

**WGIN Management Meeting  
1<sup>st</sup> May 2014 @ Syngenta, Whittlesford, Cambridgeshire**

**Minutes**

**Attendees:-**

Peter Shewry (PS)(chair), Malcolm Hawkesford (MH), Robert Jackson (RJ), Rowan Mitchell (RM), Kim Hammond-Kosack (KHK), Michael Hammond-Kosack (MHK) (**RRes**), Simon Griffiths (SG), Luzie Wingen (LW), Sue Freeman (SF), Cathy Mumford (CM)(**JIC**), John Foulkes (JF)(**UoN**), Paul Rowe (PR) (**Limagrain**), Jacob Lage (JL)(**KWS**), Andy Greenland (AG) (**NIAB**), Ellie Marshall (**HGCA**), Lucie James (LJ) (**ADAS**), David Feuerhelm (DF)(**Syngenta**), Stephen Smith (SS)(**Elsoms**), Giulia Cuccato (GC)(**Defra**)

**Welcome – Peter Shewry**

As the JIC team were held up in traffic, the agenda was revised, moving “action items” to after the presentations (starting with RJ) and allowing for SG to give his presentation last and discuss the minutes from the last meeting (Limagrain, 6<sup>th</sup> December 2013) with all attendees present.

**RESEARCH UPDATES:**

**Objective 8 – NUE (Malcolm Hawkesford)**

**Presentation – 001 Robert Jackson**

RJ presented his work on “The Use of NIRS (Near Infrared Spectroscopy) to Identify Nitrogen Content”, carried out during the WGIN2 extension. The main aim was to evaluate whether the very clean and non-invasive NIRS can replace the current, destructive and very toxic methods (Kjeldahl, Dumas) and thus whether NIRS could be used routinely in the continuing wheat NUE studies.

The answer is that NIRS presents a cheap, non-destructive, safe alternative for %N determination, providing a GenStat model taking into account the effects of variety and year is used for the analysis, and NOT the intrinsic NIRS software calibration (which gives large errors). However, the correlations are not as good with milled straw as with milled grain [MH: straw data were not included in the presentation but will be made available on the WGIN website]. Importantly, for milled grain, calibration curves from previous year CAN be used for subsequent years with relatively small errors. [MH: still need to look further at the consistency of NIRS]

RJ also gave a summary regarding the compilation of the WGIN Nitrogen-diversity trial data, with a new model for yield, grain/straw %N content, HI, N uptake, NHI, NutE, developed by RRes Stats to allow ranking of variety performance.

Q. Have whole grain samples been tested?

A. Yes, but the data shown here are from milled grain samples.

Q. Are these calibration curves robust enough to use in subsequent years?

A. I would prefer to use Dumas (MH).

Q. How many Dumas samples had been tested with NIRS?

A. 2/3 were measured with NIRS, the rest predicted and tested.

Q. Can NIRS straw and grain samples be compared?

A. No, you can't go between the two (separate calibration curves needed).

Q. Were calibration only made with WGIN samples?

A. Yes

Q. Did you purchase manufacturer's calibration curves?

A. No

Q. How long ago were the milled samples stored and is there any likely degradation of samples?

A. Samples were milled soon after harvest, dried at 80°C, stored dry (not frozen), not sure about robustness of samples.

C: impossible for samples to degrade without water being present.

### **Objective 10 - Take-all (Kim Hammond-Kosack)**

Presentation – **002 KHK**

KHK gave an update on the Take-all Disease Research at RRes, focussing here on the Take-All Inoculum Build-up (TAB) (first published by McMillan et al, 2011). Unfortunately, due to the non-conducive weather conditions the 2013 Diversity Trial failed to build up Take-all inoculum. The 2014 Diversity Trial will be evaluated.

There is now a decade of Take-all build up data from the WGIN diversity trial available. This data is suitable for identifying the weather variables which influence TAB.

Concerning Take-all disease, there is a marked difference between commercially grown wheat varieties regarding the percentage of infected roots, with Cadenza consistently (over the 10 year WGIN trial period) showing low infection, Hereward showing high infection and Avalon intermediate levels..

KHK also mentioned the ongoing introgression of Take all resistance from *Triticum monococcum* (Tm) into hexaploid Paragon wheat (F<sub>1</sub> seed generated) and the progression of two new *Tm* populations to the F<sub>5</sub> generation, currently in the glasshouse to produce the F<sub>4</sub>.

Q. With the project at an end, how would work on the *Tm* lines and the mapping populations continue?

A. Currently a Ph.D. student is working on the further characterisation of the most promising lines and will evaluate the mapping populations. This Take-all studentship is funded by BBSRC, HGCA and Agrii (Oct 2012- Sept 2016).

C. There were some comments about the “natural” Take-all decline after 5 years. However, if wheat is not grown continuously over 5 years, the TAB decline is interrupted and any subsequent re-sowing of a wheat crop would start the whole build-up process again (KHK). Also, importantly, the yield of continually grown wheat is still lower.

Q. How many farmers grow continuous wheat?

A. Popular in mid70s, but currently only ~25% of the UK crop.

Q. Is the level of Take-all in a >5 year wheat field more or less than the 1st wheat situation?

A. More

Q. In the 10 year diversity trial, why is the lowTAB trait in Cadenza relative to Avalon (and Hereward) not as low in some years?

A. Currently unknown. Need to check weather data for each year to see if a trend emerged.

### **Objective 9 – Drought Tolerance (John Foulkes)**

Presentation – 003 JF

JF presented on the Savannah x Rialto DH mapping population QTL data, focusing on the two field season where temporary trough had occurred, named 2010-2011 and 2012-2013, when drought had occurred in the unirrigated trials.

Q. Is stomatal aperture the main driver for total field water use?

A. Ability to access water appears to be a key driver for productivity under UK drought.

C. But the trade-off is more crop per drop

Q. Can you find outliers in the data set that could be the focus of future investigations.

A. Yes, some of the DH lines have a smaller stomatal aperture and high water use efficiency.

Q. Is there a similar correlation between stomata aperture and WUE in the Australian varieties that have a high level of drought tolerance?

A. In Australia the stomata close when there is severe drought stress. But some varieties exhibit greater water use efficiency.

Q. Was the stay green effect identified in the wet year 2011-2012, then seen in the drought year 2012-2013?

A. No

### **Objective 2, 3 and 4 – Tools and Resources (Simon Griffiths)**

Presentation - 004 SG

SG presented an update on the WGIN resources focussing on the NILS development from the Avalon x Cadenza mapping population.

Currently has 570 NILs in the 2013 field trial at JIC, these are BC3, i.e. mini populations.

C. The genotyping of the entire Watkins collection is now accepted for publication in TAG.

Q. What trait is provided by *Aegilops uniaristata* 3N

A. Aluminium tolerance and strong root growth.

#### **ACTION ITEMS (from last MM):**

**No.1: WGIN output** Most peer-reviewed publications until March 2014 have been put on the website with direct links to the pdf of each publication (MHK) (some still likely to be missing). Each scientist was asked to **double-check the publication list** on the WGIN website (<http://www.wgin.org.uk/information/publications.php>) and send details of any missing ones to MHK.

It was thought highly likely that quite a few **publications using WGIN resources** but not having any WGIN funded scientists as authors would have been missed, with WGIN possibly only mentioned in the acknowledgements.

**No.2: Objective 12 Inter-comparison of traits.** All the data sets for the three soil based traits namely NUE, WUE and resistance to Take-all need to be statistically inter-compared. [MH, JF, KHK and the RRes stats dept.] **This needs to be done by the end of May.**

C: JF – 18 cultivars ready (Cianna x Rialto), MH – not quite ready, KHK – everything ranked, ready to go

**No.3: All suggestions for a discussion topic for the stakeholder meeting November 2014, that would engage millers, farmers, agronomists, breeders, researchers** – so far, no suggestions have been forthcoming.

C: The panel discussion at the last Stakeholder Meeting (4<sup>th</sup> Dec 2013) felt like a “dead horse” to some.

C: questions should not be answered by every panellist, but only one or two should be asked for their answers by the Chairperson.

C: Possibly revisit one of the previous discussion topics. For example, why is there such a large gap between farmers’ yields and breeders’ yields?

C: for a more lively discussion it would be good for panellists to be along the lines of “What has science/WGIN done for us?”

**No.4: Martonvasar** BBSRC sponsored workshop – receipts for all costs incurred should be sent to SG asap after the meeting. Any questions regarding this workshop also to SG.

C: more central European speakers than at the previous Martonvasar workshops. And still not much UK University involvement. BUT – still possible for latecomers to join.

**No.5: WGIN 2 Final Project Report – To be submitted by end of May 2014.**

This report will cover the achievements over the whole period (WGIN 1 & 2), including newly developed (genetic) markers, the wider impact on other projects, usefulness to breeding community and value of traits to growers.

C: Indeed, Defra expects a 10 year report with **concrete examples** regarding the usefulness of WGIN (GC).

C: The influence on breeders would be very hard to quantify, but the fact that breeders from most UK (based) companies have been attending **all** WGIN meetings, confirms their strong interest. WGIN has really been successful in bringing industry and academics together.

HGCA has offered to carry out a cost/benefit analysis and an outline of what is planned has already been received (KHK).

The Avalon x Cadenza mapping population has had a tremendous impact on breeders and academics alike. Need to generate a graph with markers and seed stocks requested before and during WGIN.

WISP and LoLa could/would not have happened without WGIN paving the way. Agritech Catalyst has also been resurrected by WGIN [links with Agritech “**particularly important**” (GC)].

WGIN has generally really opened things up – before WGIN, requests for new germplasm were generally denied. It has transformed the community – “now one wouldn’t dream of launching a new project without approaching breeders”.

The WGIN Stakeholder meetings are by far the biggest wheat community meetings, with the appeal of a broad scope and lots of different topics.

**Action:** ask Simon Orford for no of accessed/ requested germplasms and MTAs (MHK to do) and from here to follow up on possible additional publications and grants.

**Action:** JL agreed to update a document regarding the importance of WGIN for breeders and send it to KHK/MHK

Regarding a possible follow-up WGIN3 project, it was felt that it has got to be unique, i.e. focussed on new traits and techniques, although some unfinished work should be completed. A reappraisal is clearly needed. The ideas for the WGIN science come from three sources, the breeders, the researchers and defra.

**Action:** PS et al to have a meeting during the Martonvasar workshop, which should focus on top priority breeders traits, good science and the current Defra objectives [>check defra website]

C: Defra is very impressed by WGIN – and WGIN is one of their priorities! (GC)

C: useful to arrange a meeting between WGIN and CYMMIT (**SG to make initial contact**), and also India

The **milestones** spreadsheet was filled in (column S, month 65), with most goals achieved. This was felt to clearly demonstrate the strength of WGIN. Also, it was agreed to maintain the WGIN website for at least **2 years** post funding.

At the end GC was asked to clarify Defra's financial background and criteria regarding possible funding for WGIN3:

Severe financial cuts up to 10% of the total budget, with some departments being hit more than others, mean that DEFRA now requires **CLEAR OBJECTIVES** and **MEASURING OF OUTCOMES**.

In particular projects should try and fit in with the main Defra objectives of:

1. growing the rural economy
2. improving the environment
3. safeguarding plant health

**1) Growing the rural economy, productivity and growth**

- Unlocking the potential for Agri-science, enhance British farming and its competitiveness.
- Developing a sustainable and resilient farming sector, managing risks and contingencies.
- Create/maintain a good network and help communication between different parties;
- Provide useful advice to farmers.

**2) Improving the environment**

- Managing our natural resources (soil, fertilisers, natural pest control) while delivering sustainable growth
- Reduced risk of plant pest and disease outbreaks
- Build UK's ability to adapt to unpredictable weather conditions
- Improve water's quality using less fertilizers and pesticides and improving NUE

**3) To a lesser extent – safeguarding plant health.**