Grading Factors

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Outline

- Quality testing
- Protein quality
- Grading factors

Why Do We Test Quality?

- Monitor parameters
  - Physical, chemical, rheological
- Ensure consistency of product
- Ensure conformation to specifications or regulations
  - Internal or external
  - Legal requirements

Basic Quality Tests

- Wheat
  - Protein
  - Moisture
  - Ash
  - Falling number
  - Gluten
  - Specific weight
  - Kernel hardness
- Flour:
  - Protein
  - Moisture
  - Ash
  - Gluten
  - Farinograph
  - Alveograph
  - Extensograph
  - Colour

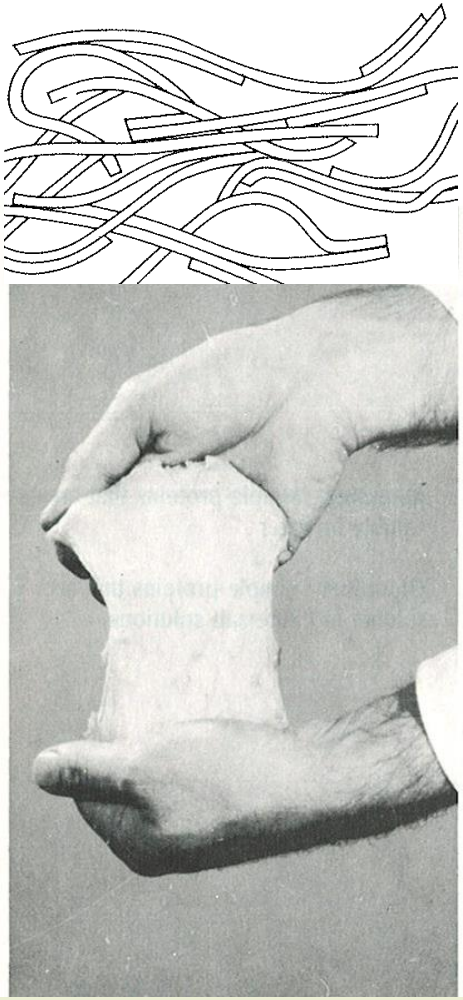
Analytical Services

Protein Quality

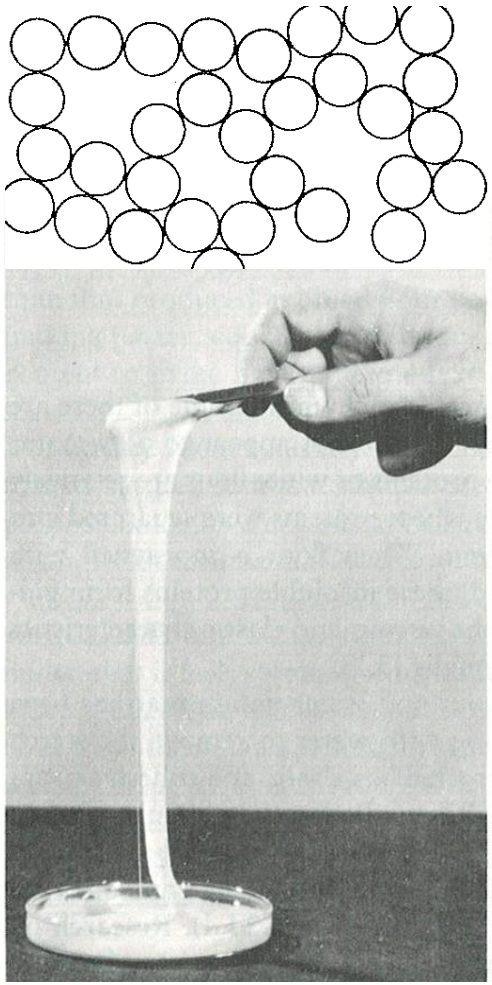
- Protein quantity is important but so is quality
- Protein quality refers to gluten quality
- Gluten provides dough with viscoelastic properties

Protein Quality

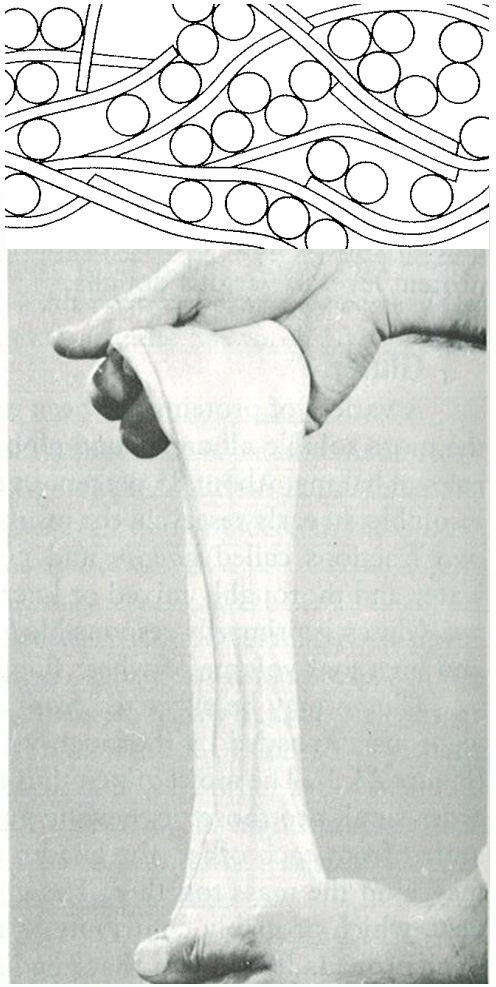
Gluten



Glutenin



Gliadin



Gluten

Adapted from Dimler. 1963. Bakers Digest. 37: 52 and Huebner. 1977. Bakers Digest. 51(10):25-31.

Gluten

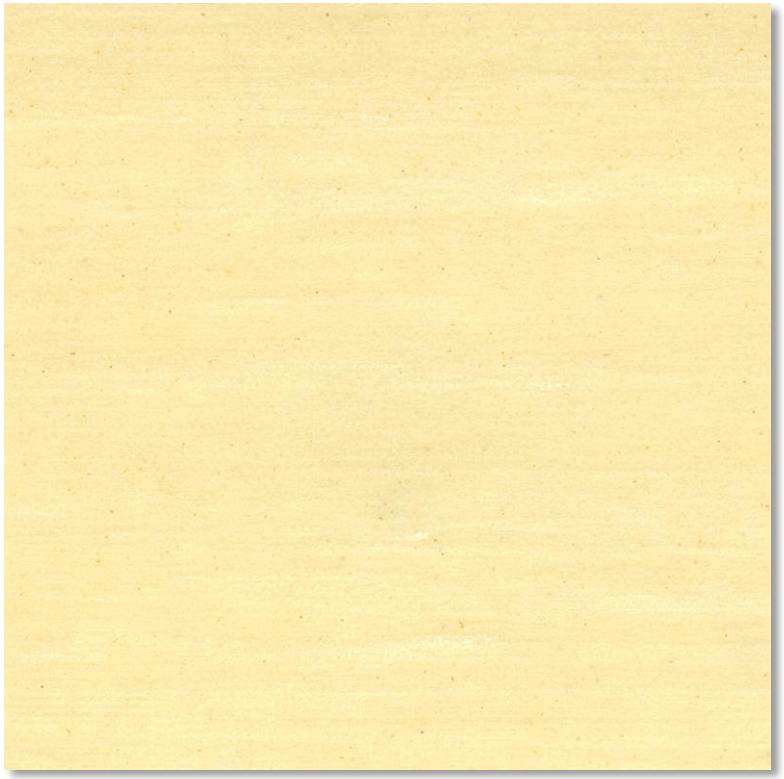
Grading Factors

- Mildew
- Sprout damage
- Frost/Heat stress
- Fusarium damage
- Midge
- Hard vitreous kernels (HVK)

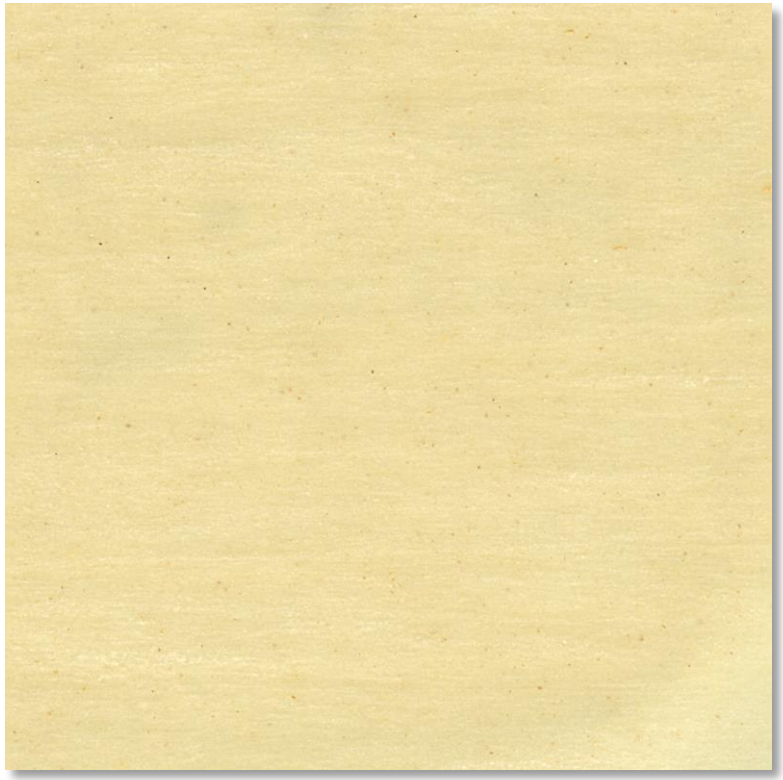
Degrading Factor – Mildew

- Fungal infection
- Kernels have greyish appearance
- Not a human health concern
- Affects flour colour and brightness
- May decrease the flour yield
- Increased specks in semolina

Noodle Colour



1CWRS



3CWRS

Degrading Factor - Sprout Damage

Images courtesy of the Canadian Grain Commission

- Sprouting occurs when mature kernels in the field receive moisture which causes sprouting
- Causes biochemical reactions in the kernel to begin

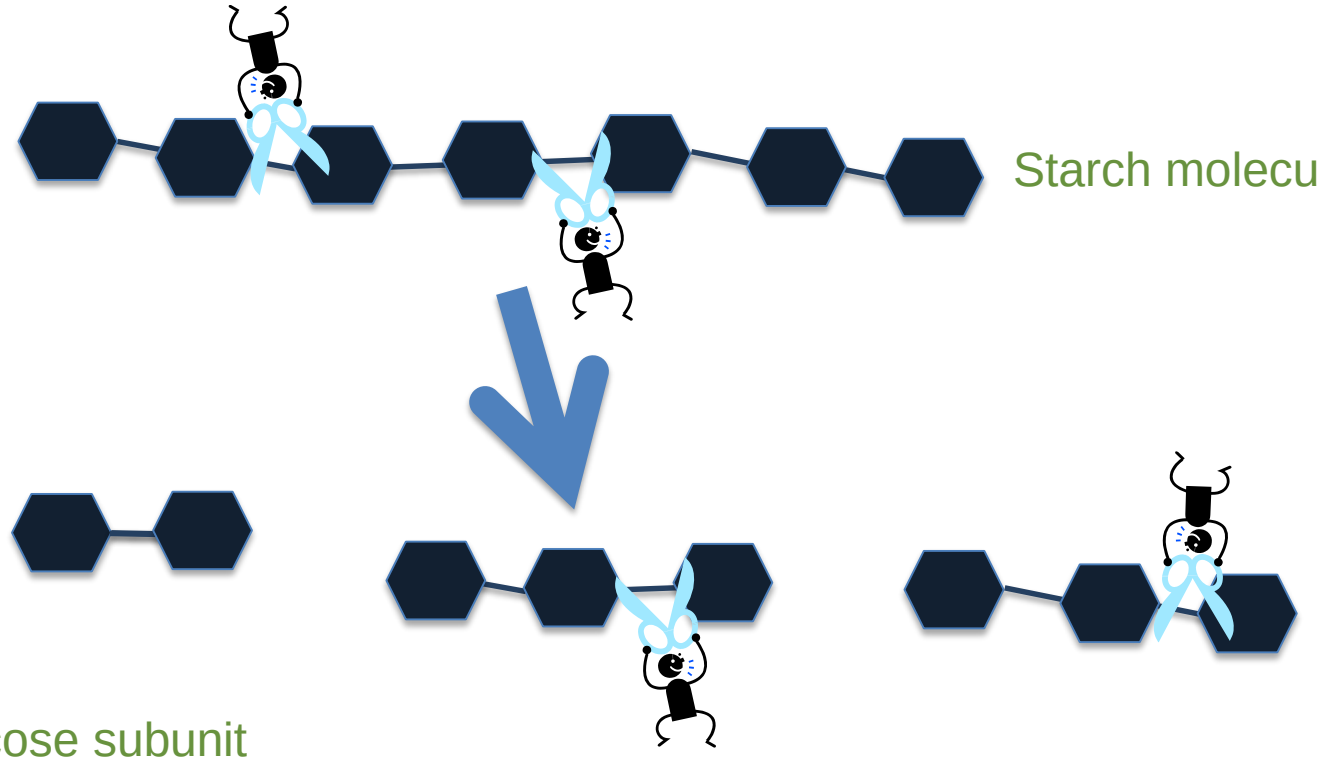
Degrading Factor - Sprout Damage

CWRS - Sprouted

CWRS - Sound

Images courtesy of the Canadian Grain Commission

What Does α-Amylase Do?



= glucose subunit

= α-amylase, each can cleave 3000-5000 bonds/s

Sprout Damage

Sprouting causes:

- Lower grades
- Lower test weight
- Decreased flour yield

Effects of Sprout Damaged Wheat

Baking:

- Sticky dough
- Sticky crumb
- May cause decreased loaf volume
- May affect crumb texture

FN – Effect on Breadmaking

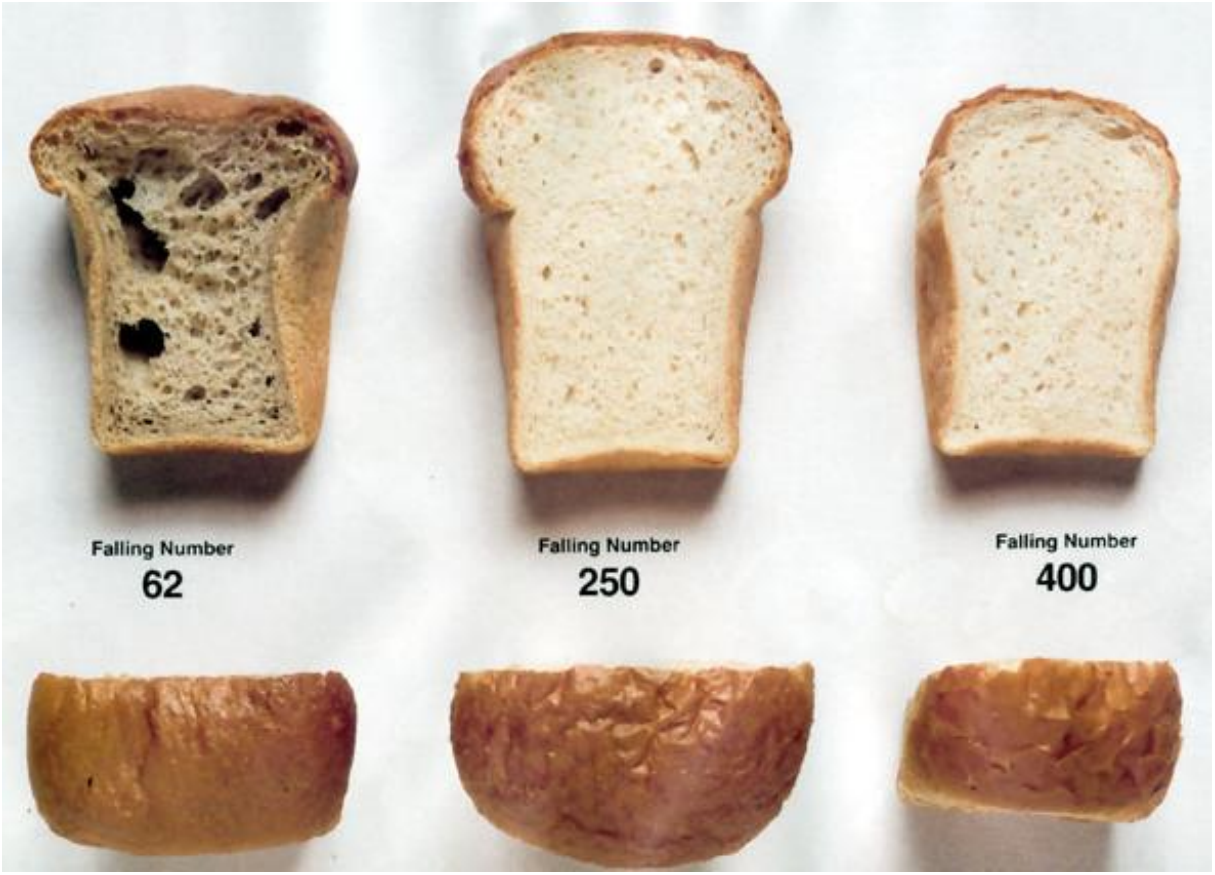


Image courtesy of Perten

FN – Effect on Breadmaking

Image courtesy of the Canadian Grain Commission

Sound

Sprouted

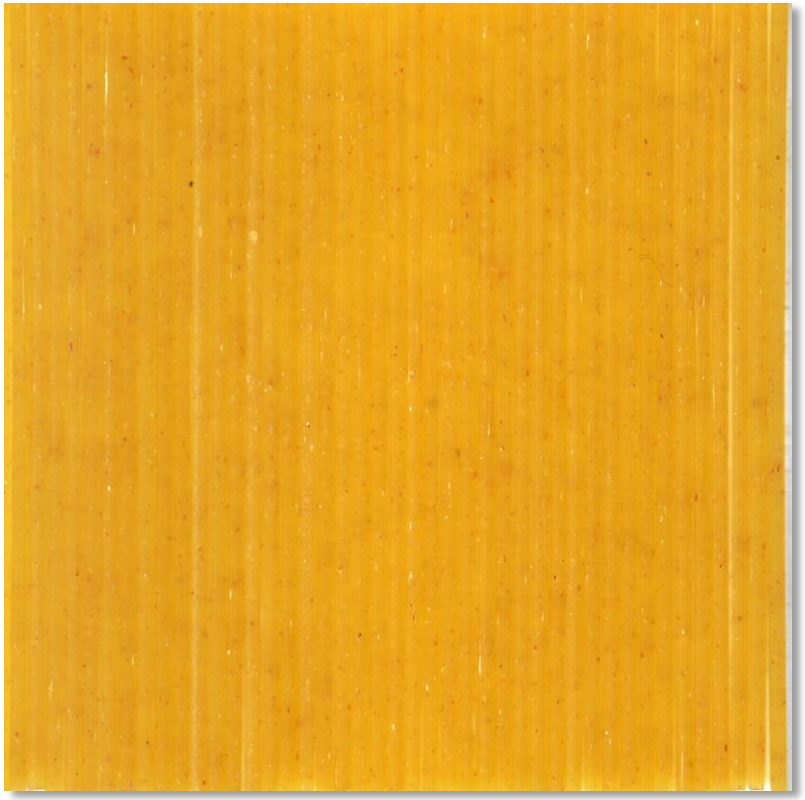
Severely sprouted

Effect on Pasta

Potential effects on pasta processing:

- Increased cooking loss
- Increase in cooked pasta stickiness
- Decrease in cooked pasta firmness
- Increase in checking in dried pasta

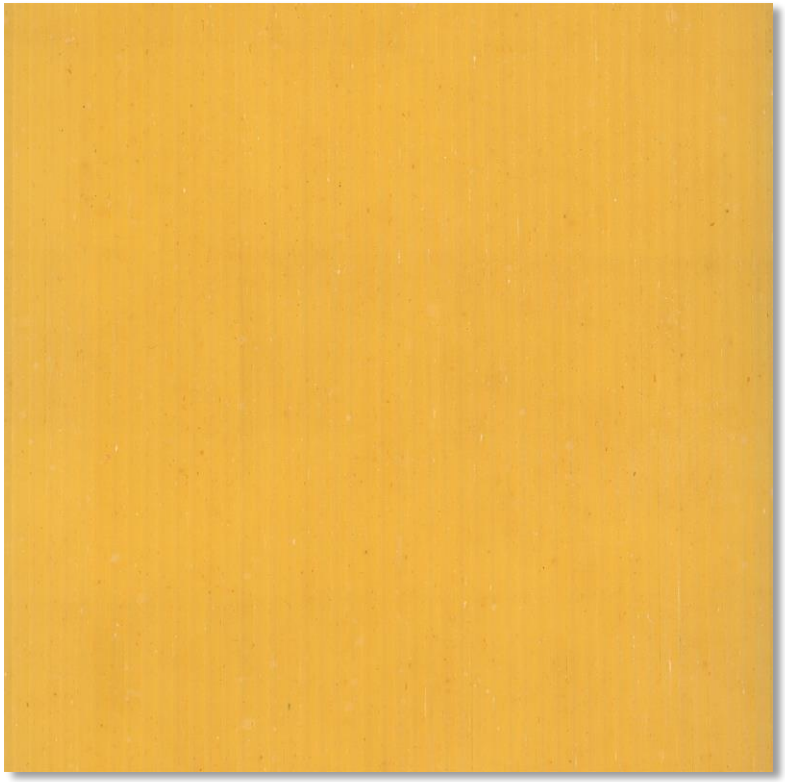
Effect on Pasta



1CWAD
FN 435s

5CWAD
FN 106s

Effect on Pasta



Unchecked pasta

Checked pasta

Effect on Noodles

High FN

Low FN

Image courtesy of Perten

Frost Damaged Kernels

- Most detrimental if it occurs during the grain filling period
- Severity of frost depends on:
  - Length of time
  - Temperature
  - Kernel moisture content
  - Kernel maturity

Frost Damaged Kernels

CWRS – Frost damage (light)

CWRS – Frost damage (severe)

Images courtesy of the Canadian Grain Commission

Frost Damaged Kernels

- Effects on quality:
  - Increased bran in flour
  - Poor flour colour
  - Poor noodle and pasta colour
  - Increased specks in semolina
  - Increased starch damage in flour
  - Undesirable increase in flour absorption

Degrading Factor – Fusarium Damage

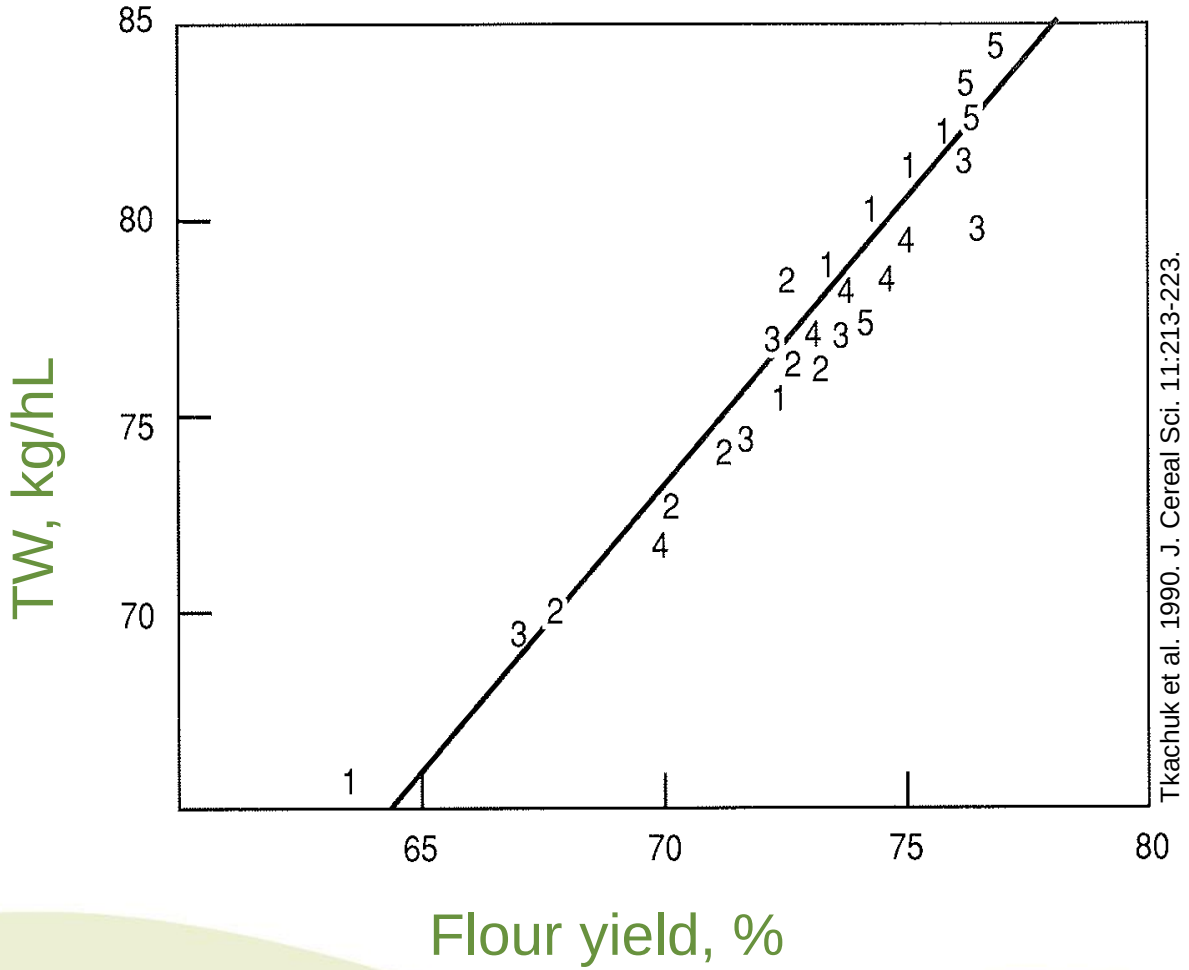
- Fungal disease
- Kernels are thin/shrunken
- Chalk-like appearance
- May have white or pink mould growth
- Fusarium damage results in the production of vomitoxin

Degrading Factor – Fusarium Damage

- Effects on quality:
  - Negatively affects protein, starch and other kernel components
  - Lower milling yield
  - Lower TW due to shrunken kernels

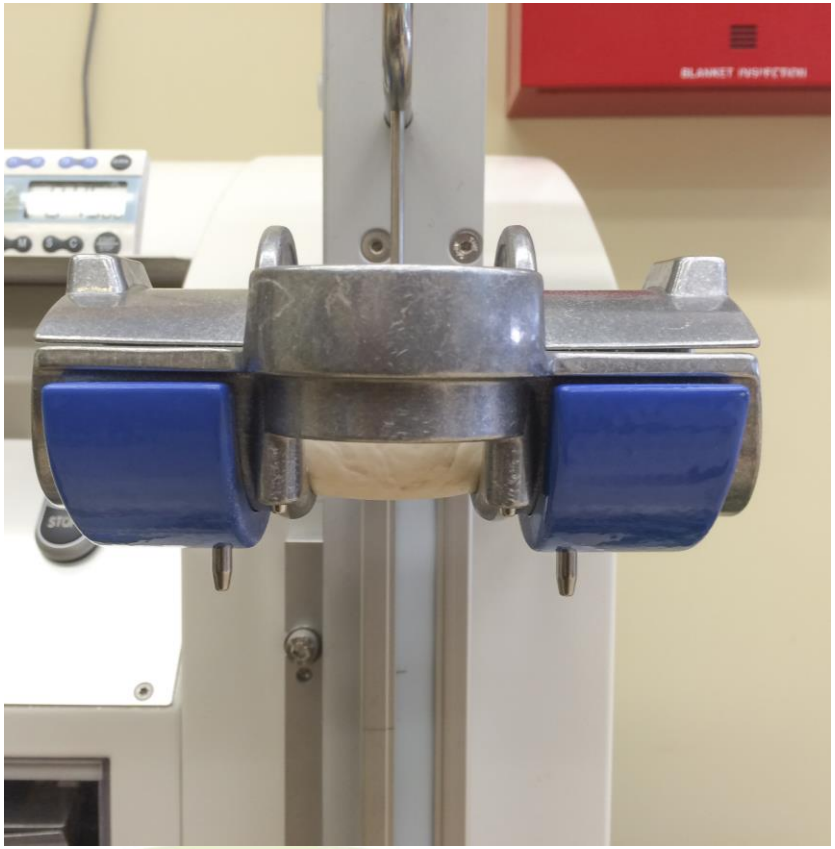
Images courtesy of the Canadian Grain Commission

TW & CWRS Milling Performance

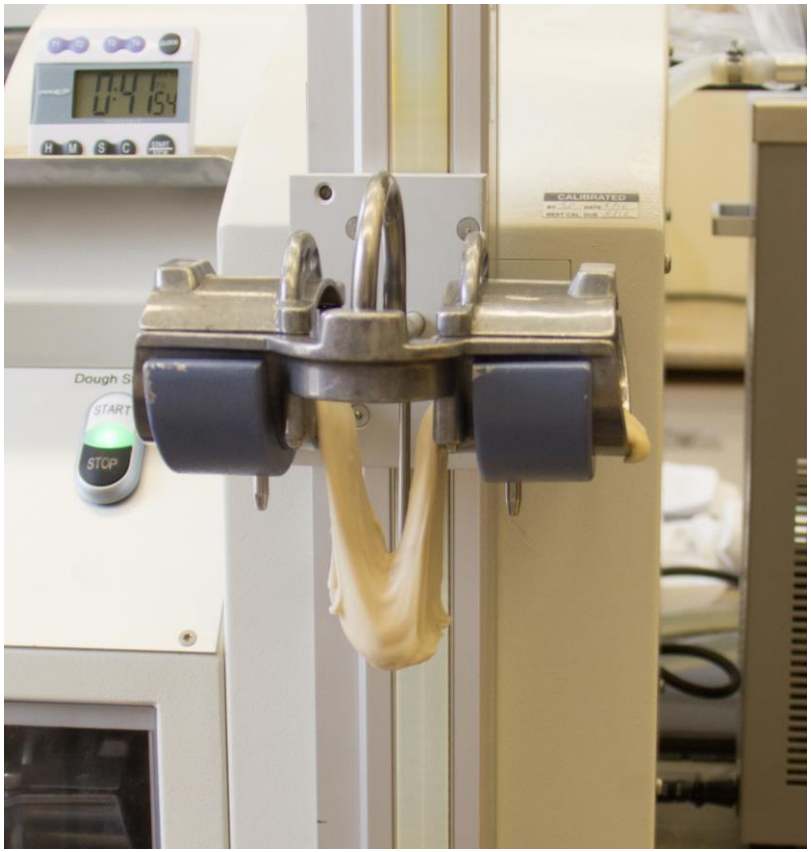


Strong dough

Weak dough



Strong dough



Weak dough

Sticky Dough

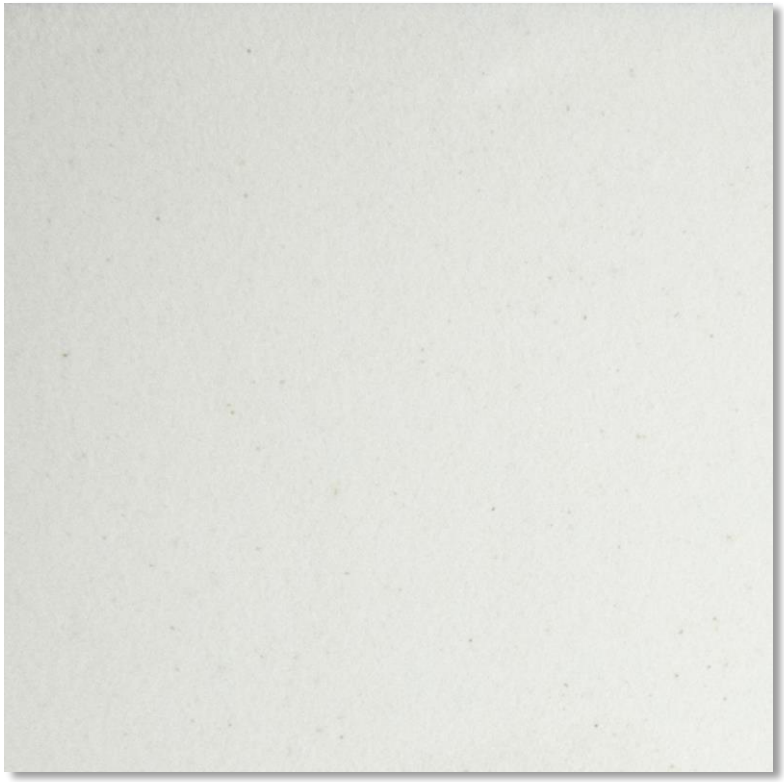
Degrading Factor – Midge Damage

- Insect attacks developing kernel resulting in:
  - Ruptured bran on back or side
  - Distinct white line/mark on back or side
  - Distinctly distorted kernel

Degrading Factor – Midge Damage

- Effects on quality:
  - Wheat has very high protein content
  - Reduced milling yields
  - High flour ash
  - Darker flour colour
  - Weak and sticky dough
  - Reduced baking absorption and bread quality

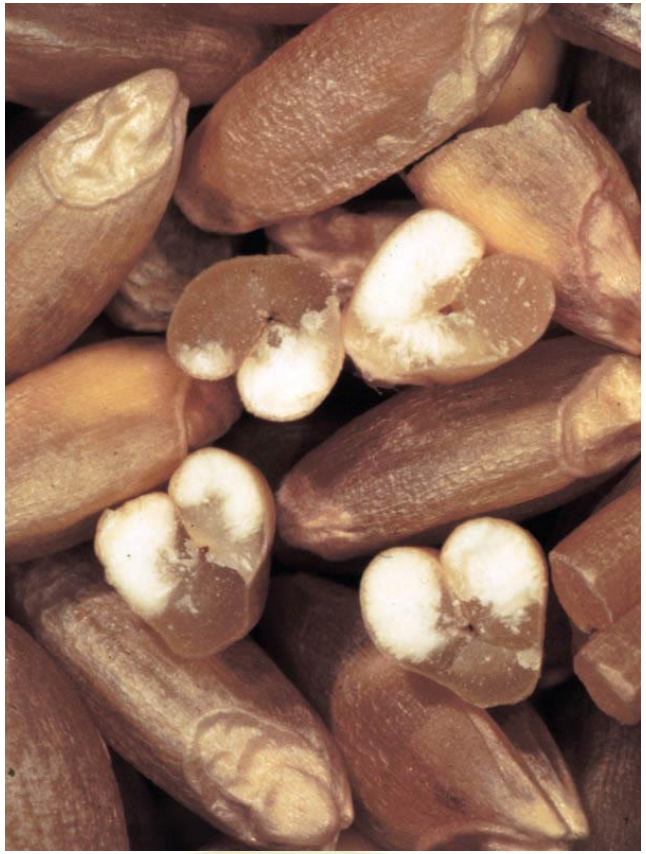
Flour Colour



Bright flour

Dull flour

Degrading Factor – Hard Vitreous Kernels (HVK)



- Vitreousness is the natural translucence in the kernel
- Provides an indication of kernel hardness
- Grading factor in CWRS and CWAD
- Affects semolina extraction in CWAD

Images courtesy of the Canadian Grain Commission

Semolina Colour

- Factors affecting semolina colour:
  - Yellow pigment content
  - Ash content
  - Semolina extraction level
  - Enzyme activity: polyphenol oxidase (PPO) and peroxidase (PO)
  - Specks

Semolina Specks – Causes

Ergot

Mildew

Frost damage

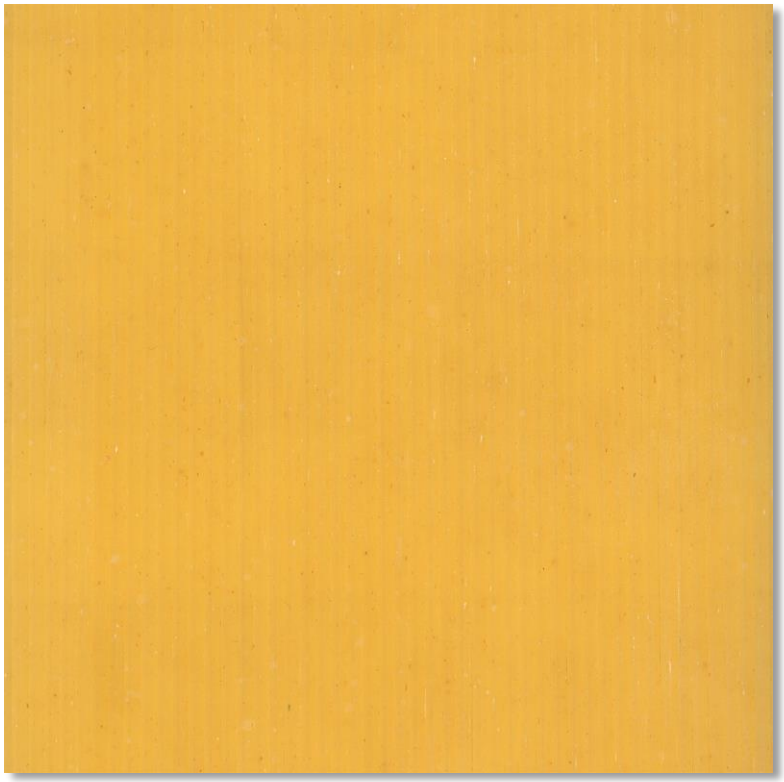
Blackpoint

Smudge

Blackpoint

Images courtesy of the Canadian Grain Commission

Semolina Specks



Thank You