Identification of the long sought-after Ph2 gene, a step towards the control of homoeologous recombination in wheat

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Q&A session

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The webinar recording is available on the IWGSC YouTube channel at https://youtu.be/zt6Z4EXDqOc

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Q: Can you give a real-live example of the use of the ph2 mutation to promote homoeologous recombination in a breeding program?

Timestamp: 45'02"

Here are the references of the research articles reporting the use of ph2 mutations in introgression breeding: Wei et al., 2015, utilised ph2a and ph2b mutants for introgressing Aegilops sharonensis chromatin containing HMW-GSs, whilst Benavente et al., 1998 confirmed a wheat/rye translocation event by GISH using ph2b. In addition, Marais et al., 1992 utilised ph2b to break linkage drag between yellow seed pigment and leaf rust resistance on an existing introgression fragment from Thinopyrum distichum.

Q: What are the expression levels across tissues of the MSH7 3A and 3B in the ph2a mutants? And ph2b mutants?

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We did not look at RNA abundance in the ph2a mutant.

In ph2b anthers, msh7-3A and 3B RNA abundances are slightly reduced compared to wt anthers. We did not check their expression in any other tissues.

Q: Can we do CRISPER cas9 mutation for MSH7 if yes what will be the phenotype, and is there any other effect of MSH7 I mean pleiotropic effect

Timestamp: 46'20"

Q: Your MI chromosome pairing data: have you corrected the scores for the ph2 lines for the presence of structural aberrations that must have accumulated over the generations? When you score pairing in such lines you look not only at the effect of the mutation on this particular meiocyte but also on the accumulated effects of the mutation since it was first created.

Timestamp: 47'37"

Structural rearrangements (resulting from previous homoeologous exchanges) can indeed impact chromosome pairing at metaphase I. However, only very rare multivalents are observed in ph2 wheat meiocytes indicating that homoeologous recombination is still suppressed in this context and do not

induce structural rearrangement. Accumulation of structural aberrations over generations is consequently unlikely.

Q: Wouldn't you worry about detrimental effects in case of ph1/ph2 double mutations?

Timestamp: 50’34”

Q: What do you think can be the case for durum wheat, where the D geneme is not present? Could it be that the Ph2 job is taken over by its 3A and/or 3B homoeologs?

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Q: Any interactions between Ph1 and Ph2?

Timestamp: 52’50”

Q: The ph1b mutation has been shown to be deletereous for wheat caryotype stability. Do you think that combining ph2b with ph1b can be a better transfer breeding strategies than use of ph2b alone?

Timestamp: 53’56”

Q: Is it known if Spo11 interact with MSH7/2 complexes?

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