

# Report of a Working Group on *Malus/Pyrus*

Fourth Meeting, 7-9 March 2012, Weggis, Switzerland  
M. Lateur, M. Ordidge, J. Engels and E. Lipman







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

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#### **Citation**

Lateur M, Ordidge M, Engels J, Lipman E. 2013. Report of a Working Group on *Malus/Pyrus*. Fourth Meeting, 7-9 March 2012, Weggis, Switzerland. Bioversity International, Rome, Italy.

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Apple diversity in Switzerland displayed to the public. Courtesy of © M. Kellerhals, Agroscope Changins-Wädenswil, Switzerland.

Acknowledgements to L. Currah for English language editing.

ISBN 978-92-9043-934-9

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*Bioversity International* is the operating name of the International Plant Genetic Resources Institute (IPGRI).

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Related presentations, summaries and papers can be downloaded from  
[http://www.ecpgr.cgiar.org/networks/fruit/maluspyrus/maluspyrus\\_meeting\\_2012/summaries\\_of\\_presentations.html](http://www.ecpgr.cgiar.org/networks/fruit/maluspyrus/maluspyrus_meeting_2012/summaries_of_presentations.html)

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## SUMMARY REPORT OF THE MEETING

### Introduction

The fourth meeting of the Working Group on *Malus/Pyrus* of the European Cooperative Programme for Plant Genetic Resources (ECPGR) was held from 7 to 9 March 2012 in Weggis, Switzerland. The meeting, organized in collaboration with Agroscope-Changins Wädenswil (ACW), brought together 28 participants, including 22 ECPGR country representatives, 5 observers, and Jan Engels, representative of the ECPGR Secretariat, also Coordinator of the initiative for “A European Genebank Integrated System” (AEGIS).

Markus Kellerhals, ACW, welcomed the participants to Switzerland. He briefly described the Weggis region and informed the participants about the Agroscope’s research activities, especially Agroscope Changins-Wädenswil which is devoted to research on plant production. He presented some figures about fruit production in Switzerland and the developments of the apple varieties. ‘Gala’, followed by ‘Golden Delicious’ are the most important commercial varieties. New plantations include varieties such as ‘Milwa’, ‘Scifresh’, ‘La Flamboyante’, etc. In Switzerland, besides fruit orchards, there is still an important production of traditional standard trees for juice and cider. This type of production is also supported as an important ecological landscaping element.

Marc Lateur, Chair of the Working Group (WG) on *Malus/Pyrus*, also welcomed the participants and particularly the new members, stressing the importance of the work to be achieved during this unique European forum. Indeed, many of the best qualified pome fruits experts are members of this WG and our European colleagues are looking forward to making progress on harmonized protocols, descriptor lists, methodologies regarding synonyms and, last but not least, common strategies for a safe conservation and dynamic utilization of fruit tree genetic resources.

### Update on ECPGR

Jan Engels, AEGIS Coordinator, updated the Group on the ECPGR membership (currently 43 countries) and the structure of the Networks. The Fruit Network consists of three Working Groups: *Malus/Pyrus*, *Prunus* and *Vitis*. The *Malus/Pyrus* WG is one of the older WGs of ECPGR. Its budget for ECPGR’s Phase VIII includes the current fourth meeting, the two preliminary ad hoc meetings on synonyms and descriptors held respectively on 6 and 7 March, and an allocation to work on the *Malus* and *Pyrus* Databases. J. Engels listed the publications produced by the WG during Phase VIII and mentioned the “List of minimum passport descriptors for all *Prunus* species” developed by the *Prunus* WG; a similar approach might be considered by the *Malus/Pyrus* WG. He presented the Fruit Network Web site, inviting WG members to provide comments for its further improvement and to use it as a platform for posting material of interest to the WG. He also mentioned the recommendation made by the Solanaceae WG at its last meeting (February 2012) regarding the relationship of the European Plant Genetic Resources Catalogue (or European Internet Search Catalogue, EURISCO) and the Central Crop Databases (CCDBs): “that the Documentation and Information Network take up the discussion about the need to improve EURISCO in such a way that it can serve the purpose of identifying AEGIS candidate accessions. EURISCO should therefore host all the crop-specific data that are necessary to analyse the existing European collections.”

In July 2010 ECPGR underwent an Independent External Review resulting in 25 recommendations. The Review Panel recommended that the ECPGR take more responsibility for the conservation and use of plant genetic resources for food and agriculture (PGRFA) by establishing more accountability among its membership, exploring the option of obtaining a legal persona and establishing an Executive Committee. These proposals were not immediately accepted by the Steering Committee (SC) at its (extraordinary) twelfth meeting in Bratislava, Slovakia, in December 2010, as they would require an increased investment in the Programme. Nonetheless, the SC decided to nominate an Executive Committee (ExCo) with a Chair and four members to examine the proposals and to start operating as an executive body of the SC. The SC also decided to revise the objectives of the ECPGR and tasked the ExCo to prepare an "Options paper" that would elaborate on the ECPGR objectives and analyse its legal status, operating structure, hosting arrangements and the overall cost implications. The long-term goal and the six outcomes of the ECPGR, defined by the SC at its meeting in Bratislava were presented. The cancellation of the All-Networks Coordinating Groups meeting will allow savings for a Common Fund to finance special actions on a competitive basis across WGs and Networks. The WG meetings are expected to result in concrete outputs, such as the definition of lists of accessions proposed for the European Collection and draft lists of crop-specific standards for conservation. Finally, the Crop Wild Relatives (CWRs) project of the Global Crop Diversity Trust, in particular its activities on pre-breeding, was briefly mentioned as it might provide a source of funding for the eastern European countries as well as an umbrella for work on CWRs of *Malus* and *Pyrus* across the region.

### **Update on AEGIS**

Jan Engels presented to the WG the 12 major milestones and the key components of AEGIS, including the Memorandum of Understanding (MoU) that underpins membership of AEGIS. Thirty countries have signed the MoU and 46 genebanks have signed Associate Membership Agreements with their respective National Coordinators. J. Engels described briefly the main elements of the AEGIS Quality System (AQUAS) and summarized the AEGIS-related activities carried out by the *Prunus* WG. Aspects related to the European Collection, including the suggested "simplified procedure" for the selection of candidate European Accessions and the establishment of generic genebank standards, as well as the development of crop-specific standards, would be presented on the second day of the meeting. J. Engels briefly mentioned the AEGIS Grant Scheme and the Seventh Framework (FP7) project proposal (Plant Gene Access) submitted in November 2011 to the European Commission (EC) for funding (€ 10 million and 34 partners).

### **Chair's report**

Marc Lateur reported on the activities carried out by the *Malus/Pyrus* WG since its last meeting in Tbilisi, 2006.<sup>1</sup> He summarized the progress of the WG against milestones, including the presentation of posters on ECPGR activities and the updating of the *Pyrus* Database (DB), noting that after having organized an update procedure and having sent to each curator their own list of accessions with data for validation and update, only a few replies to requests for updated data had been received. Matthew Ordidge, Manager of the *Malus* DB, indicated that it had not been recently updated.

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<sup>1</sup> Lateur M, Maggioni L, Lipman E. 2010. Report of a Working Group on *Malus/Pyrus*. Third Meeting, 25-27 October 2006, Tbilisi, Georgia. Bioversity International, Rome, Italy.



The Chair also reported that the lists of simple sequence repeats (SSR) markers and reference accessions had been discussed and agreed during an ad hoc meeting at East Malling, UK (December 2006). The *Pyrus* and *Prunus* lists had been published<sup>2</sup> but the *Malus* list had not. This was to be discussed during the meeting and Felicidad Fernández (East Malling Research (EMR), UK) had supplied some information although she was unable to attend the present meeting.

The Chair reported on the ad hoc meeting on synonymy held jointly with a DB Managers meeting in Gembloux, Belgium (June 2008), resulting in the development of a set of methodologies for dealing with synonymy. A set of recommended procedures for the inclusion of photographs in the DBs had been prepared and discussed further during the ad hoc meeting on synonyms held on 5 March (see below).

The outcomes of the SSR marker meeting had been further discussed at the EUCARPIA Fruit Genetics and Breeding Symposium in Zaragoza, Spain (September 2007).

A set of basic agreements on the harmonization of the Fruit DBs had been made; further development of tools for harmonization would be developed through the *Prunus* DB at INRA, France, as agreed during a meeting between the DB Managers at INRA-Bordeaux in August 2010. The outcome of the meeting is reported in the section "Update on the development of the *Pyrus* Central Crop Database" (p. 7).

Characterization and evaluation (C&E) descriptors had been developed and discussed in the ad hoc meeting held on 6 March (see below) and protocols and scoring systems had been largely agreed; further work had been carried out on synonyms during the ad hoc meeting on synonyms; the meeting to discuss common *in situ* and *ex situ* conservation strategies was not held and therefore no progress had been made in this area. The implementation of AEGIS had focused initially on bringing together accessions listed under synonymous names.

The Chair presented the agenda (see Appendix VI, pp. 31-33).

## Phenotypic characterization and evaluation of *Malus/Pyrus* collections

### **Report of the ad hoc meeting on descriptors**

Marc Lateur presented the results of the ad hoc meeting on descriptors held on the morning of 6 March 2012. The detailed agenda of this meeting, attended by 11 experts on both *Malus* and *Pyrus* species, is included in the global agenda (Appendix VI).

### **Validation of a first version of an apple and pear descriptor list for characterization and evaluation work**

Marc Lateur circulated a first version of a broad compilation of descriptors useful for the WG's work. The philosophy is to make use of the already available descriptors collected

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<sup>2</sup> Evans KM, Fernández-Fernández F, Govan C. 2009. Harmonising fingerprinting protocols to allow comparisons between germplasm collections – *Pyrus*. In: Socias y Company R, Espiau MT, Alonso JM, editors. Proceedings of the Twelfth Eucarpia Symposium on Fruit Breeding and Genetics, 20 March 2009, Zaragoza, Spain. Acta Horticulturae 814:103-106. ([http://www.actahort.org/books/814/814\\_10.htm](http://www.actahort.org/books/814/814_10.htm))

Clarke JB, Tobutt KR. 2009. A standard set of accessions, microsatellites and genotypes for harmonising the fingerprinting of cherry collections for the ECPGR. In: Socias y Company R, Espiau MT, Alonso JM, editors. Proceedings of the Twelfth Eucarpia Symposium on Fruit Breeding and Genetics, 20 March 2009, Zaragoza, Spain. Acta Horticulturae 814:615-618. ([http://www.actahort.org/books/814/814\\_104.htm](http://www.actahort.org/books/814/814_104.htm))

from the specialized literature (IBPGR, UPOV, CPVO, Szalatnay<sup>3</sup>) and in some cases adapt them to the specific use of characterization and evaluation of genetic resources. The specific aim was to define more precisely the protocols and also provide explanations on firstly, how to use the descriptors and secondly, how to analyse and synthesize the data resulting from their use.

It was agreed to insert in the document as many figures and pictures as possible, that will help in clarifying the descriptors. Lists of informative reference synonyms, particularly those linked to phenological traits (flowering period, picking period, etc.) were also recognized as very useful.

### **Conclusion**

The documents were successfully reviewed and some descriptors were improved or clarified. The resulting list will be presented to the whole WG meeting for validation.

A Task Force was set up to finalize the work, integrating the valuable work of Szalatnay (2006) with the aim of publishing a final document in the form of a robust and practical field manual to be used in evaluation orchards (see Workplan, Appendix I, pp. 21-23).

### ***Presentation and validation by the Working Group of the pre-validated list of phenotypic descriptors for apple and pear adopted during the ad hoc meeting***

The Chair presented the list of C&E descriptors and protocols as agreed during the ad hoc meeting. This document is a kind of compendium of experiences and is rather innovative as it not only lists tables of descriptors, but has a broader approach in explaining how and why to use them and by defining methods and protocols.

The descriptors previously agreed – related to flower, fruit appearance, fruit quality or characteristics of the tree – were prioritized into three groups (1, 2, 3) (see Appendix II, pp. 24-25).

Various issues were discussed during the prioritization process:

- photographs of fruit were felt to be of high importance to illustrate many characters; they would be of value in the databases and were initially considered for highest priority ranking; however, the relative priority of photographs was reduced, partly due to their limited value in providing searchable data and partly due to potential limitations on the free availability of images;
- fruit quality characters (including a range of sensorial analyses) were seen as high priority whilst more individual measures (such as objective fruit quality characters

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<sup>3</sup> Watkins R, Smith RA. 1982. Apple descriptors. Commission of the European Communities (CEC) Secretariat, Brussels and International Board for Plant Genetic Resources (IBPGR) Secretariat, Rome.

Thibaut B, Watkins R, Smith RA, editors. 1983. Pear descriptors. Commission of the European Communities (CEC) Secretariat, Brussels and International Board for Plant Genetic Resources (IBPGR) Secretariat, Rome.

UPOV. 2005. Apple (Fruit Varieties) - UPOV Code: MALUS\_DOM - (*Malus domestica* Borkh.). Guidelines for the conduct of tests for distinctness, uniformity and stability. TG/14/9. International Union for the Protection of New Varieties of Plants, Geneva.

CPVO. 2006. Protocol for distinctness, uniformity and stability tests. *Malus domestica* Borkh. APPLE. UPOV Species Code: MALUS\_DOM. Adopted on 14/03/2006. CPVO-TP/14/2 European Union, Community Plant Variety Office.

CPVO. 2003. Protocol for distinctness, uniformity and stability tests. *Pyrus communis* (L.). PEAR. UPOV Species Code: PYRUS\_COM. Adopted on 27/03/2003. CPVO-TP/15/1 European Union, Community Plant Variety Office.

Szalatnay D. 2006. Obst-Deskriptoren NAP – Descripteurs de Fruits PAN. Agroscope Changins-Wädenswil ACW and Vereinigung FRUCTUS.

measured by penetrometer, refractometer, etc., as well as some individual sensorial characters) were given lower priority than the overall global values (for instance acid/sugar ratio);

- flowering period and intensity were considered high priority whilst other flower characters were considered lower;
- harvest time and fruit appearance characters were considered high priority;
- number of pips was agreed to be of value as an indicator of ploidy (which has importance for breeding) although seed number was given second priority;
- disease characteristics were given a secondary level of priority as these were complicated by the requirement for un-sprayed collections and numerous years of replicated measures;
- pomological characters, whilst of potential value for distinction of cultivars were given low priority within the list.

Priorities within apple and pear were generally similar, with the following exceptions: juiciness and overall aroma were given lower priority in pear than apple; proportion of fruit shape, astringency and depth of cavity were given higher priority in pear than in apple.

It is important to note that the prioritization of C&E descriptors was specifically limited to prioritizing the characters which it was felt could be reasonably scored at this stage. It was emphasized that any level of characterization or evaluation would require significant work (and might well go beyond the scope of the in-kind contributions within ECPGR) and that curators can prioritize within their collections which accessions might be most valuably studied: suggestions were to focus on sets of most original national cultivars or most important national cultivars, but it was agreed that this would be driven by varying factors and would best be decided by the curators at this stage. It was also noted that if any collections already held valuable data on these traits it would be valuable to focus on filling the gaps, aligning with the agreed scales (if possible) or moving to the lower priority levels. It was felt that evaluating and characterizing at standardized levels of physiological ripeness was not readily possible at this stage. The Chair also suggested that a standard set of cultivars could be included as references to be used across collections and for representing the three sub-regions (i.e. Northern, Southern and Central Europe) with the understanding that there might well be some (desirable) overlap.

Note: In line with the descriptor list already published by Szalatnay (2006) which is already available in three languages (French, Italian and German), it was suggested that the document could also be usefully translated into further languages within individual countries.

### *Recommendations*

- The list of prioritized C&E descriptors and protocols for their assessment should be used when characterizing collections, with priority given to traits related to fruit.
- A set of standard varieties should be used to standardize across collections.
- The descriptor list should be published as an update to the previous IBPGR *Malus* and *Pyrus* descriptors (if possible in four languages, English, French, Italian and German).

### *Workplan*

- A Task Force composed of M. Lateur, D. Szalatnay and E. Dapena will finalize the work on apple descriptor lists, integrating the valuable work of Szalatnay (2006); the Chair will then distribute the agreed prioritized draft descriptor list to Working Group members for comments and for use as a working document (**by mid-June 2013**).
- WG members to provide comments to the Chair **by end August 2013**.
- The Chair will compile the comments and circulate the final draft list to WG members for use as a working document until publication of the final document, and provide it to the ECPGR Secretariat for uploading onto the Web site (**by end October 2013**).
- The above Task Force will explore solutions for publishing the final document in the form of a robust and practical field manual to be used in the evaluation orchards, with support from the ECPGR Secretariat (**by end 2013**).
- The same procedures will be followed for pear descriptors, taking advantage of the fact that many descriptors and methods are rather similar (**same schedule as above**).

### ***Presentation of the validated ranked list of SSR markers for apple and pear and common methodology***

Felicidad Fernández had provided a summary of the outputs of the ECPGR Workshop held at East Malling in 2006 but was unable to attend. Henryk Flachowsky led the discussion and summarized the information supplied by F. Fernández, starting with an introduction on the principles of fingerprinting technology and summarizing the importance of the choice of markers and reference accessions, principally to cover a range of different genomic locations with a range of alleles which would be able to be run in multiplex reactions and including a range of reference accessions which would be used to standardize scoring across different studies (see also Appendix III, pp. 26-27).

It was clarified that the reference accessions should be considered at the specific tree level and that users should acquire material from the already nominated reference accessions: *Pyrus* at Brogdale (contact Matthew Ordidge, University of Reading, m.ordidge@reading.ac.uk), *Malus* at INRA (contact Charles-Eric Durel, INRA-Angers, charles-eric.durel@angers.inra.fr) and *Prunus* at EMR (contact Felicidad Fernández, Felicidad.Fernandez@emr.ac.uk).

The issue of data availability was discussed and it was generally agreed that they should be available to ECPGR members. The information should be summarized in a document to be posted on the ECPGR Web site, with references to the scientific publications as these were not in "open access" format. It was agreed that a Task Force be set up to develop this document, as below.

### *Workplan*

- A Task Force composed of **Henryk Flachowsky (Leader)**, Larissa Gustavsson, Felicidad Fernández, Charles-Eric Durel, Matthew Ordidge and Marc Lateur will compile the relevant information on SSR markers across *Malus*, *Pyrus* and *Prunus*, for the publication of a manual on the ECPGR Web site (**by end March 2013**).

## Databases and documentation

### **Update on the Malus Central Crop Database**

Matthew Ordidge summarized the development of the *Malus* Central Crop Database, (CCDB). The structure would be based upon the UK National Fruit Collection database, which is based in MySQL and uses PHP. The search tool and ability to handle multiple synonymous names was demonstrated along with a further tool which had been developed to aid with linking both variety names (as had been used during the ad hoc synonyms meeting) and accession names (for the updating of accession lists and acknowledgement of synonymous and local names). He also pointed out that the accession lists and institutes (according to institute codes) within the *Malus* Database and EURISCO were out of sync, with many accessions or institutes being uniquely listed in one or other database.

### **Workplan**

- ECPGR Secretariat will inform the Database Manager as soon as the updated FAO/Bioversity *Multi-crop passport descriptor* (MCPD) list is available.<sup>4</sup>
- Database Manager will request updates from members according to the updated MCPD list by **end February 2013**.
- Working Group members will supply updated accession lists through appropriate channels to the *Malus* CCDB and to EURISCO by **end April 2013**.

### **Update on the development of the Pyrus Central Crop Database**

Marc Lateur, *Pyrus* Database Manager, explained that the further development of the *Pyrus* CCDB is definitively linked to the new *Prunus* CCDB structure created by INRA-Bordeaux. The four Managers of the ECPGR Fruit DBs (Emilie Balsemin – *Prunus* DB, Erika Maul – *Vitis* DB, Matthew Ordidge – *Malus* DB and Marc Lateur and Robert Oger – *Pyrus* DB) had already met in Gembloux in June 2008.

It was jointly decided to strengthen collaboration and to share tools or applications. A ranked list of priority tools that should be present in all Fruit DBs was developed and a harmonization process is ongoing, concerning (1) the informatics environment; (2) the homepage model; (3) the set of passport descriptors (FAO, EURISCO, AEGIS); (4) the molecular markers data and (5) the photographs.

The *Pyrus* and *Prunus* CCDB Managers met at INRA-Bordeaux, 25-27 August 2010, to formalize collaboration and help finalize the last version of the *Prunus* DB. A group of French and Belgian DB administrators were invited for a joint workday for improving some output tools, testing the draft version and presenting requests for specific functionalities. This version has been developed in line with the Database of the EU GEN RES 036 “GenBerry” project on Strawberry Genetic Resources in Europe (<https://www.bordeaux.inra.fr/genberry/>). Considering that this version needed to be finalized, and that it would be jointly used by the ECPGR *Prunus* and *Pyrus* DBs, it was decided at this time that part of the Fruit Network’s funds would be available for INRA-Bordeaux to hire the computer specialist (Thomas Persohn) for 1.5 month. The database is based on recent (freely available) technologies, namely: database management system: ‘MySQL 5.1’; Web Server: Apache 2; scripting language: PHP 5.2.4.

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<sup>4</sup> The new MCPDs were uploaded on Bioversity’s Web site on 19 June 2012 and the ECPGR Secretariat informed all ECPGR members by email on 20 June 2012.

The work has now been finalized and Marc Lateur presented the new *Prunus* DB structure, dynamic facilities and multiple choice query facilities, especially the full screen comparison tool of fruit pictures from different origins of the same name of an accession. The Group agreed that the new version of the DB marked a significant improvement and matched the expectations, and was eager to receive the database structure. It is agreed that the new version of the *Prunus* DB structure and facilities will be freely available for the *Pyrus* DB and it is planned to build further practical and official collaboration protocol agreement between INRA-Bordeaux and CRA-W Gembloux, including the possibility to link with the BIODIMESTICA INTERREG project with CRRG–North-France Region.

#### *Workplan*

- ECPGR Secretariat will inform the Database Manager as soon as the updated FAO/Bioversity *Multi-crop passport descriptor* (MCPD) list is available;<sup>5</sup>
- Database Manager will request updates from members according to the updated MCPD list **by end February 2013**.
- Working Group Members will supply updated accession lists through appropriate channels to the *Pyrus* CCDB and to EURISCO **by end April 2013**.
- Marc Lateur will finalize the upgrading of the *Pyrus* Database according to the new structure of the *Prunus* Database **by end June 2013**.

#### **Documentation of old reference pomological literature: synthesis of a European survey and proposed common acronyms**

Inger Hjalmarsson presented an overview of important works in the 19th century European pomological literature. The presentation was primarily based on E.A. Bunyards' article *A guide to the literature of pomology* published in *The Journal of the Royal Horticulture Society* in 1915. When possible the presentation was supplemented with illustrations from the presented works. Among the most important books surveyed were *Pomona Franconica* (Mayer 1776-1801), *Kernobstsorten* (Diel 1799-1825), *Illustriertes Handbuch der Obstkunde* (Oberdick et al. 1859), *Schweizerische Obstsorten* (Pfau-Schellenberg 1863-1873), *Le jardin fruitier* (Noisette 1821), *Le verger* (Mas 1865-1872), *Dictionnaire de Pomologie* (Leroy 1867-1879), *Pomona Herefordiensis* (Knight 1811), *Pomona Londinensis* (Hooker 1818) and *Album de Pomologie* (Bivort 1847-1851). Many pomological works of the 19th century were published in multiple editions, and often the editions differed markedly from one another. Sometimes the first edition was not illustrated. Illustrations were however often added in later editions causing changes to the numbers of volumes and names of editors.

Marc Lateur presented to the Group a common and standardized method to facilitate the retrieval of pomological books' references; each literature reference is assigned a unique acronym. The Group considered that it would be very useful to implement this tool in the CCDBs.

#### *Workplan*

- The Chair will circulate the list of pomological books' references to WG members for comments and addition of further references and Web links to available texts (**by end February 2013**).

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<sup>5</sup> The new MCPDs were uploaded on Bioversity's Web site on 19 June 2012 and the ECPGR Secretariat informed all ECPGR members by email on 20 June 2012.

- WG members to reply to the Chair **by end April 2013**.
- The finalized list will be sent by the Chair to the ECPGR Secretariat **by end May 2013** for uploading on the *Malus/Pyrus* WG's Web site.
- The pomological reference list should be integrated by DB Managers into the Central Crop Databases to be used for referencing cultivar names (by **end June 2013**).

### ***Perspectives of the further development of the Malus and Pyrus Databases and EURISCO***

#### ***Discussion***

The general perspectives of the further development of the *Malus* and *Pyrus* Databases were discussed. Key items highlighted in the discussion were the value of the CCDBs and the Crop Working Groups in resolving crop-specific issues and providing essential technical knowledge which it was felt would be required for the development of the European Collection. It was again noted that a better coordination and clarification of responsibilities would be essential for both the Central Crop Databases and EURISCO.

#### ***Recommendations***

- Accession details in the CCDBs and EURISCO should be better harmonized so that accessions listed uniquely in each are minimized;
- Links between the Documentation and Information Network and the CCDB Managers should be improved and a joint meeting should be organized.

### **Presentation of the *ad hoc* work on apple and pear synonyms**

#### ***Report of the ad hoc meeting on apple and pear synonyms***

Marc Lateur reported on the ad hoc meeting on synonyms held on 5 March. The detailed agenda of this meeting, attended by 11 experts, is included in the global agenda (Appendix VI).

#### **Introduction and validation procedure of the most important synonyms lists**

- **Pear synonyms**

Marc Lateur summarized the background reasons for synonymy and the difficulties encountered in solving the issue, and presented the intended methodology, based on creating acronyms of bibliographical references. A proposed bibliography listing publications to be used as reference sources was circulated and screened by the group and the Chair asked for comments, updates and suggestions for inclusion of additional sources, following the same structure.

Laila Ikase underlined the difficulties in transliterating from Cyrillic for Russian names.

The Chair summarized the use of accession names (names received from the donor of an accession, which need to be validated by curators), preferred names (accepted variety names with validation and referencing), euonyms (simplified versions of the accepted name to be validated by the expert group – the Chair indicated that he found it preferable not to create new names for these, but rather to use the preferred name) and synonyms (variety names traced from the literature, which can be prioritized and ranked – for example the Chair proposed to reduce the synonyms included in the *Pyrus* Database to those most used).

The Chair highlighted that there were various conflicting views on “preferred or original name” and that it was the group’s responsibility to bring together the knowledge rather than to act as a referee in such matters.

He also suggested the use of a standard reference book for each variety – choosing the first available historically and most reliable, and to start initially with the list of most common accessions. He underlined that the aim of the group was to cover the main (most used and common) cultivars, and that the responsibility to work similarly for local/national names and local/national varieties must remain with the local or national curators in each country.

The group screened the pear synonym list and updated it, including new synonyms and adjusting preferred names and euonyms. The handling of mutants was discussed, and David Szalatnay suggested including mutant-related information in a “Remarks” field as it is important to be able to handle both mutants and tradenames and to be able to link these to the original variety. Matthew Ordidge suggested the possibility of including a “class” for mutants, tradenames, etc. in the same way (possibly as a field) to distinguish preferred names and the differential ranking of synonyms.

As a result of the meeting, the methodology proposed was adopted and implemented on 3471 accession names and synonyms from the ECPGR *Pyrus* Database that have been analysed by the expert group, and the following points were validated:

- “Preferred name” + reference of authors and, if necessary, “euonym” (only in case of excessively long names)
- “Most common” synonyms + reference of authors
- Historical data : country of origin, date + reference of authors
- Preferred reference description of the cultivar + reference of authors.

#### • **Apple synonyms**

Matthew Ordidge presented the latest version of a “name-checking tool” developed alongside the Brogdale Collection Database that offers the possibility to search synonyms, homonyms and “preferred name” in a user-friendly way. This tool will also be used to develop the ECPGR *Malus* Database. Harmonizing names from the Brogdale DB and ECPGR *Malus* DB will allow the improving of data quality and identification of replicated material within the accession lists. The system works by creating ID codes for each name (or each instance of a homonymous name) along with further ID codes for each synonymous name. These ID codes are then used to associate synonyms with the “preferred name” for each variety.

Literature sources for currently included synonyms were mostly from the UK National Apple Register written by Muriel Smith (1971)<sup>6</sup>. Jacobus Bosschaerts presented his extensive work on the historical traceability of synonym apple names; he had scanned more than 31 books and, using OCR software, had inserted all the names in an Excel file, which he was happy to offer for inclusion in the *Malus* Database. So far 16 000 names were already recorded with different types of information, including: synonyms named in each book, preferred name in each book, page in the book where the cultivar is described, book acronym and type of illustration. An edited version of this file (screened as far as possible for unique preferred names from each publication) was used to input names via the name-checking tool and generate a direct link from the database name list to the referenced name sources. Out of 3500 names in the list, 499 preferred names were checked and included in the synonym list of UK Brogdale DB. An additional set of 170 new names and synonyms were included in the

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<sup>6</sup> Smith M. 1971. National Apple Register of the United Kingdom. Ministry of Agriculture, Fisheries and Food, Pinner, UK.



DB and further reference sources were added for others, along with the ability to link directly to the other associated synonyms in the original file.

#### *Workplan for apple and pear*

- The *Malus* DB Manager will make the link between Brogdale's synonym DB and the last version of the ECPGR *Malus* Database and match all the information **by end March 2013**.
- The *Malus* and *Pyrus* DB Managers will add "preferred name" to the synonym list with the link to the referenced literature compiled by Jacobus Bosschaerts **by end March 2013**.
- The *Pyrus* DB Manager will add as far as possible the literature source for each already existing synonym name **by end March 2013**.
- The *Malus* and *Pyrus* DB Managers will add the most probable historical country of origin and the most probable date of raising **by end March 2013**.

#### *General workplan*

- DB Managers will send back (**by end April 2013**) to the curators their respective lists of apple and pear accessions extracted from the last version of the ECPGR DBs with the added synonyms list, asking the curators to check their lists and provide a ranking of synonym names as follows:
  - 1 = Preferred name
  - 2 = Useful or commonly used synonym
  - 3 = No longer used or never heard-of synonym name
  - 4 = Wrong synonym, as checked and confirmed by local experts. If possible, provide the literature source or the link of this "false" synonym to the right cultivar.
 The ranking will be provided to the DB Managers (**by end June 2013**).
- Based on their good knowledge of their cultivars and reference books, the experts having attended the meeting will communicate their ranking of the global quality of the mentioned literature sources according to the following scale:
  - 1 = Mostly reliable information found in the book
  - 2 = Some doubtful information found
  - 3 = Very often doubtful information found.
 The ranking will be provided by experts to the DB Managers (**by end June 2013**).
- DB Managers will include this information in the respective DBs **by September 2013**.

### **Implementation of characterization, evaluation and utilization of the collections**

Country reports were presented by members from Armenia, Belarus, Bosnia and Herzegovina, Israel, Lithuania, Montenegro, Romania, Spain, Switzerland and Sweden.

Marc Lateur presented "Biodimestica", a European INTERREG IV project aiming at a more dynamic management of local old fruit biodiversity (cross-border, Franco-Belgian project).

#### **General discussion and setting up of priority rules**

This session was intended to provide a good overview of activities carried out on each collection, so that collection holders could use the experience of others to set their own priorities for further characterization and evaluation. Some discussion followed on the global policy toward the identification of priority areas and it was suggested that a list of areas of

priority and expertise would be useful to create a source of information, with the aim that people could readily identify potential collaborative opportunities. Larissa Gustavsson agreed to help in putting this together.

In discussion on the overall identification of priority areas it was observed that for some specific elements (e.g. disease screening) it had proved valuable for the Group to retain a diversified approach as this had led to the identification of better techniques.

The possibility for the Working Group to have a collaborative workspace with restricted access on the ECPGR Web site was discussed.

### ***Recommendation***

- Curators should consider the experiences and activities of other collections when planning further work.

### ***Workplan***

- The list of activities and expertise, already partially compiled during the meeting, will be included as an Appendix to the draft report of the meeting (see Appendix IV, pp. 28-29);
- Working Group members will validate and complete the list for inclusion in the final report.

## **Collecting activities**

### ***Joint JKI/VIR expedition to North Caucasus in 2011 to collect genotypes of Malus orientalis, Prunus cerasifera, Pyrus caucasica and Fragaria vesca***

Henryk Flachowsky presented the joint project on prospecting for wild fruit relative species in the Caucasus. A joint expedition of scientists from the Julius Kühn-Institute (JKI), Germany and the N.I. Vavilov Research Institute of Plant Industry (VIR), Russian Federation took place from 22 August to 4 September 2011 in the North Caucasus region. The expedition aimed at collecting fruit genetic resources in this region. During the expedition a total of 7955 seeds of 103 *Malus orientalis* trees from 8 different sites in the North Caucasus region were collected. The scientists also collected seeds of *Pyrus caucasica*, stones of different genotypes of *Prunus cerasifera*, plants of *Fragaria vesca* and *F. viridis* as well as budwood of *Malus x domestica*, *Pyrus communis* and *Prunus avium*. All fruit genetic resources will be introduced into the fruit genebanks of both institutes. The collected material will subsequently be evaluated by the participating partners for sources of agronomically important traits in order to provide new resources for breeding purposes.

## **Technical or scientific contributions**

### ***The Fruit Breedomics project***

Marc Lateur briefly presented the Fruit Breedomics project (<http://www.fruitbreedomics.com/>) funded by the European Union Seventh Framework Programme (FP7). The project aims at increasing the genetic diversity available to breeding and integrating functional genomics to develop tools for marker-assisted breeding. One aim of the project is to allow the better integration of germplasm collections into the breeding programmes.

## **Experiences with the “National Collection” concept; strategies and actions for durable conservation of collections**

Reports were given by members from Germany, Ireland, Italy and Switzerland.

M. Lateur gave a presentation on lessons to be learnt from the experience of setting up a network of repository orchards.

## **The *Malus/Pyrus* Working Group and implementing AEGIS**

### ***The establishment of the European Collection***

Jan Engels, AEGIS Coordinator, presented the general concept of the European Collection, which consists of dispersed accessions (“unique and/or important”) which have been identified in European genebanks where they are maintained as European Accessions. In order to provide a legal foundation to the Collection, a Memorandum of Understanding (MoU) is being concluded with countries that accept the responsibility for long-term conservation of the European Accessions and are prepared to make this material available to users. Furthermore, by signing the MoU the countries agree to conserve and manage the European Accessions in accordance with agreed quality standards that form part of an AEGIS Quality Management System (AQUAS).

The main players in selecting the European Accessions are the Crop Working Groups (WGs) with their technical expertise, together with the countries holding the germplasm and prepared to place the selected accessions in the European Collection. A simplified selection procedure for the European Accessions has been proposed and is being used by a number of WGs. The first step is for the WG to elaborate a list from the entire pool of accessions for a given crop maintained in European genebanks, using the data available in EURISCO and the respective Central Crop Database (CCDB), by applying the Selection Requirements that each of the European Accessions has to fulfil. In case two or more accessions are identified as candidate European Accessions and they turn out to be duplicates, the crop-specific selection criteria, to be defined by each WG, will be used to identify the Most Appropriate Accessions (MAAs) from that group of potential duplicates.

The list of selected accessions will be sent by the WG to the National Coordinator (NC) in each of the holding countries with the request to consider the selected accessions maintained in their country for inclusion in the European Collection. The NC, in close consultation with the respective holding institute(s), will then inform the WG whether or not the selected accessions can be included in the European Collection. The accessions selected and accepted for inclusion in the European Collection will subsequently have to be flagged in EURISCO as AEGIS Accessions by the EURISCO National Focal Point. If the accessions proposed by the WG are not accepted by the respective country, the WG will look for alternative accessions and seek acceptance for inclusion from the respective holding institute/country through the procedure described above.

### ***Discussion and action plan***

The Group discussed various issues related to the establishment of a European Collection: definition of primary criteria to start a global process that all members would be able to achieve concretely, using the list of priorities for selection of MAAs among sets of duplicated accessions, as established by the *Prunus* WG. It was generally felt that these would be appropriate, although a number of key elements were highlighted as presented below.

The first key criterion to take into account in the implementation of AEGIS by the WG is the “Country of historic origin” of the variety, which provides more accurate information on

the origin of material than the country from which the accession was obtained by the current holder. "Trueness to type" will then be used as the second priority criterion. This was considered useful although any assessment would need to take into account that the fruit genebanks would be expected to contain valuable material which had not been described in any way (e.g. landraces and seedlings) and could therefore not be "verified as true to type". It was suggested that material should therefore be recognized as being either found "true to type" or "genetically unique".

The Chair also highlighted that the inclusion of passport information was important but that the intention of the *Prunus* WG was to insist upon a restricted minimal set of passport data since some passport descriptors were less relevant to the clonally propagated perennial crops. It was generally felt that a first approach would be to consider that MAAs would probably be accessions of varieties which were held in their country of origin. High health status was also suggested as important although it was noted that this should focus on quarantine pests and diseases as it was inevitable that some material would probably hold levels of virus which would be expected to remain practically undetectable. The way to address clones, mutants and "sports" as particular germplasm types was also discussed. It was felt that these should be given lesser priority whilst more genetically diverse material was being considered; however a clear approach to these would be needed in the future.

The conclusion of the discussion was that the Working Group should start making progress toward the development of a European Collection as follows: as a first step, all WG members should consider accessions within their respective collections and identify a set of the most likely candidates to be considered for possible future inclusion in the European Collection. These candidates would be accessions of varieties which were likely to meet most of the criteria, which were clearly known to be of value and to originate in the holding country. These accessions could be used to allow the Group to test the procedure and to allow any further items that required consideration to be identified.

### *Workplan*

- The DB Managers will send to each WG member a standardized form (MCPD format) to be filled in with the obvious accessions of national interest and completed with the requested information concerning priority passport data (**by end May 2013**).
- WG members will return the completed forms to the DB Managers **by end July 2013**.
- The DB Managers, together with the Chair and Vice-Chair, will analyse the data and propose a list of candidate European accessions to the WG **by end September 2013**.

### ***The development of crop-specific standards for Malus and Pyrus***

Jan Engels updated the meeting on the current situation of the generic technical genebank standards that form an integral part of the AEGIS Quality Management System (AQUAS). During the process of developing the generic technical standards for seed germplasm by a number of WGs it was decided to join the FAO Genebank Standards updating process. A number of ECPGR members commented on the draft orthodox seed genebank standards and the Secretariat participated in the Expert Consultation. An advanced draft was discussed by the FAO Commission on Genetic Resources for Food and Agriculture during its meeting in July 2011 and subsequently a revised draft orthodox seeds document was issued, including the evaluation standards suggested by the Commission. This version will be sent to the Intergovernmental Technical Working Group on Plant Genetic Resources for Food and Agriculture of the Commission and can be found on the FAO and AEGIS Web sites. Beside the addition of a section on evaluation standards, the Commission had requested the development of standards on field genebanks and on *in vitro*/cryopreservation of non-orthodox seeds and vegetatively propagated crops. Both first draft documents were

discussed by an Expert Consultation in January 2012 and final drafts will be prepared for the next Technical Working Group meeting, November 2012.

The meeting was informed that the finalized draft field genebank standards, based on the Expert Consultation, will become available soon and that the *Malus/Pyrus* experts (and others) will be asked for comments. It is planned by FAO to submit a final draft to the Technical Working Group during summer 2012 for discussion and guidance to the Commission. It is foreseen that the final draft will be submitted to the Commission for its meeting in April 2013.

Jan Engels shared with the meeting his perception of the methodology followed by the Expert Consultation and indicated that the draft list of field genebank technical standards currently covers the ten technical areas listed below. Examples of the draft texts were provided for the technical standards in sections 3, 4 and 10 (for details see the presentation):

1. Choice of locations,
2. Acquisition of germplasm,
3. **Establishment of field collection,**
4. **Field management,**
5. Regeneration and propagation,
6. Characterization,
7. Evaluation,
8. Documentation,
9. Distribution, and
10. **Security and safety-duplication.**

### ***General discussion and plan of action***

The WG remarked that the draft general standards for the three sections presented by J. Engels made good logical sense, were realistic and useful. However, several members also commented that it was critically important that the final field genebank standards document be short, easy to read and to use in daily work. It was suggested that the document should have the standards presented in the final document at the beginning, to be listed in a logical order and that the necessary explanations regarding the use of the standards be easily accessible.

### ***Workplan***

- The WG will analyse the Commission-approved field genebank standards and decide if and which crop-specific technical standards are required and subsequently, develop these (**within 6 months after the final publication**).

### **How to enhance the efficiency of the *Malus/Pyrus* Working Group?**

The Chair led the discussion on how to ensure progress in implementing the workplan between meetings and invited the Group to suggest solutions for improvement.

The Chair felt that the current system of formal WG meetings held at such long intervals due to ECPGR budget constraints was not convenient. One of the drawbacks is the change in membership from one meeting to the next, making it difficult to develop agreed plans for the future. However, the interim ad hoc meetings had been successful in addressing specific tasks, and increased cost-efficiency had been achieved by linking ad hoc meetings together or to WG meetings to reduce travel costs. It was also observed that significant additional value was gained during this WG meeting through the act of bringing together people with a variety of skills and experience, and it was noted that a number of wider potential

collaborative opportunities in the areas of research around the collections had been developed.

Suggestions included:

- The development of a Web-based collaborative workspace for the WG.
- Taking advantage of international conferences to organize small satellite meetings, in line with specific tasks and task force projects; exploring the possibility for ECPGR to contribute toward the costs of meeting registration.
- Considering the submission of an application to set up a COST Action (this should be coordinated to fit with current applications within the *Prunus* WG).

Regarding operative aspects, it was noted that:

- The WG members' mailing list should be used to disseminate information.
- WG members should provide timely input on agreed actions (e.g. delivery of reports).
- It might be valuable to instigate a system where more regular (e.g. annual) reports or information could be supplied by members and circulated to the Group. Eva Maria Gantar kindly proposed to help the Chair and Vice-Chair in such "keeping aware actions".
- The WG needs to focus on realistic goals, which should also be of value to each of the members in their general work in their respective countries.
- Discussions on descriptors, methodologies to handle synonymy, etc. were seen to be of great value; however, in order to allow better participation of all members in the sometimes lengthy and complex discussions, more background information should be provided on topics on the agenda, well ahead of the meeting.
- Ad hoc meetings organized by the Chair were very effective to solve or make progress on concrete actions. Discussions on descriptors, methodologies to handle synonymy, etc. were seen as being of great value; however, in order to allow better participation of all members in the sometimes lengthy and complex discussions, more background information could be provided on topics on the agenda, well ahead of the meeting.

Widening the scope of the WG's activities and enhancing communication were also discussed:

- The management of the collections and their links with research vary widely within the Group and sharing ideas on wider research opportunities should be encouraged.
- Links among the WG members, and between the WG and other related projects such as Fruit Breedomics, should be enhanced.
- The Chair indicated that there might be opportunities within Fruit Breedomics for a better collaboration between collections' holders and he highlighted elements around the project database (aimed at making data on collections available to breeders); the Fruit Breedomics project aims to better understand the work within collections.
- The WG should be kept informed of annual meetings such as those of Fruit Breedomics and a survey will be organized with a specific questionnaire oriented to the collection Managers.

### *Workplan*

- Gordana Đurić, Henryk Flachowsky, Matthew Ordidge and Marc Lateur will consider the possibility of applying for a COST action (**by end March 2012**).<sup>7</sup>
- The WG Vice-Chair, with support from the ECPGR Secretariat, will set up a mailing list for circulation of documents and information within the Working Group (**by end February 2013**).
- The Vice-Chair will organize, with the help of Eva Maria Gantar and the Chair, an annual consultation of the progress made for each activity of the workplan and provide the WG members with a brief update on key developments (**by end March 2013** and annually thereafter).

### **Conclusion**

There was a wide agreement that the existence of the *Malus/Pyrus* WG meetings is critically important for the European region in order to allow coordination of activities, to stimulate collaboration, to generate synergies and thus to allow an effective conservation and use of *Malus* and *Pyrus* genetic resources in Europe. This can be achieved because the WG is made up of most of the European experts in these fields with knowledge and experience of the necessary procedures and who operate within their respective national contexts; the formal and informal meetings in which the experts participate allow strengthening the sometimes insufficient collaboration, e.g. to identify and formulate jointly new projects and allow new findings to be shared and applied. Given the natural turn-over of members of the WG, these meetings play also a key role in capacity building for junior members and allow them to benefit from such a forum of shared experience and knowledge. The Group proposes to alternate ad hoc specific and technical meetings with the most competent experts and classical WG meetings with an optimal rhythm of every two years (maximum three years).

### ***Presentation and adoption of the recommendations and workplan***

The workplan synthesizing the decisions made at the meeting was proposed to the Group and discussed, allowing each participant to react on the proposed actions, responsibilities and implementation calendar. The draft workplan was adopted by the Group (Annex I).

### ***Election of Chair and Vice-Chair***

Marc Lateur was re-elected as Chair. Bronislovas Gelvonauskis stepped down from his role of Vice-Chair and Dorota Ewa Kruczynska was nominated to replace him. Eva Maria Gantar will provide help for communication within the WG.

### ***Closing remarks***

The Chair congratulated the Group for their particularly fine work spirit that facilitated the good results obtained; he thanked their colleagues from ACW for the excellent – first class - organization of the meeting and the interesting visit to Wädenswil where the participants were shown the research infrastructure and administrative buildings, visited the field collections, glasshouse trials and molecular laboratory, and took part in an interesting juice and brandy tasting session.

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<sup>7</sup> Update at time of publication: A project proposal was developed by the group and submitted but unfortunately failed.





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## Appendix I. Workplan 2012-2013

Activities	Responsibility	Deadline
<b>Characterization and evaluation descriptors for apple and pear</b>		
Finalize the work on apple descriptor lists, integrating the valuable work of Szalatnay (2006)	Task Force composed of: M. Lateur, D. Szalatnay, E. Dapena	Mid-June 2013
Distribute the agreed apple prioritized PDF draft descriptor list to Working Group members for comments	Chair	Mid-June 2013
Send comments on the above to the Chair	All WG members	End August 2013
Compile the comments and circulate the final draft list to WG members for use as a working document until publication of final document; provide the final draft list to the ECPGR Secretariat for uploading on the Web site	Chair	End October 2013
Use the list as a working document until publication of final document	All WG members	(depending on date of final publication)
Explore solutions for publishing the final document in the form of a robust and practical field manual to be used in the evaluation orchards	Task Force composed of: M. Lateur, D. Szalatnay, E. Dapena with support of ECPGR Secretariat	End 2013
Follow the same procedures as above for pear descriptors, taking advantage of the fact that many descriptors and methods are rather similar	Task Force composed of: M. Lateur, D. Szalatnay, E. Dapena with support of ECPGR Secretariat	(same schedule as above; final draft document available by mid-June 2013)
<b>SSR markers for apple and pear and common methodology</b>		
Compile the relevant information on SSR markers across <i>Malus</i> , <i>Pyrus</i> and <i>Prunus</i> and produce a practical manual for publication on the ECPGR Web site	Task force composed of: Henryk Flachowsky (Coordinator), Larissa Gustavsson, Felicidad Fernández, Charles-Eric Durel (contacted by Henryk)	End March 2013
<b>Databases and documentation</b>		
Inform the Database Managers of the release of the updated FAO/Bioversity Multi-crop passport descriptor list	ECPGR Secretariat	As soon as the revised MCPDs are available
Request updates from WG members according to the updated MCPD list	DB Managers	End February 2013

<b>Activities</b>	<b>Responsibility</b>	<b>Deadline</b>
Supply updated accession lists through appropriate channels to the <i>Malus</i> and <i>Pyrus</i> CCDBs and to EURISCO	All WG members	End April 2013
Finalize the upgrading of the <i>Pyrus</i> Database according to the structure of the new <i>Prunus</i> Database	Chair and INRA-Bordeaux (Teresa Barreneche and Emilie Balsemin)	End June 2013
<b>European Fruit books' pomologies</b>		
Circulate the list of pomological references to WG members for comment and addition of further references and Web links to available texts	Chair	End February 2013
Send replies to Chair	WG members	End April 2013
Send the finalized list to the ECPGR Secretariat for uploading on the <i>Malus/Pyrus</i> WG's Web site	Chair	End May 2013
Integrate pomological reference list into the Central Crop Databases to be used for referencing cultivar names	Chair and DB Managers	End June 2013
<b>Synonyms</b>		
<b><i>Workplan for apple and pear</i></b>		
Make the link between Brogdale's synonym DB and the last version of the ECPGR <i>Malus</i> Database and match all the information	<i>Malus</i> DB Manager	End March 2013
Add "preferred name" to the synonym list with the link to the referenced literature compiled by Jacobus Bosschaerts	<i>Malus</i> and <i>Pyrus</i> DB Managers	End March 2013
Add as far as possible the literature source for each already existing synonym name	<i>Pyrus</i> DB Manager	End March 2013
Add the most probable historical country of origin and the most probable date of raising	<i>Malus</i> and <i>Pyrus</i> DB Managers	End March 2013
Send back to the curators their respective lists of apple and pear accessions extracted from the last version of the ECPGR DBs with the added synonyms list, asking the curators to check and validate their list and provide a ranking of synonym names as follows: 1 = Preferred name 2 = Useful or commonly used synonym 3 = No longer used or never heard-of synonym name 4 = Wrong synonym, as checked and confirmed by local experts. If possible, provide the literature source or the link of this "false" synonym to the right cultivars.	<i>Malus</i> and <i>Pyrus</i> DB Managers	End April 2013
Provide responses of ranking to the DB Managers	Curators	End June 2013

<b>Activities</b>	<b>Responsibility</b>	<b>Deadline</b>
Based on their good knowledge of their cultivars and reference books, rank the global quality of the mentioned literature sources according to the following scale: 1 = Mostly reliable information found in the book 2 = Some doubtful information found 3 = Very often doubtful information found and provide ranking to the DB Managers	Experts attending the ad hoc meeting on synonyms, under the coordination of the Chair and DB Managers	End June 2013
Include this information in the respective DBs	<i>Malus</i> and <i>Pyrus</i> DB Managers	September 2013
<b>Enhancement of collaboration within the WG</b>		
Include the list of activities and expertise (already partially completed during the meeting) in the draft report of the meeting	Chair and ECPGR Secretariat	(at time of production of draft report)
Validate and complete the lists for inclusion in final report	WG members and meeting participants	(according to request from Chair/ECPGR Secretariat)
<b>Implementation of AEGIS</b>		
Send to each WG member a standardized form (MCPD format) to be used to list the first accessions of national interest along with priority passport data	DB Managers	End May 2013
Return completed forms to Database Managers	All WG members	End July 2013
Analyse the data and propose a list of candidate European accessions to the WG	DB Managers, Chair, Vice-Chair	End September 2013
<b>Crop-specific standards</b>		
Analyse the Commission-approved field genebank standards and decide if and which crop-specific technical standards are required and subsequently, develop these.	All WG members	Within 6 months after publication of final standards
<b>Enhancement of the efficiency of the <i>Malus/Pyrus</i> Working Group</b>		
Consider the possibility to apply for a COST action	Gordana Đurić, Henryk Flachowsky, Matthew Ordidge and Marc Lateur	End March 2012
Set up a mailing list for circulation of documents and information within the Working Group	Vice-Chair, with support of ECPGR Secretariat	End February 2013
Organize an annual consultation on the progress made for each activity of the workplan and provide the WG members with a brief update on key developments.	Vice-Chair, with the help of Eva Maria Gantar and Chair	End March 2013 and annually thereafter

## Appendix II. Priority ranking of descriptors

N.B. It was decided that all members would start with ranking 1 descriptors related to flowers and fruit characters.

Traits	Traits related to	Apple	Pear
Flowering period	flower	1	1
Intensity of flowering	flower	1	1
Regularity of flowering	flower	3	3
Secondary flowering	flower	3	2
Flower colour	flower	3	3
Pictures	fruit	1	1
Optimal ripening stage	fruit	1	1
Classification harvest maturity	fruit	1	1
Global mean fruit shape	fruit	1	1
Relative fruit size	fruit	1	1
Colour fruit skin ground colour	fruit	1	1
Amount over colour	fruit	1	1
Overcolour of fully mature skin	fruit	1	1
Pattern of overcolour	fruit	3	3
Amount of russet	fruit	1	1
Crowning at apex end of fruit	fruit	2	3
Length of stalk	fruit	2	3
Average number of well formed pips	fruit	2	2
General proportion of fruit shapes	fruit	3	1
Regularity of shape	fruit	3	3
Greasiness	fruit	3	
Aperture of eye	fruit	3	3
Flesh colour	fruit	3	3
Depth of stalk cavity	fruit		1
Thickness of fruit stalk	fruit		3
Angle of the stalk	fruit		3
Stone cells	fruit quality		2
Internal breakdown	fruit quality		2
Musky aroma	fruit quality		2
Firmness (sensorial)	fruit quality	1	?
Global ratio acid/sugar (sensorial)	fruit quality	1	1
Flesh juiciness (sensorial)	fruit quality	1	2
Overall aroma (sensorial)	fruit quality	1	2
Overall fruit quality appreciation (sensorial)	fruit quality	1	1
Firmness (penetrometer)	fruit quality	2	2
Sweetness (refractometer or sensory)	fruit quality	2	2
Sensory analysis acidity	fruit quality	2	2
Crunchiness (sensorial)	fruit quality	2	
Tendency to become mealy (sensorial)	fruit quality	2	
Relative keeping ability after harvest	fruit quality	2	2
Thickness of skin (sensorial)	fruit quality	3	2
Bitterness (sensorial)	fruit quality	3	2

<b>Traits</b>	<b>Traits related to</b>	<b>Apple</b>	<b>Pear</b>
Astringency (sensorial)	fruit quality		1
Relative precocity in production	tree	2	2
Relative productivity	tree	2	2
Tree global architecture	tree	2	2
Type of global fruit bearing habit	tree	2	2
Graft compatibility	tree		2
Scab on leaves	tree disease susceptibility	2	2
Scab on fruits	tree disease susceptibility	2	2
Powdery mildew on shoots and leaves	tree disease susceptibility	2	2
Nectria canker	tree disease susceptibility	2	2
Fire blight	tree disease susceptibility	2	2
Scab on twigs	tree disease susceptibility		2
Pear rust	tree disease susceptibility		2

### Appendix III. Common set of ECPGR SSR markers for *Malus* characterization

(Abstract of the presentation of Felicidad Fernández Fernández, East Malling Research, UK)

- Accessions chosen as a reference set (all maintained at INRA Angers):

- *Malus x domestica*:
  - ‘Delicious’
  - ‘Fiesta’
  - ‘Prima’
  - ‘Worcester Pearmain’
  - ‘Michelin’ (Cider)
  - ‘Malling 9’ (Rootstock)
- *Malus floribunda* 821
- *Malus robusta* 5

- Common set of markers, priority group and linkage groups:

12 SSRs in 3 multiplexes (MPs) designed for a four-dye system in an ABI genetic analyzer that fulfils the following conditions:

- MPs ‘Small’ and ‘Large’ do not overlap in sizes so that they can be pooled for electrophoresis (if PCRs done with standard reagents) or multiplexed all together with SSR-Type it kit (Qiagen)
- MP ‘Medium’ is done separately with either standard or Type-it reagents.

Marker	EMR Dye	EMR MP	Priority group	Linkage group
CH04e05	F	L	1	7
CH02c11	N	L	1	10
CH02c09	P	L	1	15
CH02d08	V	L	1	11
CH04c07	F	S	1	14
CH01h01	N	S	1	17
Hi02c07	P	S	1	1
CH01h10	V	S	1	8
CH01f02	F	M	2	12
GD12	N	M	2	3
GD147	P	M	2	13
CH01f03b	V	M	2	9



- Summary of EMR optimized multiplex protocols.

Malus MP 1 small			Malus MP 2 medium			Malus MP 3 large					
ABI 3100			ABI 3100			ABI 3100					
Componenten (1x mix):			Componenten (1x mix):			Componenten (1x mix):					
		x105			x105			x105			
10x PCR buffer (Invitrogene)	1.25	131.25	10x PCR buffer (Invitrogene)	1.25	131.25	10x PCR buffer (Invitrogene)	1.25	131.25			
MgCl <sub>2</sub> 25mM (Invitrogene)	1.00	105.00	MgCl <sub>2</sub> 25mM (Invitrogene)	1.00	105.00	MgCl <sub>2</sub> (25mM Invitrogene)	1.00	105.00			
dNTP (2.5 mM)	1.00	105.00	dNTP (2.5 mM)	1.00	105.00	dNTP (2.5mM)	1.00	105.00			
CH01h01 F+R (2µM)	NED	0.65	68.25	CH01f02 F+R (2µM)	6-FAM	0.80	84.00	CH04e05 F+R (2µM)	6-FAM	1.10	115.50
CH04c07 F+R (2µM)	6-FAM	1.10	115.50	GD12 F+R (2µM)	NED	0.80	84.00	CH02c11 F+R (2µM)	NED	0.90	94.50
CH01h10 F+R (2µM)	VIC	0.80	84.00	CH01f03b F+R (2µM)	VIC	0.50	52.50	CH02d08 F+R (2µM)	VIC	1.10	115.50
HI02c07 F+R (2µM)	PET	0.50	52.50	GD147 F+R (2µM)	PET	1.00	105.00	CH02c09 F+R (2µM)	PET	1.00	105.00
PTaq 5 U/µl (Invitrogene)		0.05	5.25	PTaq 5 U/µl (Invitrogene)		0.05	5.25	PTaq (5 U/µl Invitrogene)		0.05	5.25
dWater		3.65	383.25	dWater		3.60	378.00	dWater		2.60	273.00
Total		10.00	1050.00	Total		10.00	1050.00	Total		10.00	1050.00
DNA (2.5 ng/µl)		2.50	12.50	DNA (2.5 ng/µl)		2.50	12.50	DNA (2.5ng/µl)		2.50	12.50
TD-SSR PROGRAMME			TD-SSR PROGRAMME			TD-SSR PROGRAMME					
94°C	3 min		94°C	3 min		94°C	3 min				
94°C	30 s		94°C	30 s		94°C	30 s				
60-50°C▼-1.0°C/Cycle	90 s	x10	60-50°C▼-1.0°C/Cycle	90 s	x10	60-50°C▼-1.0°C/Cycle	90 s	x10			
72°C	60 s		72°C	60 s		72°C	60 s				
94°C	30 s		94°C	30 s		94°C	30 s				
50°C	90 s	x25	50°C	90 s	x25	50°C	90 s	x25			
72°C	60 s		72°C	60 s		72°C	60 s				
60°C	30 min		60°C	30 min		60°C	30 min				
10°C	hold		10°C	hold		10°C	hold				

- EMR's results obtained with the 3 MPs on the *Malus* reference cultivars:

Malus MP1 small	Malus MP2 medium	Malus MP3 large
<b>CH01h01</b>	<b>CH01f02</b>	<b>CH02c09</b>
Delicious 115	Delicious 178 182	Delicious 244 254
Fiesta 117 129	Fiesta 180 203	Fiesta 232 248
Malling_9 113 119	Malling_9 168 170	Malling_9 244
Michelin 119 125	Michelin 182	Michelin 240 250
M_floribunda_821 103 137	M_floribunda_821 174 178	M_floribunda_821 230 250
M_robusta_5 86 97	M_robusta_5 174 178	M_robusta_5 247
Prima 113 117	Prima 178 205	Prima 232 242
Worcester_Pearmain 111 129	Worcester_Pearmain 186 205	Worcester_Pearmain 232 244
<b>CH01h10</b>	<b>CH01f03b</b>	<b>CH02c11</b>
Delicious 88 96	Delicious 136 178	Delicious 205 231
Fiesta 96	Fiesta 158 170	Fiesta 215 227
Malling_9 96 113	Malling_9 158 170	Malling_9 213 233
Michelin 96 103	Michelin 170	Michelin 229
M_floribunda_821 101 109	M_floribunda_821 148	M_floribunda_821 221 225
M_robusta_5 86 109	M_robusta_5 170	M_robusta_5 203 217
Prima 88 96	Prima 136 158	Prima 227 231
Worcester_Pearmain 96 101	Worcester_Pearmain 136 170	Worcester_Pearmain 221 225
<b>CH04c07</b>	<b>GD12</b>	<b>CH02d08</b>
Delicious 118 133	Delicious 147 153	Delicious 210 216
Fiesta 106 112	Fiesta 148	Fiesta 224 254
Malling_9 106 114 129	Malling_9 148 160	Malling_9 212 254
Michelin 112	Michelin 138 148	Michelin 210 246
M_floribunda_821 108	M_floribunda_821 148 172	M_floribunda_821 214 218
M_robusta_5 106 109	M_robusta_5 150 151	M_robusta_5 210 212
Prima 104 106	Prima 182 190	Prima 254
Worcester_Pearmain 108 110	Worcester_Pearmain 148	Worcester_Pearmain 210 250
<b>HI02c07</b>	<b>GD147</b>	<b>CH04e05</b>
Delicious 114 116	Delicious 137 152	Delicious 173 202
Fiesta 116 151	Fiesta 145 150	Fiesta 199 226
Malling_9 116	Malling_9 139 152	Malling_9 197 220
Michelin 116	Michelin 137	Michelin 200
M_floribunda_821 114 136	M_floribunda_821 123	M_floribunda_821 187 197
M_robusta_5 116 118	M_robusta_5 145 150	M_robusta_5 181
Prima 110 118	Prima 131 150	Prima 173 208
Worcester_Pearmain 114 151	Worcester_Pearmain 137 150	Worcester_Pearmain 173 200





## Appendix V. Acronyms and abbreviations

ACW	Agroscope Changins-Wädenswil, Switzerland
AEGIS	A European Genebank Integrated System
AQUAS	AEGIS Quality System
C&E	Characterization and evaluation
CCDB	Central Crop Database
CPVO	Community Plant Variety Office
CRA-W	Centre wallon de Recherches Agronomiques (Walloon Agricultural Research Centre), Gembloux, Belgium
CRRG	Centre régional de ressources génétiques du Nord/Pas de Calais (Regional centre for genetic resources), Villeneuve d'Ascq, France
CWR	Crop Wild Relative
DB	Database
EC	European Commission
ECPGR	European Cooperative Programme for Plant Genetic Resources
EMR	East Malling Research, UK
EU	European Union
EUCARPIA	European Association for Research on Plant Breeding
EURISCO	European Internet Search Catalogue
ExCo	Executive Committee
FAO	Food and Agriculture Organization of the United Nations, Rome, Italy
IBPGR	International Board for Plant Genetic Resources ( <i>now Bioversity International</i> )
IBV	Information and Coordination Centre for Biological Diversity, Germany
INRA	Institut national de la recherche agronomique (National Agronomic Research Institute), France
IPGRI	International Plant Genetic Resources Institute ( <i>now Bioversity International</i> )
JKI	Julius Kühn-Institute, Quedlinburg, Germany
MAA	Most Appropriate Accession ( <i>for AEGIS</i> )
MCPD	Multi-crop passport descriptors
MoU	Memorandum of Understanding
NC	National Coordinator
PGRFA	Plant genetic resources for food and agriculture
SC	Steering Committee
SSR	Simple sequence repeat
UPOV	Union internationale pour la protection des obtentions végétales (International Union for the Protection of New Varieties of Plants), Geneva, Switzerland
VIR	N.I. Vavilov Research Institute of Plant Industry, St Petersburg, Russian Federation
WG	Working Group

## Appendix VI. Agenda

**Ad hoc meeting on Fruit synonyms  
Ad hoc meeting on Descriptors  
Fourth Meeting of the ECPGR Working Group on Malus/Pyrus  
5-9 March 2012, Weggis, Switzerland**

### Sunday, 4 March

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Arrival of participants for meeting on Fruit synonyms

### Monday, 5 March – Ad hoc meeting on Fruit synonyms

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- 08:30 Introduction**
- Objectives of the meeting and presentation of the general methodologies applied on pear and on apple (*M. Lateur and M. Ordidge*)
  - Presentation of the results already achieved on pear and start of the validation procedure (*M. Lateur*)
- 10:00 *Coffee break*
- 10:20** • Validation of the list of pear synonyms and solving the pending problems
- 12:30 *Lunch*
- 13:45 List of apple synonyms**
- Presentation of the draft list of apple synonyms (*M. Ordidge*)
  - Discussion and establishment of the list of apple synonyms
- 15:00 *Coffee break*
- 15:20 Continuation**

Arrival of other participants in meeting on Descriptors and WG meeting

### Tuesday, 6 March (morning) – Ad hoc meeting on Descriptors

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- 8:30**
- **Use of SSRs as apple and pear identification tools**  
Presentation of the compiled lists of ranked SSRs and control cultivars: results of the ECPGR ad hoc meeting (December 2006, EMRS, UK) and further validation procedures (*H. Flachowsky, on behalf of F. Fernández Fernández*)
  - **Presentation of the document on apple and pear descriptor lists for characterization and evaluation** (*M. Lateur*)  
Review of the descriptors, discussion, validation and definition of a priority ranking of descriptors
- 10:00 *Coffee break*
- 10:20 Continuation**
- 12:30 *Lunch*

**Tuesday, 6 March (afternoon) – Fourth Meeting of the *Malus/Pyrus* Working Group**

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**13:45 Introduction**

- Opening and welcome addresses (*M. Lateur, Chair; M. Kellerhals, host*)
- ECPGR update (*J. Engels*)
- AEGIS update (*J. Engels*)
- Report of the Chairperson (*M. Lateur*)
- Introduction of participants
- Presentation of the agenda

15:00 *Coffee break*

**15:20 Phenotypic characterization and evaluation of *Malus/Pyrus* collections**

- Presentation and validation by the group of the pre-validated list of phenotypic descriptors for apple and pear adopted during the ad hoc meeting

Evening • Activities related to fruit genetic resources in the Rigi area (*W. Amgarten, Vitznau*)

**Wednesday, 7 March – Fourth Meeting of the *Malus/Pyrus* Working Group (cont.)**

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**08:30 Phenotypic characterization and evaluation of *Malus/Pyrus* collections (continued)**

- Presentation of the validated ranked list of SSR markers for apple and pear and common methodology

**Databases and documentation**

- Update of the *Malus* CCDB (*M. Ordidge*)
- Update of the *Pyrus* CCDB (*M. Lateur*)
- Documentation of old reference pomological literature: synthesis of a European survey and proposed common acronyms (*M. Lateur and I. Hjalmarsson*)
- Perspectives of the further development of the *Malus* and *Pyrus* Databases and EURISCO (*general discussion introduced by J. Engels and M. Lateur*)

10:00 *Coffee break*

**10:20 Presentation of the ad hoc work on synonyms on apple and pear**

- Introduction and validation procedure of the most important synonyms lists
- Presentation of the further workplan

12:30 *Lunch*

**13:45 Implementation of characterization, evaluation and utilization of the collections (*oral presentations: 15 min + 5 min questions*)**

- Evaluation and utilization of apple and pear collections in Belarus (*Z. Kozlovskaya*)
- Status of apple and pear Genetic Resources in Armenia (*H. Hovhannisyan*)
- Update on *Malus/Pyrus* genetic resources in Sweden 2012 (*I. Hjalmarsson*)
- Work on *Malus/Pyrus* in Bosnia and Herzegovina (*G. Đurić*)
- Old and local Israeli accessions of *Pyrus* and *Malus* in Israel (*D. Holland*)
- Characterization and use of *Malus* and *Pyrus* genetic resources in Lithuania (*B. Gelvonauskis*)

15:00 *Coffee break*

**15:20 Implementation of characterization, evaluation and utilization of the collections (*continued*)**

- *Malus/Pyrus* Romanian germplasm fund and its use in the breeding programme (*M. Militaru*)
- Description of pome fruit genetic resources in Switzerland (*M. Kellerhals, K. Hunziker, S. Noser and D. Szalatnay*)
- Activities on fruit tree genetic resources in Montenegro (*B. Lazovic*)
- BIODIMESTICA, an INTERREG IV project aiming at a more dynamic management of our local old fruit biodiversity (*M. Lateur*)
- General discussion and setting up of priority rules for the WG

**Collecting activities**

- Joint JKI/VIR expedition to Caucasus in 2011 to collect genotypes of *Malus orientalis*, *Prunus cerasifera*, *Pyrus caucasica* and *Fragaria vesca* (*H. Flachowsky, V. Hanke and M. Höfer*)

**Technical or scientific contributions**

- EU FP7 Fruit Breedomics project and FGR (*M. Lateur*)

**Thursday, 8 March – Fourth Meeting of the *Malus/Pyrus* Working Group (cont.)**

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**08:30 Experiences on “National Collection” concept<sup>8</sup>; strategies and actions for durable conservation of collections**

- German National Fruit Genebank (*H. Flachowsky*)
- Apple conservation work in Ireland (*J. Choiseul*)
- State of *Malus/Pyrus* collections in Italy (*M. Bergamaschi*)
- Conservation of pome fruit genetic resources in Switzerland (*M. Kellerhals and H. Kreis*)
- Update of apple and pear National Collections of Spain (*E. Dapena*)
- What can we learn from the experience of setting up a network of repository orchards? (*M. Lateur*)

10:00 *Coffee break*

**10:20** • General discussion and setting up of priority rules for the WG**The *Malus/Pyrus* Working Group and implementing AEGIS**

- The establishment of the European Collection (*Jan Engels*)
- Criteria for selection of accessions of *Malus* and *Pyrus* + How to integrate quality and quarantine pest and disease risks? (*M. Lateur*)
- The development of crop-specific standards for *Malus* and *Pyrus* (*Jan Engels*)
- Discussion and plan of action

12:30 *Lunch*

*Afternoon* **Excursion by bus to Wädenswil**

*Presentation of field collections, glasshouse trials (breeding, genetic resources), molecular lab and juice and brandy evaluation.*

*Evening* *Social dinner in Wädenswil and return by bus to Weggis*

**Friday, 9 March – Fourth Meeting of the *Malus/Pyrus* Working Group (final session)**

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**08:30 How to enhance the efficiency of the *Malus/Pyrus* WG?** (*Chaired by J. Engels and M. Ordidge*)

- Discussion and establishment of workplan
- How to ensure progress in the workplan during the time between two WG meetings? Examples of solutions and adoption of new work methods

10:00 *Coffee break*

**10:20 Conclusion**

- Presentation and adoption of the recommendations
- Election of Chair and Vice-Chair
- Closing remarks

12:30 *Lunch*

Departure of participants

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<sup>8</sup> See National Management Models for Fruit Genebanks (<http://www.ecpgr.cgiar.org/networks/fruit.html>)

**Appendix VII. List of participants**

**Ad hoc meeting on Fruit synonyms  
Ad hoc meeting on Descriptors  
Fourth Meeting of the ECPGR Working Group on Malus/Pyrus  
5-9 March 2012, Weggis, Switzerland**

*N.B. Contact details of participants updated at the time of publication. The composition of the Working Group is subject to changes. The full list, constantly updated, is available from the Malus/Pyrus WG's Web page (<http://www.ecpgr.cgiar.org/networks/fruit/maluspyrus.html>).*

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