

# Wheat Quality Requirements

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- **Introduction to key quality parameters**
- **Quality in more detail**
  - **Why what we measure is important for quality and performance**
- **Summary**

# Quality testing for Recommended List



- Suitability of new varieties for end-use applications

## *Mill Performance and Quality Indicators*

### • Intake requirements

- Protein
- Hagberg Falling Number
- Specific weight
- Endosperm texture

### • Milling performance and flour quality

- Milling yield
- Flour colour
- Starch damage

## *Baking Performance Indicators*

### • Dough rheology

- Extensibility
- Elasticity
- Mixing behaviour
- Water absorption

### • Baking performance

- Full-size, commercially scaleable baking
- Small scale, indicative baking





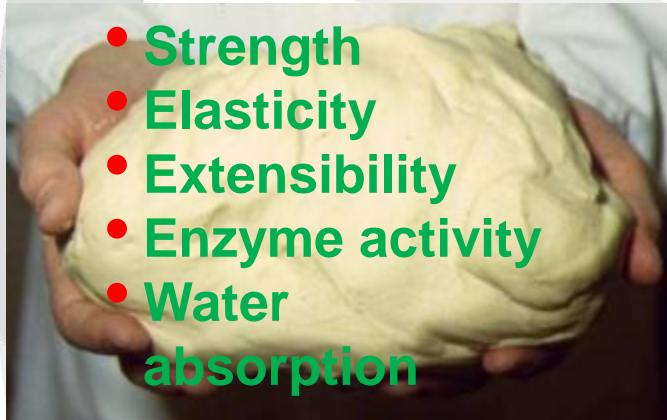
# Baked product quality chain from field to milling



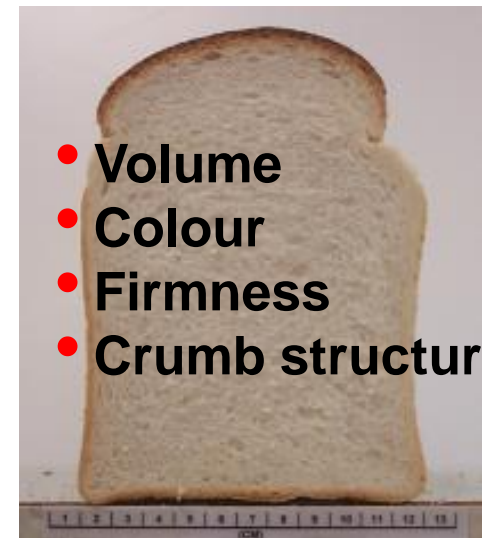
**Milling**



**Dough preparation**



**Baking**



# Baked product quality chain from field to milling

## Mill Intake

- Endosperm texture
- Grain protein
- Enzyme activity
- Grain weight
- Grain moisture

## Flour Milling

- Flour protein
- Starch damage
- Bran content
- Enzyme activity
- Milling yield
- Colour

## Dough Handling

- Strength
- Elasticity
- Extensibility
- Enzyme activity
- Water absorption

## Finished Product

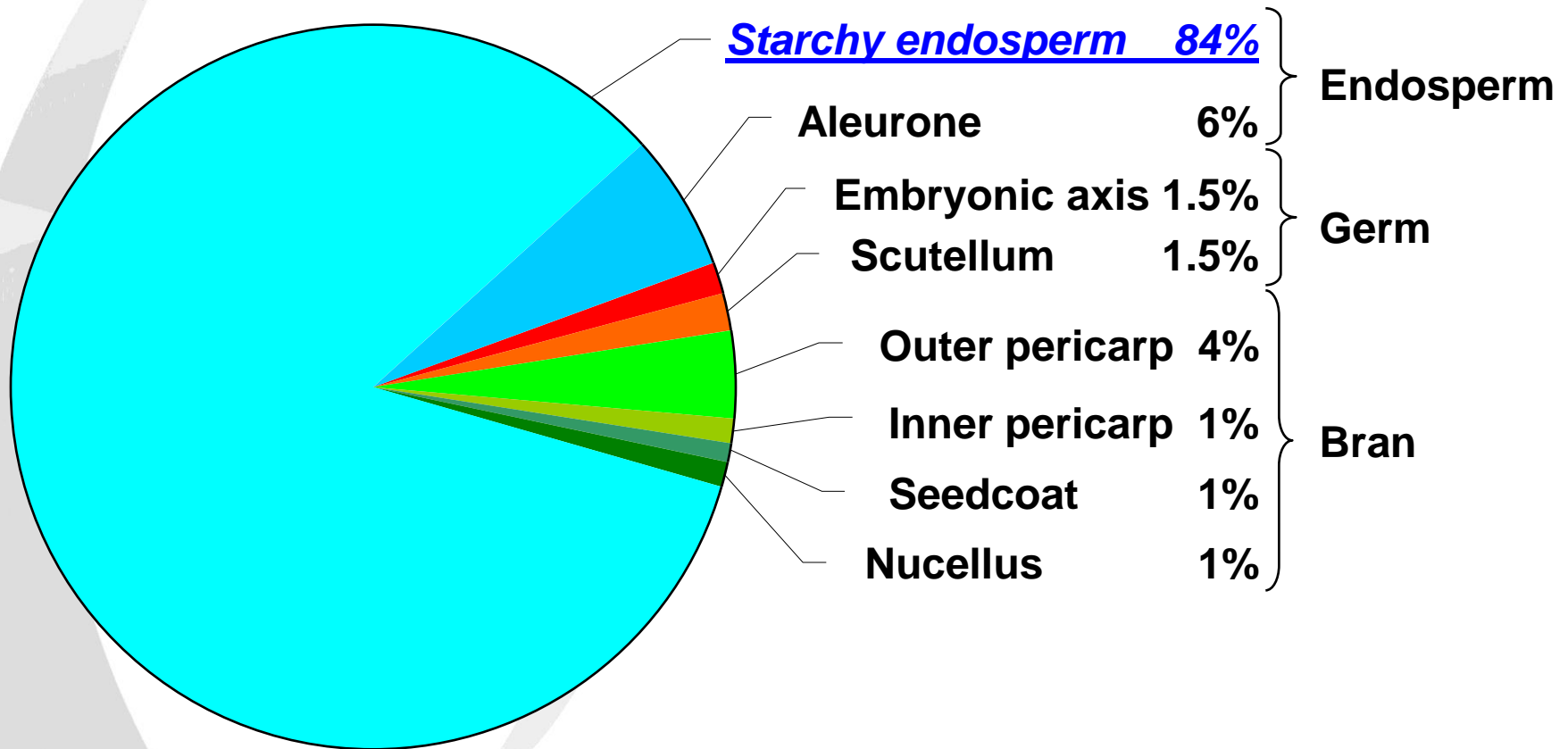
- Volume
- Colour
- Firmness
- Crumb structure

# Aim of the flour milling process is to maximise yield with desired quality

- Separation of endosperm from bran and germ
- Particle size reduction of endosperm to produce flour (whiter the better, without dark flecks)
- Creation of starch damage where appropriate to the product

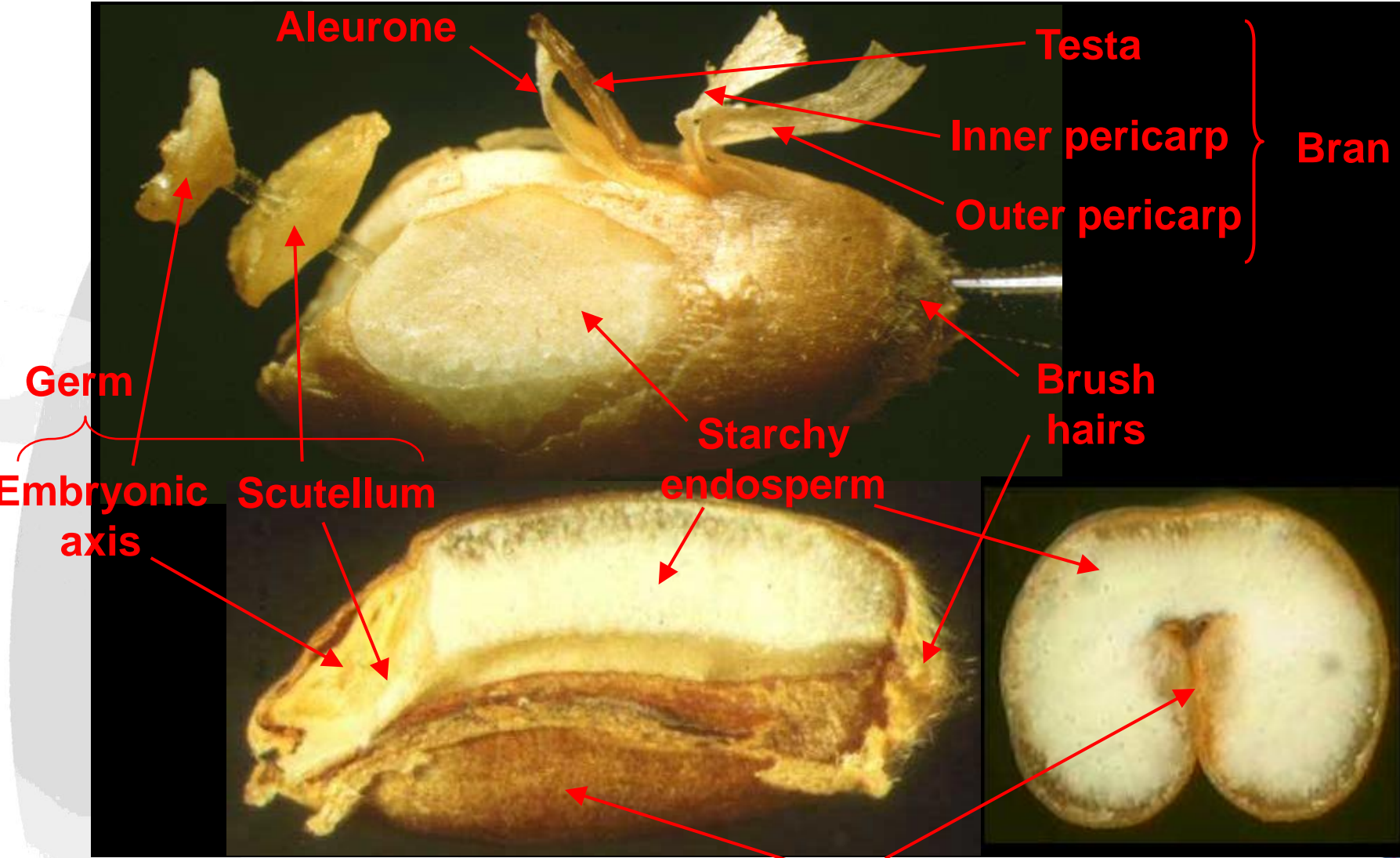
Desired output is a consistent flour produced with an economic yield

# Target is to achieve maximum yield of white flour from the process





# Grain structure dissected



# Grain fractions from milling process.

**Flour**

**Aleurone**



**Outer  
pericarp  
(‘Beeswing’)**

**Pericarp &  
testa**

**All bran samples sieved to 125-180 $\mu$ m particle size**

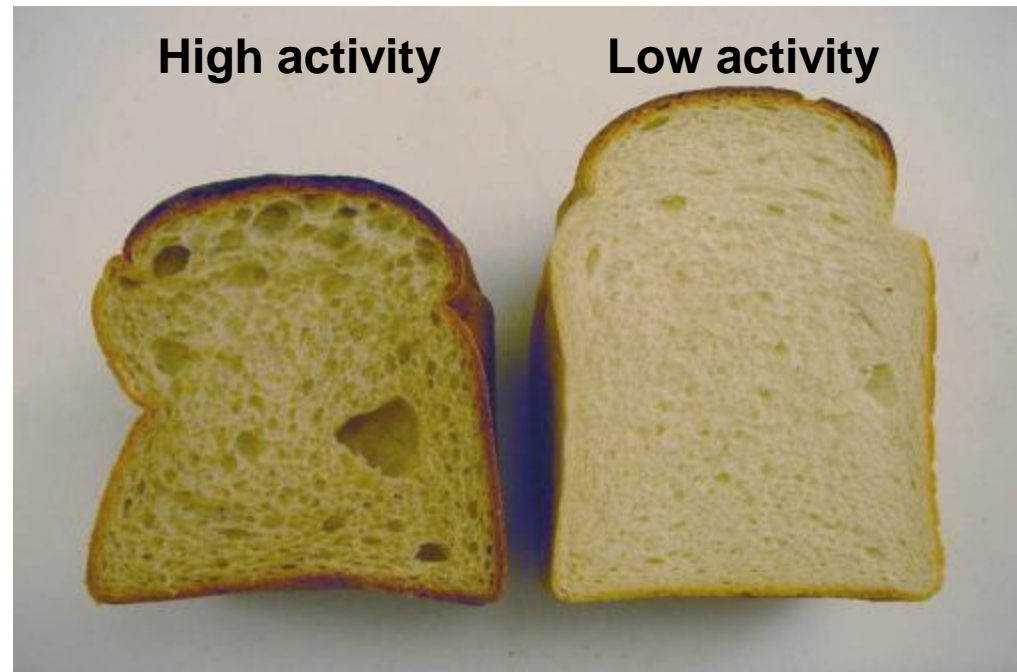
# Wheat/flour properties required for processing

	<b>Bread</b>	<b>Biscuits</b>
<b>Endosperm texture</b>	Hard milling	Soft milling
<b>Protein content (wheat)</b>	High (13%db)	Low (11%db)
<b>Protein/dough quality</b>	Elastic and extensible	Extensible
<b><i>Alpha</i>-amylase activity</b>	Low (HFN>250s)	Low (HFN>180s)
<b>Specific weight</b>	High (>76kg/hl)	High (>76kg/hl)
<b>Bran levels</b>	Low (for white)	Low (for white)
<b>Water absorption</b>	High (>60%)	Low (<55%)

- Impact of quality parameters on finished product

# Impact of grain $\alpha$ -amylase on baking quality.

- Expressed as Hagberg Falling Number
- Required in bread dough to provide sugars for gas production
- Too high activity leads to excessive starch breakdown
  - sticky crumb and collapsed loaves



# Impact of excess cereal $\alpha$ -amylase on sliced bread quality.



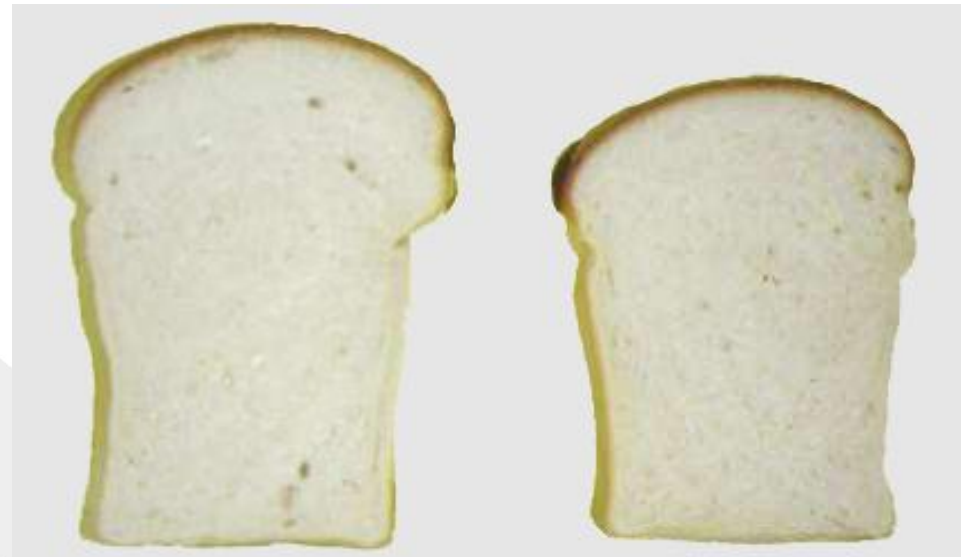
**Too much**



**Just right**

# Starch damage is important for baking performance.

- $\alpha$ -amylase only attacks damaged starch
- Damaged starch absorbs more water than intact starch granules
- There is an optimum level of starch damage for baking
  - Balances water addition with crumb structure



59.3

63.6

Water Absorption (%)

# Proteins and the quality of wheat

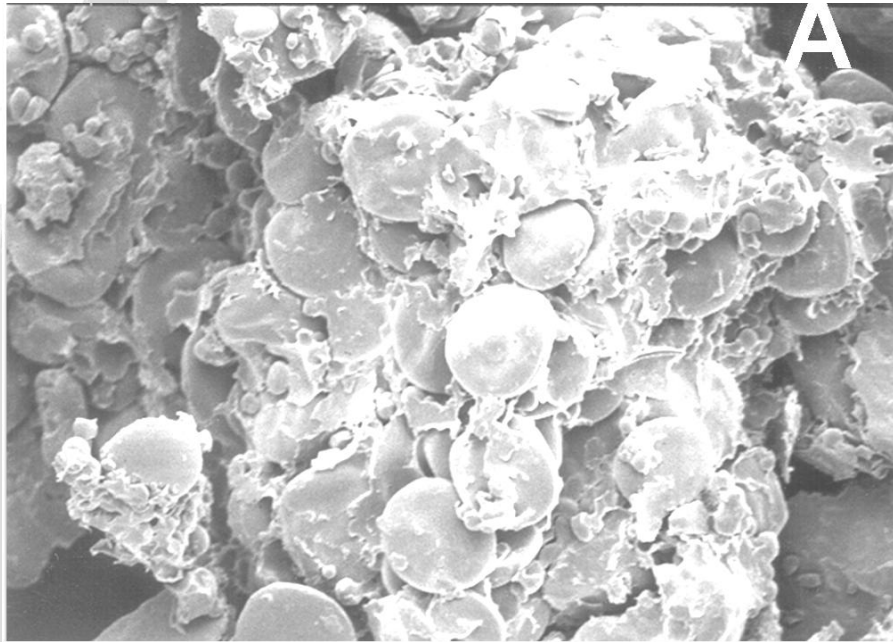


- Wheat flour proteins are crucial in relation to breadmaking quality
- Both quantity and quality are important
- Gluten proteins give wheat products unique rheological and processing properties



# Wheat dough: proteins are vital in forming and stabilising the foam structure of bread.

Flour



Dough



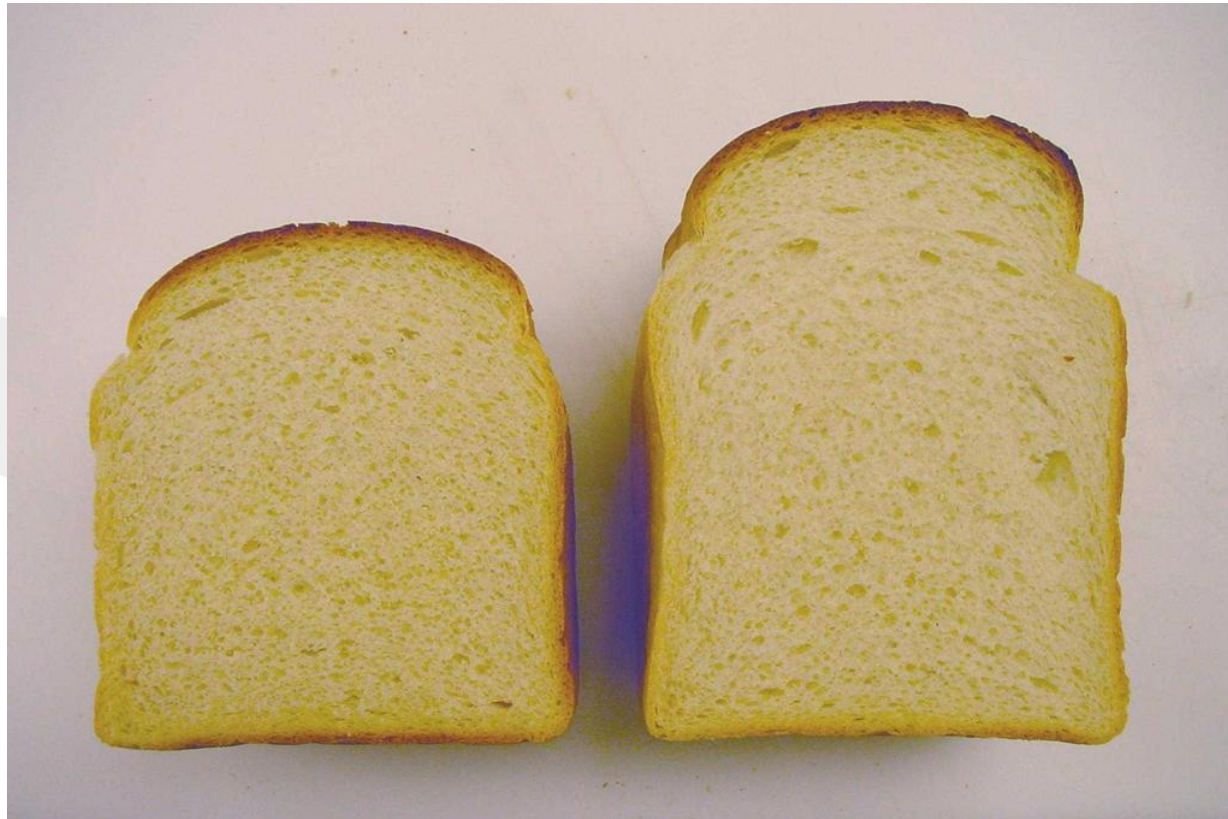
# Effect of protein content and quality on dough rising



**Increasing Protein Content and Quality**



# Effect of protein content on loaf volume and internal appearance



**Low protein**

**High Protein**

# Summary

- Grain quality characteristics reflect processors needs
  - millers
  - bakers
- Consistency is the key
  - Millers' and bakers' processes need to operate reliably
  - majority of bread in the UK is plant-bakery produced 800g white sliced loaf

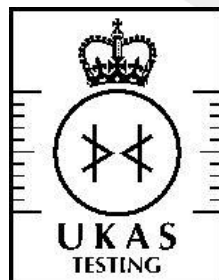
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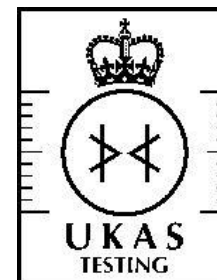
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