19th WGIN Stakeholders' Meeting (MS Teams) - Wednesday 30th March 2022

Agenda

Time 09:45 am to 4.00 pm (entry via the MS_Teams lobby open from **9.20 am**).

The **panel discussion section** will start at **13:45 Chair – Peter Shewry** (Rothamsted Research)

registration: Please register via this link to ensure you will receive the Teams invite (see below). Also, please feel free to send this agenda to any interested colleagues.

https://www.eventbrite.co.uk/e/wgin-stakeholders-meeting-tickets-253023589367

Please note: The MS_Teams invite will be sent out by our department secretary Sheila Bishop to all registered attendees shortly before March 30th. **This meeting has also been registered for BASIS points.**

09:45

1. Welcome – *Peter Shewry (WGIN Chair)* (Rothamsted Research)

AHDB

09:50

2. Wheat Market Update – *Alice Jones* (AHDB Market Analyst)

The AHDB market intelligence arable team provides independent market information from prices, to supply and demand outlooks and analyse and report on what the drivers of prices are, both domestically and globally. I will cover what's happening in the global wheat market. I will then explain why and how this is relevant to domestic markets. And then discuss what the watch points will be and where markets might be heading for the current crop in the ground (sadly, without a crystal ball).

WGIN

10:10

3. WGIN Introduction – *Kim Hammond-Kosack* (Rothamsted Research)

WGIN started in 2003 and provides a research platform for the delivery of tools, resources and expertise for the identification of naturally occurring (useful) genetic variation in a broad range of new traits. In WGIN phase 4 (2018-2023) we are delivering a suite of new resources and new knowledge based around the Paragon library, the Watkins wheat collection, several Watkins mapping populations and from introgression breeding involving the previously underutilised diploid wheat species *T. monococcum* (AA genome). WGIN is also increasingly delivering novel bioinformatics information linked to traits and genes of interest by taking advantage of the fully sequenced wheat genomes now available. WGIN has focussed on 'in field' characteristics that individually and/or in combination could improve the resilience and sustainability of the wheat crop. WGIN also acts as a catalyst giving rise to multiple and diverse areas of research which are taken up by breeders, academic researchers and other funding agencies. In this presentation, I will give an overview of the activities ongoing within the WGIN 4 core project. (http://www.wgin.org.uk/) .

10:20

4. Increasing yield stability by increasing standing power – *Simon Griffiths* (John Innes Centre)

Lodging reduces yield and quality in wheat. Breeders face a constant balancing act between increasing yield while controlling the potential for lodging. Over the years the main tool used to achieve this has been the Green Revolution

semi dwarfing gene, Rht-1. WGIN has conducted research designed to home in on some new or under utilised traits that might increase the options available in breeding and help to ensure that future UK crops lodge less.

This presentation was not given due to illness.

10:40

5. Barley Yellow Dwarf Virus and Considerations for Future Disease Control – ***Lawrence Bramham*** (Rothamsted Research)

Sap-sucking aphids detrimentally affect plants through feeding and the secretion of honeydew, reducing the photosynthetic ability of a colonised host whilst promoting saprophytic fungi. In addition and contributing to greater impacts, aphids transmit devastative plant viruses such as barley yellow dwarf virus (BYDV). Wheat yield loss from BYDV can be up to 80% with suggested impacts of 13–45 kg/ha per 1% increase in disease. Historic BYDV control has depended upon pesticides. There are, however, increasing reports of resistance(s) evolving in key aphid species against important insecticides. Genetic sources of resistance to aphids and/or BYDV may provide a reliable, environmentally friendly and cost-effective alternative to an increasingly restricted chemical arsenal. Such valuable resistances have been identified, although considerations exist for their effective deployment. We are working towards better knowledge of UK-wide BYDV variation and improved diagnostics. Combined with work into mapping aphid resistance(s), we aim to mitigate aphid and BYDV-associated wheat yield losses.

11:00

BREAK - 10 mins – attendees please stay online.

Designing Future Wheat (DFW)

11:10

6. The BBSRC Cross-Institutional programme, Designing Future Wheat – ***Graham Moore*** (John Innes Centre)

A key goal of DFW is to develop resources and tools for use by the UK and international wheat communities, through coordinating expertise across UK institutions and being a hub for international interactions. A further key goal is the development of pre-breeding germplasm. DFW has delivered a major step-change in gene functional characterisation resources in wheat over the last 5 years. Recently, we have added to these tools by contributing to the international sequencing and assembly of 15 genomes of hexaploid wheat, as well as low coverage sequencing of 242 *Ae. tauschii* accessions (D-genome progenitor). Extending this further, through an interaction with Agis, Shenzhen, the entire Watkins landrace collection of 827 lines has now been sequenced at 13x coverage providing a further step-change in the ability to exploit the DFW landrace germplasm and associated field-based phenotyping datasets. Furthermore, 72 of these field phenotyping studies have been made publicly available in an interactive and searchable form on the Grassroots Platform. Breeders have exploited our DFW pre-breeding germplasm derived from landraces, synthetics and wild relatives in their own crossing programmes. We have exploited the resources and tools developed ourselves to identify underpinning mechanisms and characterise key genes including those involved in: maintaining 50% of grain number; grain shape; starch granules; susceptibility and resistance factors as well as defining QTLs for high fibre in white flour.

11:20

7. DFW WP1 – Exploiting hormones to change the architecture of wheat – ***Steve Thomas*** (Rothamsted Research)

For more than 50 years, wheat breeders have been heavily reliant on the *Rht1*and *Rht2* dwarfing genes to develop short straw varieties that are lodging resistant and produce increased grain yields. Despite their success and widely adopted use, there are problems associated with them that can have a negative impact on some crop traits, including adverse effects on seedling establishment, nitrogen use efficiency, grain size and resistance to preharvest sprouting. We have generated an extensive collection of new dwarfing genes that are currently being assessed in field trials to

establish whether they overcome some of the limitations. These new dwarfing genes will be available to the wheat breeding and research community through the Designing Future Wheat Breeders Toolkit.

General interest

11:40

8. WISH-ROOTS: Wheat Improving Soil Health – *Maria C. Hernandez-Soriano* (John Innes Centre)

The WISH-ROOTS project, funded by the EJP Soil brings together partners from 7 countries and will be led by John Innes Centre (Norwich, UK). The project seeks to identify beneficial soil health traits and to include them in wheat breeding programs. For this, the partners aim to: 1) identify key traits associated with functionality of microbial guilds in the rhizosphere and root system architectural traits; 2) find the genes, genomic regions or metabolic pathways in wheat that can benefit soil health; 3) develop genetic tools for breeding and microbial inoculum to introduce these beneficial traits in commercial cultivars. These aims will provide advantageous varieties for farmers that support a more sustainable use of land improving soil microbial biodiversity, nutrient cycling, and structure.

12:00

9. Integrating bundled agronomic practices with genetics are crucial for raising the yield potential under current and future climates in South Asia – *Mangi Lal (ML) Jat* (CIMMYT)

South Asia is a densely populated region with 1.7 billion people and by 2050, the number is expected to rise to 2.4 billion. The region is a global 'hotspot' for contemporary and future climate vulnerability with 3-5 times higher pressure on natural resources compared to the rest of the world. The region would need more nutritious food from less and moreover degraded natural resources and higher climatic variability which is a major challenge and can not be addressed with business-as-usual approaches in research and development. Integrating bundled agronomic solutions (conservation agriculture, precision water, nutrient management, system optimization) with genetic advances are critical for improving productivity within the planetary boundaries. I will share evidence on the power of integrating bundled agronomic practices with genetics (G x E x M) for sustainably raising the yield of major cereal crops.

12:20

10. Progress in Spectral-Based Screening for Nutrient Evaluation of Wheat Germplasm Resources - *Noam Chayut* (GRU Norwich)

Ex-Situ seed conservation is vital for global food security by providing a source of allelic variation for research and crop improvement through breeding. The Germplasm Resources Unit (GRU), an international genebank for UK strategic crops hosts comprehensive collections (totalling over 51,000 accessions) of cereal and legume crop gene-pools. The GRU team is powered by a world-class germplasm information management system and public database (www.SeedStor.ac.uk), enabling cost-effective data and germplasm distribution. To enhance the collection usability, the GRU set a strategic objective to generate agronomically important phenotypic data. We focus on seed traits such as grain pigmentation, morphology, longevity, seed vigour and macro/ micronutrient content. To screen vast wheat collections for protein, starch, fibre, and mineral content, we have acquired X-ray fluorescence (XRF) and Near Infra-Red (NIR) spectrometry capabilities. The spectral screening methods were recently calibrated and validated using the WGIN panel data kindly supplied by RRS researchers.

Morning session to Finish by 12:45

Panel discussion

Topic: **'The implications of reduced input agriculture on wheat breeding and crop productivity'**

How to submit your questions - registered attendees will be invited to send in questions in advance via the WGIN email – wgin.defra@rothamsted.ac.uk and peter.shewry@rothamsted.ac.uk

13:45

11. Considering nitrogen responsiveness as a trait underlying sustainable cereal production – *Stéphanie Swarbreck* (NIAB)

Increasing nitrogen fertilizer applications have sustained a growing world population in the 20th century. However, to avoid any further associated environmental damage, new sustainable agronomic practices together with new cultivars must be developed. Improvement in nitrogen use efficiency defined as the yield produced per unit of nitrogen available must be achieved. Interestingly, high nitrogen use efficiency can be attained under low nitrogen availability suggesting that the positive effect of nitrogen on yield or nitrogen responsiveness decline with increased nitrogen availability. Thus, crops with low nitrogen requirements must respond well to low nitrogen availability and maintain this strong response even under high nitrogen status. I will consider nitrogen responsiveness as a candidate trait to select wheat varieties with lower nitrogen requirements.

14:05

12. Reducing the Requirement for Nitrogen Fertiliser for Breadmaking Wheat – *Peter Shewry* (Rothamsted Research)

UK millers require wheat with about 13% protein for breadmaking, with higher levels required for some specialised baked products. The high yield potential of modern UK wheats has resulted in dilution of the protein content of the grain and it is often necessary to provide additional nitrogen to raise the grain protein content. I will discuss strategies to reduce this requirement, by exploiting genetic variation in grain protein deviation and in breadmaking quality at low protein content. I will also discuss the wider challenges for reducing the nitrogen requirement of wheat as an introduction to the panel discussion.

14:25

13. Discussion – *Professor Peter Shewry* (panel chair)

panellists

1. **David Felce** (agrii)
2. **Dominic Amos** (organic research centre)
3. **Mark Tucker** (YARA)
4. **Stephanie Swarbreck** (NIAB)
5. **Timothy Parton** (Farmer)
6. **Joe Brennan** (UK Flour Millers)

15:30

14. general discussion about the day

16:00 ***meeting ends***

Please contact Michael Hammond-Kosack (wgin.defra@rothamsted.ac.uk) with any questions.