Wheat variety blends; genetic, agronomy and supply chain considerations

Aoife O’ Driscoll
17th October 2023
Variety blends have a long history in the UK

- Sinclair McGill researched and commercialised blends in the ‘70s
- World record achieved in 1994 with wheat and barley blends

"It has been experimentally proved, that if a plot of ground be sown with one species of grass, and a similar plot be sown with several distinct genera of grasses, a greater number of plants and a greater weight of dry herbage can be raised in the latter than in the former case. The same has been found to hold good when one variety and several mixed varieties of wheat have been sown on equal spaces of ground" (Darwin, 1859)
Mixtures of UK Wheat as an Environmentally Friendly Source

J. Stuart Swanston, Adrian C. Newton

First published: 08 February 2008 | https://doi.org/10.1016/j.jiobeer.2007.05.001

100+ research papers on wheat and barley variety blends under UK agronomic conditions

Malting Performance of Barley Cultivar Mixtures from the UK and Poland

J. S. Swanston, A. C. Newton, D. C. Guy, E. S. Gacek

Today-international markets

Approx 40% of winter wheat market

Three wheat blends commercially available with approx 7% of market.

18% of bread wheat area, 4.4% of durum wheat, 5% of barley, 15% of triticale

*Figures do not take into account home saved seed

Data Sources: Aarhus University, InraE, Agroscope
Challenges

Knowledge exchange and data interpretation
• What makes a good variety blend?
• Does diverse parentage really matter?
• The differences between a population and a variety blend

Regulatory and commercial
• Wheat supply chains built around the traceability and provenance of uniform varieties.
• Blends are attractive to growers but disruptive to the rest of the supply chain
• Managing farm-saved seed payments
• Will grain buyers accept the end-product? Are end markets restricted to feed and fuel?
Questions around disease management

• What happens to diseases in a blend?
• How do you time fungicide inputs?
• Can you reduce fungicide spend by growing a blend?
• Can you increase yields by growing a blend and using the same level of inputs?
What happens to disease in a blend?

A typical wheat field can carry ca. 3 million *Z. tritici* genotypes/ha

Produce ca. 2 trillion pycnidiospores/ha


**McDonald et al. How large and diverse are field populations of fungal plant pathogens? The case of *Zymoseptoria tritici*. Evol Appl. 2022
Leaf layer emergence and fungicide timing
Questions around disease management

• What happens to diseases in a blend?
• How do you time fungicide inputs?
• Can you reduce fungicide spend by growing a blend?
• Can you increase yields by growing a blend and using the same level of inputs?
2022 untreated yields

![Graph showing untreated yields for different varieties (G1_1, G1_2, G1_3, G1_4, G1_Blend, G3_1, G3_2, G3_3, G3_Blend, G4_1, G4_2, G4_Blend). Yields range from 7.0 to 13.0 t/ha.](image-url)
2022 treated yields
KWS Zyatt untreated

KWS Zyatt full fungicide programme

KWS Zyatt in 4-way mix. Reduced rate program

KWS Zyatt in 4-way blend. Untreated
2023 untreated yields

Variety

Untreated yield (t/ha)
2023 treated yields
Knowledge exchange and data interpretation

- What makes a good variety blend?
- Does diverse parentage really matter?
- What are the differences between populations and variety blends?
UK wheat varieties pedigree

For further information contact: Dr James Cockram or Nick Fradgley

The wheat pedigree provides information on parentage, country of origin, year of use and breeding company for an extensive set of UK wheat varieties. The pedigree is updated each year with new AHDB Recommended List varieties and we would welcome suggested edits and additions.

Download the latest input files (December 2021) for visualising pedigrees, for use with Helium software - the image below shows the entire pedigree.
Challenges and opportunities

• Blends threaten to disrupt established supply chain models in breeding, agronomy, seed certification, grain processing

• An *opportunity* for the whole supply chain to consider different approaches.

• Large mills require consistent performance enabling lower cost of production.

• *Opportunities* for smaller mills, using less automation but delivering higher value products

• Seed production; multi-component blends can be too costly to produce at scale.

• *Opportunities* for smaller seed companies to produce higher value, higher margin blends in volumes to serve specialist markets.

• Buy back contracts are available from a number of seed merchants
Thanks to:
NIAB Membership for trial and KE funding

NIAB colleagues:
Dr Phil Howell and Clare Leaman
Potential future work

• Performance in no till systems
  • Rooting depth, early vigour and resilience to drought

• Disease management
  • Dilution versus barrier effects
  • Changes in virulence and fungicide resistance
  • Agronomic strategies, timing and inputs

• Pest and weed management
  • Balancing crop competition effects with herbicide efficacy
  • Can blends confuse, attract or repel e.g. aphids?

• Larger questions around genetic drift, allelic and genotypic richness and population ecology