoms could be found or confirmed in 160 cultivars, but their expression is extremely independent of fruits or leaves. A disease-free cultivation is aimed at for the future conservation of plum cultivars. For this purpose further trials concerning Plum Pox Virus infestation have been initiated. Through virus elimination and *in vitro* thermotherapy, a virus-free *Prunus* genebank will be established.

An example of cooperation with NGOs has been the organization, planning and planting of an external sweet cherry cultivar garden in a nature park 'Saale-Unstrut-Triasland' near Nebra. The orchard was planted with old local cultivars, creating an official cultivar information centre for the people of the region.

Table 3. Status of *Prunus* collections in Germany.

Crop	Total no. accessions ₁	'Original' accessions				
		No.	Safety-duplicated	% in EPDB	% identified	% for quarantine ²
Almond	0	0	0	0	0	0
Apricot	22	2	0	0	0	0
Cherry (sour)	230	35	20	70	40	5
Cherry (sweet)	535	50	30	60	40	15
Plums	390	30	10	50	50	0
Peach	45	3	3	3	100	0
Wild subsp. hybrids	40	3	3	3	100	0
Total	1262	123	66			

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Status report on *Prunus* collections in Greece

I. Hatziharisis

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Introduction

Prunus collections only exist in the fields of three farms at the Pomology Institute, located in the areas of Naoussa, Macrochori and Skidra.

Cryopreservation of *Prunus* species seed is applied by the Greek Genebank, Cereal Institute, Thessaloniki.

The *Prunus* collections of the Pomology Institute consist of old cultivars, advanced cultivar varieties, landraces, wild species and seedlings. This genetic material has been collected through a programme of IBPGR and is supported by national programmes.

The head of the *Prunus* Genebank is I. Hatziharisis and the curator is C. Tsipouridis. One person is responsible for and involved with conservation, characterization and evaluation of each of the main *Prunus* species as follows:

A. Gouderas	<i>Prunus domestica</i> , <i>P. salicina</i>
I. Hatziharisis	<i>P. avium</i> , <i>P. cerasus</i>
A. Isaakidis	<i>P. amygdalus</i> , <i>P. dulcis</i>
Ir. Karayiannis	<i>P. armeniaca</i>
C. Tsipouridis	<i>P. persica</i>

Field protection of the collections against pests and diseases follows spraying programmes of each particular species. Very valuable immune genetic material is kept in two screenhouses.

In situ material is not protected by law or other regulations existing in Greece.

Exportation or importation of genetic material between member countries of the EU is unrestricted. Exchange with other countries is controlled by specific regulations which are related mainly to pests and diseases native to these countries. Special attention is given to virus diseases.

A special licence, and control tests, are needed in cases of importation or exportation of genetic material with non-EU countries. These tests are made through the special services of the Ministry of Agriculture.

In Greece, field conservation of genetic material of deciduous fruit trees is carried out by the Pomology Institute and the Greek Genebank for seeds. Both institutions belong to NAGREF, which facilitates cooperation.

Cooperation with the countries of the EU is related to the exchange of genetic material, information, technology and participation in common projects.

Cooperation with countries outside the EU is limited to the exchange of information and genetic material. These countries are the Balkan peninsula, USA, Canada, Japan, China and the countries surrounding the Black Sea.

All genetic material conserved at the Pomology Institute is given to NAGRAF and included in the National Catalogue of cultivars and rootstocks. Part of this genetic material comes from old cultivars, Greek landraces and wild species. This information was given to the European *Prunus* Database as passport data. No other institutions, except the Pomology Institute and the Greek Genebank, are involved in the conservation of *Prunus* genetic material. There is no safety-duplication and genetic material is unsecured.

The Pomology Institute could establish duplication collections at its three farms, in three different areas, but land and funds are in short supply. The Pomology Institute has requested land and funding from the NAGREF, as this

organization is in possession of suitable land in various areas, which could solve this problem.

Special national programmes for marking, collecting, characterization and evaluation of genetic material are not financed in Greece owing to a shortage of funds. Some money is available for this purpose from cultivar evaluation programmes. Activities on this topic are limited and deal with:

- field conservation of existing plant genetic material collected so far
- description, in a limited way, of the morphological characteristics of some cultivars
- evaluation of a small part of the material for agronomic characteristics and observations on their sensitivity to pests and diseases
- use of a small part of the genetic material (rootstocks) in breeding programmes.

In 1996 passport data will be computerized; at the moment the data are recorded manually.

The Pomology Institute is attempting to ensure financial support, through programmes, to characterize genetic material (description of morphological, biological and molecular characteristics). After this, evaluation will be made of agronomic characteristics and resistance to unfavourable conditions, diseases, etc.

Genetic material which has been lost from the conservation collections will be re-collected. This material, although it has been marked and is considered important, remains *in situ*.

For this purpose a proposal has been submitted to NAGREF. A second proposal was submitted to the European Community, on the conservation, characterization, collecting and utilization of Genetic Resources in Agriculture in cooperation with other European countries. The coordinator is Dr Dosba. This proposal has just been approved.

Research related to *Prunus* genetic resources

No special work is being done on the conservation of genetic material as tissues or other plant parts, although cryopreservation is being done in Greece. The Greek Genebank is studying preservation by cryopreservation of fruit seeds.

Preliminary work on molecular markers for various national or EU programmes is being done at the Pomology Institute for some cultivars of *Prunus armeniaca*, *P. persica* and *P. amygdalus*.

There are no special programmes in Greece for the determination of genes related to pest and disease resistance or tolerance to abiotic factors.

Other programmes related to genetic material evaluation have identified cultivars with phenological characteristics relevant to tolerance to abiotic factors. In cases of infection by pest and diseases, cultivar resistance to pest and diseases is noted, then tested by artificial inoculations.

Wild species of *Prunus* in Greece

From published information, personal communications, and the work of the Museum of Natural History, Goulandri, the Greek Genebank and the Pomology Institute, it is clear that there is a large population of wild species of *Prunus* growing throughout Greece, having a wide variety and many rare species. There are large populations growing in various areas of Greece of *P. dulcis*, *P. domestica*, *P. myrobolana*, *P. insititia*, *P. salicina*, *P. spinosa*, *P. avium*, *P. cerasus*, *P. mahaleb* and

P. armeniaca.

Little work has been done on the inventory of these species and only to mark rare species and cultivars with great variability and to list existing species. Because little is known of existence, location or density, all the researchers involved with this subject have agreed to collect all relative information, to explore all provinces and to record all genetic material existing in each province. They have agreed to survey density and latitudinal distribution, climate and slope. They will also mention existing threats and investigate means of saving the material.

This work needs time, and more money is needed in order to finance programmes of long duration, to be carried out by teams of experts (agronomists, botanists, foresters, etc.).

In order that the above-mentioned efforts are successful, they need to be supported by the public and by ecological and other organizations related to this subject. For this purpose it is necessary to raise public awareness, so that an informed public may put pressure on the relative institutions important to this venture.

Table 1. Report on the status of *Prunus* collections¹ in Greece.

Crop	Total no. of accessions²	'Original' accessions		
		Number	% in EPDB	% identified
Almond	30	40	100	14
Apricot	8	8	100	50
Cherry (sour)	–	–	–	–
Cherry (sweet)	30	36	100	20
Cherry (related spp.)	4	–	–	–
Plum + prune	6	2	33	50
Interspecific hybrids	2	–	100	50
Wild related <i>Prunus</i> spp.	30	40	100	20
Total	110	126		

¹ Includes 92 old cultivars and wild material.

² Excluding duplicates.

Activities planned for 1996-98

- 126 accessions of 10 species will be characterized for passport data, biological and other characterization
- 51 accessions of seven species will be evaluated for resistance
- characterization data will be introduced into the European *Prunus* Database
- regeneration and multiplication for exchange and distribution will be made on 126 accessions of 10 species.

Status of *Prunus* collections in Hungary

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The professional supervising board of the Hungarian Plant Gene Bank is the Plant Gene Council, which works alongside the Ministry of Agriculture. The Council coordinates the activities of the special genetic resources of the country.

The members of the Board are two senior officials of the Ministry who are also the curators of the germplasm collections for field crops, grapevine, fruit species, ornamentals, forestry species and microorganisms.

The Research Institute for Fruit Growing and Ornamentals, Budapest, was commissioned by the Ministry in 1987 to establish the Fruit Germplasm Collection. Up to 1996, more than 6000 items of fruit species were collected. After sorting out the duplicates and loss due to the decay of plants, 4414 items remained. These have been planted in living collections, which are located in three different regions:

- Pome fruit species in Ujfehértó research station, northeast Hungary, managed by T. Szabó, researcher and apple breeder.
- Small fruit species at the Fertőd research station, West Hungary, managed by Mrs S. Porpaczy, senior researcher.
- Stone fruit species near Budapest at the Research Station Érd, managed by J. Apostol, cherry breeder. The latter is the curator of all the fruit species genebanks in Hungary and a member of the Hungarian Plant Gene Council.

The living collections hold two trees, or four bushes and six plants (of strawberry) per item from every accession. Assembly continues rather slowly because of restricted funds. New accessions include some 40 to 80 items yearly.

The living collection of *Prunus* covers 9 ha. The planting site of sweet cherries, apricots and peaches was planted from 1982 to 1987; unfortunately this site is not good and transplanting was begun in 1995 and will finish in 1997. For safety both the old and new plantations will be operated for a few more years.

The continuous phenological data survey of the accessions begins when they reach the cropping age. Unfortunately, only blossoming and ripening data of every item can be recorded. A detailed data survey of the fruits' parameters and features can be made on 100 items yearly.

An expert system has been developed for the passport data. The expert system for registering the phenological data is being created. Data entry of passport data started last year; to date up to 70% has been entered.

The UPOV descriptor identification and complete data survey of the accessions are still lacking owing to insufficient staff. Currently, only 20% of a researcher's capacity and about 40% of an assistant's is available for special tasks related to the *Prunus* collection.

The national quarantine network operates under the supervision of the Ministry of Agriculture, within the framework of 20 plant protection stations. These stations have the task of preventing the introduction and spread of pests and diseases and to offer extension services and forecasting. Health control is taken care of by the exporters, or at the border in the case of imported or transited goods.

Since the fourth meeting of the *Prunus* Working Group, we have had one request, made in January 1995, from the Japanese *Prunus* Gene Bank, asking for

one apricot accession.

Table 1. Accessions in the field fruit genebank in Hungary, January 1996.

Species	Accessions
Apple (<i>Malus sylvestris</i> Mill. var. <i>domestica</i> /Borkh)	646
Pear (<i>Pyrus communis</i> L.)	503
Quince (<i>Cydonia oblonga</i> L.)	51
Medlar (<i>Mespilus germanica</i> L.)	31
Sweet cherry (<i>Prunus avium</i> L.)	300
Sour cherry (<i>Prunus cersus</i> L.)	386
Apricot (<i>Prunus armeniaca</i> L.)	606
Peach (<i>Prunus persica</i> L.)	199
Plum and prune (<i>Prunus domestica</i>)	610
Almond (<i>Prunus dulcis</i> Mill. var. <i>dulcis</i>)	166
<i>Prunus</i> rootstock	75
Hazelnut (<i>Corillus avellana</i> L)	67
Walnut (<i>Juglans regia</i> L., <i>Juglans nigra</i> L.)	81
Strawberry (<i>Fragaria vesca</i> L. var. <i>hortensis</i> Duch.)	139
Raspberry (<i>Rubus ideaus</i> L.)	256
Bramble and interspecific hybrids	41
Red currant (<i>Ribes rubrum</i> L.)	65
Black currant (<i>Ribes nigrum</i> L.)	154
Elder (<i>Sambucus nigra</i> , <i>S. ebulus</i> L.)	25
Buckthorn (<i>Hippophae rhaemoides</i> L.)	5
Mountain ash (<i>Sorbus domestica</i> L.)	4
Dogwood (<i>Cornus mas</i> . L.)	4
Total	4414

Table 2. *Prunus* collections in Hungary.

Crop	Total number of accessions	'Original' accessions
Almond	166	>150 hybrids 147
Apricot	606	>2500 hybrids 513
Cherry (sour)	386	>2100 hybrids 368
Cherry (sweet)	300	>4000 hybrids 198
Peach	199	167
Plum + prune	610	>800 hybrids 586
Interspecific hybrids	15	10
<i>Prunus</i> rootstocks	75	75
Total	2357	2064

Activities planned for 1996-98

- complete entry of passport data
- enter all assessed data
- follow-up the survey on plants in the living collection
- continue and finish the transplanting of cherries, apricots and peaches to a more suitable site
- start the identification of accessions
- complete the collection
- characterization of passport data of 2357 accessions
- biological characterization of 200 accessions
- evaluation for resistance will be made of 2357 accessions
- characterization and evaluation data for 200 accessions will be included in the European *Prunus* Database.

Status of *Prunus* collections in Italy

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Work on fruit variety evaluation and characterization has always been very active because of the importance of the fruit-growing industry in Italy. This is shown by the many monographs on fruit varieties published by scientists and research institutions operating in this field, the most famous of which was written by Gallesio at the beginning of the 19th century.

In 1978 the National Research Council funded research on the “Collection characterization and evaluation of woody crops” which involved 24 institutes belonging to three different administrations: the Ministry of Scientific Research, the National Research Council and the Ministry of Agriculture. This working group concentrated its efforts on the major woody crops present in our country – almond, apple, apricot, cherry, citrus, grape, olive, peach, pear, plum – and catalogued a total of 8471 accessions of the different species.

Since the end of the activity of the CNR Working Group, the Istituto Sperimentale per la Frutticoltura (ISF) of Rome informally began to coordinate germplasm conservation, characterization and evaluation of fruit tree germplasm. The last census of fruit tree accessions present in the field collections includes fruit from this activity.

For the *Prunus* species, 14 institutions were involved in updating the inventory (Table 1) and cataloguing a total of 6804 accessions including duplicates (Table 2).

The data reported show the breadth of activity carried out on fruit tree germplasm, but at this time there is no national coordination and, therefore, overlapping work often is carried out by the different institutes, which results in a waste of funds.

Accessions (duplicates excluded) that are actually present in Italy, the ones that are considered indigenous and the ones that have been safety-duplicated are reported in Table 3. Of the total accessions, 45% are considered original and 70% of these are safety-duplicated.

Table 1. Institutions involved in updating the *Prunus* germplasm inventory, coordinated by the Istituto Sperimentale per la Frutticoltura, Rome (1993).

Institution	Administration
Istituto Sperimentale per la Frutticoltura (Roma, Trento, Forlì, Caserta) - (ISF, Rome)	Ministry of Agriculture
Dipartimento Colture Arboree, Bologna (DCA-BO)	University
Istituto di Coltivazioni Arboree, Bari (ICA-BA)	University
Istituto di Coltivazioni Arboree, Palermo (ICA-PA)	University
Istituto di Coltivazioni Arboree, Padova (ICA-PD)	University
Dipartimento di Colture Arboree, Torino (DCA-TO)	University
Istituto di Coltivazioni Arboree, Piacenza (ICA-PC)	University
Dipartimento di Ortoflorofrutticoltura, Firenze (DO-FI)	University
Dipartimento Coltivazione e Difesa Specie Legnose, Pisa (DCDSL-PI)	University
Istituto di Coltivazioni Arboree, Napoli (ICA-NA)	University
Istituto Propagazione Specie Legnose, Firenze (IPSL-FI)	University

Istituto di Colture Arboree Mediterranea, Sassari (ICAM-SS)	National Research Council (CNR)
ERSO, Az. Marani, Ravenna (ERSO-RA)	Regional
Istituto Sperimentale di Frutticoltura, Verona (ISF-VR)	Provincial

Table 2. *Prunus* accessions in the first inventory conducted by the ISF, Rome (1993).

Operative unit	Species					
	Almond	Apricot	Peach	Plum	Sweet cherry	Sour cherry
ISF, Rome	90	–	405	–	–	–
Trento	–	–	–	–	360	129
Forli	–	–	326	114	–	–
Caserta	–	287	246	–	192	20
IPSL-FI	–	–	1135	257	17	7
DCA-BO	–	222	507	238	153	–
DCDSL-PI	–	188	93	86	–	–
ISF-VR	–	–	138	–	301	–
ERSO-RA	–	11	204	34	–	–
DO-FI	–	–	39	70	–	–
DCA-TO	–	28	126	114	133	23
ICA-PC	–	–	–	–	72	–
ICA-PD	–	–	16	–	–	–
ICA-BA	100	–	–	–	102	18
ICA-PA	–	–	11	14	–	–
ICAM-SS	47	11	–	17	26	–
ICA-NA	–	30	23	24	–	–
Total	237	777	3269	968	1356	197

Table 3. Number of accessions, replications excluded and indigenous accessions present in field collections and accessions included in the European Database.

Crop	Total no. accessions ¹	'Original' accessions				
		No.	Safety-duplicated	% in EPDB	% identified	% for quarantine ²
Almond	190	122	70	11.5	115	10
Apricot	504	225	150	77	213	5
Cherry (sour)	169	112	100	–	106	3
Cherry (sweet)	635	439	250	54	417	5
Cherry (related species)	52	–	30	–	–	–
Peach and nectarine	1881	735	550	68	698	4
Plums	521	151	100	40	143	7
Total	3952	1784	1250			

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Activities for 1996-98 on *Prunus* germplasm

- characterization of passport data will be made on 200-250 accessions (6 species)
- morphological and biological characterization will be made on 100-150 accessions (6 species)
- molecular characterization will be made of 60 accessions (peach and apricot)
- agronomic evaluation and evaluation for resistance will be made on 100-150 accessions (6 species)
- characterization data for 150-200 accessions (6 species) and evaluation data for 100-150 accessions (6 species) will be introduced into the European *Prunus*

Database

- safety-duplication is being completed on peach, cherry and almond; safety-duplication of plum and apricot will follow
- regeneration and multiplication for exchange and distribution will be done for six species.

Concurrent with conservation activities, research programmes are also carried out on *Prunus* spp. germplasm. The following are those relative to molecular markers and to the identification of sources of pest and disease resistance:

- identification of peach and nectarine cultivars using RAPDs; early singling out of resistance to *Fusicoccum amygdali* and *Verticillium dhaliae* in stone fruit species
- breeding early and late-ripening apricot cultivars resistant to diseases, Sharka in particular
- developing genetic markers and linkage maps to use in *Prunus* breeding programmes
- identifying genetic sources of resistance to *Monilia* spp. to use in breeding programmes
- breeding peach cultivars resistant to the green aphid (*Myzus persicae*).

The genus *Prunus* in the Nordic countries

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Wild *Prunus* is found only in Denmark, Finland, Norway and Sweden. It is not found, either wild or cultivated, in Iceland. In addition to species listed below, 10 to 20 European and non-European *Prunus* species have been introduced. These are cultivated locally, mostly as ornamentals, or occur as escapees from older cultivations.

Native species	Commonly cultivated	Less commonly cultivated
<i>Prunus avium</i>	<i>Prunus domestica</i> (subsp. <i>domestica</i> and subsp. <i>insititia</i>)	<i>Prunus spinosa</i>
<i>Prunus padus</i> (subsp. <i>padus</i> and subsp. <i>borealis</i>)	<i>Prunus avium</i>	<i>Prunus padus</i>
<i>Prunus spinosa</i>	<i>Prunus cerasus</i>	
	<i>Prunus cerasifera</i>	

Fruit and berry collections of Denmark, Finland, Norway and Sweden

Collections are located in clonal archives at various educational and breeding institutions, county museums or private fruit orchards.

The Nordic Gene Bank (NGB) acts as a coordinator. It requests, collects, analyzes and presents data, but does not 'own' the material.

Each Nordic country has its own national programme and national coordinators who are responsible for conservation of material.

Special projects may receive extra funds from the NGB. A project concerned with genetic variation in wild or escaped species of *Prunus* (and *Hippopæe*) was started in 1992. Through this project a large number of accessions, both seeds and clones, have been collected. Final results are not yet available, but some of the clonal material from Finland has been included in this summary.

Table 1. The status of *Prunus* collections (DNK+FIN+NOR+SWE).

Crop	Total no. accessions ¹	'Original' accessions		
		Number	Safety-duplicated	% in EPDB
Cherry (sour)	132	121	49	1
Cherry (sweet)	53	7	–	~90
Plum/prune	324	220	62	~10
Total	509	348	111	

¹ Excluding duplicates.

Activities planned for 1996-98

- results are expected from NGB's special *Prunus* project
- characterization, evaluation data for an unknown number of accessions of *Prunus avium*, *P. cerasus*, *P. domestica*, *P. spinosa* and *P. padus* (5 species), eventually leading to introduction of some accessions into the European

Prunus Database.

Status of Polish *Prunus* collections

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The main collection of *Prunus* species is located in central Poland at the Research Institute of Pomology and Floriculture, Skierniewice. The collection consists of 445 cultivars, 52 local strains and 34 selected hybrids. The collection includes 126 cultivars of *Prunus cerasus*, 48 of *P. persica* and 40 of *P. armeniaca*. The collection also includes selected strains of *P. cerasifera* var. *divaricata*, *P. salicina*, *P. fruticosa*, *P. mahaleb*, *P. besseyi*, *P. tomentosa* and some interspecies hybrids.

Each cultivar strain is represented in the orchard by three trees in a field collection which occupies about 3 ha. Plums and apricots are grafted on seedlings of *P. cerasifera*, tart cherries are grafted on *P. mahaleb* and sweet cherries on cherries Mazard F 12/1. Peaches are grafted onto peach seedling rootstock *P. manhurica* seedlings.

Two observations are performed on the collection:

- evaluation of productive value
- character description according to UPOV descriptors.

About 35% of the collection has already been verified (evaluated). Evaluation includes time of blooming and fruit-ripening, tree vigour, tree shape, fruit size, skin colour, shape and other characters. During the past year tree health was tested, especially for virus diseases. The collection is gradually being increased with new local and foreign species. A computer database has been created for *Prunus* species.

Table 1. Status of *Prunus* collections in Poland.

Crop	Total no. of accessions ¹	'Original' accessions			
		Number	Safety-duplicated	% in EPDB	% identified
<i>P. persica</i>	48	43	0	30	90
Apricot	40	33	0	25	90
Cherry (sour)	131	121	6	56	92
Cherry (sweet)	140	123	12	40	85
Cherry (related spp.)	26	0	0	0	0
Plum + prune	134	120	15	49	95
Interspecific hybrids	6	6	0	0	100
Wild related <i>Prunus</i> spp.	6	0	0	0	100
Total	531	446	33		

¹ Excluding duplicates.

Activities planned for 1996-98

- 140 accessions of three species will be characterized for passport data and morphological data
- 100 accessions of three species will be evaluated for agronomic features
- 20 accessions of two species will be evaluated for resistance
- characterization and evaluation data for 140 accessions of three species will be entered into the European *Prunus* database

- 350 accessions of three species will be safety-duplicated.

Status of the *Prunus* germplasm collections in Portugal

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Introduction

Although Algarve, the most southern Province of Portugal, was once the main production region for almond, the crop is decreasing in importance owing to the abandonment of orchards and their replacement, in some cases, by irrigated crops. An old legend tells of an Arab Caliph, of the then-called Al-Gharb, who married a Nordic princess. The princess was very unhappy because she missed the snow she used to see in her home country. The Caliph, to please his beloved wife, ordered the planting of almond trees all over the region. When the trees were flowering, the princess would go to the highest tower of the castle and would see white all around her, just like the snow in her homeland.

Prunus species, namely plum, almond, cherry (sweet and sour), apricot and peach, are important fruit crops in Portuguese fruit production.

Although difficult to assess, because of the existence of many isolated trees upon which a large proportion of the production is based, the total area occupied by *Prunus* crops is estimated to be 65 922 ha with a production of 129 650 t (IMAI AA 1994). Table 1 shows the estimated area, total production, yield, main regions of production and respective percentages for each species, against the total area planted of each crop.

So far, eight *Prunus* germplasm collections have been identified in Portugal, holding a total of 1066 accessions belonging to 14 species and three interspecific hybrids, representing 3.5% of the total national germplasm holdings. It should be emphasized that for peach, sweet cherry and plums about 80% of the holdings are made up of introduced material, which for almonds is about 40% and for sour cherry is only about 10%.

Table 2 shows *Prunus* germplasm collections and Table 3 gives a summary of holdings (pomological characterization, quarantine requirements and percentage of national accessions) for which data are included in the European *Prunus* Database.

Portugal has been a full member of ECP/GR since it became operational in 1980. Since then it has been active in various working groups, through both Attending and Corresponding members. In order to facilitate the linkage between the national activities, and the ECP/GR Working Groups, similar working groups have been implemented in Portugal to include all scientists actively working on specific crops or crop groups.

The National Institute of Agricultural Research (INIA) is committed to establishing a coordinating structure to allow the coordination and rationalization of all efforts in the field of PGR.

The main source of information used in the preparation of the present work was the National Information System on Plant Genetic Resources (SNIRGV) implemented by INIA. The System builds upon a set of related databases holding data on the national collection's holdings, conditions of maintenance, staff involved and other related data relevant to the management of a national programme on plant genetic resources.

Table 1. Estimated area, production, yield and percentage of area of production per region of *Prunus* species in Portugal.

Species	Crop	Estimated area (ha)	Production (t)	Yield (kg/ha)	Region of production	Estimated % of total area
<i>Prunus domestica</i>	Plums	2 900	13 500	5200	Entre Douro e Minho	1
					Trás-os-Montes	3
					Beira Interior	2
					Beira Litoral	3
					Ribatejo e Oeste	38
					Alentejo	48
					Algarve	5
<i>Prunus dulcis</i>	Almond	42 712	18 800		Trás-os-Montes	30
					Beira Interior	30
					Ribatejo e Oeste	2
					Alentejo	10
					Algarve	28
					Beira Interior	50
					Beira Alta	40
<i>Prunus avium</i> , <i>P. cerasus</i>	Cherry	3 100	10 800		Alentejo	10
					Trás-os-Montes	6
					Beira Interior	1
					Beira Litoral	5
					Ribatejo e Oeste	63
					Alentejo	10
					Algarve	15
<i>Prunus armeniaca</i>	Apricot	710	4 050	5700	Trás-os-Montes	5
					Beira Interior	27
					Beira Litoral	5
					Ribatejo e Oeste	51
					Alentejo	8
					Algarve	4
					<i>Prunus persica</i>	Peach

[Portugal – p. 38]

Table 2. *Prunus* germplasm collections in Portugal.

Species	Collections and number of accessions							
	A	B	C	D	E	F	G	H
<i>Prunus armeniaca</i>	97	40	20	–	35	–	26	–
<i>P. avium</i>	32	30	–	–	32	–	–	7
<i>P. canescens</i>	–	1	–	–	1	–	–	–
<i>P. cerasifera</i>	2	–	–	–	–	–	–	2
<i>P. cerasus</i>	8	8	–	–	7	–	–	26
<i>P. dawychensis</i>	–	1	–	–	1	–	–	–
<i>P. domestica</i>	18	24	34	–	4	–	21	10
<i>P. dulcis</i>	26	5	–	40	–	72	50	1
<i>P. mahaleb</i>	–	–	–	–	–	–	–	1
<i>P. mariana</i> (GF81)	–	–	1	–	1	–	–	–
<i>P. mirobalana</i>	–	–	1	–	1	–	–	–
<i>P. persica</i>	75	1	–	–	60	–	57	–
<i>P. salicina</i>	29	20	16	–	11	–	23	–
<i>P. spinosa</i>	–	–	–	–	–	–	–	2
<i>Prunus avium</i> x <i>P. pseudocerasus</i>	–	1	–	–	1	–	–	–
<i>Prunus incisa</i> x <i>P. serrulata</i>	–	3	–	–	3	–	–	–
<i>Prunus mahaleb</i> x <i>P. avium</i>	–	3	–	–	3	–	–	–
Total	287	209	72	40	160	72	177	49

- A** Department of Pomoideae and Prunoideae, Estação Nacional de Fruticultura “Vieira Natividade”, Estrada de Leiria, Apdo. 158, 2460 ALCOBAÇA Olímpio J. Salgueiro Pereira, J.A. Gomes Pereira
- B** Regional Directorate of Agriculture of Beira Interior, Rua Amato Lusitano, Lt. 3, Apdo. 107, 6000 CASTELO BRANCO J.A. Teodósio Amaro
- C** Department of Fruiticulture, University of Évora, Largo dos Colegiais, Apdo. 94, 7001 ÉVORA Codex J.M. Mota Barroso
- D** Regional Directorate of Agriculture of Algarve, Apdo. 282 - Patacão, 8000 FARO Leopoldo Ferreira
- E** Vitiviniculture and Fruiticulture Station, Regional Directorate of Agriculture of Entre-Douro e Minho, Sergude, Sendim, 4610 FELGUEIRAS B. Mota
- F** Regional Directorate of Agriculture of Trás-os-Montes, Rua da República, 137, 5370 MIRANDELA A.M. Monteiro
- G** Regional Directorate of Agriculture of Algarve, Cabeço do Mocho, 8500 PORTIMÃO V. Branco
- H** Department of Biology, University of Trás-os-Montes and Alto Douro (UTAD), Quinta de Prados, Apdo. 202, 5001 VILA REAL Codex L. Torres de Castro

Table 3. *Prunus* collections in Portugal¹.

Crop	Total no. accessions ²	'Original' accessions	
		% identified	% for quarantine ³
Almond	194	100	Collections
Apricot	218	100	for
Cherry (sour)	49	100	vegetative
Cherry (sweet)	101	100	propagation
Cherry (related spp.)	5	100	are virus free
Plum + prune	263	100	
Peach	210	100	
Interspecific hybrids	14	100	
Wild related to almond, apricot, peach and plum	6	100	
Total	1060		

¹ Number of accessions safety-duplicated is not known.

² Excluding duplicates.

³ Holdings for which quarantine requirements are met.

Status of collections

Conservation

Without any exception, the Portuguese *Prunus* germplasm collections are maintained as field collections in organized orchards serving the multiple purpose of conservation, source of vegetative material (exchange and utilization) and field observations for morphological characterization and agronomic evaluation.

The holdings by collection, species and respective number of accessions, are shown in Table 2. Addresses for the collections and curator's names are given below the table.

Characterization, evaluation and documentation

It is widely recognized that the value of a germplasm collection is greatly augmented 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 obviously should be done in a sustainable manner.

Few data are available on these activities. Therefore it is difficult to accurately state the situation concerning, mainly, the number of accessions for which characterization and evaluation are complete or ongoing, the number of characters observed and the descriptor list used.

However, Table 4 reveals that *Prunus* collections, in general, are well characterized and evaluated. The objectives of all the listed projects are either breeding or clone selection or both, which entails a good knowledge of the material and a systematic characterization and evaluation.

Regarding documentation, although not much information is available, it can be said that much more attention has to be paid to the documentation of the *Prunus* collections. Two collections are computerized; the others have manually recorded data. It is the priority of the Working Group to strengthen the documentation of the collections. A common, standard system will be sought, thus facilitating the exchange of data related to the collections, not only among the national collections, but between the national scientists and the international scientific community as well.

Table 4. Institutions, teams and research projects conducted in Portugal, relevant to *Prunus* genetic resources.

Institution	Project leader	Project title	Objectives
Department of Pomoideae and Prunoideae Estação Nacional de Fruticultura “Vieira Natividade” Estrada de Leiria, Apartado 158 2460 ALCOBAÇA Tel: (351-62)597188/98 Fax: (351-62)596221	Olímpio J. Salgueiro Pereira	Varietal breeding for qualitative and phytosanitary traits of apricot (CT-900016)	<ul style="list-style-type: none"> • Obtain new cultivars resistant, or less sensitive, to the major pests and diseases • Good yield and good fruit quality for fresh consumption and industry
	J.A. Gomes Pereira	Almond, walnut and pistacio breeding for the diversification of fruit production in the developing areas (CT-900023)	<ul style="list-style-type: none"> • Revitalization of almond production through the selection of well-adapted genotypes for dry conditions
Department of Horticulture University of Évora Largo dos Colegiais - Apt. 94 7001 ÉVORA Codex Tel: (351-66)22106/23312 Fax: (351-66)711163	J.M. Mota Barroso	Selection of ‘Rainha Cláudia’ plum variety	<ul style="list-style-type: none"> • Selection of ‘Rainha Cláudia’ clones and rootstocks
Department of Agricultural Techniques University of Trás-os-Montes and Alto Douro (UTAD) Quinta de Prados - Apt. 202 5001 VILA REAL Codex Tel: (351-59)320501; Fax: (351-59)320480 in collaboration with: Regional Directorate of Agriculture of Trás-os-Montes	Alberto Santos	Cherry growth mechanisms and yield valorization	<ul style="list-style-type: none"> • Study of varietal behaviour • Study of nutrient content in the cherry leaves • Protection against the fruit fly • Identification and selection of the variety ‘Lisboeta do Távora’
Regional Directorate of Agriculture of Trás-os-Montes Rua da República, 137 5370 MIRANDELA Tel: (351-78)27147; Fax: (351-78)27623	A.M. Monteiro	Study of almond crop	<ul style="list-style-type: none"> • Nutrition trials • Cultivar comparison trials • Drought resistance • Cultivar characterization • Establishment of a Field Genebank • Survey of the cultivars used in the region • Agronomical, physiological, biometric
		Contribution to the development of almond cultivation in the valley of	

Institution	Project leader	Project title	Objectives
		'Douro Superior' region	<ul style="list-style-type: none"> and isozyme characterization • Study of rootstock multiplication techniques appropriate for the region • N and P fertilization • Comparative study of yields of the main cultivars of interest for the region • Irrigation trials
		Characterization of physiological mechanisms of almond under dry conditions for selection and introduction in the valley of 'Douro Superior' region	<ul style="list-style-type: none"> • Adaptation trials under dry conditions
Regional Directorate of Agriculture of Beira Interior Rua Amato Lusitano, Lt. 3 - Apt. 107 6000 CASTELO BRANCO Tel: (351-72)323263; Fax: (351-26021	J.A. Teodósio Amaro	Adaptation trials of cultivars and rootstocks of sweet and sour cherry, peach, plum, apricot and almond	<ul style="list-style-type: none"> • Increasing the interest in the production of these crops in 'Cova da Beira' region
Regional Directorate of Agriculture of Algarve Cabeço do Mocho 8500 PORTIMÃO Tel: (351-82)476676; Fax: (351-82)476221	V. Branco	Regional fruit trees (almond, plum, etc.)	<ul style="list-style-type: none"> • Survey and collection of regional varieties • Establishment of a 'field collection' • Conservation, characterization and evaluation • Identification of material with good agronomic potential

[Portugal – pp. 41-42]

Safety-duplication of collections

It is clear that a certain extent of duplication exists among the *Prunus* collections in Portugal. However, it was not possible to assess to what extent this is the case.

The existing duplication is more a result of the exchange of material rather than the declared intention of a safe duplication. This exchange is a result of the intense utilization of the material preserved in collections, namely for evaluation of its agronomical value, multisite varietal comparison and introduction into culture.

Consequently, a detailed analysis of the existing data related to each accession is essential, in order to facilitate the identification of the extension of the existing duplication (intentional or not) and to clearly document the status and promote a methodical and thorough safety-duplication of the Portuguese *Prunus* germplasm collections.

Conclusions

Prunus genetic resources have been a very dynamic field of activity in Portugal, with the establishment of germplasm collections of autochthonous and exotic material, breeding and clone selection programmes and the utilization of genetic resources.

With the increase of plant genetic resources awareness and the development of new concepts concerning the conservation, management and utilization of germplasm, much attention has to be devoted to the whole programme, especially to characterization, evaluation, safety-duplication and, last but not least, the documentation of *Prunus* genetic resources.

Reference

IMAIAA. 1994. Anuário Hortofrutícola 94. Instituto dos Mercados Agrícolas e da Indústria Agro-Alimentar. Lisboa.

Status of *Prunus* collections in Romania

I. Botu

Fruit Growing Research Station, Valcea, 464, Calea Traian Str., 1000 Valcea, Romania

<i>Prunus</i> species	Location of collections	Responsible curators
Almond	Turnu Severin	Ioana Zaharia
Apricot	Constanta	Elena Topor, Viorica Balan
Cherry	Iasi, Pitesti, Baneasa	L. Petre. S. Budan
Peach	Constanta, Baneasa	Pr. Ionescu, Antonia Ivascu
Plum	Vâlcea, Pitesti, Strejesti	I. Botu, R. Roman, Mariana Nicolaescu

Romania is concentrating on vegetal genetic resources. Besides the Gene Bank at Suceava, which is a national organization, there is a National Board for Vegetal Genetic Resources which has signed the establishment agreement with IPGRI, approved by the Ministry of Agriculture and Food, Romania.

Prunus collections are of major importance to Romania, if the importance of these crop types to the fruit-growing economy is taken into account. The total number of accessions is 3280, of which 821 are 'originals'. 'Original' accessions, obtained in Romania, include 659 locally cultivated forms, six local species, 65 interspecific hybrids, 91 varieties and rootstocks. There are 33 varieties and rootstocks created with autochthonous gene sources.

Germplasm maintenance for *Prunus* is *in situ*. Two to three collections for each crop type are held in different places. Each collection owns a certain number of accessions. The following tables show total accessions without duplicates. One curator is in charge of identification, collecting, introduction and evaluation in each collection. Organization of the collections in different centres was necessary to avoid the risk of losing some genotypes.

All collections are held at the Fruit Growing Research Stations, with financial support from the Ministry of Research and Technology. Expenses are generally large and financial support doesn't always cover them.

Genetic resources maintenance of the *in situ* collections also encounters technical and phytosanitary problems.

As genetic resources are utilized by breeders in the genetic and breeding programmes, long-term conservation of these resources is secondary.

Storing of genetic resources (virus-free plants) was begun during the last 6-7 years. The number of accessions is relatively small and includes varieties which have been multiplied in nurseries.

Emphasis was placed on the collecting and introduction of germplasm of species and varieties from other countries and less on local genotypes. Nevertheless, 25% of all accessions are considered 'original'.

Sixty percent of accessions were evaluated according to IPGRI and UPOV descriptors. There were a few difficulties concerning the correct identification of accessions.

Genotypes maintained in glasshouses are healthy and can be granted phytosanitary certificates, especially as virus-free, but those kept are continuously submitted to natural infection, although phytosanitary treatments are applied in accordance with the warnings.

Table 1. *Prunus* collections in Romania.

Crop	Total no. accessions¹	'Original' accessions				No. for phytosanitary certificate³
		Number	% characterized	% identified	% for quarantine²	
Almond	170	47	80	94	75	19
Apricot	659	165	64	80	79	32
Cherry (sour)	176	72	79	83	66	35
Cherry (sweet)	518	151	49	82	62	42
Cherry (related spp.)	10	0	0	100	86	30
Peach	1023	100	64	84	78	44
Plum + prune	607	215	57	98	75	38
Interspecific hybrids	65	65	0	100	88	78
Wild related <i>Prunus</i> spp.	52	6	43	100	72	42
Total	3280	821				

¹ Excluding known duplicates.

² Holdings for which quarantine requirements are met.

³ Ready for issuance of phytosanitary certificate.

[Romania – p. 45]

The following outlines the general strategy of the National Programme for *Prunus* germplasm:

- reorganizing the collections for all *Prunus* crop types
- completion of collections through the introduction of new accessions
- utilization of local areas and drawing of zone maps charting genetic resources available, especially those for plum, prune, apricot, sour and sweet cherries
- complete evaluation for all accessions according to IPGRI descriptors and include these in the European *Prunus* Database
- organize, evaluate and preserve germplasm using modern means (*in vitro*, cryopreservation) in addition to the *in situ* collections.

Activities planned for 1996-98

- characterization of passport data and morphological and biological characterization of 1306 accessions of nine species
- molecular characterization of 40 accessions of five species
- 600 accessions of six species will be evaluated for agronomic features and resistance
- introduction to the European *Prunus* Database
 - in 1996, 200 accessions of five species
 - in 1997, 500 accessions of five species
 - in 1998, 606 accessions of five species
- 441 accessions of six species will be safety-duplicated
- 150 of nine species will be regenerated and multiplied for exchange and distribution.

Status of *Prunus* collections in Russia

V.L. Vitkovsky

Department of Fruit Crops, N.I. Vavilov Institute of Plant Industry, 42, Bolshaya Morskaya Str., 190000 St. Petersburg, Russia

All activities relating to the conservation and study of *Prunus* genetic resources are supervised and maintained by the Department of Fruit Crops, N.I. Vavilov Research Institute of Plant Industry (VIR). Conservation of viable collections is funded by the Russian Academy of Agricultural Sciences. The total number of conserved fruit germplasm samples is over 9800 accessions. These are maintained in viable conditions in orchard collections at the Institute's experimental stations. The leading station is Krymsk Experiment Breeding Station, being richest in both the number of accessions and in their genetic diversity. At Krymsk all the wild species, as well as local varieties and modern commercial cultivars, occurring throughout Russia and the C.I.S. are maintained.

The Far East Experiment Station stores indigenous germplasm collected in the Far Eastern region of Russia. Pavlovsk Experiment Station has accumulated northern winterhardy varieties of cherry and plum. In the framework of germplasm exchange agreements with the Ukraine, Uzbekistan and Turkmenia, VIR receives *Prunus* accessions available in the collections of those countries. VIR's Experiment Station supplies initial breeding materials to research institutions in Russia. Germplasm is furnished on request and is used in plant breeding programmes. Breeding programmes on stone fruit crops have been developed for, and performed in, all major climate regions of Russia.

Location of collections

Krymsk Experiment Breeding Station (Krymsk, Krasnodar Region)

Maikop Experiment Station (Maikop, Krasnodar Region)

Volgograd Experiment Station (Krasnoslobodsk, Volgograd Municipality)

Far East Experiment Station (Pavlovsk, St. Petersburg Municipality).

Table 1. *Prunus* collections in Russia.

Crop	Total no. accessions ¹	'Original' accessions			
		No.	Safety-duplicated	% identified	% for quarantine ²
Almond	120	120	0	90	100
Apricot	260	260	0	80	100
Cherry (sour)	540	420	120	90	100
Cherry (sweet)	660	570	90	90	100
Cherry (related spp.)	670	670	0	100	100
Plum + prune	5300	4500	800	0	100
Interspecific hybrids	1700	1700	0	100	100
Wild related <i>Prunus</i> spp.	600	600	0	100	100
Total	9850	8840	1010		

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Curators and crops Prof. Dr. V.L. Vitkovsky Head of the Fruit Department	all fruit crop collections
Prof. Dr. G.V Yeremin Krymsk Station of VIR	plum varieties and species, interspecific hybrids and apricot
Dr. A.A. Yushev, VIR Dr. V.P. Denisov, VIR	sweet and sour cherry almond.

Activities planned for 1996-98

- documentation of passport data for 5700 accessions and the data entered into the European *Prunus* Database
- 1000 accessions will be biologically characterized and safety-duplicated
- regeneration and multiplication for exchange and distribution as requested.

Prunus germplasm in the Slovak Republic

D. Benediková

Research Breeding Station Veselé, s.e. 92208 Veseskem, Slovakia

Conservation of plant genetic resources (PGR) is coordinated by The Research Institute of Plant Production, Piestany within the framework of the National programme for the conservation of plant genetic resources in the Slovak Republic. Collections of *Prunus* PGR are concentrated at four research institutes with different specializations and different ecoclimatic conditions:

- Research Breeding Station, Veselé – temperate stone fruits: apricot, peach, almond
- Institute for Fruit and Ornamental Woody Plants, Bojnice – prune, plum
- Research Breeding Station, Klov – sour cherry, sweet cherry, plum, prune
- University of Agriculture, Nitra – sour cherry, sweet cherry.

Table 1. Location of collections.

	Veselé	Klov	Bojnice
Latitude	49° 34' N	48° 47' N	49°0' N
Longitude	17° 45' E	18° 37' E	20°40' E
Elevation (m asl)	165	280	495
Average temperature (°C)	9.0	8.5	7.5
April-Oct average (°C)	14.9	14.9	12.8
Precipitation (mm)	625	700	619
April-October monthly average (mm)	58	58	52
Soil type	black earth	pseudoglei	brown soil
pH	7.0	6.4-6.9	5.0-6.5

At these stations there are varieties of local origin, varieties introduced from other countries, clones and breeding selections. Evaluation and active study of genotypes is carried out at these research stations for agronomic and biologic characters using five trees per genotype and following the IPGRI Descriptors list for the above-mentioned *Prunus* species. Second stage long-term conservation of genotypes is done using three trees per one genotype.

Database software FoxPro SISGZ (Slovak Information System of Genetic resources) for statistical evidence of PGR is used.

The most important abiotic and biotic factors evaluated in the collection are:

- apricot: winter frost and late spring frost
- plum: Plum Pox Potyvirus, *Gnomonia erythrostoma*, *Taphrina deformans*, *Spaerotheca pannosa*, *Monilia laxa*
- peach: winter frost
- Cherry: cracking of fruits, *Monilia* sp.

An independent programme for the protection of widespread plant germplasm in Slovakia has been undertaken by a team at the University of Agriculture, Nitra. The team collects, records and evaluates important genotypes, including species of *Prunus*. Multiple genotypes are conserved in repositories of museum character in traditional regions of Slovakia. The aim of this programme is to use germplasm not only for research and plant breeding, but also for the cultural and educational use of the general public.

Table 2. *Prunus* collections in the Slovak Republic.

Crop	Total no. accessions ¹	'Original' accessions				
		No.	Safety-duplicated	% in EPDB	% identified	% for quarantine ²
Almond	27	14	0	0	100	90
Apricot	197	6	0	59	100	80
Cherry (sour)	17	7	7	86	100	80
Cherry (sweet)	22	21	10	47	67	80
Peach	215	41	0	52	100	75
Plum + prune	112	59	5	26	33	25
Interspecific hybrids	9	0	6	0	60	90
Wild related <i>Prunus</i> spp.	7	7	0	0	100	70
Total	606	155	28			

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Activities planned for 1996-98

- the Slovak Government guarantees to continue the National programme for conservation of plant genetic resources in the Slovak Republic
- the University of Agriculture, Nitra and RBS, Veselé, will cooperate mainly on safety-duplication of original accessions for the repositories
- during the following years tests are planned on cryopreservation of apricot pollen and tests for the health of plant material (mainly virus)
- curative measures are planned.

Status of *Prunus* germplasm in Spain

R. Socias i Company

Unidad de Fruticultura, SIA-DGA, Apartado 727, 50080 Zaragoza, Spain

The Programme for Maintenance and Utilization of Plant Genetic Resources was established by an order the Spanish Ministry of Agriculture, Fisheries and Food on of 23 April 1993. All germplasm collections have since been reviewed under the terms of this new order. The following points have been decided upon, for the *Prunus* species only:

- only one reference collection will be considered as the species germplasm in Spain, thus receiving official support for its maintainance. Exceptionally, two collections are considered, owing to specific ecological conditions of the location and the requirements of the different clones of each species.
- only species representing original Spanish accessions are included; this would exclude Japanese plums.
- each collection is under the responsibility of a researcher who conducts different studies on this collection, independently of its maintenance, as a breeder or an agronomist, although assisting this work through the evaluation of the different accessions.

Status of the collections

Almond

Reference collection in Unidad de Fruticultura, SIA-DGA, Apartado 727, 50080-Zaragoza, Spain. Curators: A.J. Felipe and R. Socias i Company

More than 300 accessions including mostly cultivars of Spanish origin (62), selections from the almond breeding programme and cultivars from all the important almond-growing areas in the world (73). It is also the reference collection of the GREMPA (Groupe de Recherches et d'Etudes Méditerranéen pour l'Amandier). Periodic checks of virus status show the presence of some viruses. Virus-tested clones of the most important cultivars are maintained in a separate orchard with other fruit species such as the Spanish nuclear stock for virus-tested plants. Accessions are maintained as three trees per clone.

There are several other almond collections in Spain, of which three show particular relevance:

- IRTA-Mas Bové, Apartado 415, 43280-Reus (Tarragona). Curator: F.J. Vargas. It includes 58 Spanish accessions and 36 foreign cultivars, with three or four trees per clone, all of them well characterized; also includes a large number of selections of the almond breeding programme.
- CEBAS, Departamento de Mejora y Patología Vegetal, Apartado 4195, 30080 Murcia. Includes 25 Spanish and 25 foreign cultivars, with two trees per clone, well characterized.
- Conselleria d'Agricultura de les Illes Balears, C. Foners 10, 07006-La Ciutat de Mallorca. Curator: J. Rallo. Includes 46 accessions from the islands of Mallorca and Ibiza, a traditional growing area. The collection has five trees per clone and is partly characterized.

Most of the Spanish accessions of these three collections are also present at the reference collection of Zaragoza.

Apricot

Reference collection is at the Centro de Investigación y Desarrollo Agroalimentario, Apartado Oficial, 30150-La Alberca (Murcia). Curator: J. Rodríguez Navarro.

The collection includes 215 clones, with two trees per clone, 152 of them of Spanish origin, 113 of them well characterized.

A second collection is located at CEBAS, Departamento de Mejora y Patología Vegetal, Apartado 4195, 30080-Murcia. This includes 40 Spanish accessions and 50 foreign cultivars, with four trees per clone.

A third collection is at IVIA, Ctra. Moncada-Naquera, 46113-Moncada (Valencia). Curator: G. Llácer. It includes nearly 100 clones, half Spanish and half foreign. Most clones are the same as those in the CEBAS collection, but special attention has been given to 18 clones collected in the Valencia region. Virus status has been checked.

Cherry

Only sweet cherry is represented in Spain. The reference collection is at the Unidad de Fruticultura, S.I.A.-D.G.A., Apartado 727, 50080-Zaragoza. Curator: R. Gella. About 60 clones, most of them commercial cultivars, all of them are well characterized. Virus status is checked periodically, with virus-tested clones in the Spanish nuclear stock.

A second collection is considered for the traditional Valle del Jerte growing area, with 36 clones of the zone and three trees per clone. Curator: F. Toribio, Finca La Orden, Apartado 22, 06187-Guadajira (Badajoz).

Peach

There are two reference collections, one in Zaragoza, a colder area, and the other in Murcia, with a mild climate. Unidad de Fruticultura, S.I.A.-D.G.A., Apartado 727, 50080-Zaragoza. Curator: M. Carrera.

Differentiation is established with clingstone peaches (108 accessions, mostly Spanish), freestone peaches (60 accessions, mostly foreign), nectarines (80 accessions mostly foreign) and flat peaches (11 accessions, all Spanish); two or three trees per clone. Virus status is periodically checked. The most important clones are maintained virus tested in the Spanish nuclear stock.

Centro de Investigación y Desarrollo Agroalimentario, Apartado Oficial, 30150-La Alberca (Murcia). It includes 97 clones, all of them of Spanish origin, with two trees per clone. Seventy of the clones are characterized and come from various local populations in several growing areas of southern Spain.

Plum and prune

Only *P. domestica* is considered in the Spanish germplasm network, because no Spanish representatives of the diploid plums are found. The reference collection is at Estación Experimental de Aula Dei, Apartado 202, 50080-Zaragoza. Curator: A. Arbeloa. It includes 41 clones, mostly foreign cultivars, which are well characterized. There are two trees per clone and virus status is checked periodically.

In Centro de Investigación y Desarrollo Agroalimentario, Apartado Oficial, 30150-La Alberca (Murcia), there is a collection of 40 cultivars of plums and prunes, with two trees per clone, but no Spanish representatives are included.

Interspecific hybrids

Only peach x almond hybrids are known in Spain. Their importance as rootstock has prompted their study in the past by Estación Experimental de Aula Dei and

CRIA-MURCIA, where several spontaneous hybrids are maintained.

Wild species

At the Unidad de Fruticultura, S.I.A.-D.G.A., Apartado 727, 50080-Zaragoza, a collection of eight wild species is maintained, which are mostly related to almond. The only Spanish representative is a population of *P. webbii* from central Spain.

Other research

Presently there is no known cryopreservation of *Prunus* in Spain. More important is the work being done on molecular markers. Electrophoretic studies of isozyme variability, mostly on almond, have been carried out in the past at IRTA-Cabrils, IVIA and S.I.A.-Zaragoza. Presently, work is being carried out on genetic markers at IRTA-Cabrils, IVIA and CIMA-Vitoria. There are scattered references to resistance of some clones to pests and diseases and some abiotic factors, such as chlorosis, but no systematic survey has been carried out.

Wild species

There are two quite important wild *Prunus* species in Spain. One is *Prunus webbii* (Spach) Vierh. (although not mentioned in Flora Europea) from Central Spain, first described by Felipe and Socias i Company. The species has some representatives in Zaragoza and shows large variability probably due to hybridization with cultivated almond.

The other is *Prunus ramburii* Boiss., from Sierra Nevada (southern Spain), which is not as important for breeding purposes and the habitat is not endangered, although they are endemic.

Table 1. The *Prunus* collection in Spain.

Crop	Total no. accessions ¹	'Original' accessions		
		No.	% identified	% for quarantine ²
Almond	305	70	95	70
Apricot	215	152	75	–
Cherry (sour)	–	–	–	–
Cherry (sweet)	60	40	95	80
Cherry (related spp.)	–	–	–	–
Peach	346	200	85	–
Plum + prune	65	6	100	100
Interspecific hybrids	10	10	100	100
Wild related <i>Prunus</i> spp.	8	1	–	–
Total	1009	479		

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

Status of *Prunus* collections in Switzerland

M. Kellerhals

Federal Research Station for Fruit Growing, Viticulture and Horticulture,
8820 Wädenswil, Switzerland

A number of curators are responsible for the *Prunus* collections in Switzerland. For more information contact Dr Gert Kleijer, RAC, Rte. de Duillier, Case postale 254, CH-1260 Nyon 1 (SKEK, Swiss Commission for the conservation of cultivated plants).

The *Prunus* collections include indigenous older cultivars and wild material originating in Switzerland. They are maintained at different locations by national institutions or local NGOs. Safety is relatively good but still low.

A major step forward was undertaken during a joint project of the Swiss Federal Research Station Wädenswil, the Federal Office for Environment, Forest and Landscape and Local Fruit Advisory services on the occasion of the European Year of Nature Protection. A total of 5500 questionnaires on local sweet cherry varieties were sent to farmers, of which 1464 (26%) were filled out and returned. The data were registered on computer and analyzed.

A variety list was established that contains 365 distinct varieties of which 188 varieties were mentioned only once, 62 varieties only twice. These must all be considered threatened. Sixteen percent of all varieties were considered 'unknown'. During picking season more than 150 varieties were examined and characterized on site; some work on DNA fingerprinting of accessions was undertaken.

A discussion is currently in progress on the development of a conservation strategy for this genetically rich material. A request for prolongation and extension of the project has been submitted.

Otherwise, the situation concerning *Prunus* genetic resources in Switzerland has not changed considerably since the last meeting of the *Prunus* Working Group in 1992. The NGOs 'Fructus' and 'Pro Specie Rara' continue to collect, save and characterize traditional fruit varieties; these NGOs are concerned predominantly with apples and pears.

The Swiss Commission for the conservation of cultivated plants (SKEK), founded in 1991, with its office located at the Research Station Changins (Nyon), continues to coordinate the activities and to collect data from the different organizations.

The Federal Research Stations Wädenswil and Changins and the Institute for organic agriculture at Oberwil are collaborating on the development of a relational fruit variety database on Access, in collaboration with 'Fructus' and 'Pro Specie Rara'. It should include information on genetic resources for apple, pear, plum and cherry, as well as data on modern varieties and selections. The first priority is apple. Interconnection with the *Prunus* database at INRA Bordeaux is envisaged.

Activities planned for 1996-98

- characterization of passport, morphological and biological data of 500 accessions
- molecular characterization of 200 accessions of one species of sweet cherry
- 300 accessions of one species will be evaluated for agronomic features and resistance

- characterization data on 500 accessions and evaluation data for 300 accessions will be introduced into the European *Prunus* Database
- 100 accessions of one species will be safety-duplicated.

Table 1. *Prunus* collections in Switzerland.

Crop	Total no. accessions ¹	'Original' accessions				
		No.	Safety-duplicated	% in EPDB	% identified	% for quarantine ²
Almond	0	0	0	0	0	0
Apricot	68	9	0	0	0	0
Cherry (sour)	9	9	0	9	0	0
Cherry (sweet)	350	210*	30*	70*	40*	5*
Cherry (related spp.)	2	0	0	0	0	0
Plums and prunes	326	50*	20*	90*	30*	5*
Peach	77	10	0	5	0	0
Interspecific hybrids	0	0	0	0	0	0
Total	832	288	50			

¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

* Estimated.

Prunus germplasm in Turkey

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Introduction

Plant genetic resources activities began in 1964, with a joint project between the Turkish Government and FAO. At that time the National Plant Genetic Resources Project (NPGRP) was also approved by the Government. NPGRP cooperates with the related plant breeding units of AARI and other Agricultural Research Institutes and Agricultural Faculties in Turkey.

NPGRP has three service units (seed physiology and preservation, documentation, taxonomy) and eight plant groups (cereals, vegetables, food legumes, ornamental plants, forage crops, medicinal and aromatic plants, industrial crops, fruit trees and grapes). Endemic plants are considered a subgroup. Each plant group is responsible for the exploration, collecting, conservation, regeneration and or multiplication, evaluation and documentation of plant genetic resources.

Several species of tree fruits or their wild relatives are indigenous to Turkey, including apple, cherry (mahaleb, sour and sweet), grape, hazelnut, pear, pistachio, plum, pomegranate, quince and walnut.

Prunus germplasm studies have an important place in the 'Fruit Tree Genetic Resources' Project.

The names and distribution of different fruit tree species belonging to the *Prunus* group in Turkey are shown in Table 1. A total of 28 species have been determined. These species are widely distributed throughout Anatolia, west to east and south to north.

Prunus genetic resources activities

Survey and collecting

Since 1964 different parts of Turkey such as the Aegean, central, eastern, northern and southeastern parts of Anatolia have been explored.

Survey and collecting programmes are arranged according to the urgent needs of breeding programmes and the amount of genetic erosion threatened. Every year an AARI working committee and a National Working Group consisting of breeders, horticulturists, pathologist, technologists, etc. meet to discuss the programme proposal prepared by the fruit tree genetic resources group. In this way, present and future germplasm needs and the collecting programme for the following year are decided, e.g., which species will be studied and the regions or locations to be explored.

Accessions are generally collected as budwood or cuttings. The collecting format is used for each accession.

A new project for almond germplasm was started in cooperation with AARI and IPGRI's Regional Office for West Asia and North Africa (WANA) group in 1995. The aim of this project is to survey, collect and document almond germplasm in Turkey. Collecting germplasm in the western part of Anatolia was completed in 1995, where 107 accessions were collected. It was planned to collect almond material from the southern part of Anatolia in 1996.

A new project, supported by The World Bank, named *In situ* Conservation of Genetic Diversity in Turkey, was started in 1993. The aim of this project is to

identify and establish *in situ* conservation areas in Turkey for protection of genetic resources and wild relatives of important crops and forest tree species originating in Turkey. *Prunus divericata* L. is one of the species given priority in this project.

Table 1. *Prunus* species and their distribution in Turkey.

Species name	Distribution area
Plum	
1 <i>Prunus spinosa</i> L.	N, W, S and Central Anatolia
2 <i>Prunus kurdica</i> Fenzl.	E Anatolia (endemic)
3 <i>Prunus domestica</i> L. (<i>P. spinosa</i> L. x <i>P. divaricata</i> Led.)	Widespread in Turkey, common in north
4 <i>Prunus divaricata</i> Led. Syn: <i>Prunus cerasifera</i> Ehrh.	Widespread in Turkey
5 <i>Prunus cocomilia</i> Ten. <i>Prunus cocomilia</i> Ten. var. <i>cocomilia</i> Syn: <i>P. pseudoarmeniaca</i> Heldr. and Sart.	W Anatolia
<i>Prunus cocomilia</i> Ten. var. <i>puberula</i> (Schneider) Browicz Syn: <i>P. pseudoarmeniaca</i> Heldr. and Sart. var. <i>puberula</i> Schneider	W and SW Anatolia (endemic)
Cherry	
1 <i>Prunus prostrata</i> Lab. Syn: <i>Cerasus prostrata</i> (Lab.) Ser.	W, S, SW Anatolia and Transitional region
2 <i>Prunus brachypetala</i> (Boiss.)Walp. Syn: <i>Cerasus brachypetala</i> Boiss.	SE Anatolia
3 <i>Prunus incana</i> (Pallas)Batsch. Syn: <i>Cerasus incana</i> (Pallas)	N, C, and S Anatolia (endemic)
4 <i>Prunus incana</i> (Pallas) Batsch var. <i>angustifolia</i> (Spach) Schneider Syn: <i>Cerasus angustifolia</i> (Spach) Browicz.	NE and E Anatolia
5 <i>Prunus microcarpa</i> C.A. Mayer Syn: <i>Cerasus microcarpa</i> (C.A.Mayer) Boiss.	S and E Anatolia
6 <i>Prunus hippophaeoides</i> (Bornm.)Bornm. Syn: <i>Cerasus hippophaeoides</i> (Bornm.)Bornm. Syn: <i>Amygdalus hippophaeoides</i> (Bornm.) Bornm.	C Anatolia (endemic, rare)
7 <i>Prunus avium</i> L. Syn: <i>Cerasus avium</i> L. Moench	Widespread, mainly N Anatolia
8 <i>Prunus cerasus</i> L. Syn: <i>Cerasus vulgaris</i> Miller	Cultivated, N and E Anatolia
9 <i>Prunus mahaleb</i> L. Syn: <i>Cerasus mahaleb</i> (L.) Miller. var. <i>mahaleb</i> .	Widespread
Apricot	
1 <i>Prunus armeniaca</i> L. Syn: <i>Armeniaca vulgaris</i> Lam.	Cultivated, widespread
Peach	
1 <i>Prunus persica</i> (L.) Batsch Syn: <i>Persica vulgaris</i> Miller Syn: <i>Amygdalus persica</i> L.	Cultivated, widespread
Almond	
1 <i>Prunus amygdalus</i> Batsch. Syn: <i>P. communis</i> (L.) Arc. Syn: <i>Amygdalus communis</i> L.	Widespread
2 <i>Prunus korchinskii</i> Hand-Mazz. Syn: <i>Amygdalus korchinskii</i> (Hand-Mazz) Bornm.	S Anatolia

Species name	Distribution area
3 <i>Prunus fenzliana</i> Fritch Syn: <i>Amygdalus fenzliana</i> (Fritsch)Lipsky	
4 <i>Prunus webbii</i> (Spach) Vieh. Syn: <i>Amygdalus webbii</i> Spach Syn: <i>Amygdalus salicifolia</i> Boiss. Syn: <i>Amygdalus webbii</i> Spach var. <i>salicifolia</i>	W, NW and C Anatolia
5 <i>Prunus trichamygdalus</i> Hand-Mazz. Syn: <i>Amygdalus trichamygdalus</i> (Hand-Mazz.) Woronow.	S, E and SE Anatolia
6 <i>Prunus orientalis</i> (Miller) Koehne Syn: <i>Amygdalus orientalis</i> Miller	C, S and E Anatolia
7 <i>Prunus discolor</i> (Spach) Schneider Syn: <i>Amygdalus graeca</i> Lindley	N, W, C and SW Anatolia
8 <i>Amygdalus x balansae</i> Boiss Syn: <i>Amygdalus balansae</i> Boiss. var. <i>süpervestita</i> Bornm <i>Prunus amygdalus x P. orientalis</i> (?)	C Anatolia (endemic)
9 <i>Prunus kotschyi</i> (Boiss. & Hohen.) Nab. Syn: <i>Amygdalus Kotschyi</i> Boiss.& Hohen.	SE Anatolia; very local, rare.
10 <i>Prunus carduchorum</i> (Bornm.) Meikle Syn: <i>Amygdalus carduchorum</i> Bornm. subsp. <i>serrate</i> Browicz	SE Anatolia (endemic), very local
11 <i>Prunus arabica</i> (Oliv.) Meikle Syn: <i>Amygdalus arabica</i> Oliv.	S and E Anatolia
12 <i>Prunus lycioides</i> (Spach) Schneider Syn: <i>Amygdalus lycioides</i> Spach var. <i>lycioides</i>	E Anatolia, local

Conservation

The conservation of fruit trees belonging to the *Prunus* group has been achieved mainly in the two stages. During the first stage, 1964-85, some material was kept in the AARI orchards and others in horticultural research institutes, agricultural schools, state farms and agricultural faculties, a total of 57 locations. An inventory of these collections was published (Çetiner 1981) and later revised (Gönülşen 1986). Unfortunately, most of the institutions had tended to keep the commercial varieties, instead of *Prunus* germplasm, in their collections. After the evaluation programmes, these institutions eliminated expensive, but valuable, genetic resources which have now been lost. Additionally, some modern cultivars were introduced and have replaced old cultivars. This situation caused the extinction of many locally developed and climatically well-adapted old cultivars.

From 1985 to date, conservation maintenance of all *Prunus* materials has been centralized at the same research institutes. Every institution is involved as a centre for one or more fruit species under the patronage of AARI.

The new conservation organization for *Prunus* species is shown in Table 2. Six research institutions have already been made responsible for the *Prunus* conservation activities.

The number of accessions and the source of *Prunus* germplasm material are shown Table 3. As can be seen, most of the accessions are original and included in the European *Prunus* Database.

Table 2. Organization of *Prunus* genetic resources conservation in Turkey.

Fruit	Primary institution	Secondary institution
Plum	Aegean Agric. Res. Inst. (AARI) Izmir	Alata Hort. Res. Inst. Mersin Egirdir Hort. Res. Inst. Isparta
Almond	Aegean Agric. Res. Inst. (AARI) Izmir	Alata Hort. Res. Inst. Mersin
Sour cherry	Aegean Agric. Res. Inst. (AARI) Izmir	Hort. Res. Inst. Erzincan Egirdir Hort. Res. Inst. Isparta
Sweet cherry	Atatürk Hort. Res. Inst.-Yalova	Fruit Res. Inst. Malatya
Peach	Atatürk Hort. Res. Inst.-Yalova	Alata Hort. Res. Inst. Mersin
Apricot	Fruit Res. Inst. Malatya	Alata Hort. Res. Inst. Mersin

Evaluation

Prunus group genetic resources have been evaluated systematically for their potential use as rootstock or variety. These studies are carried out through cooperation with the National Breeding Programmes. Both IPGRI and UPOV descriptors are used as much as possible for evaluation. Almost 100% of the accessions have been evaluated (Table 3.)

Table 3. *Prunus* germplasm conserved in Turkey.

Crop	Total no. accessions¹	'Original' accessions¹			
		No.	Safety-duplicated %	in EPDB	% identified
Almond	53	53	53	100	53
Apricot	228	203	203	100	93
Cherry (sour)	122	117	117	100	100
Cherry (sweet)	80	41	41	100	100
Peach	85	10	10	10	10
Myrobolan plum	120	120	120	100	100
European plum	74	14	14	100	100
Japanese plum	38	-	-	-	-
Wild spp. (plum)	38	38	35	100	100
Total	838	596	593		

¹ Excluding duplicates.

Current evaluation work on *Prunus* germplasm

Plum

The cultivation of plum is a very ancient tradition in Turkey and the crop is widespread. Various plum species are widely distributed throughout the country (Table 1). *P. domestica* L. and *P. cerasifera* Ehrh. species grow throughout Turkey from sea level to about 2000 m altitude. The latter is an early maturing species. Genetic resources of *P. cerasifera* accessions have been evaluated for their potential as rootstock and cultivar.

Part of the evaluation work has been to determine the fruit characteristics of collected materials from the Aegean region, where 72 collected accessions were evaluated. Pomological observations such as fruit size, attractiveness, taste, flesh

firmness, juiciness, texture and harvesting time were performed. These characteristics were used as selection criteria. Other characteristics such as fruit shape, skin colour, flesh/seed ratio and pH value of juice were also examined. With the results of these evaluation studies 11 candidates were selected and registered as cultivars (Önal *et al.* 1990).

At the end of the survey programmes, conducted in the south of Anatolia, 89 different plum types were determined. Pomological and phenological characteristics of these types were investigated and 27 accessions were selected for their fruit quality and precocity (Ayanoglu *et al.* 1992; Ayanoglu and Yilmaz 1995).

Other evaluation work was performed on rootstock potential of the collected material: the propagation capability of the 47 accessions belonging to *P. cerasifera*, seed germination and rooting capacity of cuttings, uniformity in height, trunk diameter of seedling, thickness of seedling for budding in the same year, and growth habit. After all these investigations, eight accessions were selected as the most promising rootstock types (Gönülse *et al.* 1992)

Sour cherry, *P. cerasus* L.

This species is indigenous to Turkey and there is a wide range in variation of fruit characteristics. One hundred and fifteen different types of *P. cerasus* L. were collected from the Aegean, central and northern Anatolia and Marmara regions of Turkey. Some pomological and technological characteristics such as percentage of fruit juice, juice colour, taste and attractiveness were determined. Besides these characters, fruit shape, size, skin colour, flesh colour, stalk length and proportion of flesh to seed, plus fruit stalk, and pH value of fruit juice were examined. As a result, 13 accessions were selected from the whole collection as being the most promising. These were registered as new cultivars (Önal and Gönülse 1992).

Almond, *P. amygdalus* Batsch.

Anatolia is considered a secondary centre of almond diversity. Almond now grows throughout Turkey, except in the northeast and areas at high elevation in eastern Anatolia. It is widely grown in the Aegean, Mediterranean and southeastern regions of the country. Almost all the trees have been grown from seed, which provides a very rich source for selection studies. Almond trees may differ widely in vigour, yield, nut and kernel quality, and flowering time.

One of the programmes evaluating almond was carried out by the Pomology Department in Aegean University at Izmir. One hundred and sixteen different types of *P. amygdalus* Batsch were collected from the western part of Anatolia. Tree vigour, tree habit, duration of flowering, cropping efficiency, nut size, shell colour, suture opening of the shell, softness of shell, kernel colour, kernel taste and the percentage of double kernels were characteristics used in evaluation. Sixteen of the most promising types were selected at the end of the evaluation programmes (Dokuzoguz and Gülcan 1973).

Two other evaluation programmes with almond were carried out in the eastern part of Anatolia; 27 accessions out of 750 types and 20 accessions out of 217 types were selected according to morphological and pomological characters (Bostan *et al.* 1995; Aslantas and Güleriyüz 1995).

Apricot, *P. armeniaca* L.

Apricot is an important fruit crop which was introduced to Turkey 2000-4000 years ago. It is now widely distributed. Until 10-15 years ago, most of the apricot trees were grown from seed; budding or grafting was not employed. This is the reason there is such great variation in the apricot populations of Turkey.

Collected apricot material was evaluated from different ecological regions. For

example, while earliness is important in the western part of Turkey, late-maturing forms are preferred in the eastern part. The most important characteristics used for evaluation are: season of flowering and maturing, cropping efficiency (productivity); tree vigour and chilling requirement; fruit size, shape, attractiveness; flesh colour, firmness, juiciness, texture; stone size, shape and separation of stone; ground colour, over colour, eating quality, kernel taste and aroma.

Different types of accessions were collected and evaluated – 22 accessions from the Aegean Region, 51 from the south, 120 from the east – by AARI, Alata Horticultural Research Institute and Atatürk University Horticultural Department respectively (Özvardar *et al.* 1991; Ayanoglu and Kaska 1993; Bolat and Gülerüz 1993). Ten types that are relatively resistant to frost were also determined in East Anatolia (Gülerüz 1993).

Sweet cherry, *P. avium* L.

Sweet cherry is indigenous to Turkey. Various wild forms have been found, especially in northern and northeastern Turkey. Season of flowering, self-compatibility of flowers, fruit size and shape, fruit juice and flesh colour, taste, firmness of flesh, skin cracking susceptibility, length of fruit stalk, and precocity of bearing are the most important characteristics studied during evaluation. Twenty accessions and six local cultivars were studied by Aegean and Çukurova Universities respectively (Özçagiran 1966; Küden and Kaska 1995)

Pomological and phenological characteristics of red and yellow mahaleb *Prunus mahaleb* L. types were studied at Tokat, growing under ecological conditions existing in the north of Turkey (Gerçekçioğlu and Günes 1995).

Quarantine regulations

There is no restriction on the availability of *Prunus* genetic resources materials, although tobacco, fig, grape, hazelnut and pistachio are subject to certain existing regulations and laws.

Activities planned for 1996-98

- survey, collecting, conservation and evaluation activities will be continued during the next 3 years
- survey and collecting of almonds from the southern part of Anatolia has been planned for 1996; approximately 100 to 125 accessions will be collected
- A survey and collecting programme has been planned for apricot in 1997 and 1998; nearly 100 accessions will be collected during this programme
- evaluation studies of apricot and plum will be continued
- characterization of passport data and biological characters is planned for 200 accessions of two species (*P. amygdalus*, *P. armeniaca*)
- molecular characterization of 160 accessions of one species (*P. diversicata*)
- 97 accessions of two species (*P. armeniaca*, *Prunus* spp.) will be evaluated for agronomic features
- the information on 360 accessions of three species will be entered into the European *Prunus* Database
- safety-duplication depends on propagation results
- and regeneration and multiplication for exchange and distribution will be determined according to requirements.

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Status of *Prunus* collections in the United Kingdom

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UK collections

The principal *Prunus* collections in the UK are those at Brogdale (especially plum and cherry fruit cultivars), East Malling (cherry fruit cultivars, wild cherry selections, plum and cherry rootstocks, *Prunus* species, breeders' selections), Edinburgh (*Prunus* species, ornamental cultivars), Kew (*Prunus* species, ornamental cultivars), Westonbirt (*Prunus* species) and Wisley (plum scion cultivars, *Prunus* species, ornamental cultivars). The first five are funded by the state, the last privately. Between them they hold an estimated 1490 distinct accessions.

All the collections are well organized, with computerized lists of accessions. Characterization is unlikely to be a high priority without additional funding. Collaboration between the collections and overseas proceeds satisfactorily on an *ad hoc* basis. Exchange of most material within western Europe is relatively straightforward with the plant passport system; for further afield, phytosanitary certificates and possibly import permits are necessary. One collection is not considered free of Plum Pox Potyvirus and is unable to distribute plums, peach or apricot. A few *Prunus* cultivars are available as certified virus-free clones from East Malling.

Of economic importance in the UK are the fruit crops European plum and sweet cherry, the ornamental cherries, plums and laurels, and wild cherry as a timber tree.

Most, if not all, *Prunus* breeding in the UK is conducted at East Malling, which has breeding programmes for cherry and plum (scions as well as rootstocks) and for timber cherry. Breeders are sceptical about the need for extensive computerization of characterization data, especially data that are very susceptible to environmental factors.

Activities planned for 1996 to 1998 are molecular characterization of 200 accessions from one species.

Table 1. Summary of main UK holdings.

Crop	Total no. accessions	'Original' accessions ¹				
		No.	Safety-duplicated	% in EPDB	% identified	% for quarantine ₂
Almond	~10	0	–	–	–	–
Apricot	~140	2	–	100	100	100
Cherry (sour)	~70	5	–	100	100	100
Cherry (sweet)	~590	80	–	70	100	100
Cherry (related spp.)	~300	10	–	100	100	100
Peach	~50	~3	–	100	100	100
Plum + prune	~380	130	90	90	100	100
Wild spp.	~80	10	–	100	100	100

related to
almond,
apricot,
peach and
plum

Total	~1620	~240	90
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¹ Excluding duplicates.

² Holdings for which quarantine requirements are met.

UK research relevant to conservation

East Malling is working on *Prunus* molecular markers, especially in cherry. Some of this work is funded by the EU, in addition to the UK Ministry of Agriculture, as part of an international European project on *Prunus* mapping. Most work has been with isoenzymes using polyacrylamide gel electrophoresis and, to a lesser extent, isoelectric focusing. Two interspecific progenies have been analyzed for about 48 enzyme systems. Of the 68 segregating loci, 44 have proved to be linked and thus make up an outline genetic map. Fourteen cultivars of sweet cherry analyzed for the same systems are polymorphic for just 25 loci. The same progenies are being analyzed for DNA markers, RAPDs and RFLPs but DNA polymorphism in cultivars has yet to be studied. Some work also has been undertaken on almond, peach and plum. This East Malling work is the only work on *Prunus* molecular markers in the UK.

East Malling is also screening cherry cultivars, wild selections and cherry species for resistance to bacterial canker (*Pseudomonas morsprunorum* and *P. syringae*) and to cherry blackfly (*Myzus cerasi*).

No work on *Prunus* cryopreservation is in progress in the UK.

UK surveys

Prunus species considered native to the UK flora are *P. spinosa* (blackthorn), *P. avium* (wild cherry) and *P. padus* (bird cherry). The wild populations of these species are not considered to be endangered. Introduced species established in the wild are *P. domestica* (plum), *P. insititia* (damson and bullace), *P. cerasifera* (cherry plum) and *P. laurocerasus* (cherry laurel).

The only recent surveying of wild *Prunus* in the UK seems to be that currently undertaken by East Malling on *P. avium*. East Malling is seeking outstanding wild cherry trees, vigorous, straight trunked with light branching, to propagate for trial as timber trees and to add to its collection of genotypes for breeding.

Status of the *Prunus* collection in the Federal Republic of Yugoslavia

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The status of *Prunus* collections in the Federal Republic of Yugoslavia was studied and the following number of *Prunus* species and originals were selected: *Prunus domestica* L. and *Prunus insititia* L., 47; *Prunus cerasifera* L. (Myro-balan), 44; *Prunus persica* subsp. *vulgaris* (peach), 49; *Prunus armeniaca* L., 17; sweet cherry, 17; sour cherry, 16 and almond, 4.

The following autochthonous cultivars of different *Prunus* species were studied *ex situ*: plum and prune, 58; apricot, 36; peach, 57; sweet cherry, 17; sour cherry, 7.

The following foreign cultivars are held in collections: plum and prune, 160; apricot, 274; peach, 484; nectarine, 54; peach for canning, 35; sweet cherry, 138; sour cherry, 137.

Approximately 47% of the selected original accessions are included in collections. The embargo during 1992-95 halted almost all activities on investigation and preservation of genetic resources. The status of the collections *in situ* is not known; some of them may be lost, especially plums and peaches.

No duplication of collections of original cultivars was made. However, there are some duplicated cultivars of foreign collections, especially plums, apricots and peaches.

Funding of Yugoslav plant genetic resources bank started in 1990 but is incomplete because of the splitting up of the former Yugoslavia. During the last 3-4 years little research has been done on *Prunus* genetic resources. Cryopreservation will be possible after construction of the Yugoslav plant genetic resources bank in Beograd, Zemun.

Much more research was done on pest and disease resistance and tolerance to abiotic factors. There are some peaches which are tolerant to drought and resistant or tolerant to peach leaf-curl. No plum or peach cultivar showed resistance to Plum Pox Potyvirus except two foreign varieties: 'Scoldus' and 'Z'itabutilco-vidna'.

In the Federal Republic of Yugoslavia there are 19 wild *Prunus* species. Most interesting are *Prunus avium* L. genotypes. Rankovic singled out some virus-free genotypes. In *Prunus spinosa* wild populations there are many genotypes resistant to PPV which may be used as dwarfing rootstocks or interstocks for plums and apricots.

Table 1. *Prunus* collections in the Federal Republic of Yugoslavia.

Crop	Total no. accessions¹	'Original' accessions		
		No.	% in EPDB	% identified
Almond	4	2	100	100
Apricot	461	59	100	40
Cherry (sour)	74	23	100	80
Cherry (sweet)	175	36	100	47
Cherry (related spp.)	0	0	0	0
Peach	1208	149	100	35
Plum + prune	446	149	100	35
Interspecific hybrids	0	0	0	0

Wild related <i>Prunus</i> spp.	0	0	0	0
Total	2368	418		

¹ Excluding duplicates.

Activities planned for 1996-98

- characterization for passport data and morphological and biological characteristics 120 accessions of five species, which will be included in the European *Prunus* Database
- agronomic evaluation and evaluation for disease resistance and safety-duplication for 200 accessions of six species
- regeneration and multiplication for exchange and distribution are made upon request.

Establishment of a gene management zone (GMZ) for an *in situ* conservation programme in Turkey

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This information is the product of the gene management zones (GMZ) Workshop held on 7-8 September, 1996 in Camliyayla, Turkey within the framework of the Turkish *In situ* Conservation of Genetic Diversity Project.

Concept of a GMZ

The objective of establishing a Gene Management Zone (GMZ) is to support the continuation of evolution within and between populations of plant species with vulnerable/endangered as well as high and unique diversity. The areas are set aside to maintain genetic diversity for target species in selected natural or semi-natural habitats.

GMZs should also take into consideration the locations with appropriate sizes where conservation is possible.

Criteria for choosing a GMZ

Target species must have primary consideration. They may be economically important both locally and globally, such as medicinal, aromatic and ornamental plants. These species must have their centre of diversity or centre of origin within the country. Additionally, target species may be either native or endemic, but they should be threatened or endangered species.

Appropriate size and number of target species should be determined in terms of their evolutionary potential, genetic integrity and protection values. GMZs should capture as much genetic variation and species richness as possible.

The establishment of a GMZ can be in either natural or semi-natural environments. Sites under consideration should be accessible, suitable and sustainable for populations and for efficient management. Their number and size may vary according to the availability of resources.

Management strategies for GMZs

Establishment and management of GMZs require a clear legislative basis; the manager should be the owner of the land.

An overall management plan will be required for each target species and a specific plan will need to be developed for each GMZ.

The management plan for each GMZ should take account of the following:

- Maintenance of genetic diversity is the most important objective of the management plan. Maintenance of the ecosystems within which the species occur is also essential.
- The management plan should recognize the possible conflict that may arise between species richness and diversity within the target species.
- Manipulations of various kinds will be necessary within GMZs (e.g. limited grazing, selective logging, fire).

- Since the best practices are still unknown, various alternative treatments will need to be tested and compared as part of the management regime.
- The plan should address the amount of interference that would be acceptable in the face of severe potential damage to the target species (even its elimination).
- Buffer zones should be a component of all GMZs and their management included in the plan.
- Community participation and support will be vital to effective maintenance of GMZs.
- GMZs must be supported by complementary *ex situ* conservation activities.
- GMZs should be accessible to researchers, both within and outside Turkey whenever possible.

It is recognized that management plans will vary from species to species and there may be some differences between wild crop relatives and forestry species. However, the above points are broadly applicable to both groups.

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