

## **WGIN 3 Management Meeting 5 7<sup>th</sup> July 2016 @ John Innes Centre, Norwich**

This was the fifth Management Meeting of the **DEFRA** funded **WGIN3**.

### **Minutes**

#### **Attendees:**

Peter Shewry (PS) (chair), Lesley Smart (LS), Gia Aradottir (GA), Malcolm Hawkesford\*(MH), Kim Hammond-Kosack\*(KHK), Michael Hammond-Kosack (MHK) (RRes), Simon Griffiths\*\* (SG), Clare Lister\*\* (CL), John Snape (JS) (JIC), Dhan Bhandari (DB) (HGCA), Simon Berry (SB) (Limagrain),  
[\*=gave oral presentation, \*\* gave afternoon field trials tour at JIC and Church farm]

**Apologies:** Andrew Riche (RRes), Jacob Lage (KWS), Matt Kerton (MK) (DSV), Sarah Holdgate (SH) (NIAB), Vanessa McMillan (RRes), Kostya Kanyuka (RRes), Ruth Bryant (RAGT), Louise Ball (Defra)

#### **A. Welcome – Peter Shewry**

#### **B. Presentations:**

##### **1. Review of minutes from March 2<sup>nd</sup> 2016 (KHK)**

Minor changes made to two sections, then approved by all.

##### **2. Personnel Changes at Defra**

Sadly, Giulia Cuccato announced at the end of June that she will be leaving Defra for a 2 year secondment in BIS (GO-Science) and will therefore not be managing WGIN any longer.

The task will pass on to her colleagues **Dr Martin Cannell**, who has extensive experience in plant breeding and molecular biology (ex. Rothamsted) and/or **Dr Louise Ball**, EU Crops and GM team (ex JIC) . Louise had been informed (at, unavoidably, very short notice) about this Management Meeting and had planned to attend, but had a prior engagement in Brussels.

##### **3. Updates on Mineral Nutrient Interactions (MH)**

The diversity trial now includes 30 instead of the original 25 varieties. Any suggestions for changes to the additional five varieties were encouraged, but none were forthcoming. Malcolm intends to replace **Stigg** with the new variety **Graham** (bred by Syngenta) for the next trial.

The interaction of zinc with N and hence yield is unexpected, as is the significant loss of potassium during grain fill.

20 – 40% of micronutrients are taken up post anthesis.

The automated platform testing at RRes includes a “mini WGIN diversity trial” with three nitrogen regimes and is used for height determination, green pixel density and 3D data generation. This will allow volume measurements for individual ears.

The UAV trials now use two drones, a Cinestar 8 Octocopter (able to perform thermal imaging) and a DJI S900 Hexacopter, with eight and six individual rotor blades, respectively.

C. The Hexacopter was demonstrated at the Paragon x Garcia Drought Trial site after lunch by Andrew Riche and Marsh Carlton.

Q. SG – is it possible to recognise the different varieties from the UAV?

A. MH – to some extent, yes

Q. PS – is this true across the different N regimes as well?

A. MH – as above

Q. DB – can the mineral measurements also pick up Cadmium and other undesirables (heavy metals etc)?

A. MH – in principal yes, but not sure of sensitivity

Q. DB – is all nitrogen applied as ammonium nitrate?

A. MH – yes for the WGIN Diversity trial, but a separate experiment has used supplementary foliar N application at anthesis (piggy-backing on the experimental edge of the Diversity Trial field plot.

C. PS – it would be useful to look at the mineral contents in white flour (in addition to whole grain) as well.

Q. PS – are the measurements combined or separate for straw and grain?

A. MH – separate.

#### **4. Take-All and Foliar Diseases (KHK)**

In answer to a question at a previous Management meeting regarding whether the resistant Watkins lines (identified by Richard Gutteridge) had been used in the Australian field trials which used the core Watkins collection, Kim emphasised that these 10 lines - W18, W137, W203, W231, W262, W399, W495, W610, W733 and W786 - are **not** part of the core collection and had therefore not been used in the Australian study.

For some of these lines there is now a 2<sup>nd</sup> year of evidence of a Take-All induced response, because W18, W203, W231 and W610 show between 40 and 95% reduced yellow rust infection in a 3<sup>rd</sup> wheat trial. The 1<sup>st</sup> and the 3<sup>rd</sup> wheat trials were located in the 2015-2016 very close to each other on the RRes farm.

Watkins 733 and 786 were most resistant to yellow rust but are very susceptible to brown rust – do not possess multi disease resistance

W203 appears to be the most promising Watkins line regarding multiple foliar disease resistance.

Regarding Yellow Rust, some F<sub>1</sub> plants (generated by MHK, field crossing 2015) from resistant Watkins lines W203, W231, W610 and W733 to Fielder have been field tested very recently in a spring sown trial.

The F<sub>1</sub> [Fielder x W733] exhibited dominant resistance to yellow rust with 4 out of 5 plants showing zero infection and 1 trace amounts.

The F<sub>1</sub> [Fielder x W203], [Fielder x W231] and [Fielder x W610] exhibited recessive resistance to yellow rust with 2 to 3 plants showing 30 to 70% infection. However, it is important to note that these are preliminary results.

C. JS – this could be partial resistance, reducing susceptibility.

Q. JS – why are we backcrossing to Fielder?

A. KHK – Fielder is the wheat variety routinely used for stable wheat transformation. Fielder was also the fully susceptible check for the 2014 and 2015 yellow rust.

Q. SB – have any seedling tests been performed yet?

A. KHK – no, the field trial was designed to explore adult plant resistance / reduced susceptibility to multiple foliar diseases.

## 5. Exome Capture (KHK)

This work package will focus on promoter sequences rather than exons and as such is a different approach, to other projects The A, B and D genome sequences will be captured individually, although on average 25% of homologues are captured with A, B or D specific baits. There is a suggestion to re-name this milestone – **Promoter capture / promoter-omics**

C. The 96 cultivar list will be started by KHK and distributed within the Management Team only.

C. SG – flesh out the list before distributing.

C. DB – grain quality too broad an area. After discussion it was suggested and more or less agreed to split this category into Grain Composition (to be coordinated by PS) and Grain Development (coordinators SG and Cristobal).

The traits list will thus include **10 traits** as follows, with the suggested main coordinator in brackets:

- |  |                                 |
|--|---------------------------------|
| 1. Yield resilience                      | (Elizabete Carmo-Silva)         |
| 2. Grain Composition                     | (Peter Shewry)                  |
| 3. Grain Development                     | (Simon Griffiths)               |
| 4. Biotic Stress – fungi and insects     | (Kim Hammond-Kosack)            |
| 5. Abiotic Stress – drought, temperature | (Eric Ober/John Foulkes)        |
| 6. Nutrient Use Efficiency               | (Malcolm Hawkesford)            |
| 7. Canopy Development                    | (Alison Bentley)                |
| 8. Flower Biology                        | (Zoe Wilson, Scott Boden)       |
| 9. Root Architecture                     | (Malcolm Bennett/Peter Buchner) |
| 10. Recombination                        | (Keith Edwards)                 |

Each trait category can have a maximum of 50 nominated promoters with individual capture of the 3 genomes, **OR** up to 150 nominated promoters capturing only 1 genome.

C. PS – “Grain Composition” could easily make up for any categories not using their full allotment.

C. SB - a good representation of the current RL varieties would be important

C. SG – The WGIN Management group should have priority for inclusion of the most appropriate WGIN germplasm

C. MH – concurred with SG and stressed that this project should focus on WGIN

Q. SB – how quickly can the data be validated? Also, will there be a front-end bioinformatics check?

A KHK – The genomes of several wheat varieties are currently being sequenced therefore some of the validation data can be obtained this way. Secondly, varietal differences in the promoter regions are already well known for some loci.

C. KHK - the correct gene ID number to permit the promoter sequence to be received from ENSEMBL will be confirmed by the RRes bioinformatician Keywan Hassani, and specific examples given.

C. KHK - the Excel file with 11 spreadsheets, No 1 for cultivar suggestions and Nos 2-11 for the gene nominations per trait, with instructions will be circulated to the main coordinators for completion during August and finalised in September.

## **6. Topics for Stakeholder Panel discussion**

JS suggested “Priorities for Wheat Quality”, setting priorities for the research community.

PS agreed to chair the panel AND sort out the panel discussion group.

It was discussed whether to invite the other GINs to give presentations, but agreed to reserve presentations for WGIN only BUT invite the other GINs to attend the SM.

C. DB – good to include “feed” wheats in the discussion

The November Stakeholder event will be held at Rothamsted. Although MHK was initially quoted over £3500 for hire of the Fowden Hall by RoCRE, KHK has now managed them to agree to the customary £600.

**PLEASE NOTE: November 30<sup>th</sup> has now been reserved**, because it is literally the only non-clashing date with any other wheat related meetings/activities.

Nb: Eventbrite registration (either directly via the WGIN website or by invitation) is now up and running (August 2<sup>nd</sup>).

C. SG – Mark Sawkins (IWYP) would like to give a presentation about IWYP (International Wheat Yield Partnership).

**ACTION:** MHK/KHK to invite him to the meeting. KHK has contacted and given date.

C. MH – suggested Graham Moore to give a presentation about “Designing Future Wheat”.  
Nb: Graham emailed by MHK on August 2<sup>nd</sup>

C. PS – suggested to include an overview of international wheat projects.

## 7. Turkey Workshop

This was held in Konya with a field trip to Cappadocia during 23-27 May. Sixteen UK scientists participated (13 funded by the BBSRC grant), from R Res, JIC, NIAB, Nottingham, Reading Bristol and Lancaster. Discussions focused on four topics: preparation for climate change, fungal pathogens, insect pests and grain quality. Areas for collaboration were identified leading to several joint pre-proposals to the BBSRC Global Challenges initiative.

## 8. New Grants, Publications and Studentships using WGIN material

**Peter** – Rothamsted is leading a new AHDB project on water absorption in wheat, with Reading and Heygates as partners.

**Lesley/ Gia** –

Amma Simon MSc Student Royal Holloway completed her thesis with ‘Distinction’

Paper submitted to Functional Ecology:

Simon, A. L., Wellham, P. A. D., Aradottir, G. I., Gange, A. C. Unravelling mycorrhiza-induced plant susceptibility to aphids.

DTP - PhD studentship “Unravelling interactions between cereal aphids and ancestral wheat lines to elucidate mechanisms of aphid resistance”. Student, Amma Simon, started April 2016

Rothamsted International Fellowship Scheme proposal granted to Dr Beant Singh from Punjab Agricultural University and Dr Gia Aradottir entitled: “Characterization of bird cherry oat aphid (*Rhopalosiphum padi* L.) resistance in land races and wild wheat relatives”.

Aradottir G. I., Martin J. L., Clark S. J., Pickett J.A., Smart L. E. (2016) Searching for wheat resistance to aphids and wheat bulb fly in the historical Watkins and Gediflux wheat collections. *Annals of Applied Biology* in press

**Malcolm** – Nick Evans (Watkins), German PhD Student, Grzegorz Kulczycki (Polish) under the Pioneers into Practice (Climate-KIC) scheme, <https://pioneers.climate-kic.org/>

## 9. AOB

DB – AHDB has issued a Call for proposals for up to 15 PhDs to UK universities, colleges and research institutes. The projects would be starting autumn 2017 to spring 2018. A budget of £70,500 per project has been allocated to this call. AHDB Cereals & Oilseeds is inviting applications for three PhD projects and applications need to address the research priorities outlined in the R&KE research strategy. One of the three studentships is to be granted the AgriFood Charities Partnership Award, jointly with AHDB Cereals & Oilseeds. To be eligible for this special award, applications must be on a soils-related subject and involve one of the agricultural charities' long-term experimental sites. **The call will close on 19 September 2016**, with successful projects announced in January 2017. The Cereals & Oilseeds proposals would be strategically allied to WGIN.

## 10. Afternoon field trip to visit the Paragon x Garcia Drought Trial at Church Farm, Bawburgh.

The remaining meeting attendees were taken to Church Farm to view the P x G drought trial. On arrival we were given a demonstration of one of the Rothamsted drones (hexacopter, see above) by Andrew Riche and his team. AR will send the data once the analysis is complete. Following this all walked through the trial to look at the plots, particularly where Paragon and Garcia are adjacent to each other in the irrigated and non-irrigated plots.

KHK was very interested to see variation in susceptibility to *Fusarium* between the parents and amongst the RILs. KHK requested the spraying regime for the trial [since sent by Cathy Mumford]. This could indicate an additional use for the PxG population.

**Action: MHK** - Date of the next MM and breeder venue has been determined since by doodle poll / e. mail. **Tuesday 11<sup>th</sup> October** has now been chosen, with 16 out of 17 doodle participants available, including at present both Defra representatives.