

# Malting quality interactions of barley cultivar mixtures from the UK and Poland

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## Background

- Winter barley cultivar mixtures effectively control *Rhynchosporium secalis*.
- Disease control and yield gain is proportional to mixture complexity (component number).
- Malt extract yields of mixtures generally do not differ from mean of monoculture components.
- Homogeneity of cell wall modification is reduced in most mixtures.
- A winter barley mixture with components of similar pedigree gave enhanced hot water extract with no adverse effects on homogeneity.

## Aims

- Determine whether spring barley cultivars:
- maintain the malt extract mean of their components
  - have the potential to provide combinations with enhanced malting quality
  - show association between enhanced quality and similarities in pedigree

## Methods

Site and years: SCRI, Dundee - 1996 and 1997

UK cultivars: Brewster, Camargue, Cooper, Prisma

Polish cultivars: Maresi, Mobec, Orlik, Rudzik

Design: 3-component mixtures, split plot, 2 levels of N P K in 1997

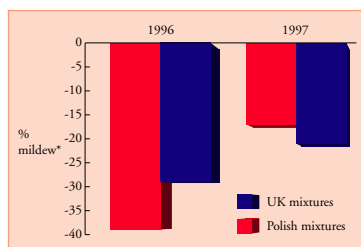
Measurements: 1996 - 30g samples in SCRI automated malting system; 1997 - 1000g samples with EBC measurements at COBORU

Main measurements: Hot water extract, grain nitrogen, filtration time, kolbach, diastatic power

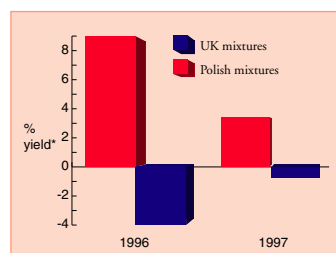
Other measurements: Germination, % dry matter, % soluble protein, colour of wort, attenuation

## Results

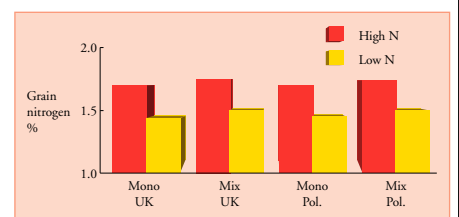
High levels of matching virulence resulted in disappointingly small reductions in mildew levels.



Yield responses do not directly reflect disease reductions indicating other competitive and complementary interactions between mixture components.

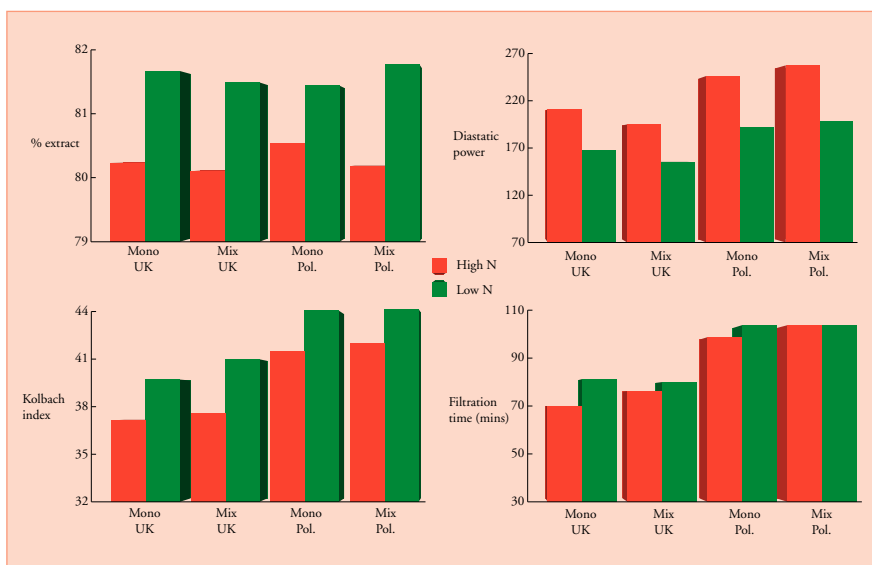


Mean grain nitrogen contents for the four groups of cultivars grown at 2 nitrogen levels in the 1997 trial.

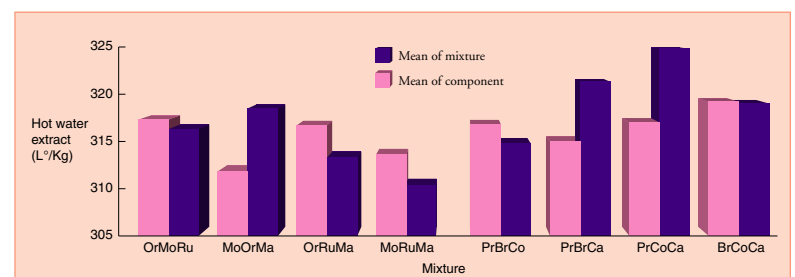


\*Mixture compared with monoculture mean.

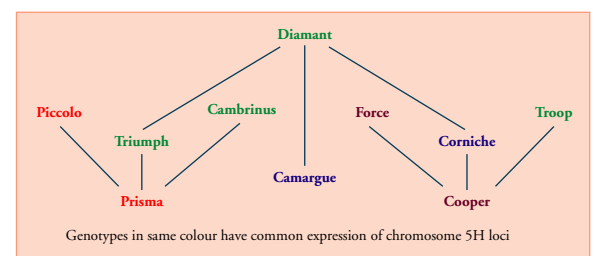
Means of the UK and Polish mixtures and monocultures in 1997 for several malting parameters shown for each of the two nitrogen levels separately.



Mean hot water extracts (L<sup>0</sup>/Kg) of the 8 mixtures included in trial in 1996 compared to the means of their component cultivars grown in the same trial.



Pedigrees of Prisma, Camargue and Cooper showing common ancestry but different origins (signified by different colour text) of malting quality loci on chromosome 5H.



## Conclusions

- Mildew reduction consistent but often results in little or no yield benefit.
- Nitrogen application and source of germplasm have very large effects on malting quality.
- Mixtures may have comparatively little effect on malting quality.
- Synergistic effects on malting quality can be observed with components of similar pedigrees.
- Homogeneity in agronomic characteristics must be balanced with heterogeneity in resistance characteristics and likewise heterogeneity in extract components may enhance homogeneity during malting.
- QTL for fermentability and other malting quality parameters are defined.
- Potential for use of molecular markers to optimise malting quality interactions.
- Molecular markers can be used to: a) verify mixture composition quantitatively and qualitatively; b) detect contamination.
- Maltsters, agronomists and distillers in Scotland are interested in applying this technology to promote use of mixtures.

### Acknowledgements

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