

AEGIS project proposal:

Improving the prerequisites for a European rye collection

1. Problem statement

The ECPGR European Secale Database (ESDB) lists 13707 Secale accessions from 25 countries (http://www.ihar.edu.pl/gene_bank/secale/secale.html). It is desirable to better understand the extent of diversity of this material and to improve communication among the holders of this diversity. The goal of this project is to initiate closer cooperation on rye germplasm by (1) Updating the European Secale database (ESDB); (2) Update of rye descriptors and list of proposed standards for rye regeneration, characterization and seed storage with focus on cultivated species; (3) List unique genotypes proposed as European Accessions; (4) List of “duplicate groups” where selection criteria should be applied to define MAA; (5) propose recommendations of the group regarding appropriate next steps for the inclusion of MAA into the European Collection. The starting point is to activate this work among the countries bordering the Baltic Sea, because the role of rye in human nutrition is particularly important in this region. A workshop will be held in Poland in 2011 to strengthen the network, facilitate communication and produce outcomes.

2. Justification and rationale

Rye has two challenging features regarding its germplasm conservation: In contrast to most other cereals it is an outcrossing species. Plant breeding activities have been concentrated during the recent years. Rye is a very important crop especially in the Baltic Sea region, both as a stable part of traditional diet, and also with a large potential for development of healthy food due to the dietary fibers. Its low input feature may become very relevant when facing climate change. Rye has importance as genetic resource for improvement of Triticale varieties, a crop of increasing relevance in several countries. As there is no formal working group for rye within the ECPGR system, it makes sense to strengthen the cooperation among countries concerned about rye diversity preservation for future use. It is needed to agree among gene banks on standards for securing the genetic integrity during germplasm regeneration of rye and to formulate regeneration guidelines. The pollination biology makes it necessary to isolate populations from each other during regeneration and different techniques can be used to do so. For defining the Most Appropriate Accession of a given rye population it is necessary to complete that passport data documentation in the ESDB. However, it will be necessary to go beyond the comparison of passport data. Morphological characterization based on standard descriptors may not provide sufficient information to identify and to distinguish populations. It is unclear, to which extent a morphological description of germplasm has been completed in the different gene banks. Other methods may need to be employed for delimitation of rye populations. The pollination biology of rye causes more plasticity within rye accession than in self-pollinating cereals. For developing a common European strategy in rye germplasm conservation it is of great importance to share the insights at different gene banks into these questions. A critical issue to be discussed are the intra-accession population dynamics in the context of defining Most Appropriate Accessions in rye.

3. Background

A recent workshop entitled “Baltic Sea Network for Management and Conservation of Plant Genetic Resources” held in Tallinn, Estonia, Nov. 30 and Dec. 01, 2010, included in a short discussion of rye germplasm conservation and utilization in this region. Rye is a crop of specific importance for human consumption within the Baltic region. More than 90% of the world

production of rye occurs in Europe and within Europe the north eastern region surrounding the Baltic Sea produces most rye (FAO, 2010). The European rye production used to be a crop typical on poor soils. Recently, F1-hybrid cultivars have been developed, resulting in higher yields but also higher input requirements of the crop. As a result, the area devoted to rye has declined considerably, while rye production showed less decline. From the diversification point of view, F1-hybrids are narrowing the genetic stability of rye. Breeding programs exist presently in several countries, e. g. Poland, Estonia, Russia, Germany, Sweden and Finland. Recently, new findings of rye landraces have been reported from Finland (Heinonen and Vetelainen 2010). Poland hosts the ESDB which was established in 1984 (Serwinsky and Konopka 1984). Despite updating the database using EURISCO, considerable gaps still exist (Zaczynski in Kleijer et al. 2007). While the ESDB comprises 13,707 accessions, Kntipffer (2009) mentioned 15,845 rye accessions for Europe. It is necessary to clarify, which gaps in the ESDB still exist and how to fill them. The descriptor list for rye (IBPGR 1985) needs to be updated (Kleijer et al. 2007) and it is needed to define crop specific standards for rye regeneration in genebanks to complement the information on rye seed storage compiled by Gass et al. (1998). For defining Most Appropriate Accessions in the sense of AEGIS the biological features of rye need to be taken into consideration. It is important to agree on a strategy for identifying such accessions.

4. Main objective and specific objectives

The overall objective is to support conservation of rye germplasm in the European context of AEGIS. Three specific objectives are targeted: (1) Ensure that gaps in the ECPGR rye database are filled by addressing the respective genebank curators. (2) Identify a group of authors that are ready to compile in writing an updated descriptor list and a brief standard for rye germplasm regeneration, characterization and storage in ex situ collections. (3) Compiling a report that outlines the requirements and feasibility for identifying Most Appropriate Accessions for a European Secale Collection in connection with AEGIS, (4) propose list of unique accessions as MAA.

5. Materials and methods

The Nordic Genetic Resource Centre (NordGen) at Alnarp, Sweden and the Plant Breeding and Acclimatization Institute (IHAR) will take lead in organizing a workshop in November 2011 at the (IHAR), Blonie, Radzikow, close to Warsaw. Key players involved in rye germplasm ex situ preservation from Germany, Poland, Lithuania, Latvia, Estonia, Russia, Finland, Sweden and Denmark will be contacted and invited to prepare contributions. The workshop agenda will be organized according the three specific goals mentioned above. The organizers will prepare minutes of the meeting that will be published and hopefully tasks can be assigned to follow up on the required activities. The workshop will be held over 1.5 days. Based on recommendations rye working group will agree upon during this workshop, work on listing MAA will be initiated and first list of unique accessions presented.

6. Expected outputs

- Further completion of the ESDB by integrating data of missing accessions and by completing data on existing accessions;
- Establishing a network of authors that commit to prepare an update of common rye descriptors and that compiles written standards for Secale regeneration, characterization and seed storage in genebanks with focus on the cultivated species; and
- Preparing and conducting a Workshop that addresses the relevant questions in rye ex situ conservation with particular emphasis on the question how to identify Most Appropriate Accessions in the sense of AEGIS for rye.
- First list of European Accessions

7. Benefits and impact

The goal is to bundle the efforts in rye germplasm conservation by moving issues that need to be addressed to accomplish the goals AEGIS has set. As rye is of particular importance in the Baltic region, it is suggested to build up a strengthened cooperation ensuring strong impact from this region.

8. Innovation

Among the cereals of importance in Europe rye is specific due to being the only cross pollinated species. This has major implications on rye germplasm characterization and germplasm conservation. Rye is of particular relevance in Europe. The discussion of the Most Appropriate Accession in connection with the specific Sec-ale biology is relevant. Lacking an ECPGR working group for rye makes this additional effort necessary.

9. Application of results

For integrating rye germplasm into the planned AEGIS European genebank it is necessary to take the steps outlined in this project. The project builds on ongoing discussion and has the goal to help moving these along by taking necessary steps.

10. Workplan

Activity 1 (Mostly NordGen): Preparation of one—day workshop (identifying contributors, assigning tasks to contributors, preparing agenda, sending out invitations)

Activity 2 (Mostly IHAR): Updating the ESDB, preparing and conducting a one day workshop in Radzikow, Poland (organizing accommodation, conference room, technical support, local transportation)

Activity 3 (NordGen and identified contributors): Compiling a status report summarizing the results of the workshop and reporting the status of European cooperation in rye conservation

Activity 4 (NordGen, IHAR and identified contributors) developing a list of unique accessions and proposing these as European MAA accession

Workplan (NordGen and IHAR)

	3/11	4/11	5/11	6/11	7/11	8/11	9/11	10/11	11/12	12/11	01/12	02/12	03/12	04/12
Activity1														
Activity2														
Activity3														
Activity4														

11. Budget

<u>Institute</u>	<u>EURO</u>	<u>EURO</u>
NordGen, Sweden (5 participants)		
Staff time (in kind)		
Travel	1500,00	
Accommodation	1000,00	
Supplies and/or services	700,00	3200,00
IHAR, Poland (4 participants)		
Staff time (in kind)		
Supplies and/or services	1000,00	
Meetings (Meals for 20 participants)	1700,00	2700,00
Botanical Garden of the Polish Academy of Sciences, Poland (2 participants)		
Travel	50,00	50,00
Jogeva Plant Breeding Institute, Estonia (2 participants)		
Travel	400,00	
Accommodation	400,00	800,00
Genetic Resources Centre, Latvia		
Travel	200,00	
Accommodation	200,00	400,00
Plant Gene Bank, Lithuania		
Travel	200,00	
Accommodation	200,00	400,00
MTT Agri-Food Research, Finland (2 participants)		
Travel	600,00	
Accommodation	400,00	1000,00
Institut for Plant Genetics and Crop Plant Research (IPK), Germany (2 participants)		
Travel	600,00	
Accommodation	400,00	1000,00
N.I. Vavilov Institute of Plant Industry, Russia		
Travel	300,00	
Accommodation	200,00	500,00
MAA list development (all participants)		2000,00
Total		12.050,00

12. Contributions offered by applicant

NordGen and IHAR will spend time and on preparing and conducting the workshop. Actively approaching contributors to the workshop and the ESDB will be done as in-kind contribution. The preparation of workshop proceedings will be an in kind contribution and it is assumed that proceeding can be published electronically using the ECPGR website.

13. Bibliography

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