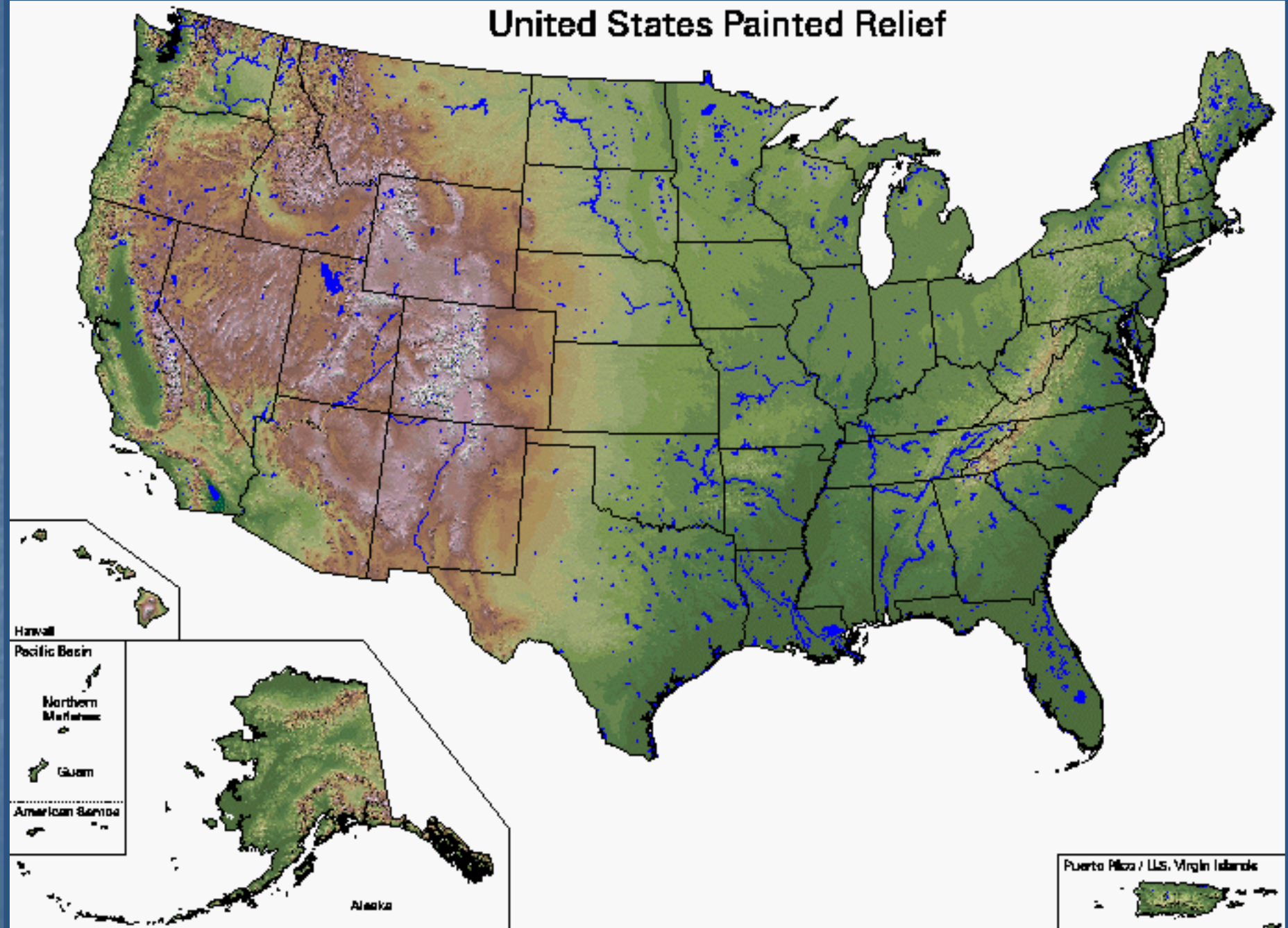


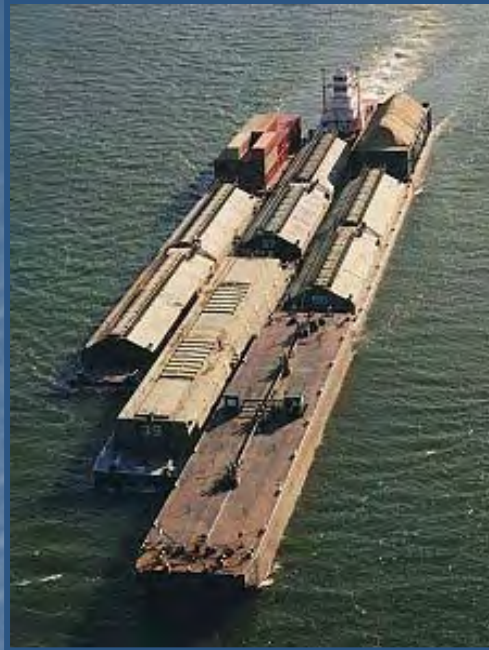
Breeding for quality - Strategies from the U.S. Pacific Northwest

**Dr. Craig F. Morris, Director
USDA-ARS**

**Western Wheat Quality Laboratory
Pullman, Washington, U. S. of A.**

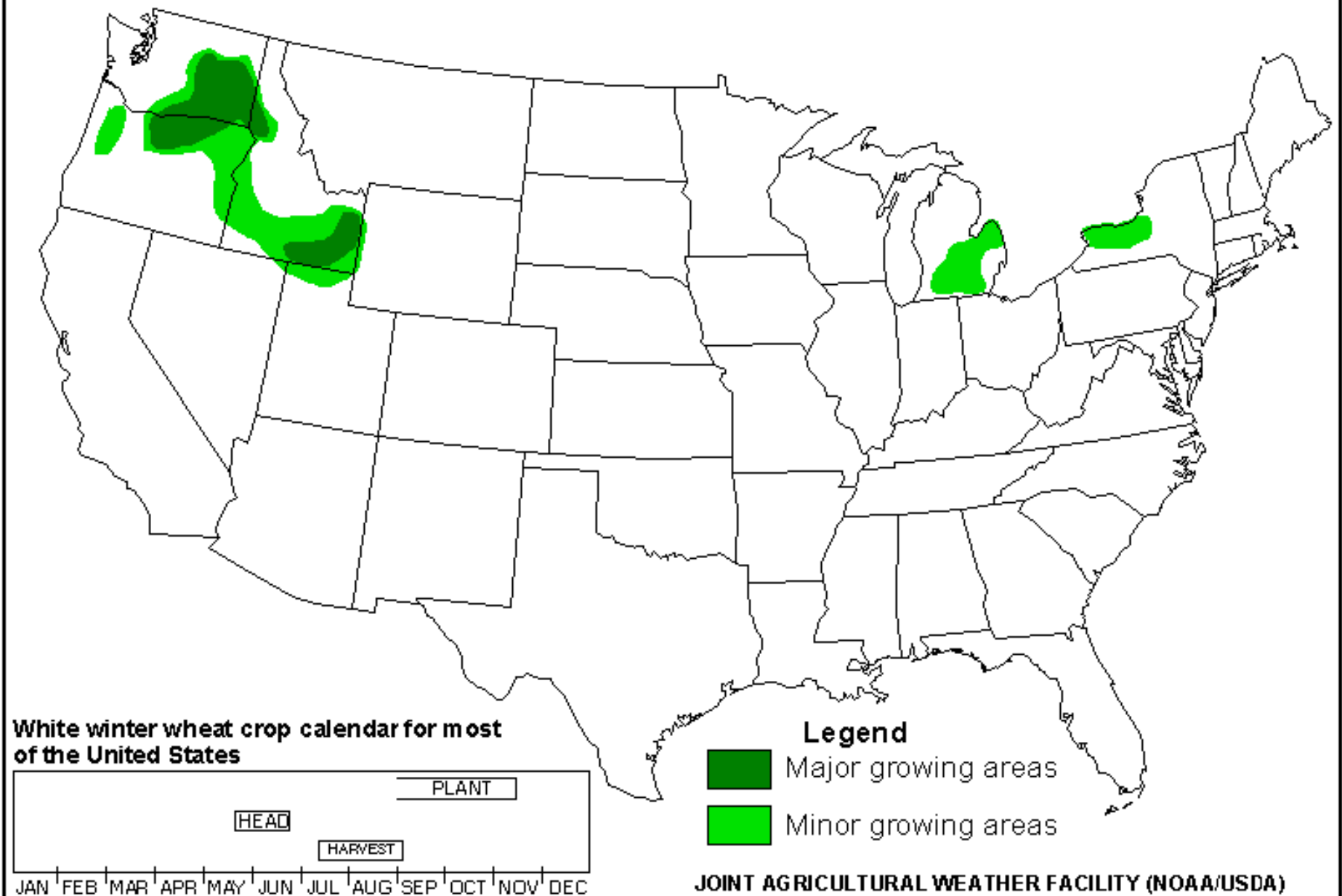
United States Painted Relief







United States: White winter wheat





USDA ARS Wheat Quality Laboratories

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Western Wheat Quality Laboratory



Pullman, Washington - U.S.A.

[WHEAT ANALYSIS SYSTEM](#)

[REGIONAL QUALITY DATA](#)

[PUROINDOLINE](#)

[PUBLICATIONS](#)

[VARIETY QUALITY SCORES](#)

[BREEDERS LOGIN](#)

SEARCH

**Welcome to the home page of the Western Wheat
Quality Laboratory of the United States Department of
Agriculture - Agricultural Research Service.**



Western Wheat Quality Lab Mission:

- **Evaluate experimental wheat breeding lines – cooperative development of new wheat varieties**
- **Conduct basic and applied research on wheat grain quality**
- **Develop and adapt new methodologies for assessing wheat grain quality**
- **Transfer technology**

Western U.S. Wheat Breeding & Genetics Programs



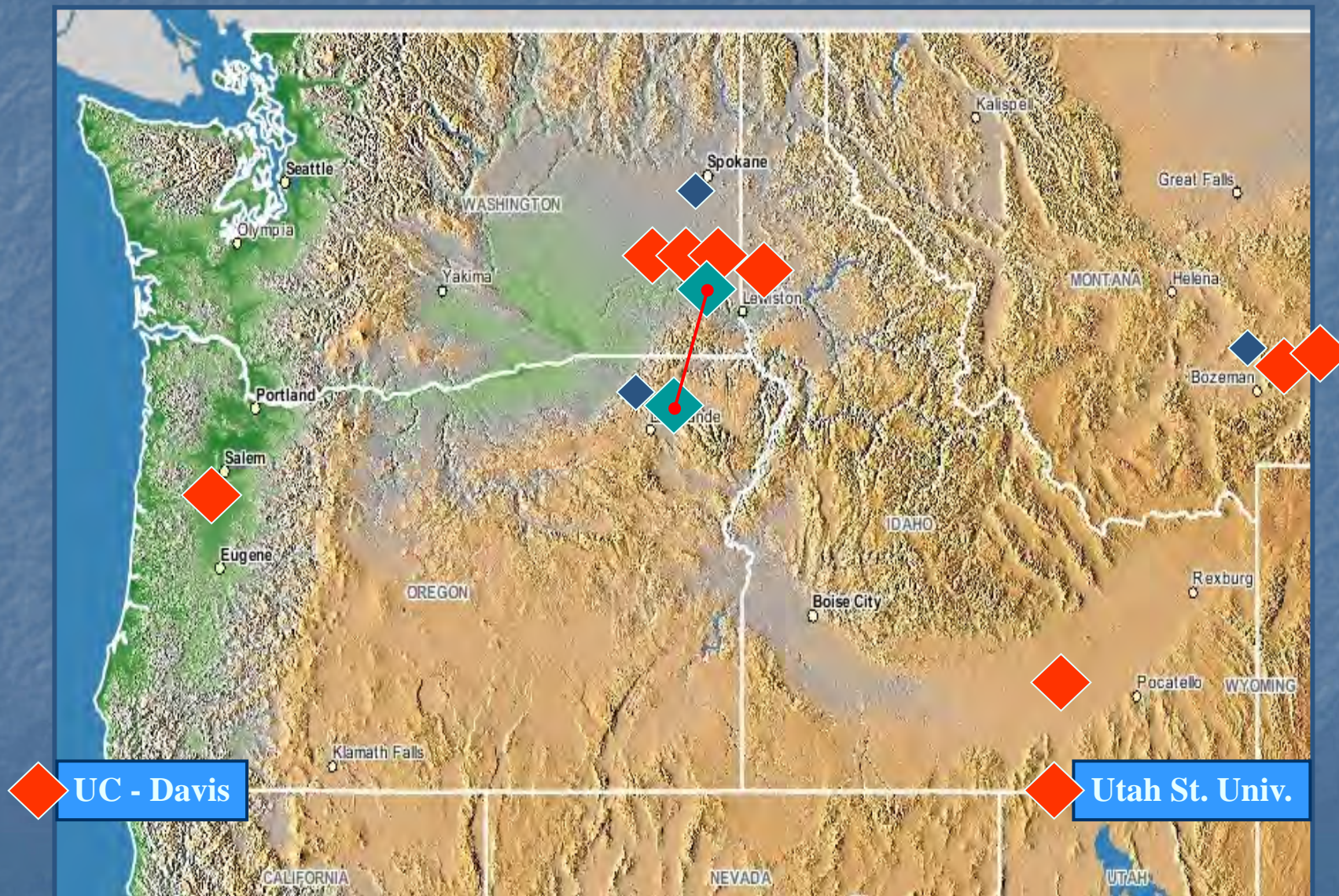
University



USDA-ARS



Private



CONSUMERS
Food Companies
Flour Mills
Grain Trade
Farmer Groups

Plant Breeding & Genetics

Wheat Varieties with Improved Traits

CONSUMERS
Food Companies
Flour Mills
Grain Trade
Farmer Groups

Plant Breeding & Genetics

Wheat Varieties with Improved Traits

**Superior
raw
material**

How are new wheat varieties developed?

How are breeding lines evaluated and which ones make it to the “Big Leagues”?



Ichiro Suzuki

Wheat breeding for the Pacific Northwest

**Soft white winter wheat
Soft white winter club wheat
Soft white spring wheat
Soft white spring club wheat
Hard red spring wheat
Hard white spring wheat
Hard red winter wheat
Hard white winter wheat**

Some things are always better:

high test weight

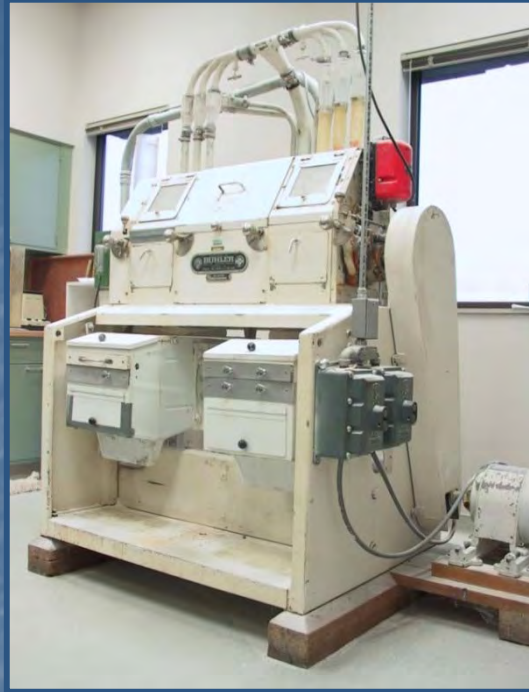
high flour yield

low flour ash

low PPO



Test Weight
with electronic data capture







Alkaline noodle sheets

L-DOPA Seed Assay



Check



Tyrosine



L-DOPA



Ferulic



Vanillic



Sinapic



Caffeic



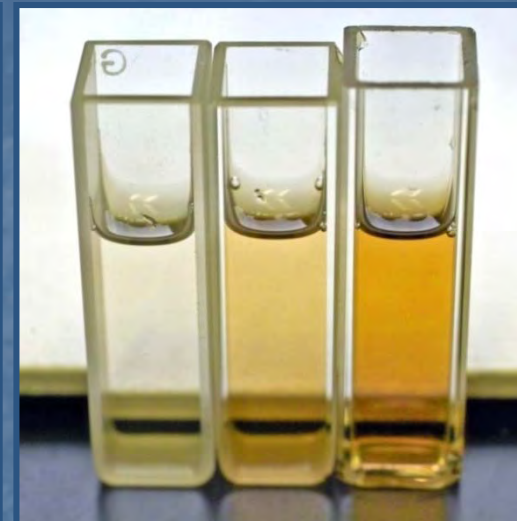
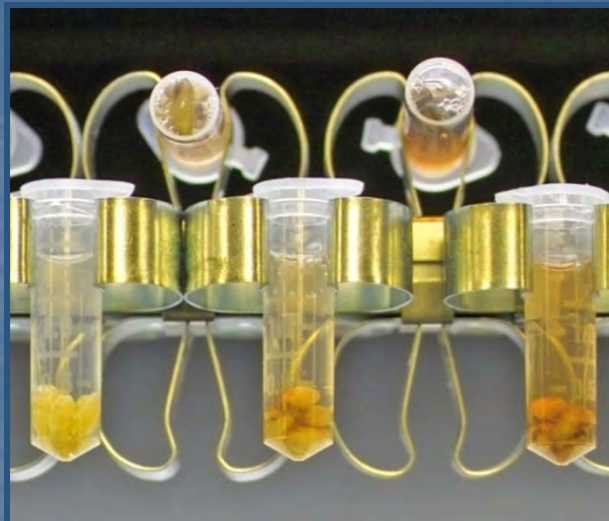
Chlorogenic



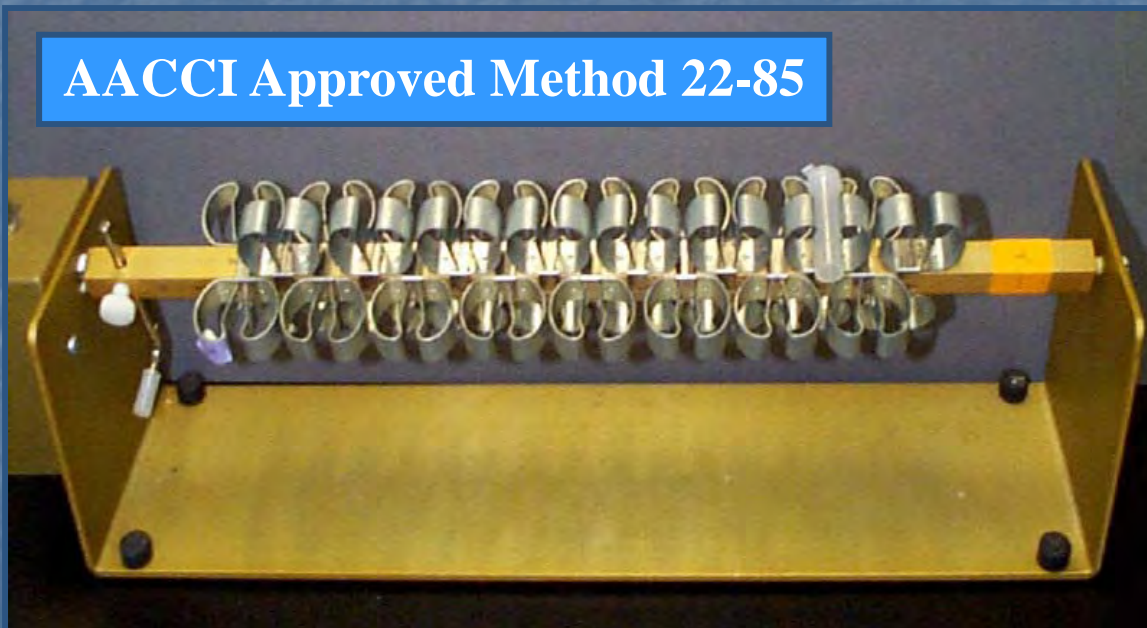
Catechin



Protochatechuic
Aldehyde



AACCI Approved Method 22-85



Some things just have to be measured:

**moisture
protein**



Thermogravimetric Analysis



Whole-Grain NIR protein



Combustion Nitrogen Analyzer

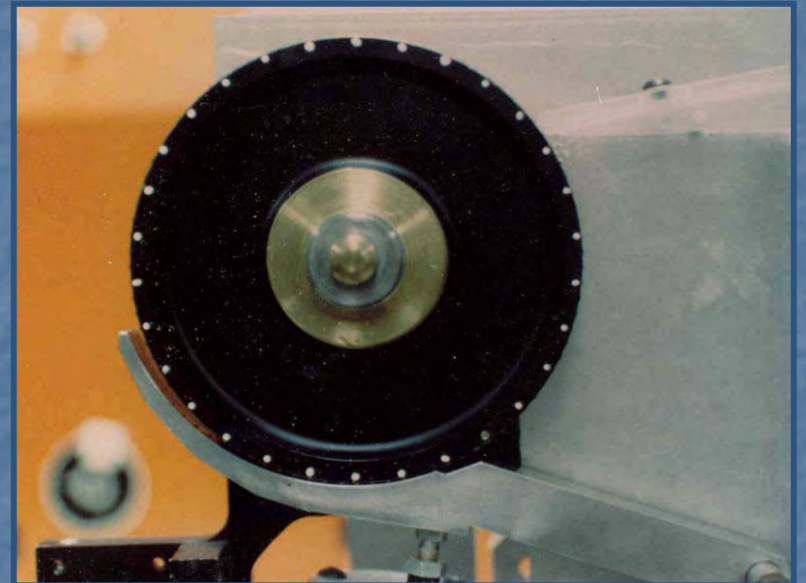
‘Pigeon Holing’ breeding lines



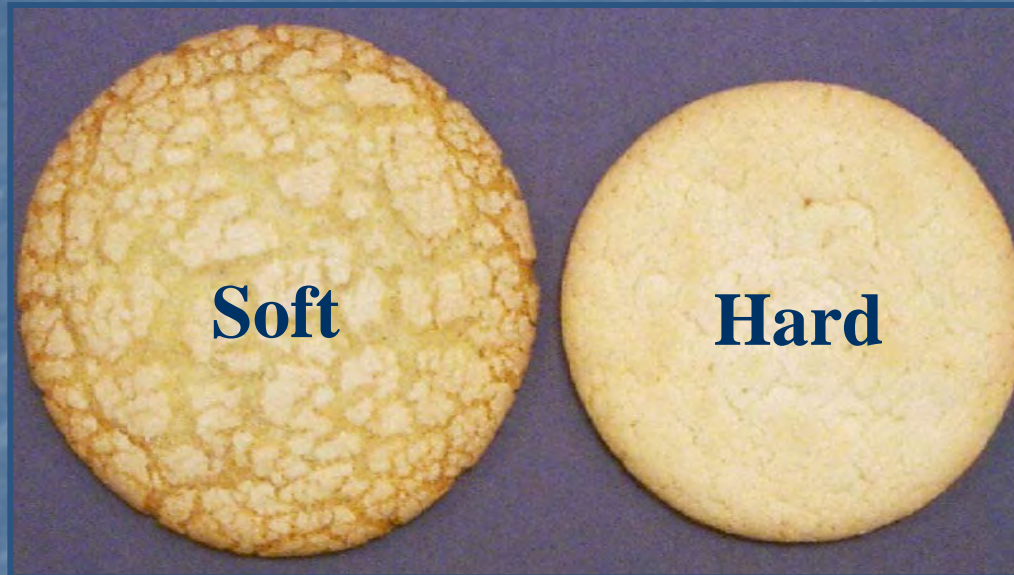


SKCS 4100

Kernel hardness



Kernel Hardness



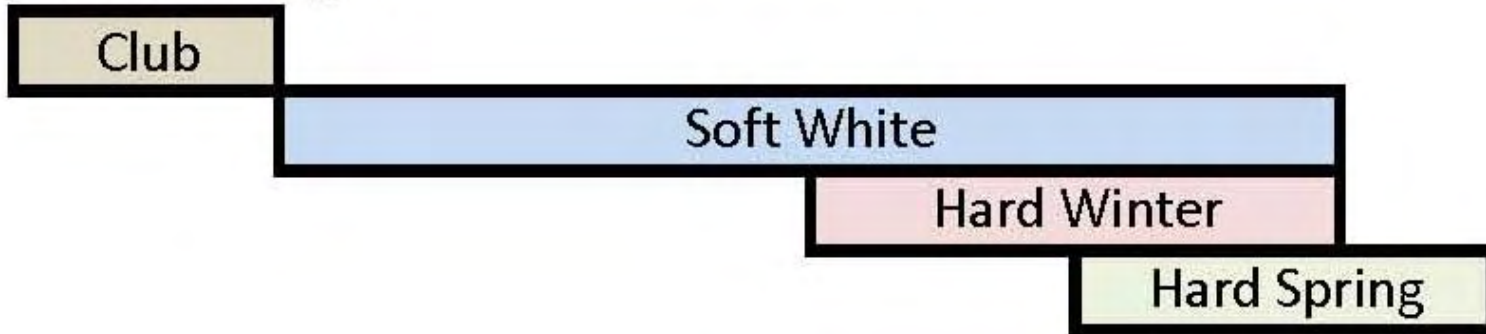
Gluen Strength

Club

Soft White

Hard Winter

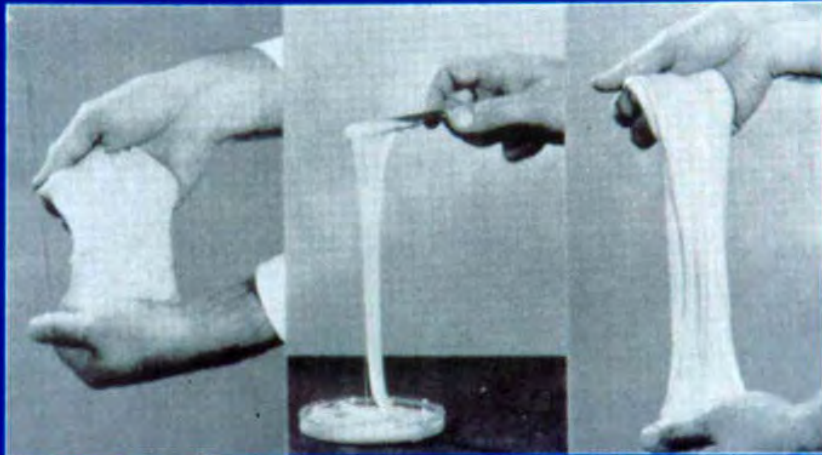
Hard Spring



Glutenin

Gliadin

Gluten

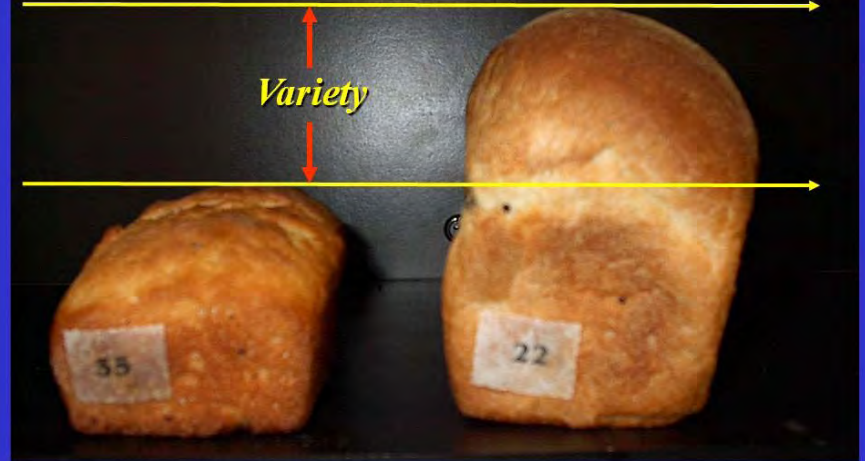


Dimler, R.J. 1963. Bakers Digest (37:1) p.52

Differences in gluten *quality*

Both flours @ 12% protein

Variety

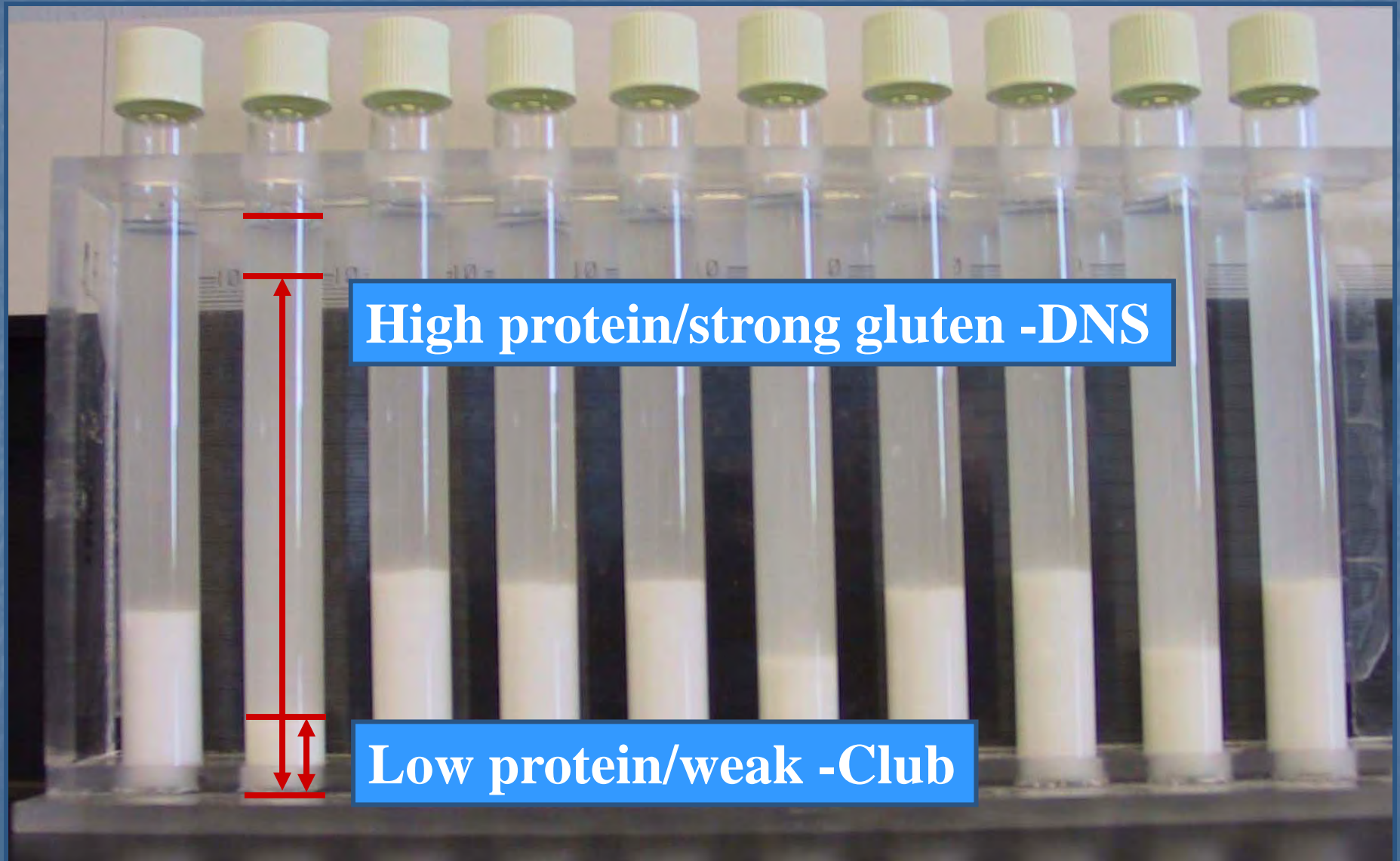


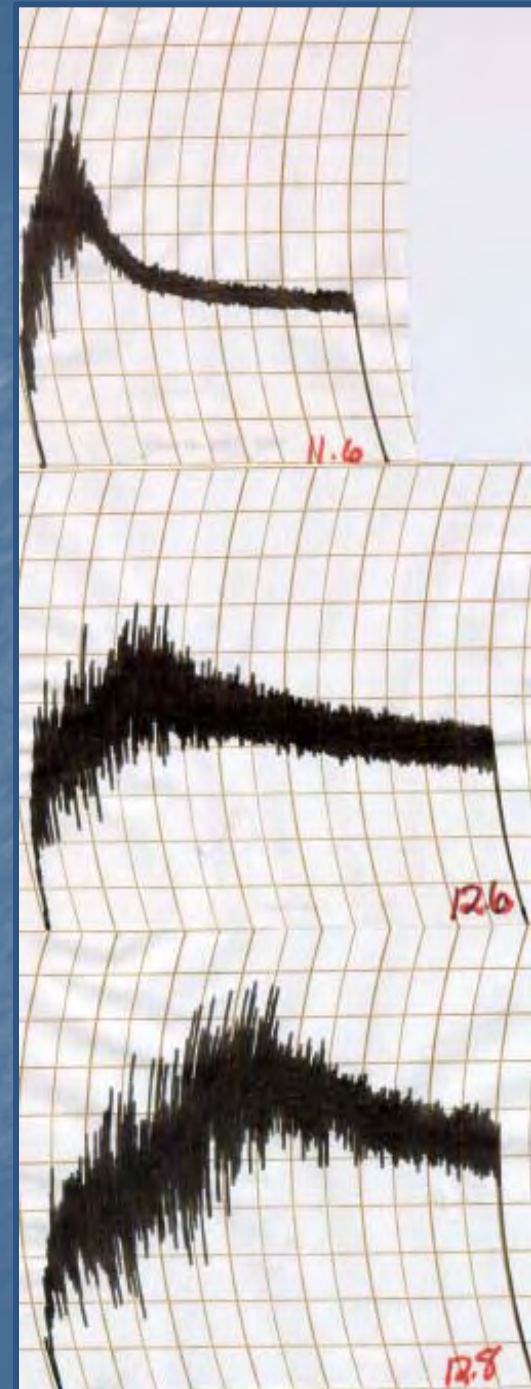
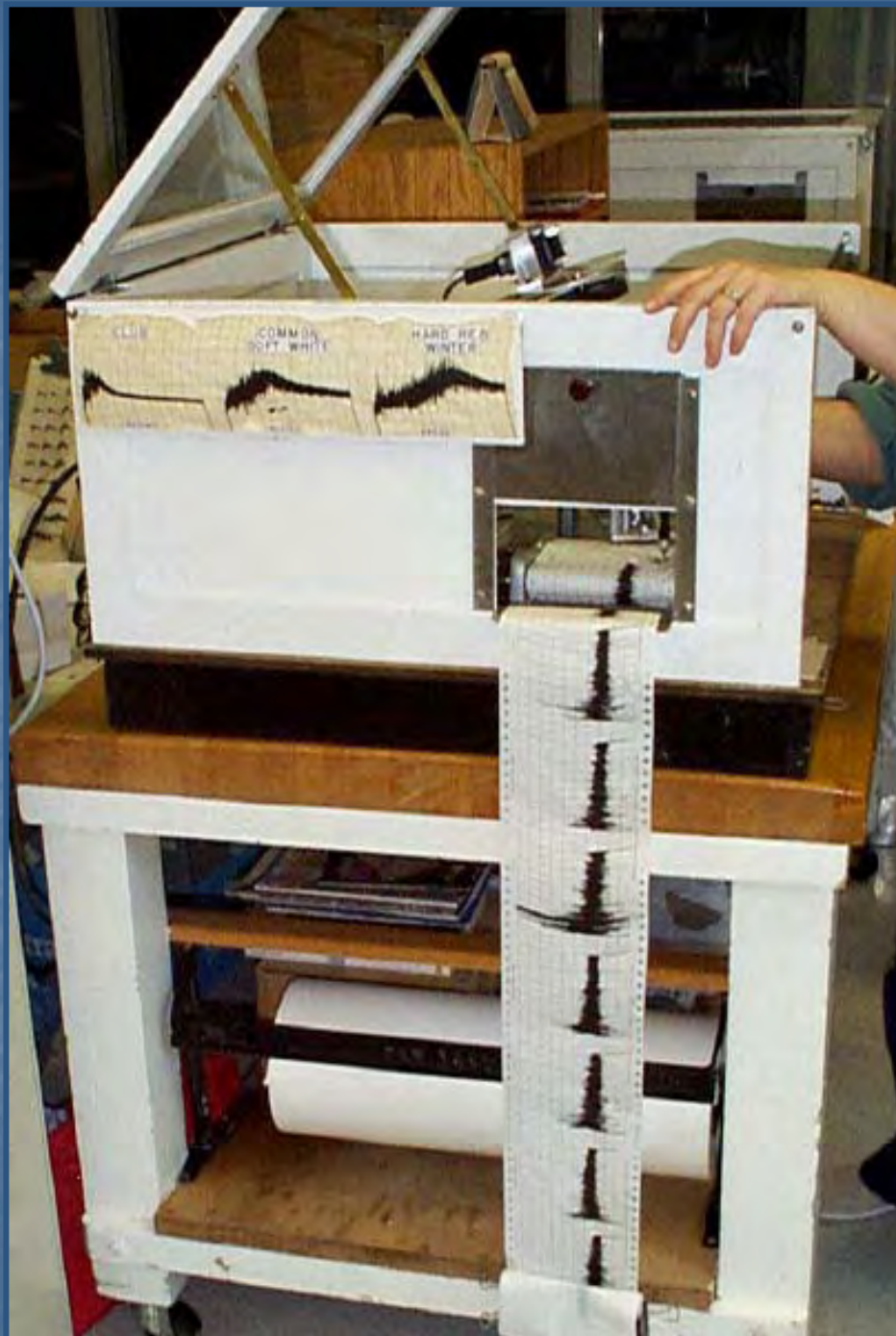
Bread quality increases

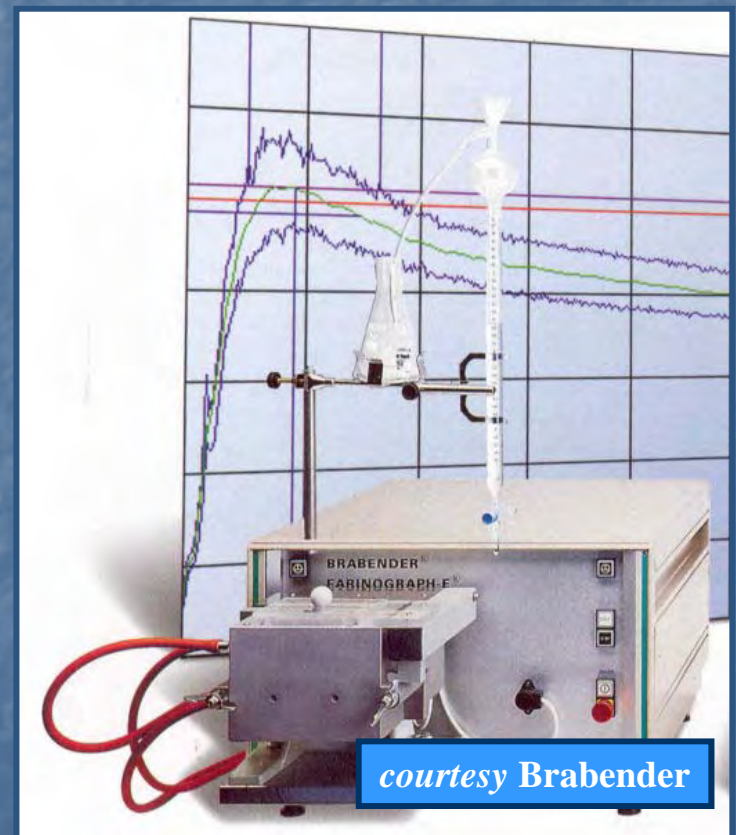
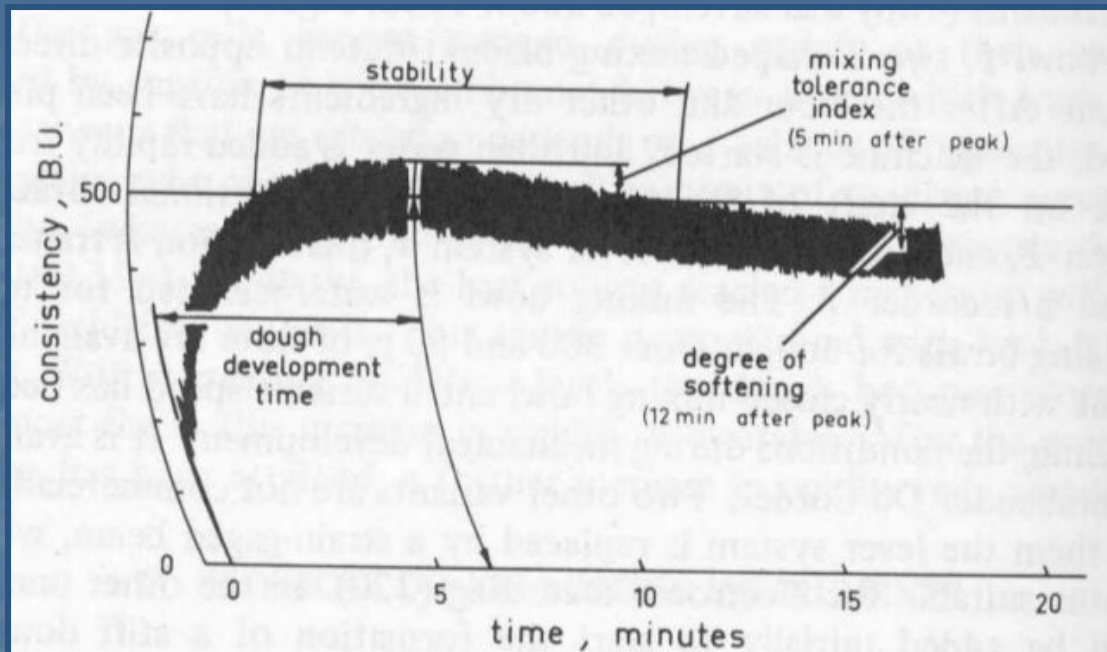


Protein content increases

SDS Sedimentation Test







Specific functional traits:

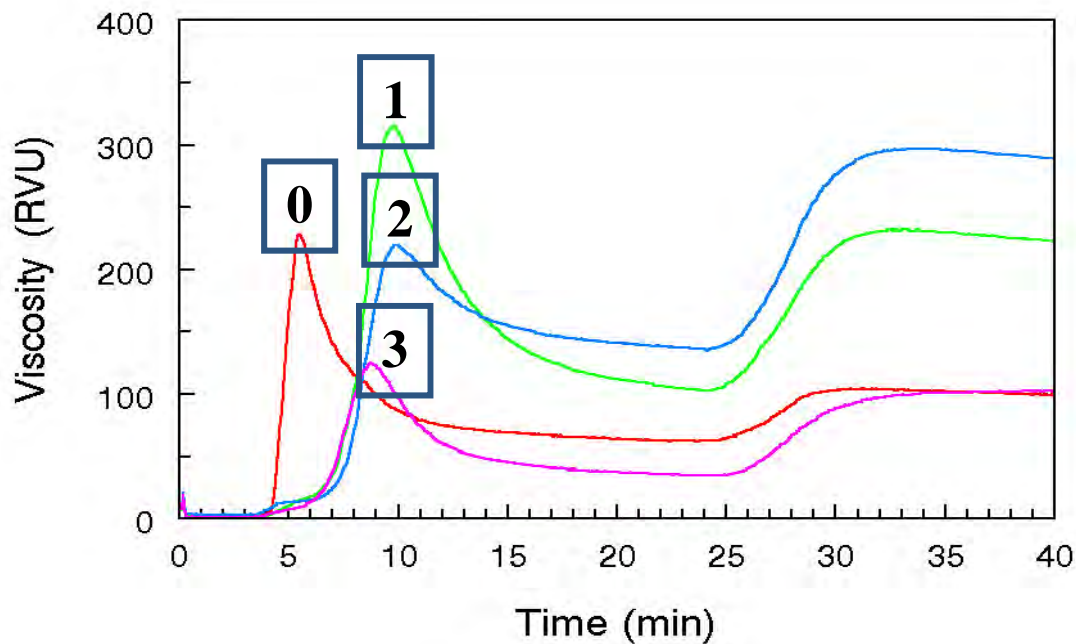
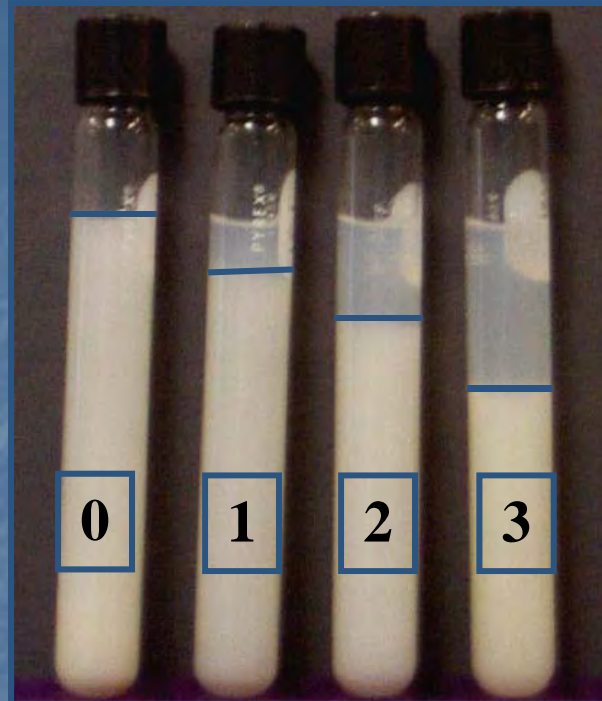
starch amylose : amylopectin

**Solvent Retention Capacity (ies)
water, carbonate, sucrose, lactic acid**

FSV



Number of
functional
GBSS Genes



RVA



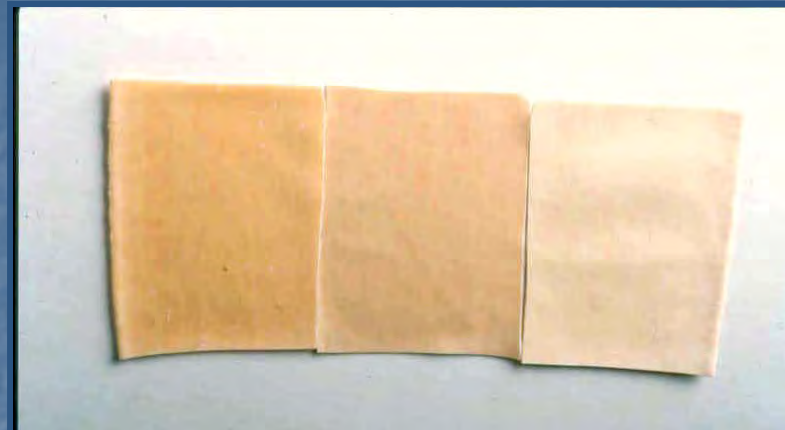


**Solvent Retention Capacity:
Water, Carbonate, Sucrose, Lactic Acid**

Bake tests:

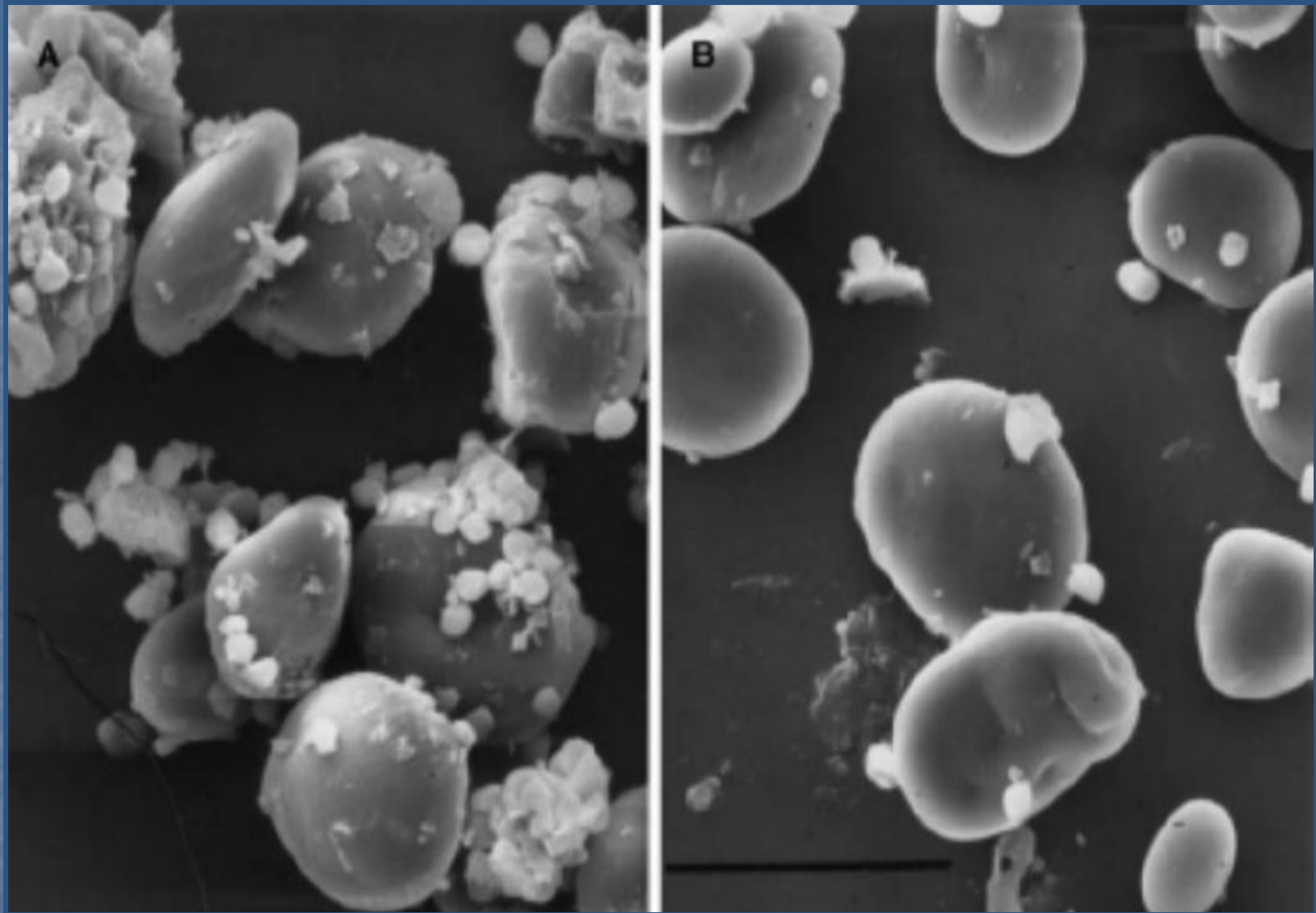
Cookie, Bread, Sponge Cake, Noodles





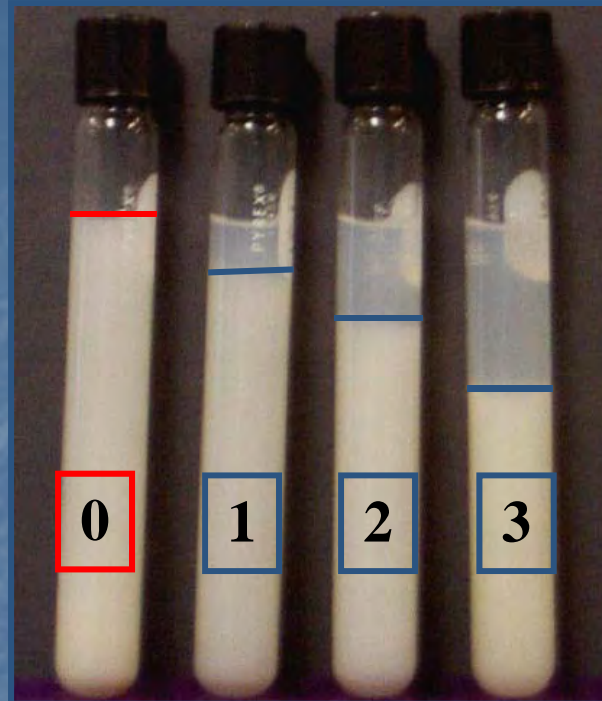
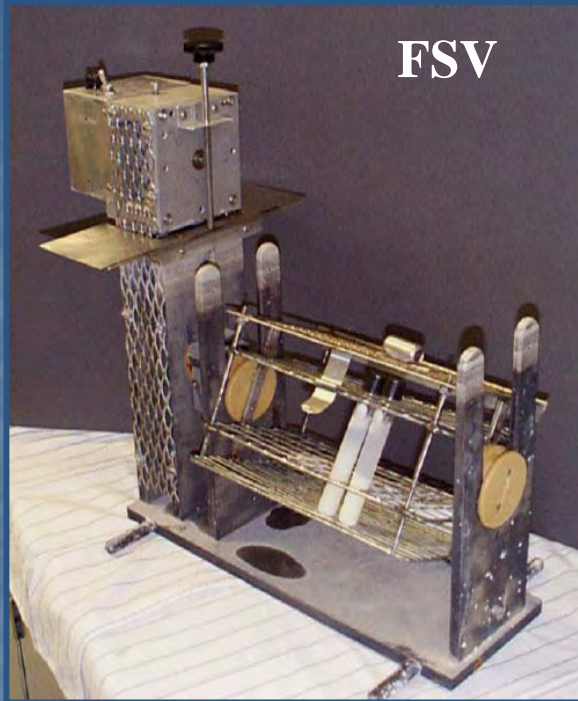
New Traits – New Wheats

New Ingredients



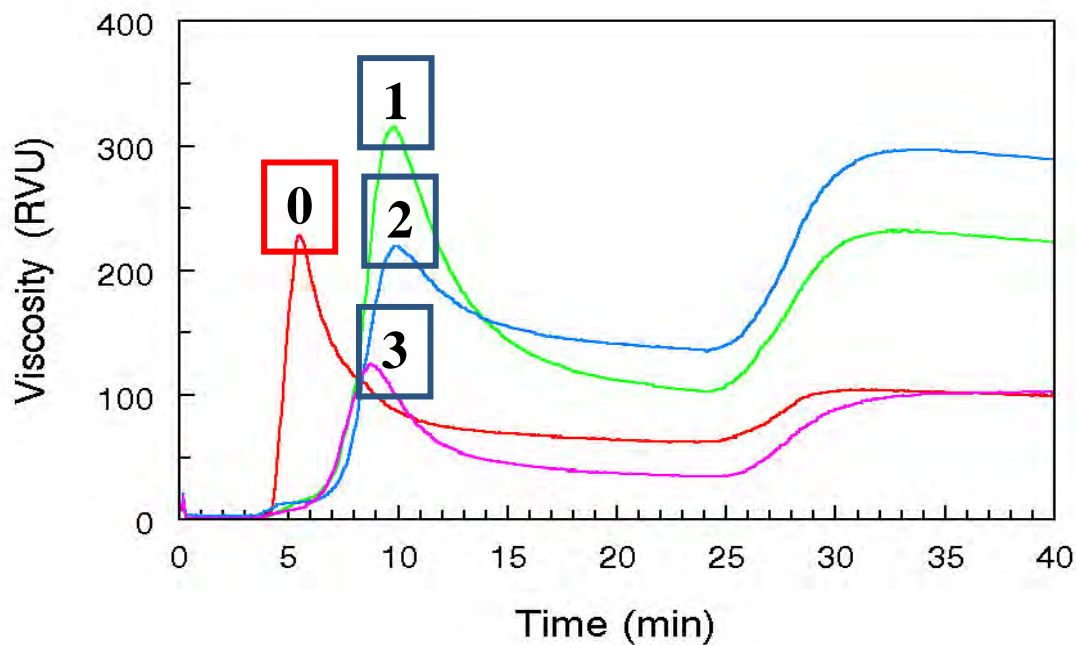
Wheat starch granules

FSV



Waxy Wheat

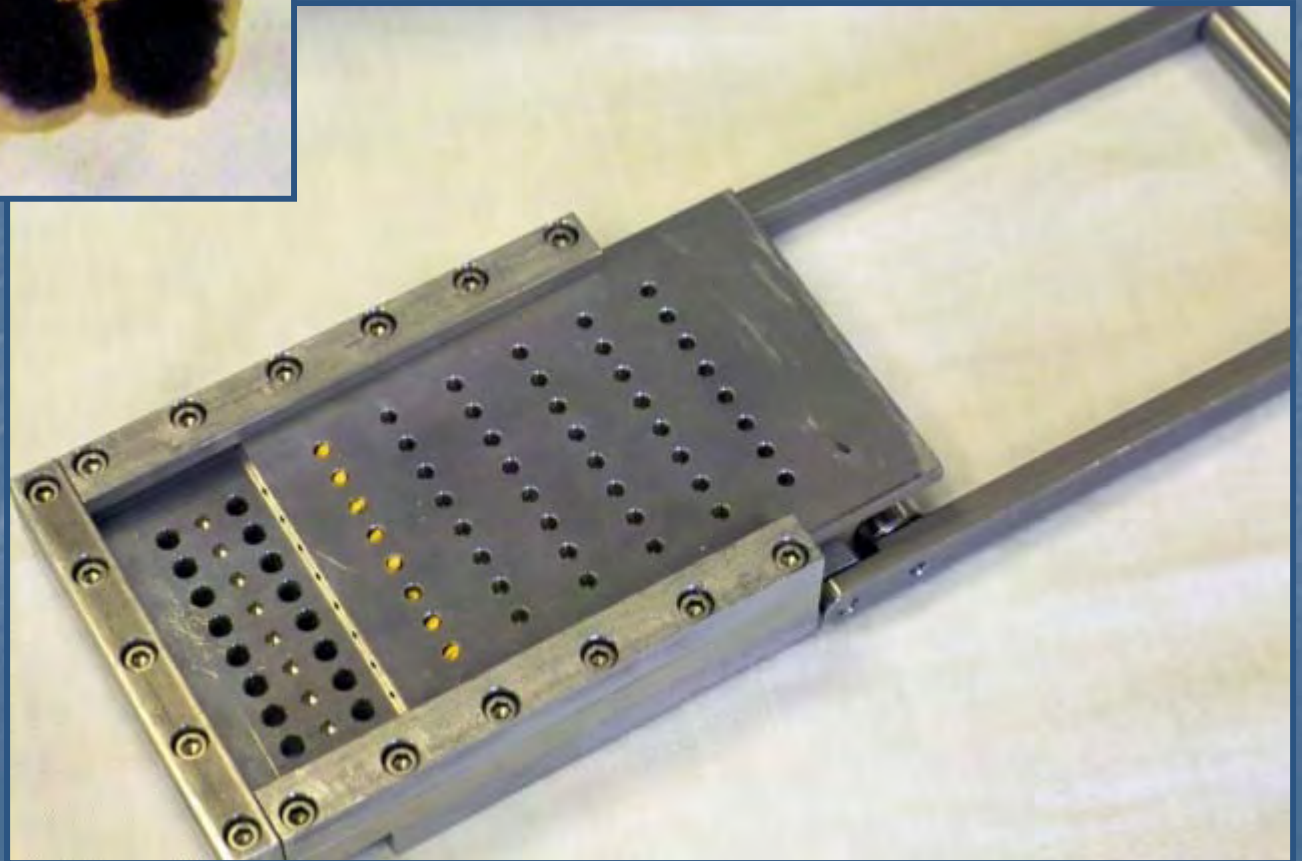
Number of
functional
GBSS Genes



RVA



Kernel 'slicer' and
iodine staining for
full waxy



Waxy Wheat

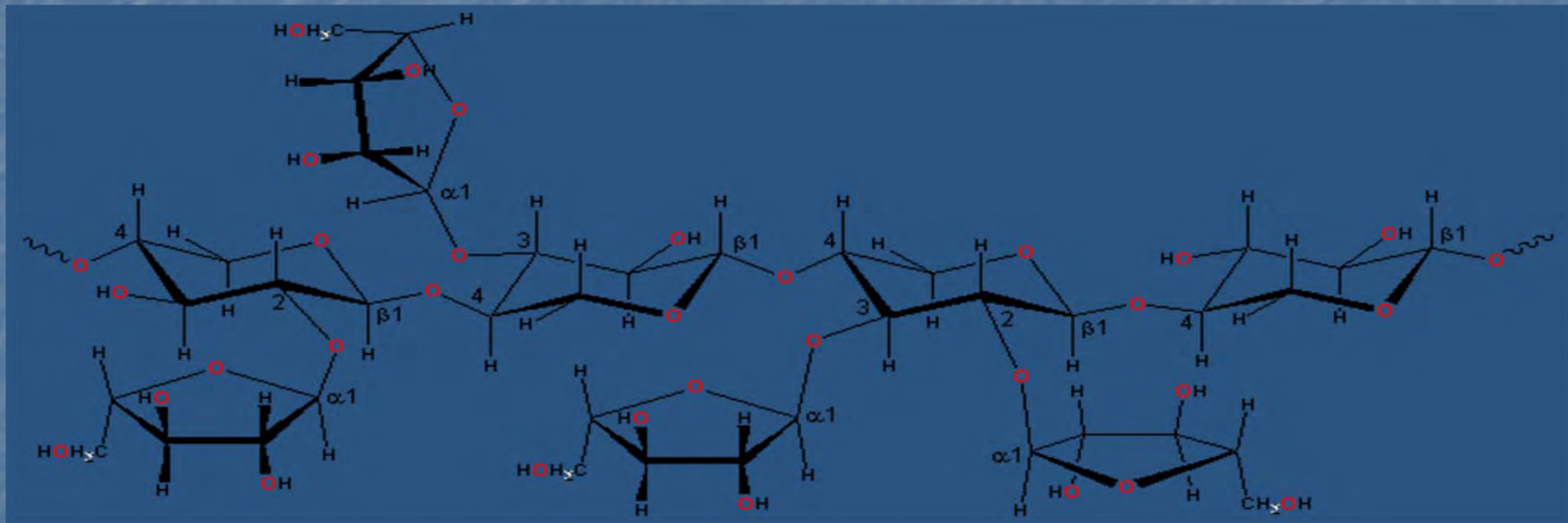


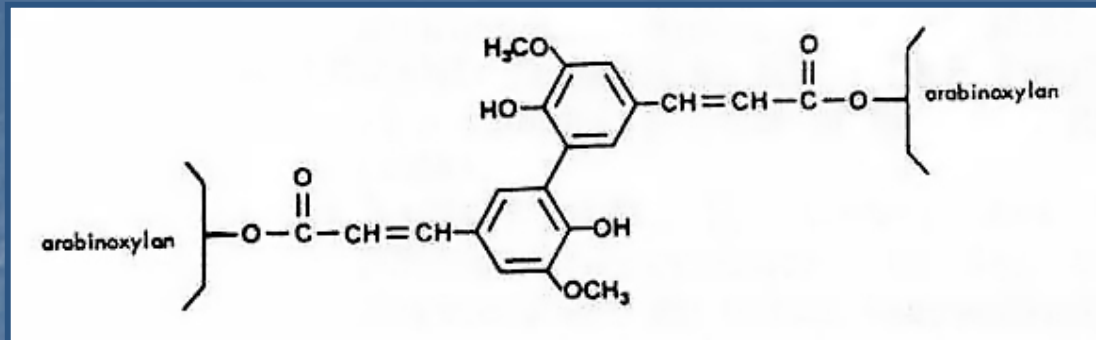
Soft Durum



High Fiber Wheat

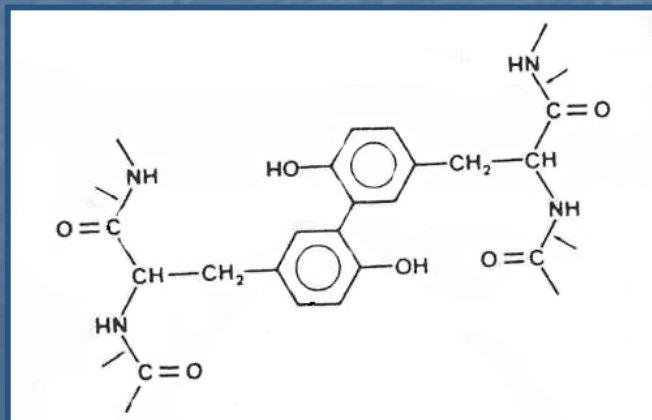
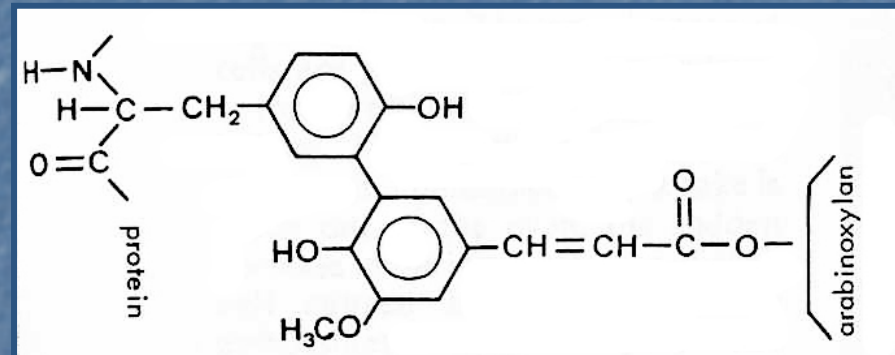
Arabinoxylan Primary Structure





Arabinose cross-linking

Arabinose – Protein cross linking

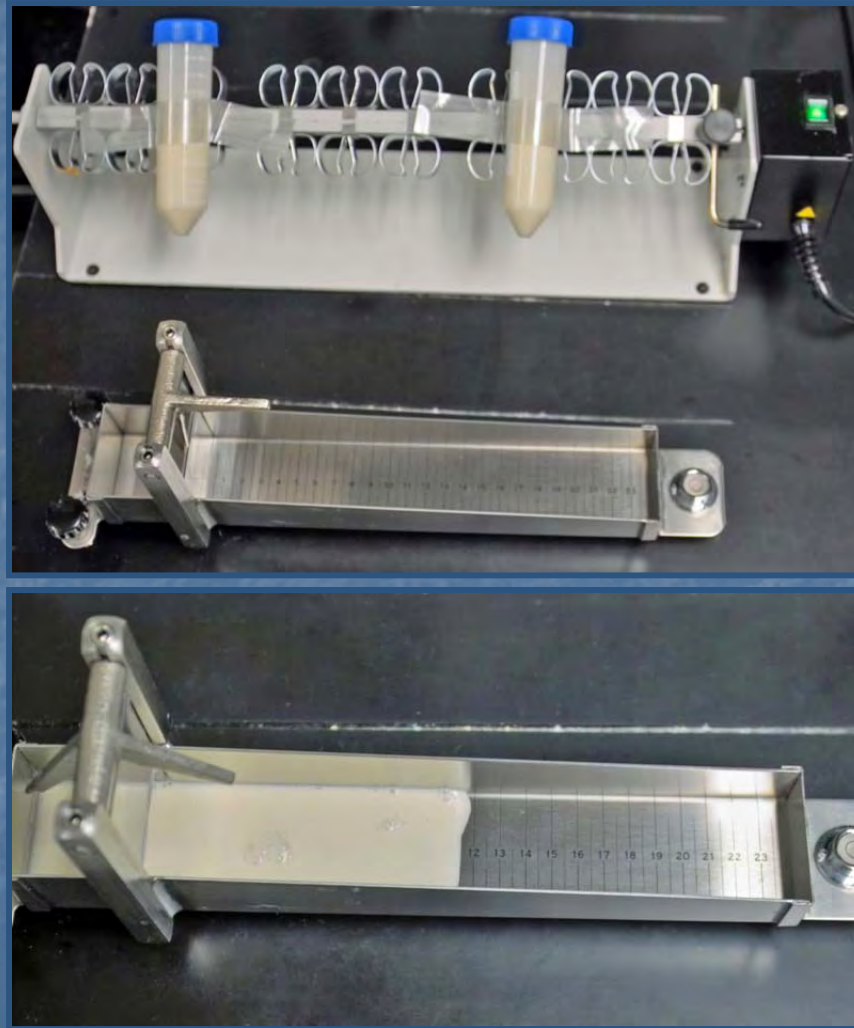


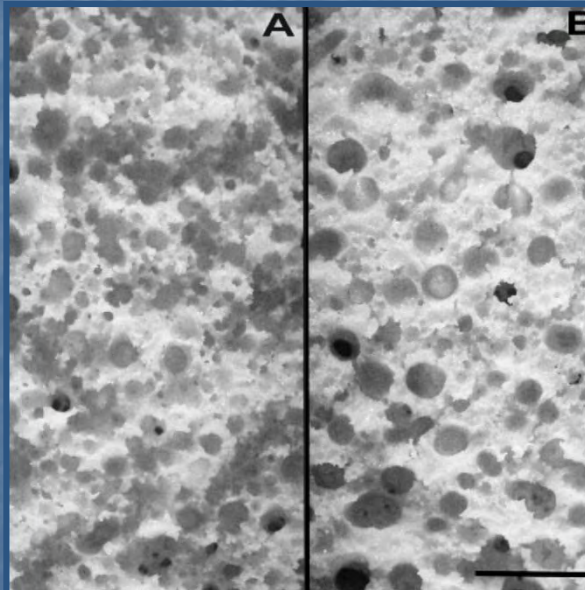
Protein – Protein (di-Tyrosine) cross linking

Neukom and Markwalder,
1978: Cereal Foods World

Oxidative Cross-Linking

Bostwick viscosity +/- peroxide and peroxidase







Thank You!