

ECPGR Cereals Network

Working Group on Wheat

Project proposal for ECPGR Phase VIII

Project proposal for capacity building for the conservation of precise genetic stocks

Background and justification

The polyploid nature of *Triticum aestivum*, *T. turgidum* and other *Triticum* species has opened opportunities to develop basic resources for genetic analysis which are so crucial to advancement of research and genetic improvement of the crop. Indeed it has been extensively exploited to develop sets of lines through genomic manipulation to give a range of different types of stocks including intervarietal and interspecific translocations, chromosome and chromosome arm additions and deletions, chromosome and alien substitution – addition lines, mono- and polysomic series, point and other mutations, and synthetics involving species within the Triticeae. While this process has been more extensively developed in wheat, some types of genetics stocks have also been developed in barley and oat. These stocks have been essential to the development and understanding of the genetics of a polyploid species like wheat and have had significant impacts on wheat science and applied breeding worldwide for many decades. These genetic stocks will continue to be important for resistance breeding for abiotic and biotic traits associated with climate change. A survey for the preparation of the global wheat conservation strategy indicated that clients of wheat germplasm collections cited the conservation of wheat genetic stocks as a high priority. The issue also arose independently in the global barley conservation strategy and coordination in this area was also initiated.

These genetic stocks are the result of years of cytogenetic investigation. Proper recording and verification of the genetic descriptions and characterizations of these stocks can be problematic. Many of these stocks are prone to chromosomal instability and so require special conditions for the proper regeneration of genetically sound germplasm, including cytogenetic observation on individual regenerated plants. It is widely acknowledged that such specialist skills are becoming scarce as training in this area is no longer provided as part of the general undergraduate level training and the skills now reside in an alarmingly few centres in older staff where there is often inadequate successional management. These valuable wheat genetic stocks are often conserved under less than optimal conditions, often to-this-day in the laboratories, or the successor laboratories, of the original developer cytogeneticists. **Many of these stocks are thus in danger!**

Many stocks remain in private collections, their existence hidden, and their value to science and breeding obscured. Finally, due to the intimate relationship between the scientist and the wheat genetic stock germplasm they develop, full and proper recognition of intellectual oversight and ownership of this germplasm is particularly critical.

These genetic stocks can be classified in three categories:

- Conventional material including mapping populations (DH or RIL), isogenic lines for key genes, mutant population (TILLING populations) and mutant isogenics. The regeneration of this type of material needs selfing under bags and is thus time and labour consuming and results in an only very limited amount of seeds available for distribution.
- Material with alien chromatin including synthetics, amphiploids, alien additions, substitutions and translocations as well as alloplasmic lines. Precautions have to be taken during the regeneration of this not always very fertile material and self pollination has to be carried out. In some cases, chromosome verification or counts are necessary.

- Aneuploids, including deletion lines, monosomics, ditelocentrics, double ditelocentrics, isochromosomes, trisomics, tetrasomics, nulli-tetrasomics, single chromosome substitution lines, recombinant chromosome substitution lines and intra-varietal translocation lines. The regeneration of this type of material necessitates very often cytogenetic observations and can only be carried out by specialised laboratories.

From an informal survey carried out for the wheat conservation strategy collections of precise genetic stocks, stocks were identified in 8 European countries but significant repositories in other European countries have not responded yet.

While these stocks represent a special category of stocks, they are not just maintained by specialist laboratories, as a number of key collections throughout Europe include holding of this type in their general holdings. The passport data for such material is markedly different to that of cultivars, landraces and breeders lines and so the Multi-Crop Passport Descriptors used in compiling the ECPGR Central Crop Databases and EURISCO fail to adequately address and describe such material. At the present time this represents a serious omission within existing cataloguing efforts that is recognised but has, to date, not been tackled directly. Because of the extensive range of these stocks that have been developed for wheat, we feel time is now becoming pressing to try to address this oversight and to try to develop a coherent strategy for the future conservation and management of such resources and this is an activity in which the ECPGR Wheat Working Group can play a lead role.

The ECPGR wheat working group during its meeting in Foça, Turkey (April 21 – 24.2008) decided to create a subgroup with the following tasks

- Contact other relevant networks which specifically deal with such stocks (EWAC, ITMI, CPI) and compile an inventory of current stocks available and where they are maintained
- Discuss with molecular geneticists as to which classes of stocks will continue to be of use in the future and where a priority actions should be focused
- Produce a report for the next wheat working group meeting on the inventory of stocks in the public domain which are freely available and future options.

Objectives of the project

- To develop an overview of the current status of precise genetic stocks within Europe and internationally with a view to their future conservation
- To identify and prioritise which types of precise genetic stocks are of most value now and in the future to know where efforts are most needed.
- To identify the requirements for capacity building with respect to "precise genetic stocks" in the Plant Genetic Resources community in Europe.
- To work with others in the development of appropriate passport database fields for these stocks with a view to developing a European and possibly an International catalogue.
- Identification of genebanks which may engage the long term conservation of such material and key laboratories for short term training (in particular for material which need cytogenetic observations for identification and regeneration)
- Link with the subgroup of the wheat working group. This subgroup will carry out their mandate as input in kind for the ECPGR wheat working group.

Workplan

- The project can be carried out once the inventory and the discussion as to which precise genetic stocks to conserve have been completed.

- 2010. Identification of a genebank or genebanks willing to assure the long term conservation of precise genetic stocks, in particular material which needs cytogenetic observations.
- 2010 or 2011 – Basic cytogenetic training in key laboratories of representatives from one or two selected genebanks interested in genetic stocks conservation.

Milestones

12.2009 Inventory of the current stocks available (by the WWG subgroup)
6.2010 Identification of genetic stocks worthwhile to conserve (by the Wheat subgroup)
12.2010 Training for long term conservation

Administration

The project will be carried out under the responsibility of the members of the subgroup precise genetic stocks of the wheat working group. Contact person: Gert Kleijer

Participants

Mike Ambrose, UK <mike.ambrose@bbsrc.ac.uk>
Alvina Avagyan, Armenia <alvinaav@hotmail.com>
Iva Faberová <faberova@vurv.cz>
François Balfourier, France <balfour@clermont.inra.fr>
Eitan Millet, Israel <eitan.millet@weizmann.ac.il>
Morten Rasmussen, NordGen <morten.rasmussen@nordgen.org>