Summary of US Wheat Associates Soft Wheat Study

International and Domestic Targets

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Agricultural Research Service

Overseas Varietal Analysis

Sponsored by US Wheat Associates and Member States

2006 OVA	2007 OVA	2008 OVA
China Colombia Malaysia Mexico Peru	China Colombia Malaysia Peru Thailand United Arab Emirates	China Colombia Dominican Republic Indonesia Malaysia Mexico Peru Philippines Thailand United Arab Emirates

Project Purpose

The Overseas Varietal Analysis Program evaluates the quality of soft red wheat varieties in cooperation with international millers and bakers.

The specific purpose is the enhancement of the milling and end-processing quality of SRW wheat to better meet the needs of international customers.

Overseas Varietal Analysis – SRW

- 10 cultivars: commercial production in exporting states
  - AR, NC, VA and occasionally other states
- Evaluation
  - Miag flour milling
  - SWQL standard evaluations
  - Cooperators in importing countries rate quality of flour for local products
- Focus
  - What are the quality characteristics of preferred cultivars?
  - How does that quality contrast with US domestic users?

Overseas Varietal Analysis – SRW

- Products in 2006, 2007, and 2008
  - Cookies
  - Cakes
  - Steam bread
- Contrast
  - Wheat Quality Council (WQC) Evaluations 2007, 2008, and 2009
- Data sets
  - Miag database of samples for OVA and WQC are embedded in the 2010 Research Review CD
- Method
  - Compare the average of the two best ranked and two worst ranked cultivars from each of the three years (6 samples in each class).

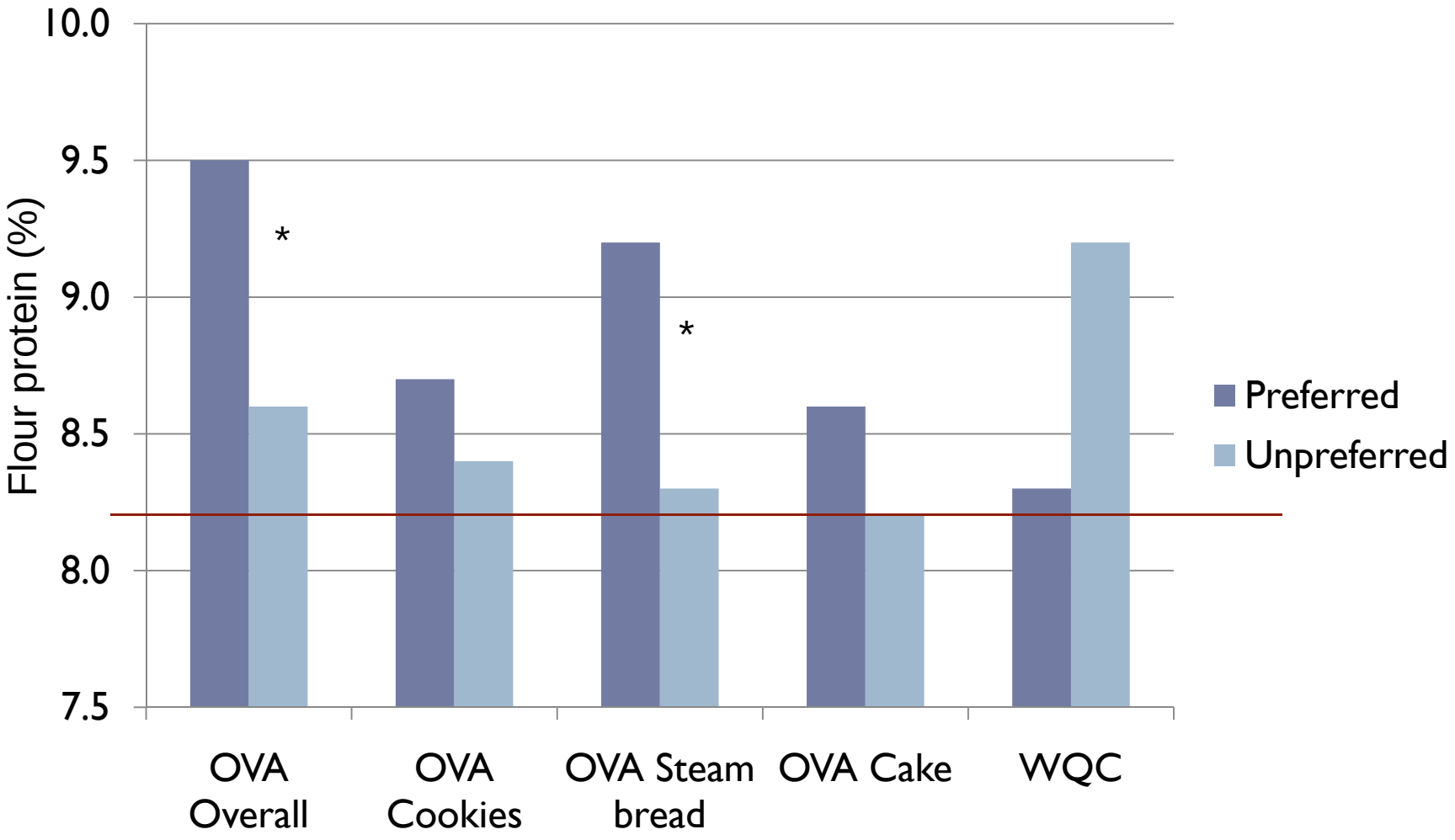
OVA – Overview of Conclusions

- 2006
  - Low water absorption and large cookie spread preferred
  - Higher protein and stronger gluten necessary for some customers
  - Reduction of water absorption should generally come from reducing starch damage or arabinoxylan content rather than the minimizing gluten strength
- 2007
  - All samples had low and very acceptable water absorption
  - Best predictors of preference were related to measurements of dough strength and extensibility.
  - Cooperators differed in their needs for gluten strength.
  - Segregation of grain lots by gluten strength is important.

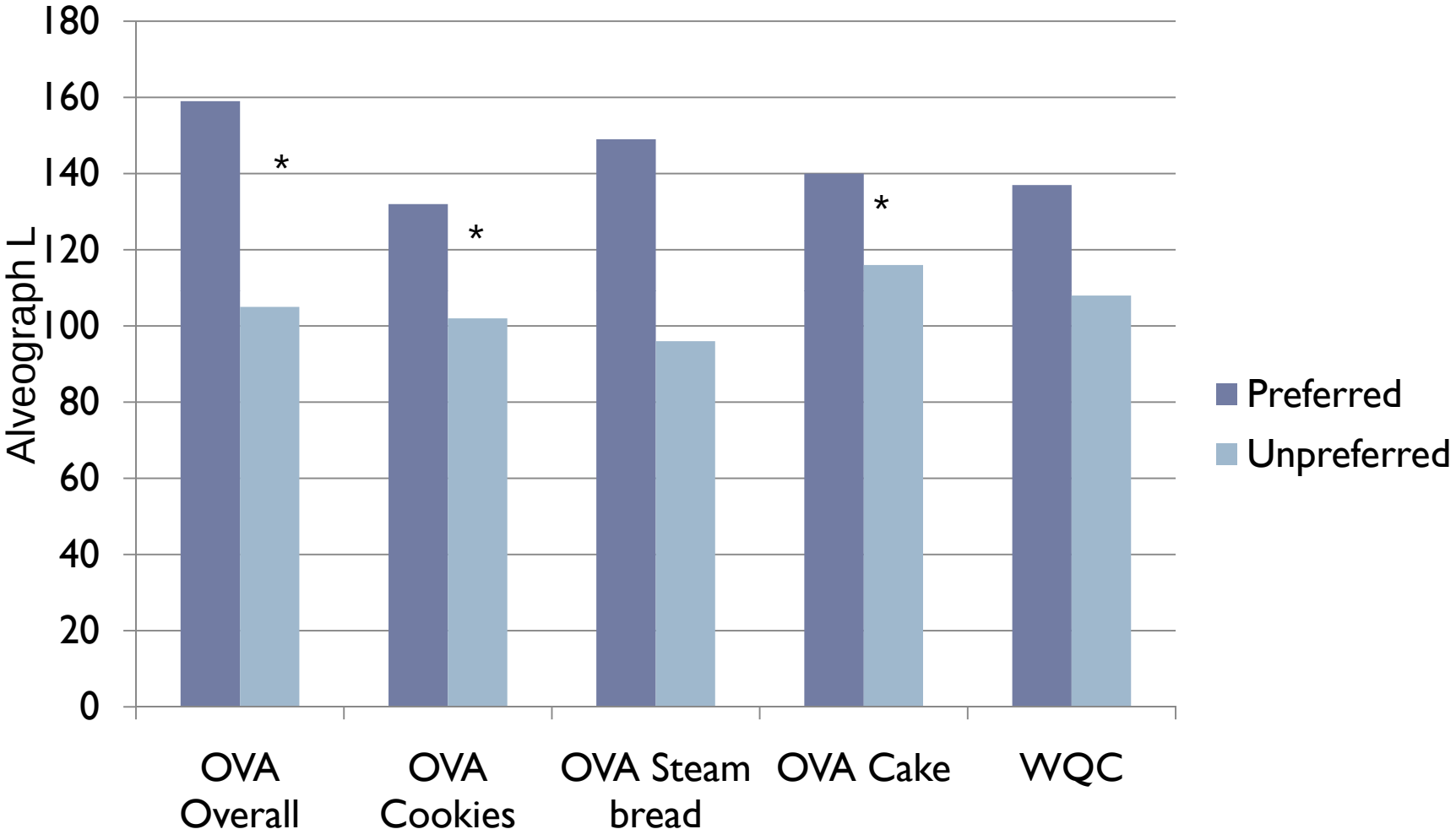
OVA – Overview of Conclusions

- 2008
  - Product quality of a range of soft wheat samples can meet the needs of a diverse set of end-use products.
    - When all samples were deficient increasing protein concentration of samples or flour chlorination would have produced a superior product.
  - US Wheat should identify for each customer an optimum protein concentration to allow them to produce the range of flours and products that will suit their marketplace.
  - US researchers also should take the initiative to identify alternatives to chlorination that are suitable for use with US soft wheat flours to produce appropriate products for Asian and Latin American markets.

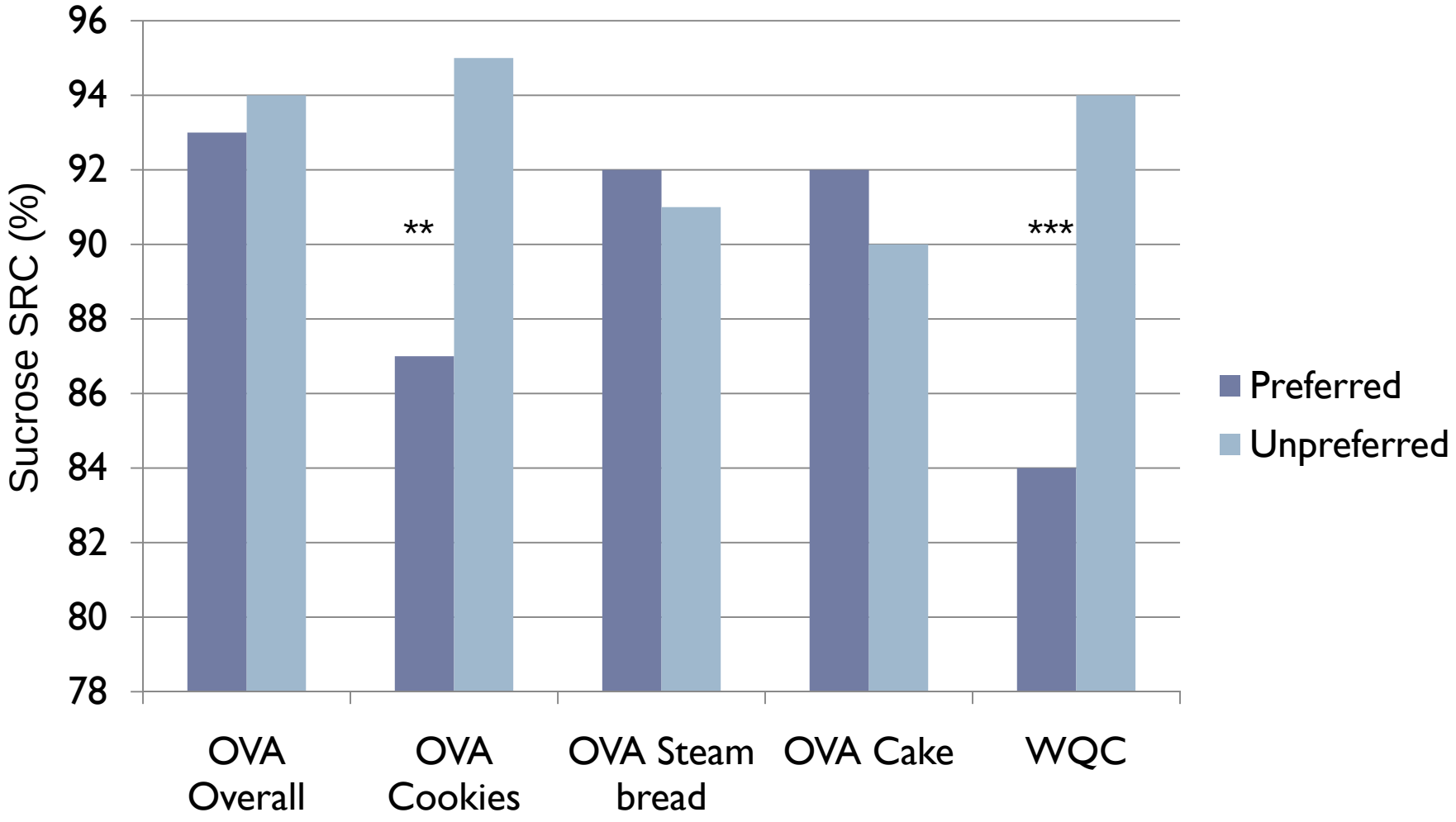
Export channels prefer greater protein concentration in contrast to domestic preferences.



Export channels prefer greater extensibility 'L.' Domestic industry has less preference.



Smaller sucrose SRC values (less arabinoxylans) preferred for cookies – Export and Domestic.



Domestic soft wheat flour preferences are strong and well-defined

Traits are significant if:
1) Cooperators in Wheat Quality Council have consistent, broad-based preference
2) Some samples had undesirable levels for the trait.

Trait	Unit	Preferred	Non-preferred	
Break flour	%	32.4	26.1	**
SKCS hardness	score	9.0	32.4	**
Damaged starch	%	1.8	3.4	**
RVA Peak	cP	3279	2832	*
Water SRC	%	50.7	54.3	*
Sucrose SRC	%	83.9	93.4	**
Farinograph Abs.	%	49.1	53.4	**
Wire-cut cookie				
Diameter	cm	16.5	15.3	**
Stack ht	mm	19.0	22.0	**
Spread factor	cm/mm	0.87	0.70	**

Export customers have some consensus on flour for cookies

Traits are significant if:
1) Cooperators in Wheat Quality Council have consistent, broad-based preference
2) Some samples had undesirable levels for the trait

Trait	Unit	Preferred	Non-preferred	
Sucrose SRC	%	87.3	94.7	**
Alveograph parameters				
P	mm	30	50	*
L	mm	149	96	*
W	$x10^{-4}J$	89	125	*
P/L		0.22	0.62	*

Are there preferences for gene effects?

Average ranking for cultivars carrying alternate alleles at two chromosomal regions affecting flour gluten strength.

Preferences both domestic and international vary by product

Problematic for marketing because of absence of market applicable grain grading system for gluten.

	1BL.1RS			Glu-D1 - 5+10 allele		
	Absent	Present		Absent	Present	
Overall	6.2	5.0	*	6.2	5.1	*
Steam bread	5.9	6.0		6.5	4.1	*
Sponge cake	6.3	4.2		5.9	6.3	
Cookie	6.2	5.1		6.2	5.4	
WQC	6.7	7.5		6.7	8.0	

Cake Quality is Not Obvious (After Eliminating Defects)

- Most millers making cake flour specify low ash, high falling number, and prefer high break flour.

- Specifications for low protein concentrations in cake flour are counter productive, particularly for high moisture cakes.

- In two of the three years:
  Sponge cake scoring positively correlated with cookie diameter and peak RVA viscosity.

Chlorination alters sponge cake quality for better and (in some markets) for worse

Chlorinated control flour
2008 OVA Thailand Workshop

Magnolia flour sample – Top rated flour
2008 OVA Thailand Workshop

Sponge cake is a formula that can produce an accurate flour assessment without chlorination of flour.

Steam bread has both visual quality and textural quality

Color
Off and yellowish colors are un-desirable.

Agtron flour color was correlated with sample ranking in 2008.

Texture
Regional and country differences make it unlikely that one style of flour will suit all steam breads.

Conclusions

What is in common between domestic and export customers?

- Reduced sucrose SRC is preferred for a wide range of high sugar baked goods.
- Small flour particle size and its linked traits (break flour yield and softness equivalent) are desired for a wide range of products.
- Alveograph P and L are good predictors of a wide range of user preferences.
- Flour color seems important for Asia and is a valued but minor part of domestic industry

Conclusions

What is problematic?

- Cake quality is difficult to predict
  - Methods may be dependent on chlorination
  - Performance of chlorinated cake flour is difficult to predict from unchlorinated flour samples
  - Different cake styles have different flour requirement
- Steam bread does not have a single standard
  - Bright creamy color is a nearly universal requirement
  - Moderate water absorption is desirable
    - and -
  - Additional flour characteristics vary from mill to mill and may be best achieved through adjusting milling and with blends of hard wheats

Protein

- Protein preferences by customers are often below the optimum necessary to produce a desirable product.
- Gluten preferences vary widely in the market place
- In domestic market: lower protein samples generally are preferred. Yet, too low of protein can be undesirable.

Protein

- Anecdotally, protein concentration in grain seems to be generally declining in eastern US crop
  - Indicator that fertilization levels are declining relative to target yields
  - Most SWQL studies do not find large genetic variation for protein concentration in elite soft wheat germplasm
  - Fertilizer recommendations may need to be modified to meet quality standards and yield performance goals for the eastern US crop