



Future **Wheat**

How the temperature and different environmental factors influence to the synthesis, polymerization and structure of gluten protein in developing wheat grain.

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Background

- Norwegian wheat production ~ 460,000 ton
- Closed market – all wheat passing food grade will be used
- ~70% Norwegian wheat in bread flour
- 100% import to almost self-sufficiency

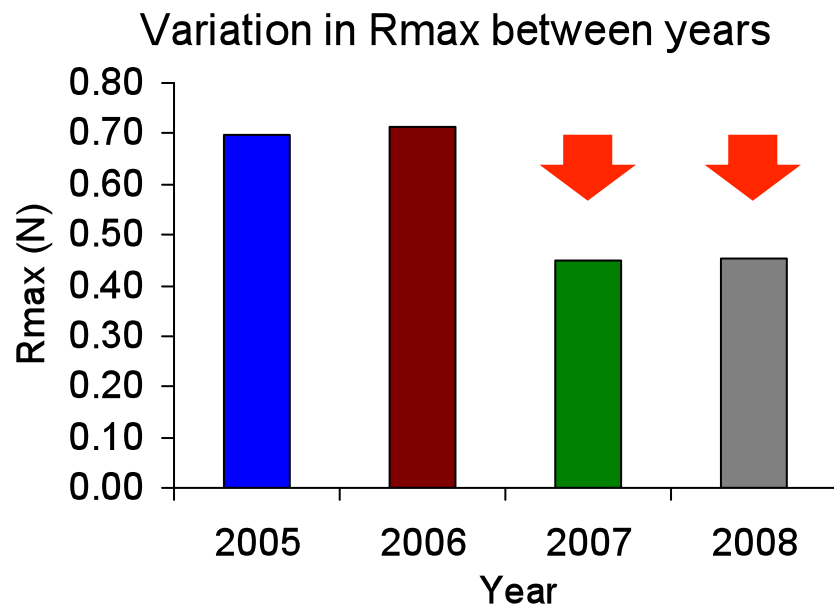


Gluten quality of Norwegian wheat cultivars introduced in the period 1900-2000.

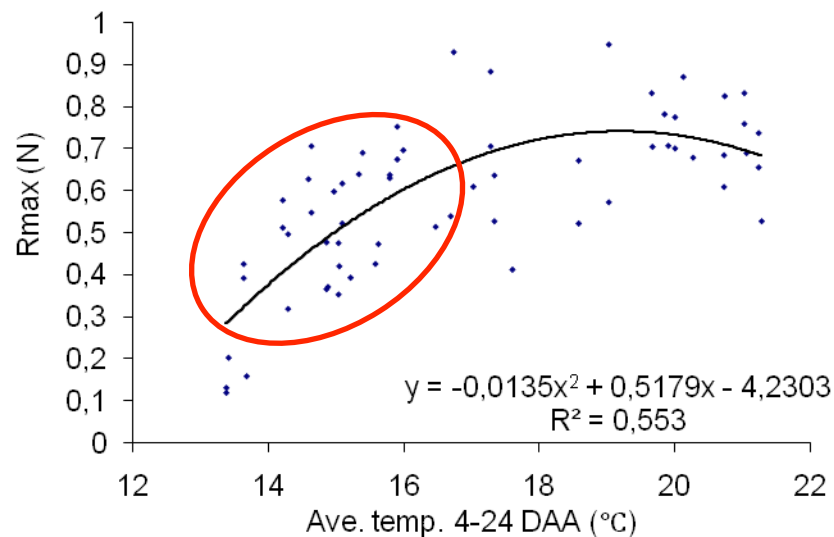


*1 HMW-GS 1Dx5+1Dy10; good breadmaking quality

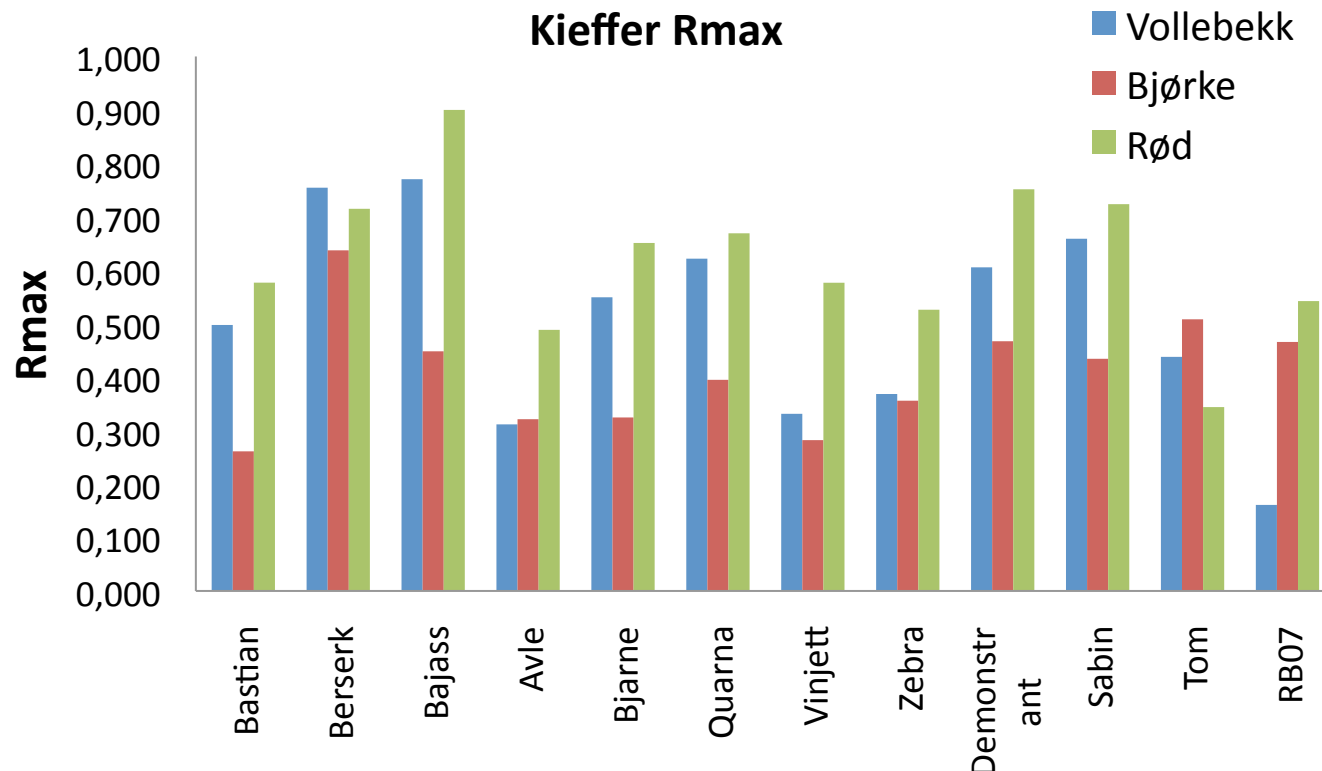
Future
Wheat



The correlation between Rmax and temp. during differentiation/ accumulation phase



- Protein quality varies from year to year.
- There is correlation between Rmax and temperature during grain filling.
- Low Rmax value was observed at low temp.



- 12 cultivars were cultivated in 3 different locations in Norway.
- Big differences were found between the locations.
- Temperature during grain filling was different from location to location.
- Sabin, Tom and RB07 are US cultivars. Rmax of 0.8-0.9 was observed for these cultivars grown in US.

Hypothesis and Goal

Low temperature during flowering and beginning of grain filling might cause poor gluten protein in wheat.

Goal for my study is to understand the effects of different environmental factors, mainly temperature, during grain filling on the synthesis, polymerization and structure of gluten protein in developing grain.

- Climate chamber exp.: Temperature ↔ Protein quality
- Field exp.: Environmental factors



Experiment in climate chamber

Plant material ; Wheat : *Triticum aestivum*

Cultivar : Bjarne (Norway), Cadenza (UK)

→Plants are grown in greenhouse and moved to climate chamber a couple of days before flowering.

Temperature treatment at climate chamber;

13/10 °C (day/night)

18/15 °C

23/20 °C

	Differentiation phase	Accumulation/ maturation phase
1		13
2	13	18
3		23
4	18	18
5		23
6	23	23

Sampling; 6,8,12,16,20 and 32 DAA (18 °C) corresponds to 102, 136, 204, 272, 340, and 544 d° and mature grain



Analyses

Immature grain sampled during grain filling

- Protein characterization by *electrophoresis (SDS-PAGE)*
- Gene expression by *micro array*

Mature grain

- Protein characterization by *electrophoresis*
- Evaluation of gluten quality by *SDS-sedimentation test*
- To study the size distribution of the protein by *SE-FLPC*
(*Size exclusion fast protein liquid chromatography*)
- To measure the gluten extensibility by *Kieffer-rig extensigraph*



Field experiment

Plant material ;

Wheat : *Triticum aestivum*

9 cultivars from Norway and 3 cultivars from USA

Field;

4 different locations in Norway

Vollbekk, Bjørke, Rød and Apelsvoll

Goal;

To understand how different environmental factors in different locations influence the protein quality in wheat.

Analyses;

- Climatic/environmental data from different locations
- *Kieffer-rig extensigraph*
- *SDS sedimentation test*
- *SE-FPLC*
- Protein characterization in flour and developed gluten/dough by *electrophoresis*



Thank you for your attention!