Pre-breeding with synthetic wheat – stopping the gene pool from becoming stagnant!

Dr Phil Howell

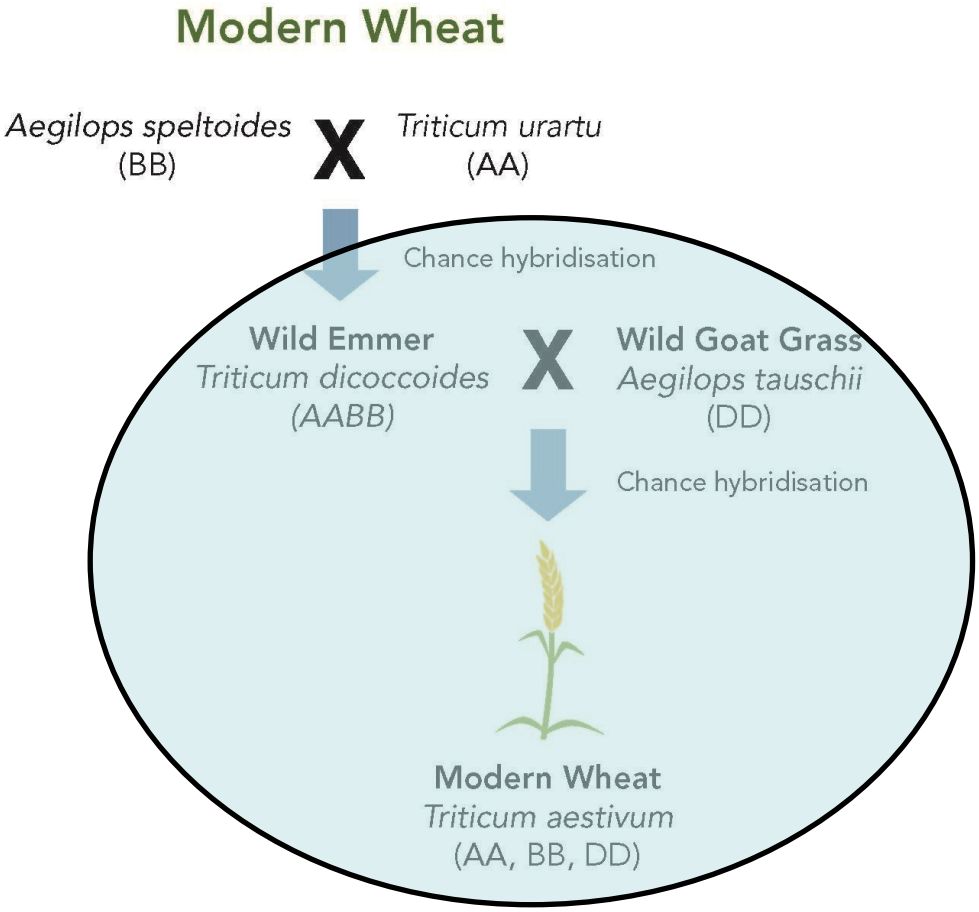
NIAB TAG Pre-breeding group

What is pre-breeding?

- Pre-breeding sits in the (big!) gap between “high science” and the market

- Moving new genes & traits into adapted backgrounds
- Much more likely to produce interesting parents than directly lead to new varieties
- It requires a different mindset - most of my NIAB selections would have got me the sack at Syngenta!

Synthetic Hexaploid Wheat (SHWs)



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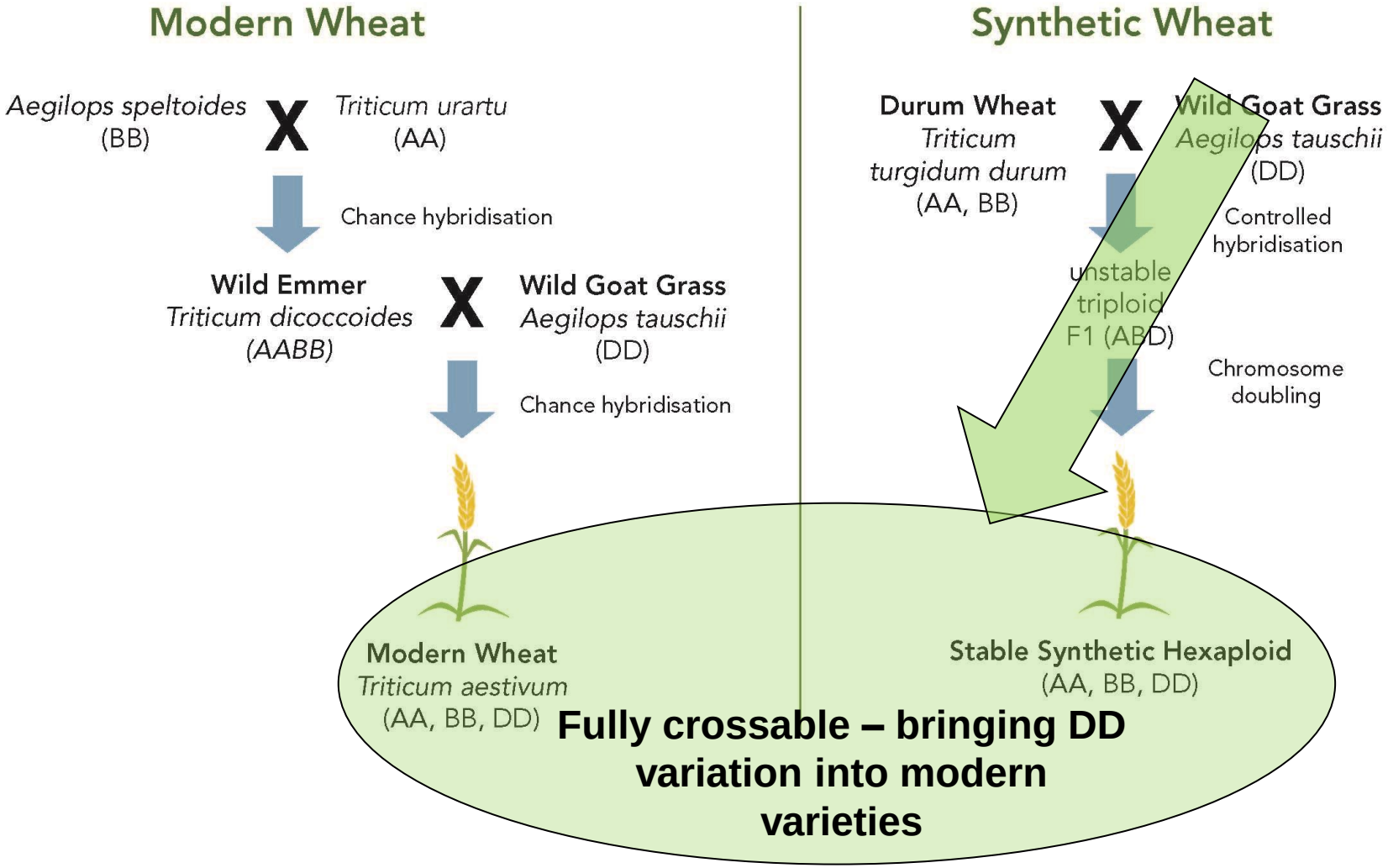


Tetraploid / hexaploid direct crossing

Robigus,
Paragon
Triticum aestivum
(AA, BB, DD)

X

Wild Emmer
Triticum dicoccoides
(AA, BB)

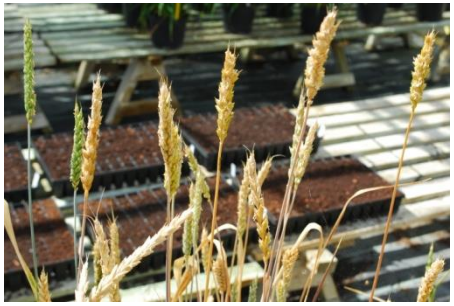
Cultivated Emmer
Triticum dicoccum
(AA, BB)

Durum Wheat
Triticum durum
(AA, BB)

pentaploid F1
(AA, BB, D)

X

Robigus,
Paragon

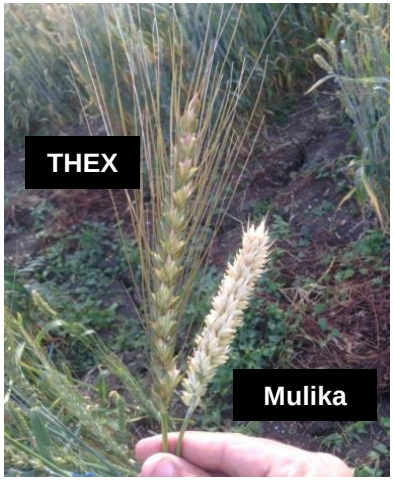


Segregating BC1 generation
(AA, BB, D); (AA, BB, DD)

Inbred BC1F5 generation
(AA, BB); (AA, BB, DD)

Positive results so far.....

- High yield potential in SHW-derived selections
  - Best yields >30% above adapted parent
- Room for further improvement:
  - eg110% yield but 119% biomass: can we tweak harvest index further?
  - Even if yield only = best elites, likely to be for different reasons: are these additive?
- High yields may be maintained better at lower N than elites
- We have also seen increases in yield components:
  - Very large grains
  - Increased grain number



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10,000-year-old wheat ancestor offers a grain of hope to farmers

Sunday 12 May 2013 8:11 pm

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Britain's grain shortage could be eased by a 10,000-year-old original wild ancestor of wheat.

A new strain combining modern wheat varieties with an ancient forerunner has the potential to increase supplies by nearly a third.

Scientists said the hybrid may also increase the crop's resistance to disease and tolerance of drought.

National Farmers' Union president Peter Kendall said the potential of the breakthrough is 'just enormous'.

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Cambridge-based scientists develop 'superwheat'

British scientists say they have developed a new type of wheat which could increase productivity by 30%.

The Cambridge-based National Institute of Agricultural Botany has combined an ancient ancestor of wheat with a modern variety to produce a new strain.

In early trials, the resulting crop seemed bigger and stronger than the current modern wheat varieties.

The scientists transferred some of the resilience of the ancient ancestor of wheat into modern varieties

It will take at least five years of tests and regulatory approval before it is harvested by farmers.

Some farmers, however, are urging new initiatives between the food industry, scientists and government.

They believe the regulatory process needs to be speeded up to ensure that the global food security demands of the next few decades can be met, says the BBC's Tom Heap.

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Funding

- NIAB's pre-breeding is funded from several sources
  - BBSRC
  - HGCA
  - Breeders
  - EU
  - Technology Strategy Board
  - NIAB Trust

BBSRC bioscience for the future

European Commission

HGCA

BSPB promoting innovation

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