

Oil and Protein Crops Network: Project Proposal Phase VIII (2009 – 2013)

July 2008

Currently the Grain Legume Working Group (WGGL) is the only working group in operation within this Network. The WGGL covers an important range of species of importance to European agriculture and research. The WGGL is well recognised within the European and international grain legume community as evidenced by the interactions and outputs relating to a number of ECPGR priority areas as outlined in the WGGL summary report.

The 4th WGGL meeting held in November 2007 resulted in the identification of a series of priority objectives that the working group wishes to take forward into Phase VIII. These are detailed in the 4 parts to the project proposal for the network.

- 1) Grain Legume Climate Change Monitoring Network
- 2) Revision and development of European Grain Legume Central Crop Databases
- 3) Interaction with in-situ and on-farm network (joint meeting)
- 4) Regular meeting of WGGL

1. Grain Legume Climate Change Monitoring Network

This project proposal aims to utilise the existing European wide ECPGR network of legume genebanks to produce baseline dataset to assist in monitoring climate change by focusing on two key targets. The targets have been selected on the basis of utility by the PGR and wider European legume growing community.

Key targets:

1. Collate information on the geographic distribution of target insect pest that are currently a significant problem in some areas and could spread (are already spreading in some cases) further.
2. Record flowering time on a set of key *Pisum* accessions of known genotype to develop a baseline flowering time contour map for Europe.

Background and justification

The growing evidence associated with climate change is high on the political agenda across the globe. Over recent years the climate across Europe has moved away from the predictable patterns of previous decades where traditional seasons are occurring less frequently and fluctuations in temperature and rainfall are in many cases, outside the ranges recorded in continuous weather records dating back 200 years. There are many examples of initiatives aimed at trying to identify and model different scenarios. One such example is the Cost action 734: Impact of climate change and variability on European agriculture. In 2006 an ECPGR cross-cutting activity workshop was hosted by the Finnish national programme for PGR entitled “Genetic resources in the northern parts of Europe: current status and the future in relation to major environmental changes”. This meeting focused on the conservation issues of PGR that were considered under threat under projected models for climate change and their effect on species distribution. What is also clear and has not hitherto been touched upon is the unique position of the PGR community to gather data through the ECPGR network that could contribute to baseline assessments in key areas likely to be affected by climate change such as distribution of pests and using data from actual plants as biological indicators. This data would be passed directly to the wider agricultural community of plant breeding, farming and production sectors.

In recent years the milder winters have seen an extension of the distribution range of a species of bruchid beetle that is a serious pest of *Vicia faba*. A significant premium associated with the vegetable and human consumption market is dependent on very low levels of damage by this pest. Monitoring and mapping of the incidence of this pest within the network would provide valuable data as to the status of this pest in the years to come. Bruchids associated with *Pisum* are currently more limited in their European distribution. Again, monitoring and mapping of the incidence of this pest across the network would be valuable to both the network and the wider grain legume community. These are just two examples of insect pests that could be monitored by the proposed network.

Crop phenology is intimately associated with climatic conditions. The flowering time of crop plant is therefore dependent both on the genetic constitution of a particular variety and the environment in

which it is grown. The genes controlling flowering time in pea are well described. Type lines for these genes both individually and in combinations represent very sensitive and robust monitoring agents for integrating climate.

A number of national and European disease surveillance networks have been in existence for many years (Cost Action 817: Airborne pathogens on cereals and pathogen virulence surveys) and as mentioned, there have been numerous groups who have come together to integrate meteorological and climatic data to forecast climate change scenarios. We propose that the unique geographic distribution of the ECPGR network makes it ideally placed to act as a surveillance network by undertaking the collation of basic data as outlined in this project which is not currently available via any other source and would have widespread utility for the wider legume growing community thus broadening the profile of the ECPGR WGGL. The emphasis is focused on collecting actual data that will result in baseline distribution maps being developed for key insect pest in grain legumes and climate as monitored using flowering time in defined genetic stocks of *Pisum*. The proposal is to develop a pilot network in the first instance and to evaluate results over the Phase VIII period before scaling up further. This project could provide a useful model for other crop networks. While these activities are not directly association with conservation of PGR the monitoring of insect pest distribution they are considered as important for curators to informing their activities and assessing the feasibility of utilising the existing network to new ends that could directly influence where certain materials might be more optimally grown in the future.

Objectives of the project

- Establish a pilot surveillance network amongst European grain legume collections
- Establish baseline distributions and contour maps for a number of key insect pests for grain legume species that currently exist in Europe or pose a threat.
- Annual data collation will enable changes from the baseline distribution of pests to be monitored. Effective monitoring would enable an early warning system to be developed were year on year trends in particular pest species distributions have been observed.
- Collect data and establish a baseline of actual plant responses to climate across the European region based on a set of *Pisum* genotypes characterised for key flowering time genes. The data would be used to generate a flowering time contour map for Europe.

Workplan

The project outline arose from discussions at the 4th meeting of the WGGL in Lisbon 2007 and were unanimously supported. The project focuses on easy to collect data and is therefore considered achievable by the WGGL. Having said that, the proposal remains ambitious as, given the fluctuating nature of climate across Europe, it is important to understand that this project will need quite a long time frame in order to establish baselines in the two target areas and to assess their impact. Clearly one years data, although useful will only be a start and the baseline states may only be properly established after 3-4 years. We remain however, highly optimistic that useful data will emerge over the course of this project. If the work proves of value we will also look for additional sources of funding to help develop the software mapping side of the project. (*USDA cool season legumes group have expressed strong interest in joining the flowering time monitoring part of this project*)

WGGL members, together with input from the wider community, will produce a list of insect species that cause serious damage to grain legume crops or seed that are currently restricted in their European distribution or are not currently a problem in Europe but could cause problems if their distributions spread. WGGL members have considerable experience in insect pests so drawing up a list of key insect pest species for grain legumes in Europe should be straightforward.

Annual reporting will be on the basis of simple proforma sheets developed in consultation with members of the WGGL and with input from map modellers.

The work on flowering time will be focused on genebanks with field growing capacity. The number of *Pisum* genotypes will be limited (yet to be defined but in the order of 8-10 lines) and will be identified with input from the Jim Weller's group in Hobart Tasmania who are have the most experience in the field of flowering time genes in *Pisum*.

Curators will grow the material in the field as small lines of 10 plants of each genotype against wire (for support). The growing site GIS reference and altitude will be recorded along with the sowing and

flowering time of each genotype. Temperature monitoring will be undertaken on at least 3 sites to enable accumulated degree days to be calculated.

Flowering time data for all genotypes at all sites will be converted into accumulated degree days and transformed into a flowering time contour map for Europe.

The data analysis and 2D contour mapping will be developed in collaboration groups currently engaged with GIS mapping in climatology groups such as the one based at UEA, Norwich, UK. Clearly the more centres involved with collecting data, the more detailed the isoline maps generated will become. We would estimate that 15 genebanks would be engaged in the first instance.

Milestones

2008 (end of year)

Produced list of key legume pests to be monitored

Developed list of *Pisum* genotypes with the assistance of the group from Hobart Tasmania (leading authority of flowering time in *Pisum*)

Devised proforma report and scales for monitoring

2009

Undertake 1st year of data collection

Produce distribution maps for pests and flowering time contour map for *Pisum*

2010

Undertake 2nd year of data collection

Write report for presenting at the joint conference of the 5th International Food Legume Research Conference (IFLRC) & 7th European Conference on Grain Legumes (AEP), Antalya, Turkey.

2011-12

Undertake 3rd and 4th year data collection. Write a report assessing the project as a whole and whether it has met its objectives and should be continued.

Equipment

Certain equipment is required to launch this project which will be funded by the collections.

i. Temperature probes (soil and air) and battery operated data loggers are required to collate baseline data at growing sites to calibrate the accumulated degree days with flowering time. Three set of equipment will be used.

ii. A professional mapping software package (Surfer v8) has been recommended for the distribution and contour mapping.

2. Revision and development of European Grain Legume Central Crop Databases

Background and justification

The WGGL has compiled and curates Central Crop Databases for 10 grain legume species (*Arachis*, *Cicer*, *Glycine*, *Lathyrus*, *Lens*, *Lupinus*, *Phaseolus*, *Pisum*, *Vicia* and *Vigna*). While three of these have only recently been constructed or revised, the majority were established in the mid 1990's and are in need of major revision. The proportion of minimum descriptors is low and more effort is needed in this area and that information on safety duplication.

The further development of the AEGIS project will require significant input from all the ECPGR crop working groups and the central crop database managers. The WGGL wishes to play its part in the AEGIS project and this programme of work is focused on revising and improving the data relating to grain legumes in order that the WGGL is in a position to deliver and contribute effectively to the AEGIS project and the wider community.

Objectives of the project

- Revise European Central Crop Databases for Grain Legumes with an emphasis on including minimum descriptors and information on safety duplication.
- To form a more active database community for the WGGL and its engagement with AEGIS.

Workplan

Ad hoc meeting of grain legume CCDB managers is required to detail the work required and organise workplan.

Project coordination and administrative structure

Overseen by the Network Coordinating Committee in liaison with the CCB managers.

3. Interaction with the In situ and On-farm Network**Background and justification**

The WGGL has an ongoing dialogue with the in-situ and on farm network with respect to issues specifically relating to grain legumes (see WGGL standard report). This items is to enable members of the WGGL to attend a meeting planned and organised by the In situ and On-farm network to explore and elaborate the in situ needs of grain legumes and develop a joint cross crop and thematic network workplan.

4. Regular meeting of WGGL**Background and justification**

This full meeting of the working group is required in order to provide the opportunity for full discussion on the work undertaken within the working group over Phase VIII and to begin to prepare plans for the future. The meeting is scheduled to coincide with the 5th International Food legume Research Conference (IFLRC) and the 7th European Conference on Grain Legumes (AEP). This is very opportune as the WGGL is well recognised by both organisations and has benefitted significantly in terms of financial and in kind support of venues and administration on previous occasions. Combining meetings has the added advantage of increasing attendance and participation at both the conference and ECPGR WGGL meetings.

Appendix 1: Workplan

Activity - No.	Activity	Output	Milestone	Time	Respons. and comments
1	Grain Legume Climate Change Monitoring Network	Active network collecting data on insect pests and flowering time data		2009-2012	
1.1		Protocols, proformas and detailed operational model for the project	Develop list of Pisum flowering time germplasm for distribution	12/ 2008	
1.2		Check lists	Produce list and key of legume pests to be monitored.	02/ 2009	
1.3		Workshop for main participants prior to start of project		10/ 2009	
1.3		Establish baseline distribution maps for Key grain legume pest and flowering time data for yr 1 and 2	Baseline distribution maps produced	11/ 2010	
1.4	Undertake yr 3 and 4 data collection			2011-2012	
2	Ad hoc meeting of the 10 Grain Legume DB managers	Review progress on revision of the 10 CCDB's coordinated by the WG	User-friendly search tool applied to all 10 Dbases	2009	All grain legume CCDB managers
2.1		Develop detailed workplan for revision and expansion of grain legume CCDB's	Agree detailed workplan and milestones by the end of 2009	2009	
2.2		Uploading of revised grain legume CCDB to web	To be completed by the end of 2010	2010	
3	In-situ requirements of Grain legumes	Attendance at a meeting organised by the In situ and on-farm conservation Network	3 WGGL delegates	2009	Members from BUL, ESP, UK
3.1		Development of in situ workplan for Grain legumes		2009	
4	Meeting of Working Group for Grain Legumes (Anatalya, Turkey)	Review progress of Phase VIII projects and workplan	Meeting held with 20 participants	04/2010	
4.1		Discuss development and engagement with AEGIS project	Timetable with agreed milestones by the end of 2011	2011	
4.2		Prepare proposals for new workplan	Detailed workplans drafted and agreed by 2013	2013	
5	Network coordinators meeting	Review progress and plan future developments	Draft proposals for Phase VIII to WGGL	10/2009	

