Toward High Quality Whole Grain Soft Wheat Flour

Mary Guttieri
Clay Sneller
Ed Souza

THE OHIO STATE UNIVERSITY

Agricultural Research Service

Flour Milling

Miag Multomat

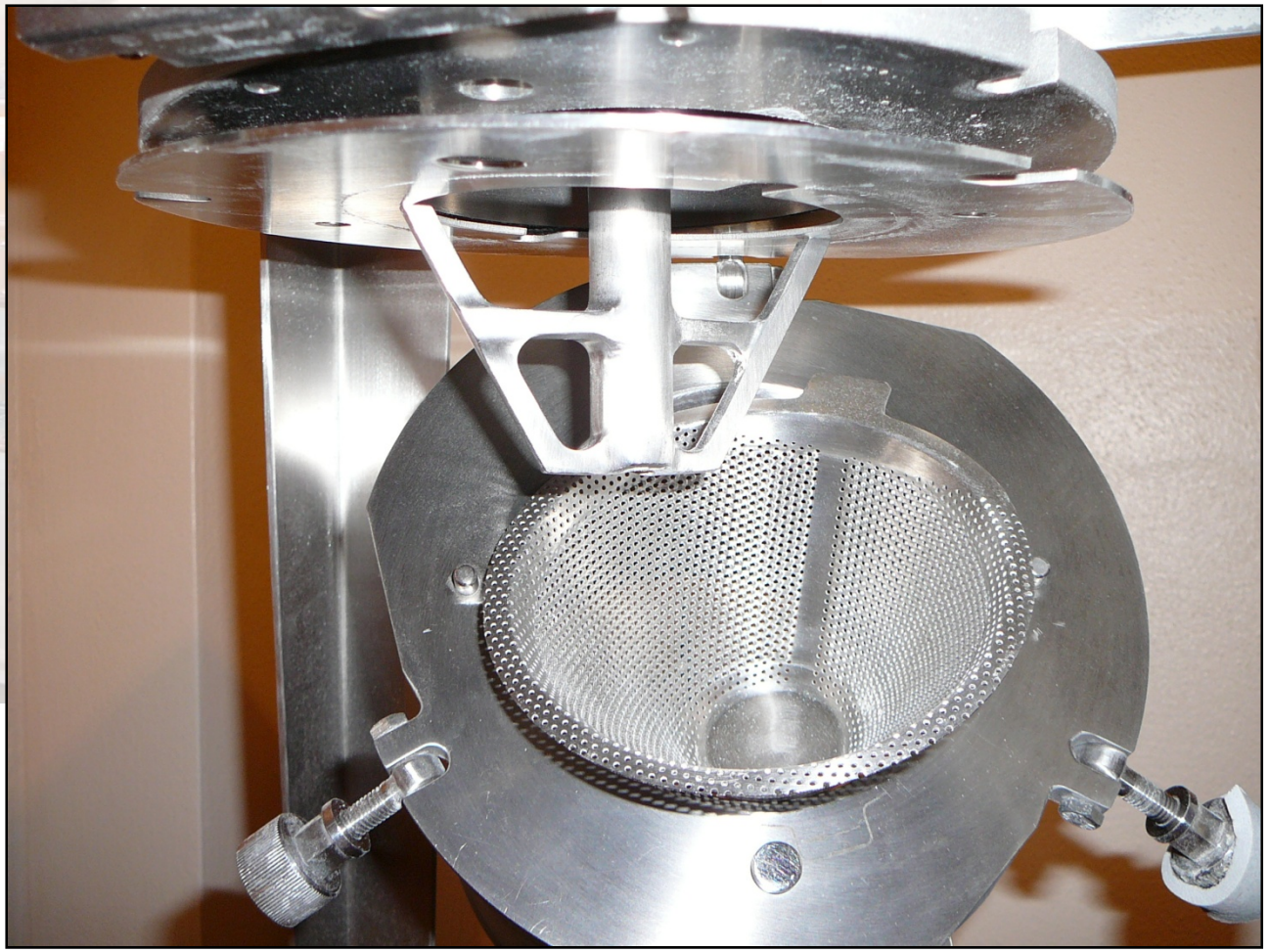
Quadrumat “Advanced”

Bran Particle Size Reduction

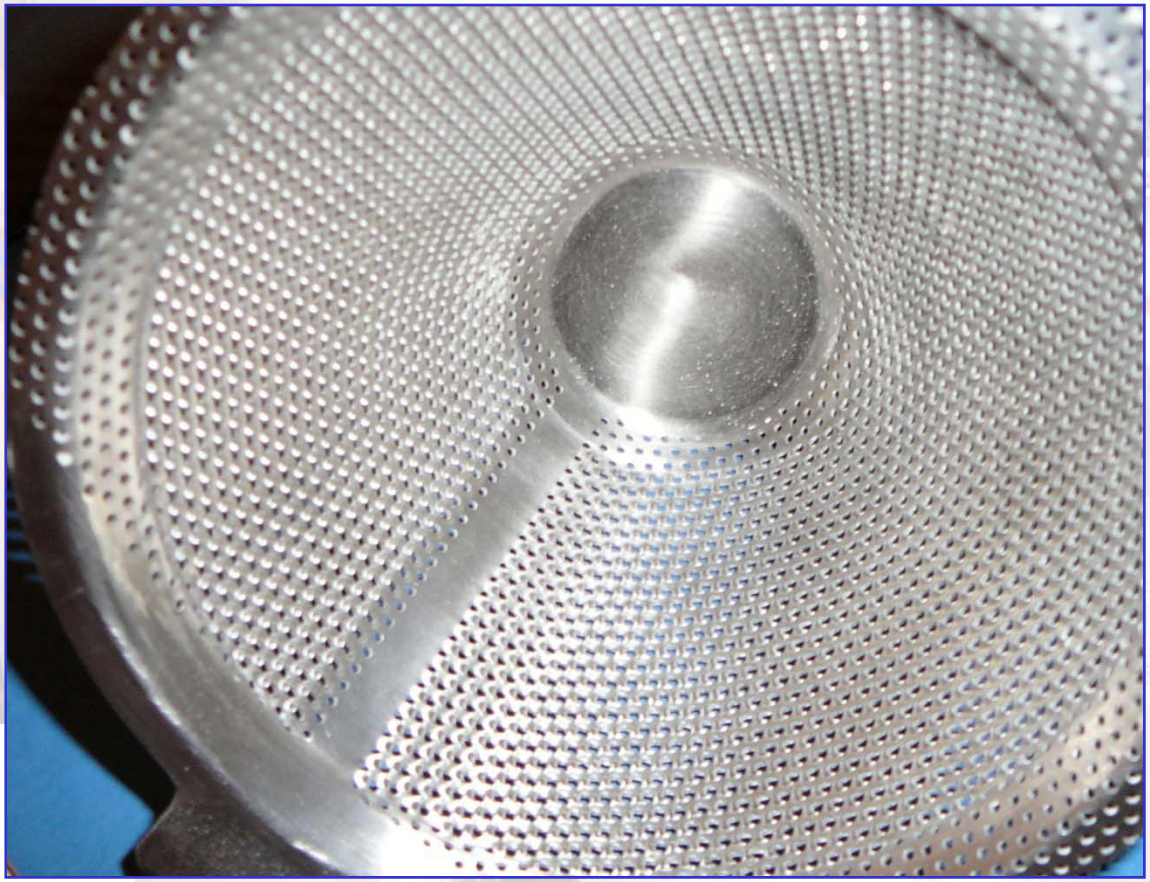
Quadro Comil

Minimum heat input

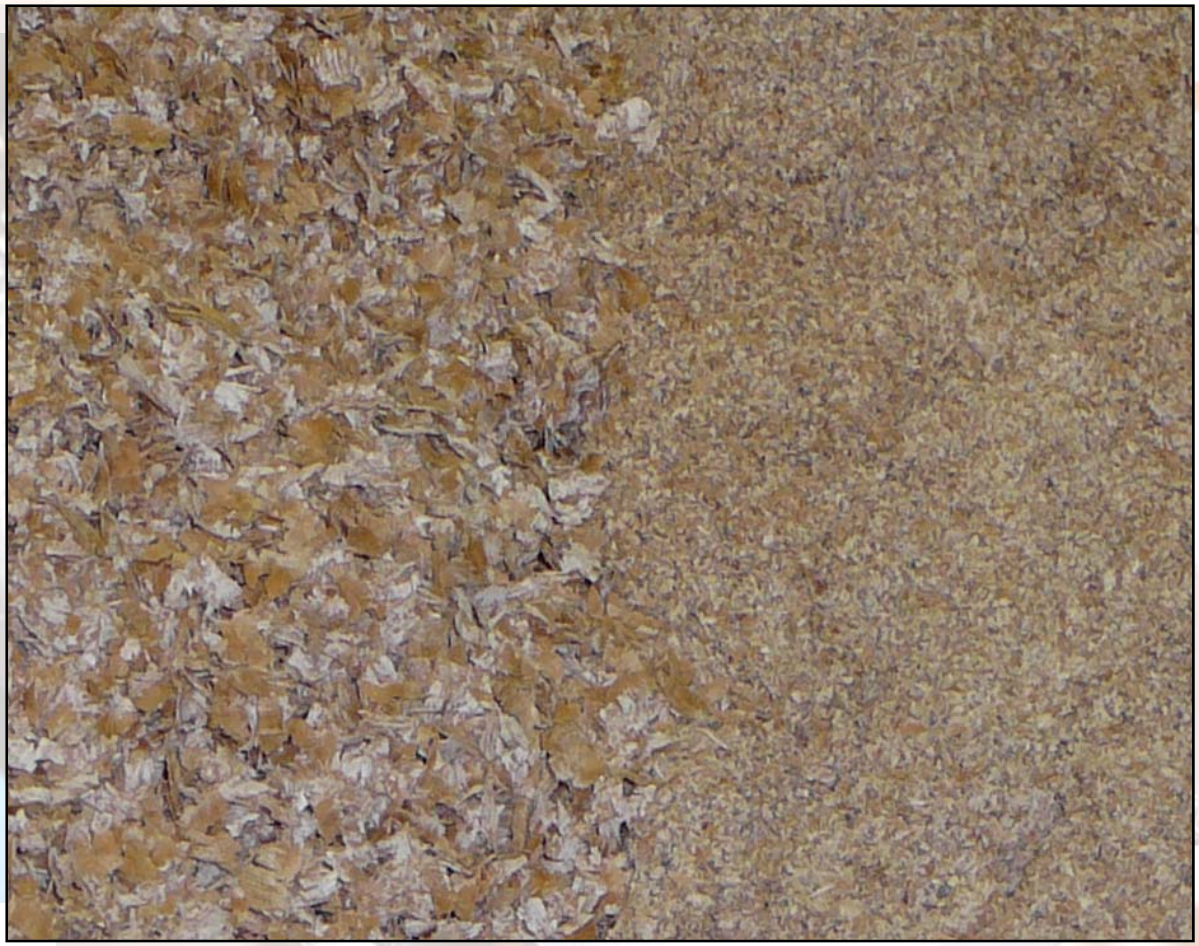
Bran Particle Size Reduction



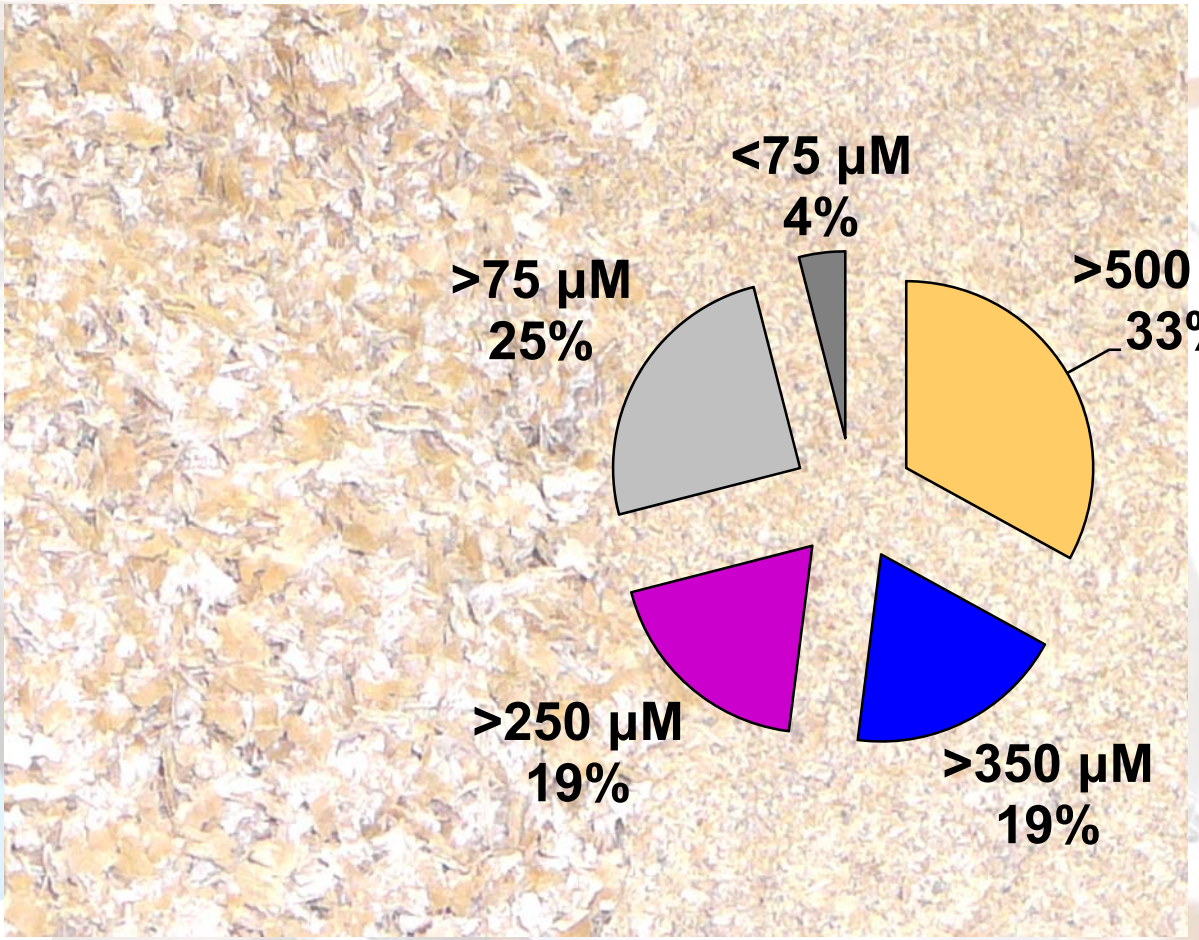
Bran Particle Size Reduction



Bran Particle Size Reduction



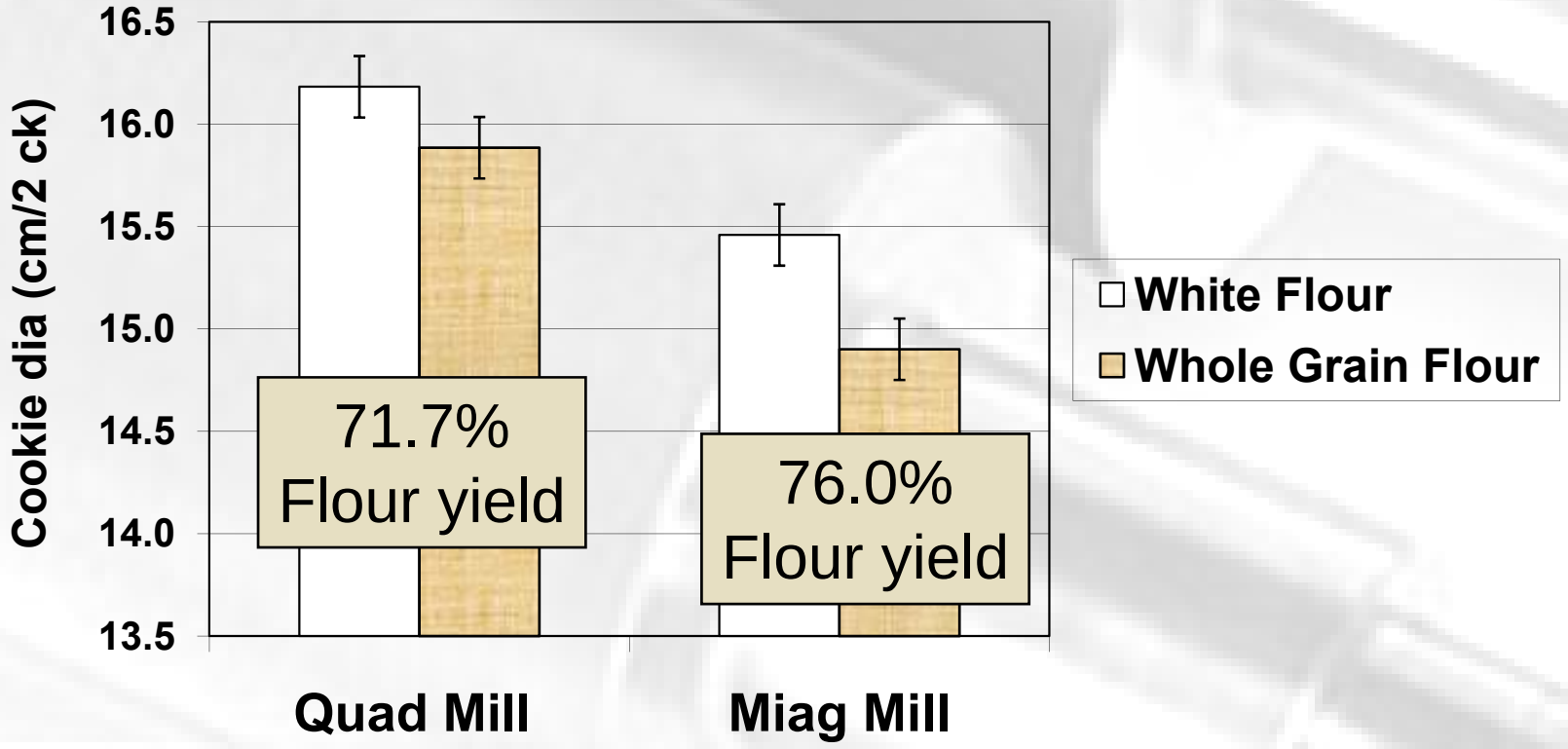
Bran Particle Size Reduction



Experimental Materials
Replicated Studies

- 4 Growing Environments
  - 2007 and 2008
  - Two Ohio locations
- Miag Mill: 6 varieties
  - 5 Soft White Winter, 1 Soft Red Winter
- Quad Mill: 14 varieties
  - 11 Soft White Winter, 3 Soft Red Winter

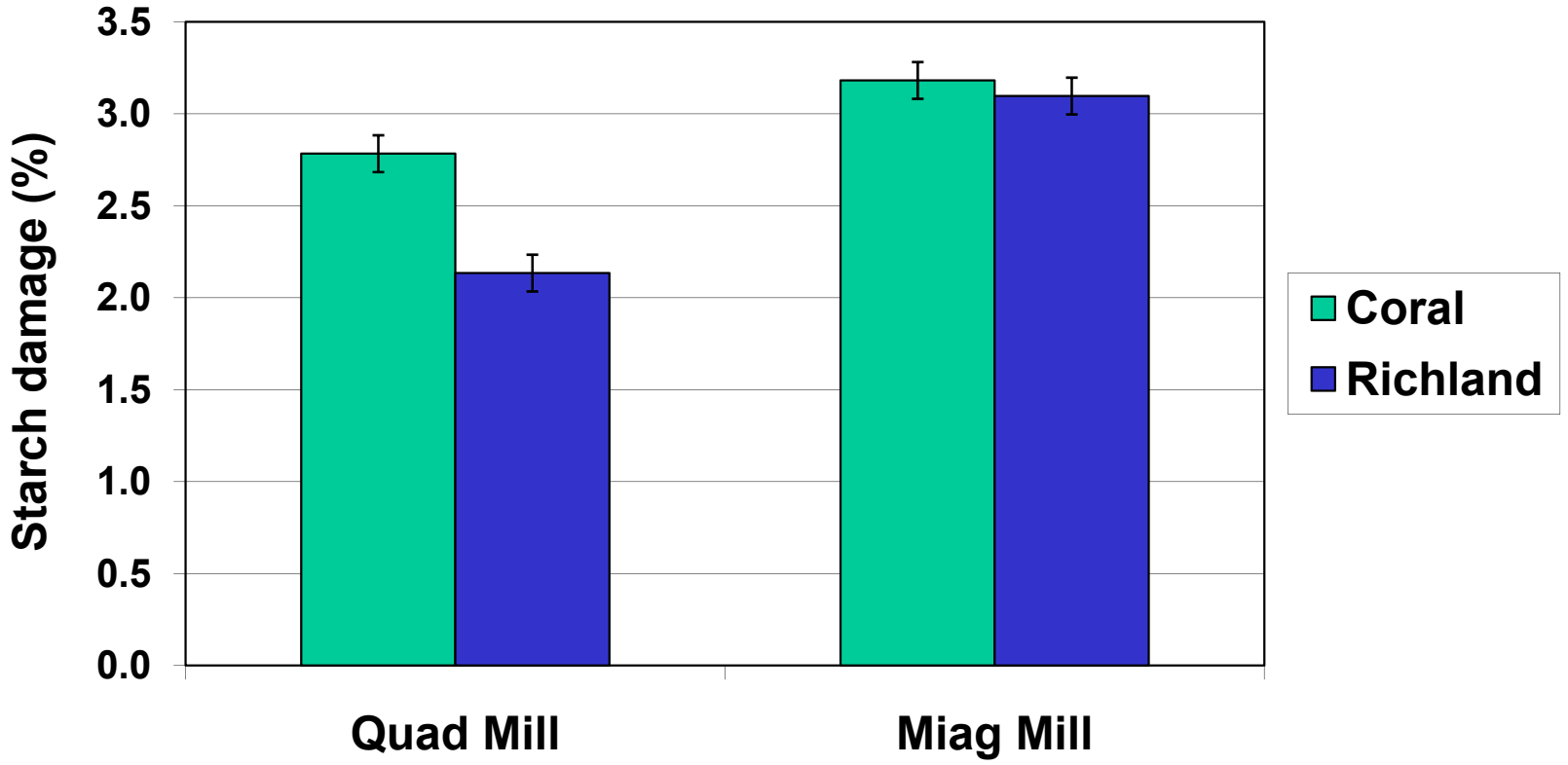
Effect of Flour Mill on Cookie Diameter



4 environments, 6 cultivars. AACC Wire-cut Micro

Guttieri, Sneller, and Souza. AACC 2009

Effect of Flour Mill on Whole Grain Starch Damage



Megazyme Enzymatic Assay, AACC Method 76-31

Conclusion

- Minimize roller milling
- Quadrumat Advanced + Comil system appropriate for characterizing cultivar variation

Courtesy Shellamaria Souza, AACC 2009

Softness Equivalent

Bran

40-mesh nylon

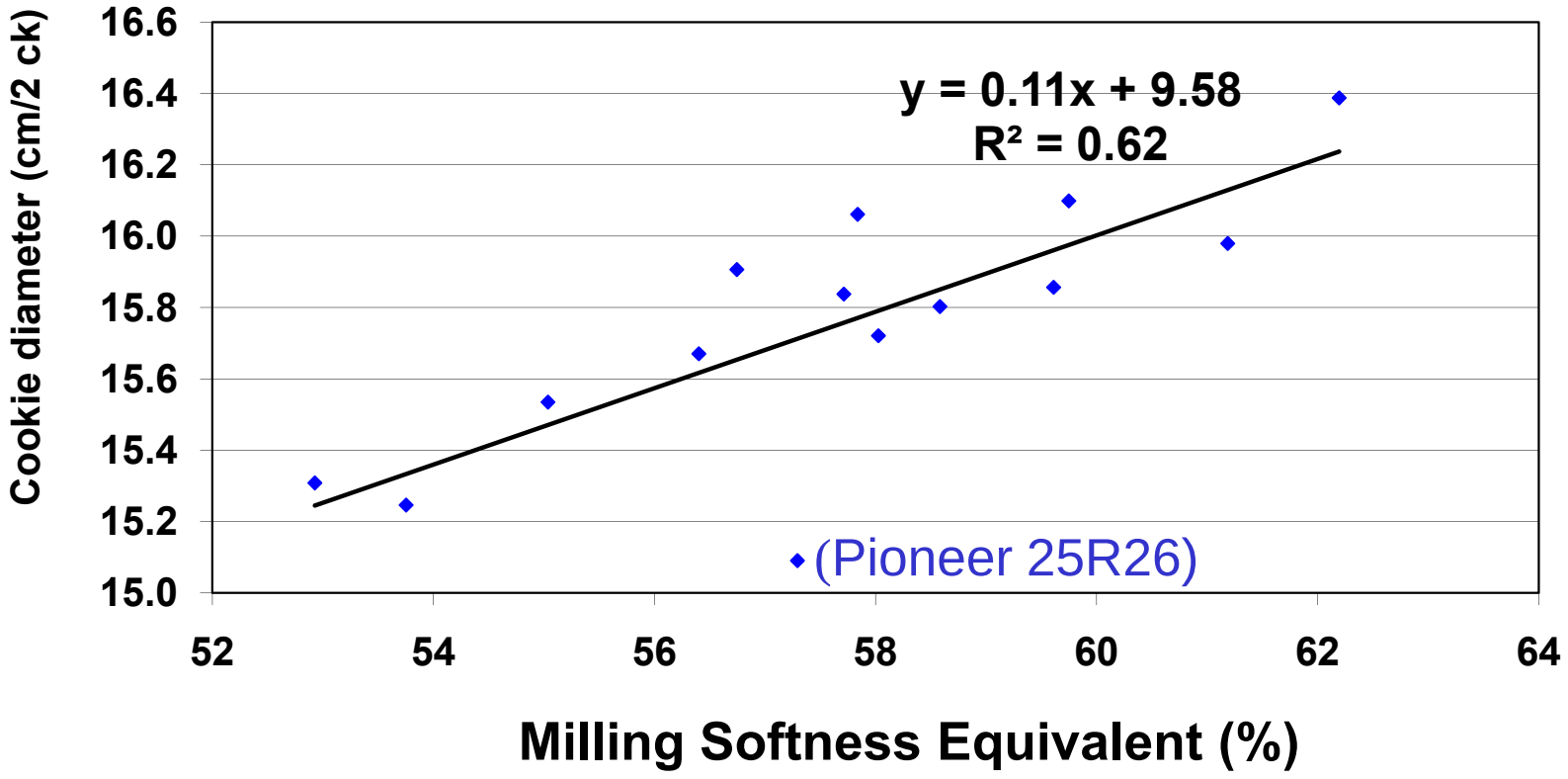
Mids

94-mesh nylon

Throughs

$$\textit{Softness Equiv} = 100\% \times \frac{\textit{Throughs}}{\textit{Throughs} + \textit{Mids}}$$

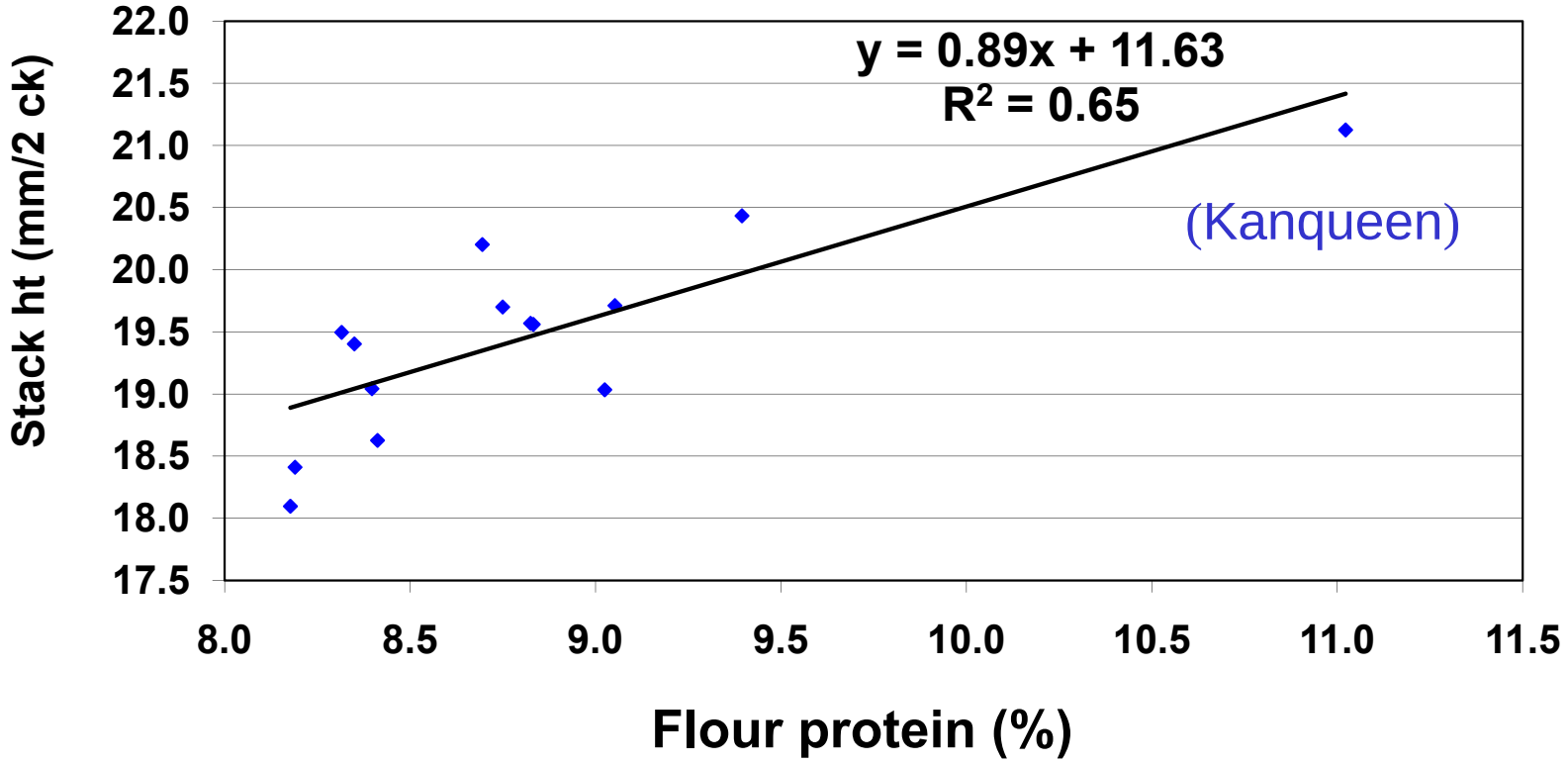
Cultivar Variation – Whole Grain Wire-cut Cookie Diameter



4 Ohio Environments, 14 Soft Wheat Cultivars

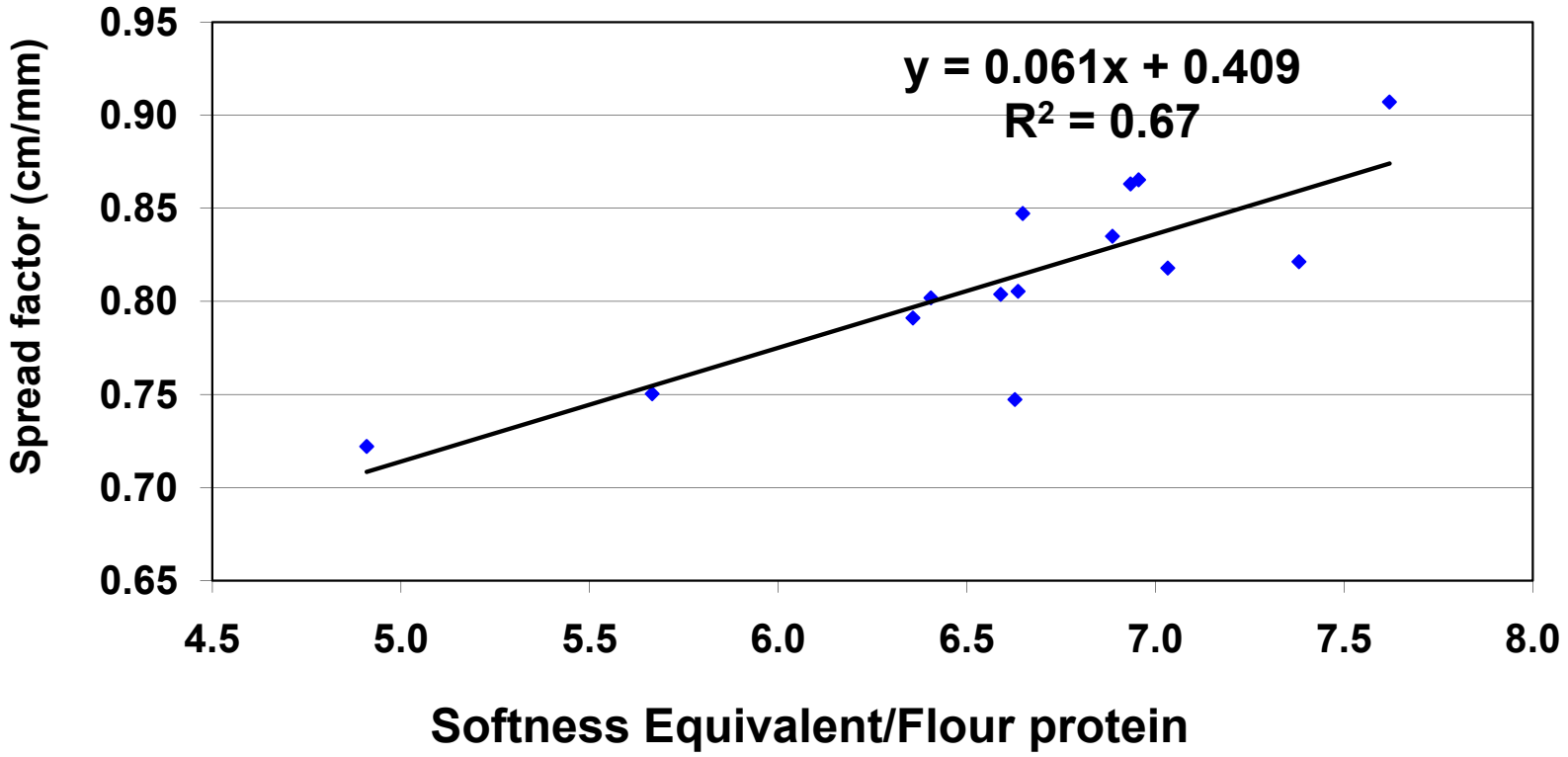
Guttieri, Sneller, and Souza. AACC 2009

Cultivar Variation – Whole Grain Wire-cut Cookie Stack Height



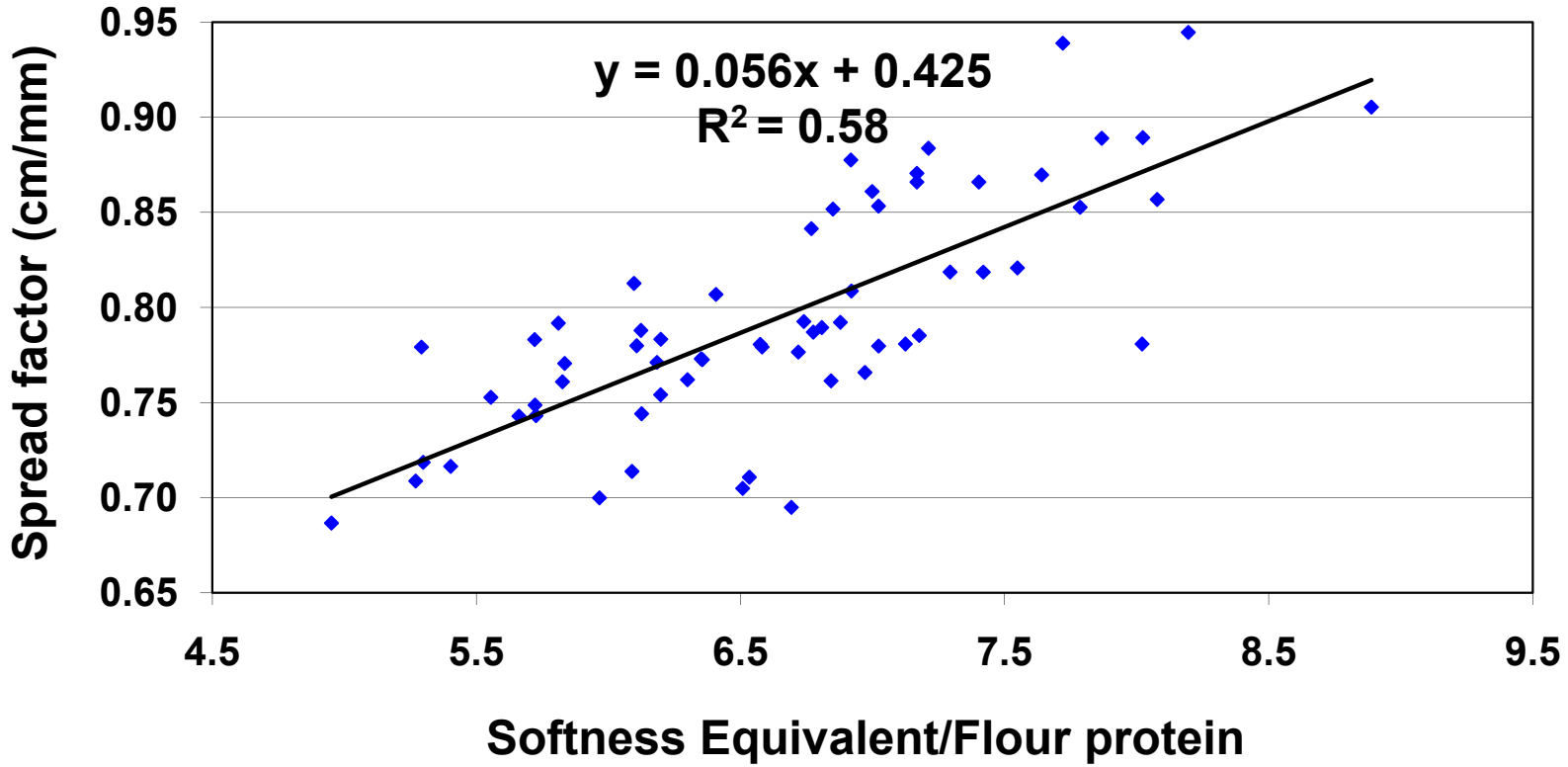
4 Ohio Environments, 14 Soft Wheat Cultivars

Cultivar Variation – Whole Grain Wire-cut Cookie Spread Factor



4 Ohio Environments, 14 Soft Wheat Cultivars

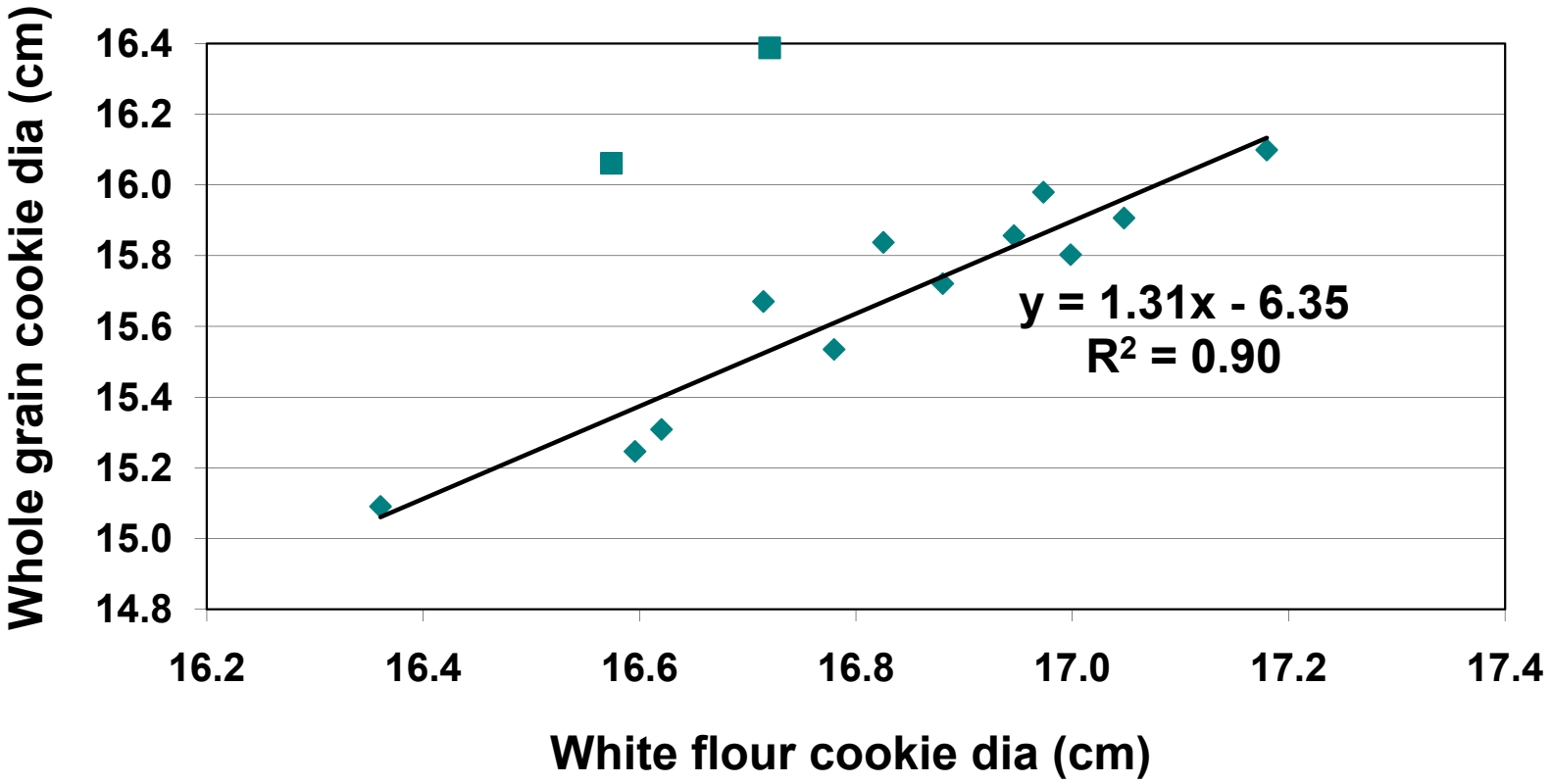
Sample Variation – Whole Grain Wire-cut Cookie Spread Factor



63 Soft wheat samples from 4 Ohio trials

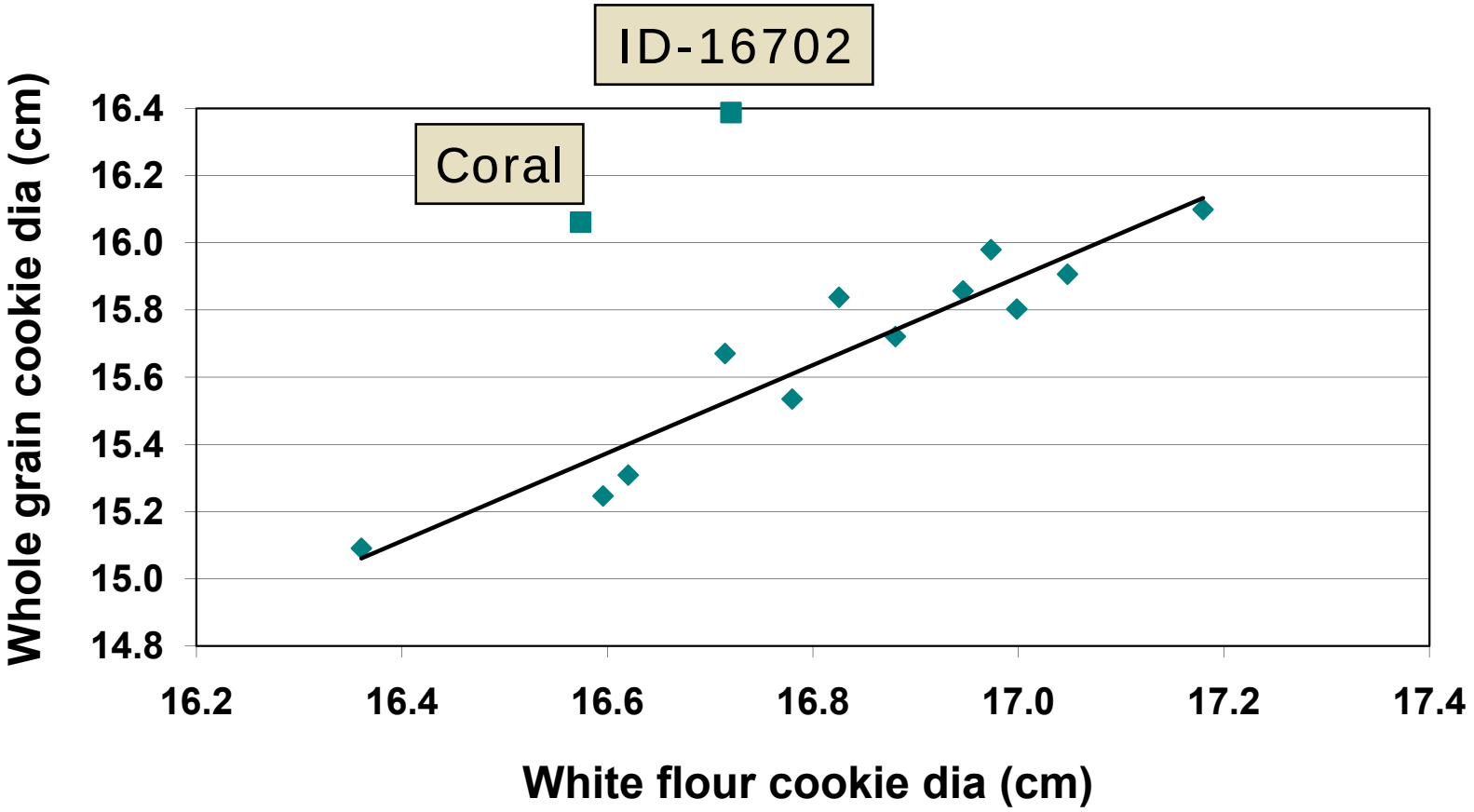
Bran Variation

Whole Grain vs. White Flour Wire-cut Cookie Diameter



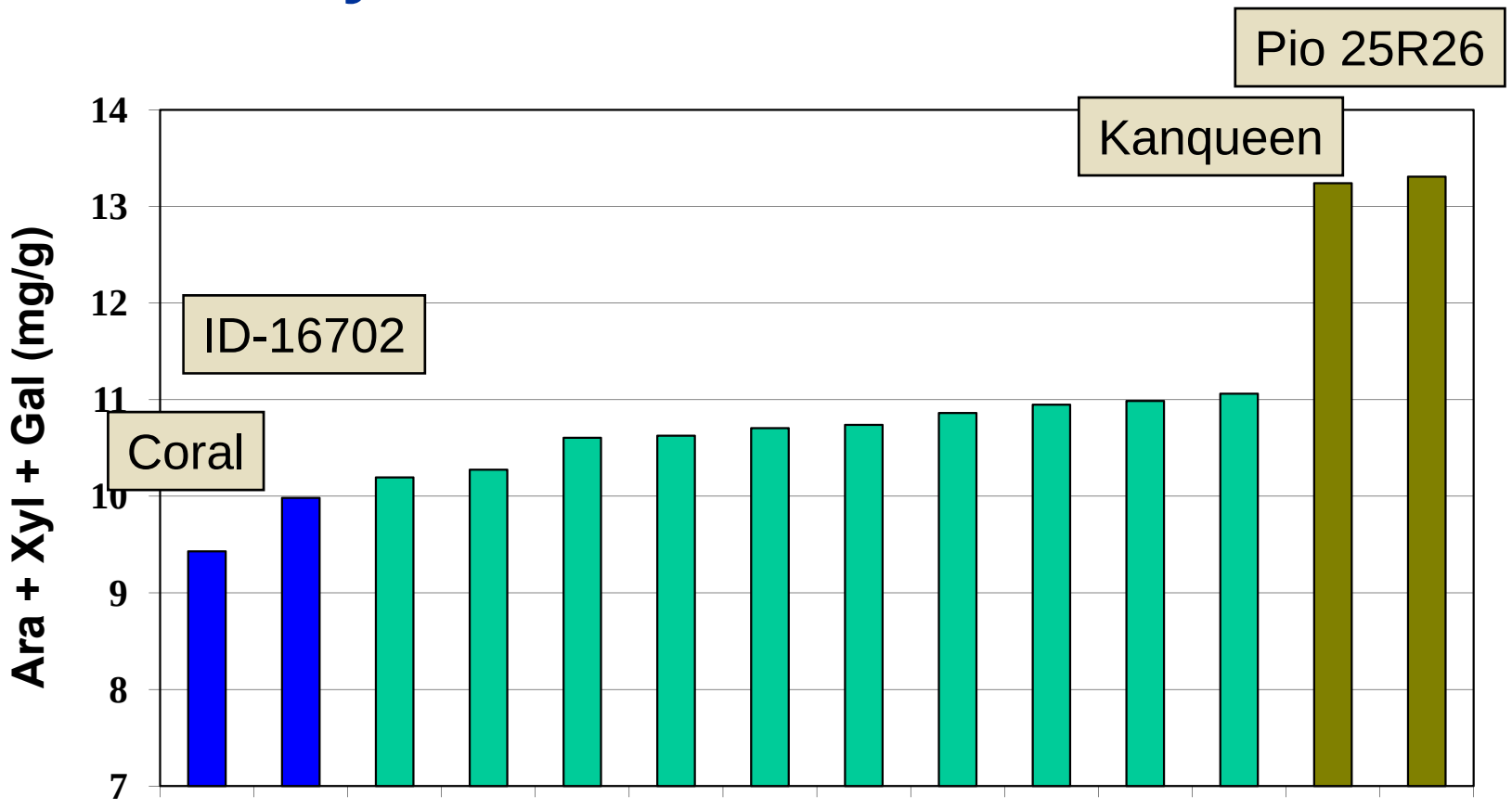
4 Ohio Environments, 14 Soft Wheat Cultivars

Whole Grain vs. White Flour Wire-cut Cookie Diameter



4 Ohio Environments, 14 Soft Wheat Cultivars

Water-extractable Non-starch Polysaccharides in Bran



Whole Grain Cookie Texture Predicted by Bran WE-NSPs

- Punch test – 2 cookies, 5 punches each
- Cookie volume as a covariate in analyses
- 14 Cultivars @ 4 env:
  - Cultivar F = 3.2** Range: 1.38 – 2.11 kg
- Force =
  $1.40 + (0.10 \times [\text{NSP}]) - (0.83 \times [\text{Ara}]/[\text{Xyl}])$
  $r^2 = 0.77$

Conclusions

- Less is More
  - Minimize milling
  - Simple testing is informative: Softness equivalent & Protein
- Variability in bran contribution to cookie performance is important – and an opportunity

Thank You

- Technical Assistance of Amy Bugaj, USDA-ARS Soft Wheat Quality Lab
- Financial Support of Kraft Foods and USDA-ARS