PROTECTION OF GENETIC RESOURCES OF POMOLOGICAL PLANTS AND SELECTION OF GENITORS WITH TRAITS VALUABLE FOR SUSTAINABLE FRUIT PRODUCTION

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THE *Prunus* EUROPEAN COOPERATIVE PROGRAMME FOR GENETIC RESOURCES: A NETWORKING ACTIVITY FOR THE EUROPEAN *Prunus* DATABASE AND THE CHALLENGE FOR EUROPEAN COLLECTIONS

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ABSTRACT

The European *Prunus* database (EPDB) was created under the auspices of IPGRI (International Plant Genetic Resources Institute) twenty years ago and was first maintained in Sweden. In the nineties, the EPDB was transferred to INRA research centre of Bordeaux and developed to become an interactive database. The accessions incorporated in the database mainly originate from Europe and should have at least passport data and also characterisation data: common (primary) and specific (secondary) descriptors were agreed by the European *Prunus* Working Group. Public availability is planned at the beginning of 2005 and different queries are under development for the database. With the support of the European Union from 1996 to 1999, a European network on *Prunus* genetic resources was organised by IPGRI in the context of the European Cooperative Programme for Crop Genetic Resources (ECP/GR). More than 20 countries are involved in the survey of national collections. At present the permanent collections have more than 8 000 accessions for which passport and characterisation data are registered in the EPDB and available via the Internet site of IPGRI. However the web interface to allow direct search is still under development. Concerning European Collections, plans for establishing a Decentralised European *Prunus* Collection (DEPC) have been established. It is agreed that each country is responsible for its own genetic resources. Not all the material held in national collections is eligible for the DEPC but it concerns essentially original genetic resources responding to the sovereign rights of

states over the *prunus* european cooperative programme for genetic resources: their natural resources as proposed by the Convention of Biological Diversity originating from the Rio Conference in 1992. Furthermore contacts have been established between the *Prunus* and *Malus*/*Pyrus* Working Groups in order to establish common strategies for stone and pome fruit genetic resources at the European level.

Key words: *Prunus*, stone fruit, genetic resources, database, European network

INTRODUCTION

In the context of European organisation of plant genetic resources, IPGRI (International Plant Genetic Resources Institute) is in charge of certain species while another set of cultivated species is the responsibility of FAO. Concerning *Prunus* species, the work is coordinated by IPGRI and at the European level, this has been developed since 1980 in the context of the European Cooperative Programme for Genetic Resources (ECP/GR).

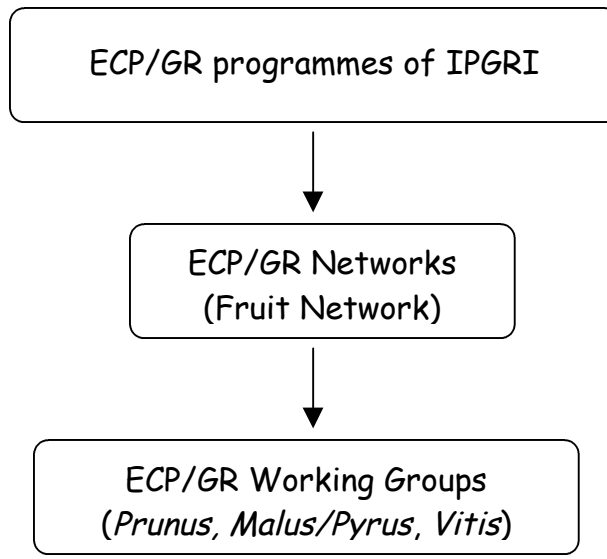

Figure 1. ECP/GR organisation

The ECP/GR networks coordinated by IPGRI were formulated in agreement with the recommendations of other international organisations such as FAO and Eucarpia, and they have developed cooperative programmes among most European countries. The main objective is to facilitate the long term conservation of plant genetic resources and to encourage their utilisation.

This long term conservation could be organised through *in situ* or *ex situ* situation. The development of identification and characterisation of plant genetic resources is an encouragement to the utilisation of these resources either by breeders or the amateurs. Furthermore the objectives of the ECP/GR networks includes strengthening the links between the participants and the programmes of different countries and developing joint projects to submit to CE or other funders. The last objective is to make public and international authorities aware of the interest of plant genetic resources.

In 2004, 37 European countries were members of ECP/GR networks. Of these, only 19 signed their membership to the phase VII of the programme which was initiated in 2004 for four years. In all, 18 ECP/GR Working Groups are operating and three of them are devoted to fruit trees (*Prunus, Malus/Pyrus* and *Vitis*) which constitute the Fruit Network. For each network, the organisation is based upon a steering committee facilitating the coordination of national programmes and assisted by a coordinating secretariat. At the national level a coordinator is nominated for each species group and is in charge of the national organisation and relationships with IPGRI and the network. The general organisation is summarised in Figure 1.

The European network on *Prunus* genetic resources

The European *Prunus* genetic resources has constituted a Working Group since 1983 under the auspices of IPGRI. The coordination of the Group's activity was ensured by the Nordic Gene Bank, based in Sweden until 1993 (IBPGR, 1983; IBPGR, 1985; IBPGR, 1989; Frison and Tobutt, 1993; Gass et al., 1996). The ECP/GR *Prunus* Working Group gathers most European countries concerned with *Prunus* species. For example, from 1996 to 1999, there was a European project supported by EU, RESGEN61, with eight EU countries, and nine non EU countries supported by IPGRI. The objectives of the ECP/GR *Prunus* Working Group were: 1) the survey of national European collections, 2) the complete documentation of the European *Prunus* collections for passport and characterisation data, 3) the establishment and use of the descriptor list, 4) the registration of data in the EPDB (European *Prunus* database), managed by INRA Bordeaux, 5) the curation and rationalisation of the national collections, 6) the promotion of free exchange of material, 7) the definition and establishment of a European *Prunus* collection and 8) the raising the level of expertise in genebank.

The *Prunus* collections in Europe are mostly *ex situ* collections (and a few *in situ* sites). This comprise native national germplasm and introduced material, especially of peach, from 17 countries. There are 5300 native accessions among the 8500 total (respectively 4000 and 11400 in 1995). The data were collected and have been entered in the EPDB at INRA Bordeaux since 1994. Regular updates of the collection were implemented by the central

database manager. The software was changed from dBase III to MS-ACCESS and it is now maintained on the Internet for easy consultation. This development is in My-SQL language under PHP MYadmin on an Apache server.

The choice of the descriptors for the EPDB was decided with all the *Prunus* curators within the RESGEN 61 project, in collaboration with the ECP/GR *Prunus* Working Group. The IPGRI multicrop passport descriptor list (19 descriptors) was used (Hazekamp et al., 1997) and five additional passport descriptors specific for *Prunus* were added. Seven primary characterisation descriptors and 7 to 22 specific characterisation descriptors depending on each crop were listed. Numerical scales and reference cultivars, for Eastern and Western European countries, were chosen (Maggioni et al., 1997; Zanetto et al., 1998; Dosba et al., 1999; Zanetto et al., 2002). In all 85 specific characterisation descriptors were used for *Prunus,* covering all the different species (almond, apricot, cherry, peach and plum; Tab. 1).

Table 1. Number of specific descriptors relating to plant, fruit and agronomic characters

Characters	Almond	Apricot	Cherry	Peach	Plum	Hybrids	Total
Plant	2	2	2	7	3	1	17
Fruit	6	10	4	11	8	-	39
Agronomic	3	3	9	4	4	6	29
Total	11	15	15	22	15	7	**85**

The next step is to integrate molecular markers data in the EPDB. Incompatibility (*S*) alleles are already defined (Sonneveld et al., 2003; Sutherland et al., 2004) and systematic detection should be implemented. Microsatellites are already used for identification of cultivars (Dirlewanger et al., 2002; Aranzana et al., 2003.). The same questions occur for distinction between varieties by UPOV. The systematic analyses of the European *Prunus* collection should make possible the sorting of synonyms and correct the misuse of translated names.

Definition of the European *Prunus* Collection

The necessity to develop the concept of a European *Prunus* collection became more and more evident in the development of the *Prunus* Working Group. Two concepts were discussed and defended by the country members. One proposal was for a centralised collection with the arguments of

efficiency, cost reduction and international organisation. A second proposal was to consider that each country has the responsibility of its own genetic resources and that the phytosanitary risks are too high to concentrate the whole European collection in the same location. This principle being accepted, the main objectives defined by the Working Group have been:

- to coordinate individual efforts of each European country to maintain the national *Prunus* germplasm and share responsibilities,
- to organise long term conservation of the original accessions originating from Europe and make them available for diffusion and utilisation (propagation and research),
- to constitute the DEPC (Decentralised European *Prunus* Collection) from a network of the national *Prunus* collections.

The general aims are to implement national and international policy frameworks, to define the type of accession to be integrated into the collection, and to constitute user groups. The management of the DEPC and the definition of accessions were inspired by work done in France (BRG, 1998; Zanetto and Mitteau, 2000). The general principle is based upon the national charter for the management of genetic resources establishing the French national strategy for genetic resources management supported by the government The *Prunus* charter sets up a cooperative network for the management of *Prunus* genetic resources and fosters the interaction of different stakeholders according to a mutually agreed strategy. The members of the network agree to participate in maintenance, conservation and evaluation and to make the genetic resources available.

The management of the DEPC relies on the following principles. The policy framework is based upon the convention on Biological Diversity and the International Treaty of Plant Genetic Resources for Food and Agriculture which entered into force in June 2004 and gave the founding principles regarding ownership and exchanges of genetic resources. The management is also following the recommendations of the guide for germplasm collections edited by IPGRI in order to define the general context of the DEPC management. The effective management is based upon:

- the national sovereignty of each country participating in the DEPC,
- the relationships between the DEPC programme and the national *Prunus* genetic resources programmes,
- national and international policies and regulations.

The DEPC accessions are held in various European countries and by the different stakeholders. The DEPC contains different kinds of accessions: wild material collected in Europe and cultivars or selections raised in Europe. On the other hand, the DEPC should not include accessions infected by

quarantine pests or diseases, or protected by plant breeder's rights. At present, the national collections still contain different types of accessions not eligible for DEPC. Furthermore, geographic considerations have to be taken into account: for example climatic adaptation, long term conservation and/or short term utilisation and regional phytosanitary regulation such as protected areas.

The evolution of the DEPC is also linked with collecting strategies to be developed in consultation at the national and/or European level. The success of the DEPC will be evaluated to the capacity of European organisations to encourage utilisation. In particular, the accessions should be used to promote food security and diversity and to contribute to the development of sustainable agricultural production. Reflection is now encouraged in order to think about conservation for the future, for example by introducing *in situ* local diversity and by developing the use of genetic resources for scientific or applied purposes.

The establishment of the DEPC should facilitate germplasm exchanges. One question concerns: how best to organise exchanges freely or bilaterally? The objective is to facilitate exchange as much as possible but respecting national and international policies and phytosanitary directives, especially the EC directive 2000/29. This means that the material exchanged has to be delivered with a phytosanitary passport.

The first stage of discussions inside the *Prunus* Working Group has led towards the implementation of the DEPC to coordinate the efforts of individual European countries to conserve *Prunus* accessions originating form Europe or otherwise important to European horticulture, silviculture, cultural heritage or science and make them available for propagation and research. Each country remains responsible for its own genetic resources (Maggioni, 1999; Zanetto et al., 1998).

The status of the European collection accessions is defined by several of criteria. First of all, the European accessions have to be accepted by the ECP/GR *Prunus* Working Group. The accessions are considered important if they are collected and originated from Europe as well as representing the genetic diversity of the species. They can be landraces, cultivars or exceptionally certain selections with outstanding traits raised in Europe or important material from non European origin. Furthermore the number of accessions of the same genotype should be limited.

Concerning the implementation of the DEPC, the EPDB manager works in collaboration with the national curators. They send to the manager the list of accessions. The offers are analysed by the EPDB manager assisted by a sub-group of curators and are proposed for agreement to the *Prunus* Working Group. One site is identified for holding each accession and a second site for its safety duplications. The responsibilities of the DEPC are shared at different levels (Tab. 2).

Table 2. Responsibilities shared for the implementation of the DEPC

Participating genebanks	■ Provide the name and identification of the accessions ■ Maintain the trees ■ Provide passport and characterisation data to the database manager ■ Make scion wood available
European *Prunus* database manager	■ Obtains the lists of accessions and location ■ Confirms with ECP/GR *Prunus* WG the European collection accessions ■ Seeks characterisation data of accepted accessions ■ Receives and disseminates information ■ Updates EPDB, when informed by holders
ECP/GR *Prunus* Working Group	■ Examines the composition of the DEPC ■ Reexamines regularly the collection and updates or adjusts its composition

CONCLUSION

New steps are now planned for the DEPC. In addition to the improvement of the EPDB with respect to its user-friendliness, accessibility and the implementation of the DEPC, new integrated strategies are being developed in the context of IPGRI:

- the functioning of the fruit network including *Prunus*, *Malus/Pyrus* and *Vitis* Working Groups,
- the potential connection to other fruit species or EUFORGEN Noble Hardwood Networks.

It is also desirable to develop common strategies for *Rosaceae* and fruit groups and to integrate the general concept such of AEGIS (A European Genebank Integrative System) to ensure the conservation and continuing use of existing crop genetic diversity in Europe.

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EUROPEJSKI PROGRAM WSPÓŁPRACY W DZIEDZINIE ZASOBÓW GENOWYCH RODZAJU *Prunus*: ORGANIZACJA I DZIAŁALNOŚĆ EUROPEJSKIEJ BAZY DANYCH RODZAJU *Prunus* ORAZ WYZWANIA STOJĄCE PRZED EUROPEJSKIMI KOLEKCJAMI ZGROMADZONYMI W EUROPIE

Françoise Dosba i Anne Zanetto

STRESZCZENIE

Europejską Bazę Danych rodzaju *Prunus* (EPDB) utworzono pod auspicjami Międzynarodowego Instytutu Zasobów Genowych Roślin (IPGRI) dwadzieścia lat temu i początkowo była ona zlokalizowana w Szwecji. W latach dziewięćdziesiątych ubiegłego stulecia bazę tą przeniesiono do Centrum Naukowego INRA w Bordeaux we Francji i rozwinięto jej działalność. Istniejące genotypy pochodzące głównie z Europy włączono do tej bazy i przygotowano dla nich cechy paszportowe i opisowe według deskryptorów opracowanych w grupach roboczych *Prunus*.

Całkowite udostępnienie Bazy Danych jest planowane na początek 2005 roku i różne scenariusze jej rozwoju są brane pod uwagę. Dzięki wsparciu Unii Europejskiej w latach 1996-1999 było możliwe stworzenie europejskiej współpracy dotyczącej gromadzenia zasobów genowych rodzaju *Prunus* w ramach szerokiego europejskiego programu obejmującego zasoby genowe w ogóle (ECP/GR). Ponad 20 krajów jest zaangażowanych w utrzymanie narodowych kolekcji. Obecnie w kolekcjach zgromadzono ponad 8 tysięcy taksonów, dla których opracowano dane paszportowe i opisy pomologiczne. Są one dostępne na stronie internetowej IPGRI. Strona ta jest ciągle aktualizowana. W przyszłości planuje się decentralizację europejskiej kolekcji rodzaju *Prunus* (DEPC). To znaczy każdy kraj będzie odpowiedzialny za własne zasoby genowe. Nie cały materiał zgromadzony w kolekcjach narodowych kwalifikuje się do utrzymywania w ramach tego programu. Najważniejsze są kolekcje narodowe z oryginalnymi zasobami genowymi właściwymi dla danego państwa zgodne z konwencją bioróżnorodności przyjętą w Rio de Janeiro w 1992 roku. Ponadto zapoczątkowano współpracę pomiędzy grupami robaczymi *Prunus i Malus/Pyrus* w celu utworzenia wspólnej strategii dotyczącej gromadzenia zasobów genowych drzew pestkowych i ziarnkowych w skali całej Europy.

Słowa kluczowe: *Prunus*, drzewa pestkowe, zasoby genowe, baza danych, współpraca europejska