

Beta Working Group

Beta Working Group progress during the first part of Phase IX (2014-2015)

Working group members

The *Beta* Working Group consists of 47 members listed below:

Mr Ndoc Faslja (Albania), Mr Ledion Salillari (Albania), Mr Andreas Melikyan (Armenia), Mr Wolfgang Kainz (Austria), Mr Paul Freudenthaler (Austria), Ms Vusala Izzatullayeva (Azerbaijan), Mr Dmitryj Lushinskij (Belarus), Ms Anna Vasko (Belarus), Ms Svetlana Melentjeva (Belarus), Ms Nadzeya Lis (Belarus), Mr Stanislau Grib (Belarus), Mr Angelos Kyratzis (Cyprus), Mr Gert Bundgaard Poulsen (Denmark), Mr Bruno Desprez (France), Mr Guram Aleksidze (Georgia), Ms Ulrike Lohwasser (Germany), Mr Lothar Frese (Germany), Ms Parthenopi Ralli (Chair of the WG) (Greece), Mr Lajos Horváth (Hungary), Mr Lajos Horváth, Jr (Hungary), Mr Dermot Grogan (Ireland), Mr Tzion Fahima (Israel), Mr Piergiorgio Stevanato (Italy), Ms Rasa Karklelienė (Lithuania), Ms Asta Blažytė (Lithuania), Ms Kamilla Kuzdowicz (Poland), Mr Marcin Zaczyński (Poland), Mr Miguel Angelo Carvalho (Portugal), Ms Maria Cristina Duarte (Portugal), Mr Humberto Nóbrega (Portugal), Mr Benvindo Martins Maçãs (Portugal), Ms Dana Constantinovici (Romania), Mr Ioan Gherman (Romania), Ms Silvia Străjeru (Romania), Mr Valentin Burenin (Russian Federation), Mr Živko Čurčić (Serbia), Mr Mihajo Ćirić (Serbia), Ms Anna Palmé (Sweden), Ms Annette Hägnfelt (Sweden), Mr Kjell-Åke Lundblad (Sweden), Mr Jens Weibull (Sweden), Ms Christina Kägi (Switzerland), Mr Markus Hardegger (Switzerland), Mr Christian Eigenmann (Switzerland), Mr Stanislav Orlov (Ukraine), Mr Nigel Maxted (United Kingdom), Ms Charlotte Allender (United Kingdom).

A.1. AEGIS-related tasks

1. Crop Conservation Workplan

In consultation with the WG members, develop at the beginning of each Phase a Crop Conservation Workplan, to be implemented with in-kind contributions and/or ECPGR funds. This Workplan should be based on various sources of information, including: a) the Phase Activity Plans elaborated by the AEGIS Associate Members and aggregated in a crop-wise fashion by the Secretariat; b) the composition of the current European Collection as available from the AEGIS website; c) the Genebank Operational Manuals and the agreed technical standards. This Workplan entails addressing the following aspects:

- a. identifying gaps or redundancies in the European Collection;
- b. promoting inclusion of valuable accessions into the European Collection;
- c. monitoring implementation of genebank standards;
- d. setting priorities for characterization/evaluation;
- e. setting priorities for regeneration;
- f. sharing responsibilities for any of the above-mentioned tasks;
- g. any other aspect that can improve the quality, efficiency and utilization of the Collection.

Regarding the abovementioned AEGIS-related tasks we can report the following:

- *In the framework of the different research projects the group contributed to the objectives of the ECPGR and AEGIS. In particular, during the “Genetic diversity of Patellifolia species (GeDiPa)” project geographic gaps in the European Collection of Patellifolia accessions were identified and collection trips took place to close gaps. A set of polymorphic SSR marker were developed suited to characterize genetic diversity of Patellifolia species. The set will allow for the rationale selection of MAA for AEGIS. The AKER project proposed to identify accessions that would contain rare alleles of interest to widen the genetic diversity in elite germplasm thanks to genetic resources. For this purpose a collection of genetic resources coming from the different Data base and Networks around the world was gathered and a core collection was selected. Dense molecular mapping and sequencing were carried out to help core collection selection and monitor diversity in order to estimate and exploit the available genetic diversity better.*
- *Generally there was a slow rate in the inclusion of accessions in the European Collection.*
- *The Secretariat contacted the Working Group Chair to verify the formal acceptance of the FAO Genebank Standards for PGRFA and/or to provide crop-specific standards. The chair indicated few modifications and additions made to meet the WG own needs, according to the crop specificities and the first draft of the Crop-specific genebank standards for orthodox seeds for Beta and Patellifolia species was prepared for circulation to the Beta Working Group.*
- *The Julius Kühn-Institut (JKI) is still operating the International Data Base for Beet (IDBB). The mission of (IDBB) is to promote the conservation, management and sustainable use of plant genetic resources of beets (Patellifolia, Beta). The IDBB is a joint undertaking of an international group of curators, researchers and users of beet germplasm. This internet site provides access to information systems suited to support the development of a complementary conservation programme for Beta and Patellifolia. The IDBB is an inventory of ex situ accessions maintained in an international, decentralized network of gene banks. This information system allows the search for passport, characterization and evaluation data on gene bank accessions. The crop specific Population Level Information System ([CWRIS-AEGRO-PLIS](#)) and Genetic Reserve Information System ([GenResIS](#)) provide access to information on plant occurrences observed in the ecosystems and natural habitats where they have developed their distinctive properties.*
- *An updated version of the Seed increase protocol for Beta and Patellifolia species, written in 1996, was developed and published on line (November 2014) (http://www.ecpgr.cgiar.org/fileadmin/templates/ecpgr.org/upload/WG_UPLO ADS_PHASE_IX/BETA/SEEDINCR-UpdatedVersion2014.pdf).*
- *A research note on Corollinae species (GeDiBelo) was developed and could be a starting point for a joint action or a research project similar to GeDiPa.*

2. Oversight of Associate Members’ European Collection management

Make a critical technical assessment of annual reports for a given crop genepool, provided by the Secretariat upon consolidation of Associate Members’ reports. The

WG Chair is expected to make suggestions, in consultation with the Secretariat, on possible corrective measures, capacity building activities and/or collaborations with identified Associate Members.

A.2. Other tasks

- 3. Provide information** to the WG members on ECPGR events and mode of operation, on a need or request basis.

The project on “Genetic diversity of Patellifolia species (GeDiPa)” started with a project coordinating meeting in Madrid, Spain on the 17th of February 2015. Members of the Working Group on Beta and the Working Group on Wild Species Conservation in Genetic Reserves participated in the meeting.

- 4. Orchestrate the know-how available in the pool of experts** for a given crop genepool to resolve specific technical issues that might evolve as part of the operation of the WG or that are being raised by Associate Members as part of the management of the European Collection.

A primer note entitled “Functional SSR markers for the genus Patellifolia derived from P. procumbens (Chenopodiaceae) genomic sequences” was prepared for publication. After submission and acceptance of the publication, the SSR will be available to the pool of experts.

- 5. Initiate and coordinate the preparation of project ideas and proposals** for funding from the competitive ECPGR funding scheme and/or from other sources. The WG Chair will also be responsible for the timely submission of the proposals to the Executive Committee (ExCo).

Many activities of the WG were carried out within the framework of different projects.

- The project on “Genetic diversity of Patellifolia species (GeDiPa)”, submitted by the Beta and Wild Species Conservation in Genetic Reserves Working Groups for funding under the ECPGR Activity Grant Scheme (Phase IX) in 2014, was selected for funding. Lothar Frese (former chair of the Beta WG) is the activity coordinator. The project was selected by the Executive Committee, started in February 2015 and will be completed in December 2016. The first results are included in the Interim Activity Report (covering the period February-December 2015) which is available online from the GeDiPa webpage (<http://www.ecpgr.cgiar.org/working-groups/beta/gedipa/>). The action aims at a better understanding of the spatial distribution of genetic diversity within the genus Patellifolia, the establishment of taxonomic standard accessions as well as the identification of MAAs for AEGIS and to (re)visit sites recommended for the establishment of genetic reserves by the AEGRO project team.*
- The 8-year AKER programme launched in September 2012, and is supported by 11 partners, government agencies and private operators in the French sugar beet sector dealing with the management of genetic resources in the Genus Beta. Research Project Coordinator is Dr Christian Huyghe (INRA's Deputy Scientific Director - Agriculture) and Bruno Desprez (CEO of Florimond Desprez, and member of the WG) is the President of the Coordinating Committee. The AKER*

programme aims to improve the competitiveness of sugar beet in France by 2020 by doubling the annual increase in sugar yield / hectare. It will first expand the genetic variability of sugar beet by providing a collection of genes from resources around the world. Then it will exploit the AKER genetic material obtained by crossing with elite sugar beet, to produce new varieties with high potential for use by the sugar beet industry (<http://www.aker-betterave.fr/en/press/press-release/85-launch-of-the-aker-programme-to-improve-the-competitiveness-of-sugar-beet-in-france>). Year 2013 has been however very reach in producing first results for AKER. This 2013 year can be considered as being successful in the main "Go-no Go" step of the project: an important hypothesis was effectively that few plants could recover a high percentage of genetic variability in the genus Beta. As far as a lot of molecular markers were used to check this hypothesis, looking at the results, we can now consider that excluding cultivated beet variability, a core collection of 15 individuals seems to be enough to represent a maximum allelic diversity over the 10,000 accessions collected from World Gene Banks. Out of rare alleles, 100% of the genetic variability seems to be included in that core collection. This is indubitably an important new concept for Genetic Resources management. Considering all the other research aspects including back-crossing with elite lines, exploring genomic selection, phenotyping improvement, etc, a lot of experiments has been also implemented, with sometimes anticipating timelines but never delay. AKER programme is now also entering into collaborative programs such as ADAPT. ADAPT is considering landscape genomics as an approach of using Beta Genetic Resources to better understand connection between molecular markers and local adaptation of wild beet (Andrello et al, 2015). Another collaboration programme with USDA and Rovigo Institute, named BE DOMINO is also considering Genetic Resources and their impact in sugar beet Breeding. Some approaches are considering the variety release and compare them genetically to wild accessions. The aim is to follow domestication process and also impact of Genetic Resources in the sugar beet history. Some special care is also taken on observing genes which are used in Breeding (Rhizomania resistance, Nematode resistance, etc), and come from wild origin. New sources of alleles from wild are also tracked. A DNA chip made from wild and cultivated beet SNPs is under production and used for all these studies.

- Lothar Frese and Lorenz Bülow submitted an application for the COST Action entitled "European infrastructure components for research on conservation and utilization of sugar beet genetic resources" in 2014 in order to establish an open and flexible network addressing needs of breeding scientists and aspects of sustainable use of beet PGR, but the project was unsuccessful. The proposal was submitted with, inter alia, the objective to develop strengthen and improve the International Data Base for Beta (IDBB).
- Other WG members were able to submit as coordinators or take part to several international projects.

6. Coordinate ECPGR-related activities for the crop genepool(s) that fall under the responsibility of the respective WG.

This goal was achieved as required through correspondence.

7. Contribute to the relevant sections of the ECPGR annual reports and reports to the Steering Committee when prompted by the Secretariat, providing accounts on

progress made, including an assessment of what has and has not been achieved considering the crop genepool Phase strategy and workplan, identifying the constraints in reaching the planned objectives.

Contributions were made as requested.

Publications produced by the Beta WG members in 2014/15

Peer Reviewed Articles

Stevanato, P., Trebbi, D., Panella, L., Richardson, K., Broccanello, C., Pakish, L., Fenwick, A.L., Saccomani, M. 2014. Identification and Validation of a SNP Marker Linked to the Gene HsBvm-1 for Nematode Resistance in Sugar Beet. Plant Mol Biol Rep, DOI 10.1007/s11105-014-0763-8.

Andrello, M., Henry, K., Devaux, P., Desprez, B., Manel, S. 2015. Taxonomic, spatial and adaptive genetic variation of Beta section Beta. Theor Appl Genet, DOI 10.1007/s00122-015-2625-7.

Litwiniec, A., Goška, M., Choińska, B., Kuźdowicz, K., Łukanowski, A., Skibowska, B. 2015. Evaluation of rhizomania-resistance segregating sequences and overall genetic diversity pattern among selected accessions of Beta and Patellifolia. Potential implications of breeding for genetic bottlenecks in terms of rhizomania resistance. Euphytica, DOI 10.1007/s10681-015-1570-5.

National activities

- *Using funding obtained from the EC FP7 project PGR Secure, Hannah Fielder (supervised by Nigel Maxted) undertook an analysis of CWR diversity across the UK and highlighted in situ and ex situ conservation priorities. This included working with Natural England (English national conservation agency) to establish the first UK genetic reserve for CWR taxa on the Lizard peninsula in the extreme Southwest of England. A priority taxon within the genetic analysis and conservation action was Beta vulgaris subsp. maritima, which is now actively conserved on the Lizard and seed samples deposited in the Millennium Seed Bank.*
- *The Federal Ministry of Food and Agriculture, Germany (BMEL) launched a PhD funding programme for research in the field of Global Food Security in 2015. On request of the BMEL the Institute for Breeding Research on Agricultural Crops of the JKI submitted together with the Jaramogi Oginga Odinga University of Science and Technology (JOUST), Bondo, Kenya a project proposal entitled “Improving the nutritional quality of Kenyan Swiss chard by tapping European genetic resources (Switch)”. The project aimed to analyze inter alia the genetic diversity of Swiss chard genebank accessions. Unfortunately, the proposal was not selected for unknown reasons.*