

# An overview of taste sensations of whole grain products

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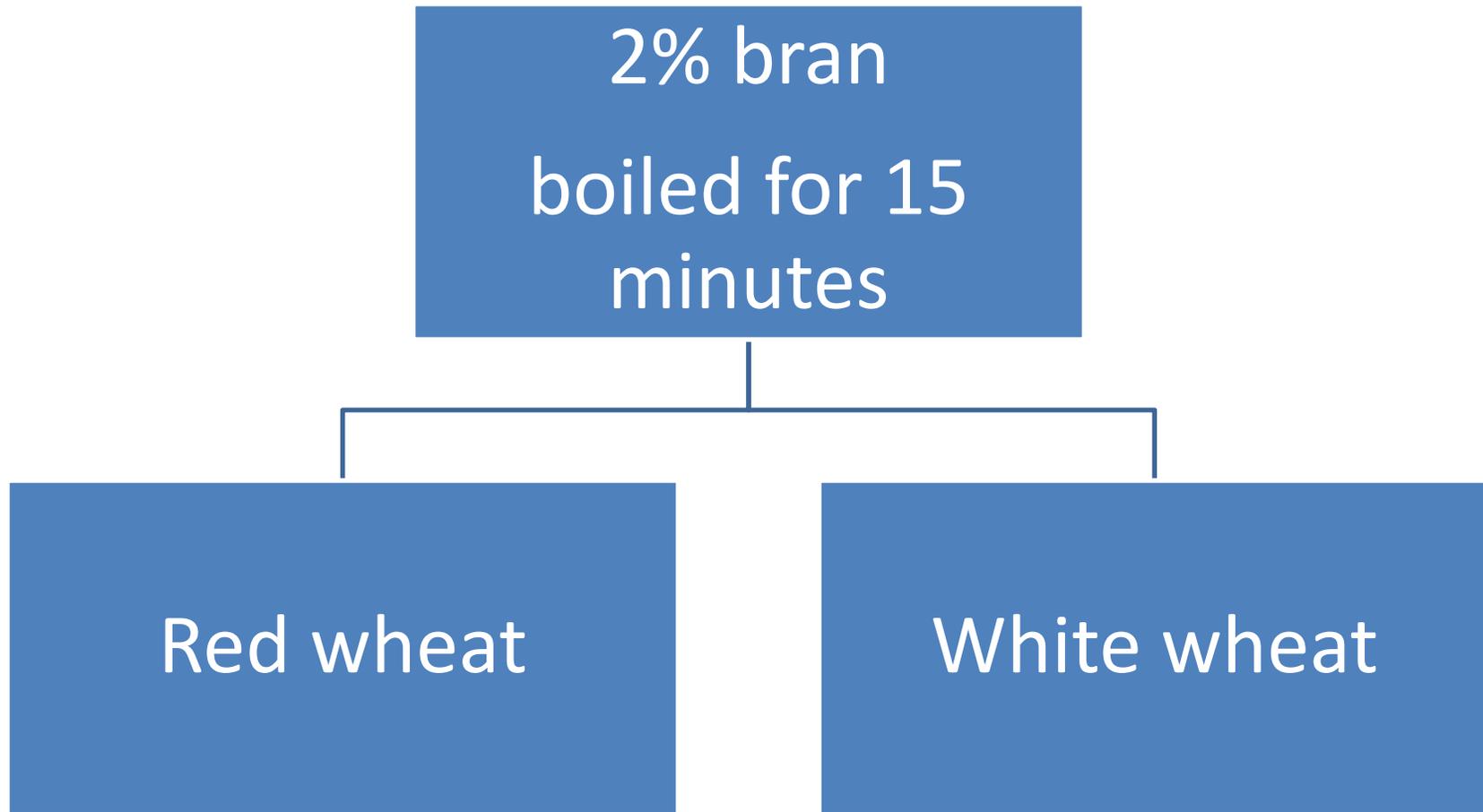
# Background

- Consumers are demanding healthier products
  - Products manufactured from white bran more acceptable than those from red
  - Polyphenols
    - Perceivable off flavors (bitter and astringent) bran
    - Bran pigmentation



- Do red and white wheats impart different sensory properties:
  - In bran infusions?
  - In intermediate moisture products?
  - In low moisture products?

# Bran infusions in water

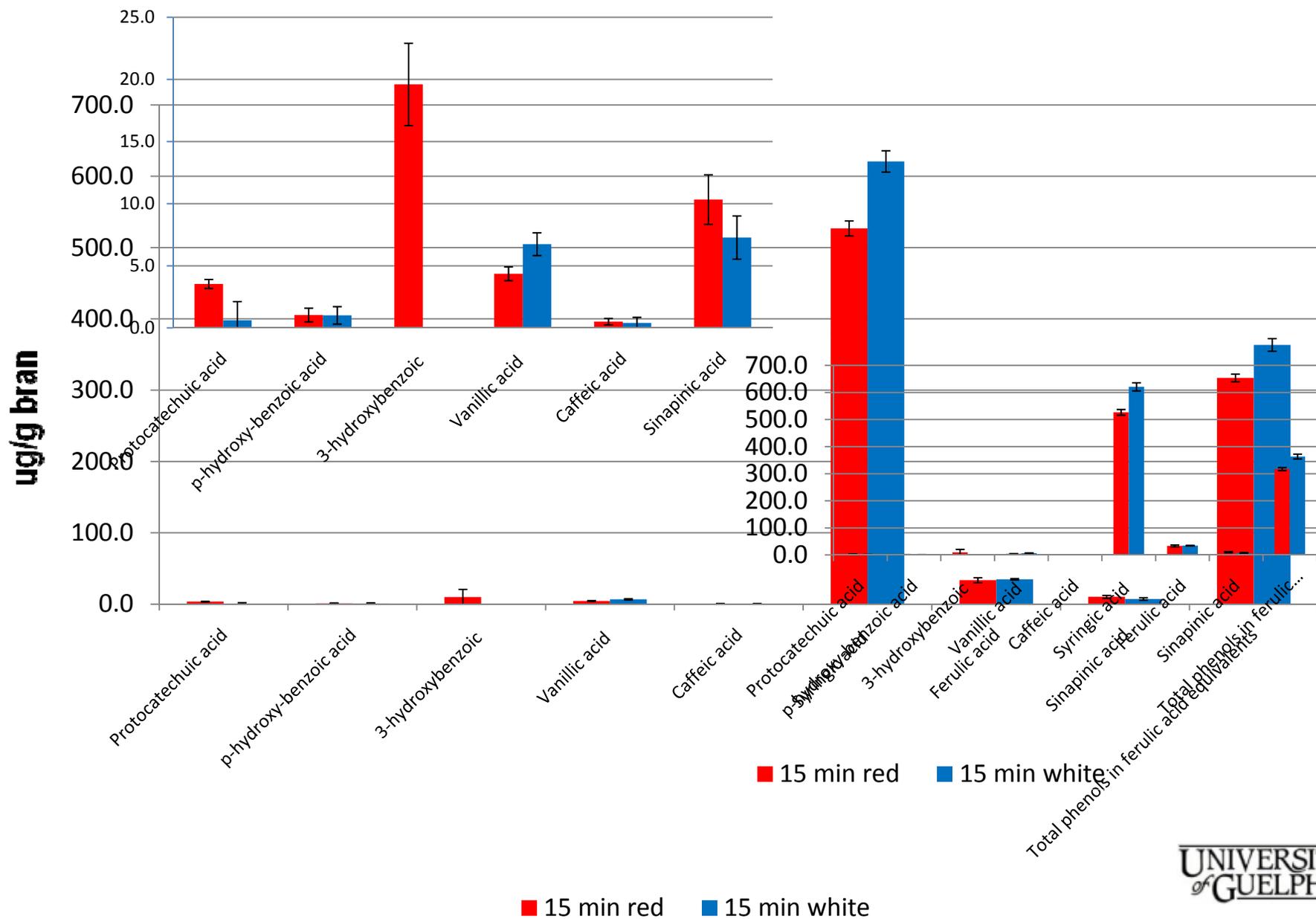


Means<sup>1</sup> and Tukeys allocation total phenol content (2% bran infusions boiled for 15 minutes) using the Folin-Ciocalteu method

	Red	White
<b>Total Phenol Content</b>		
Mean	1590.2a <sup>2,3</sup>	1688.1b
SD	102.26	66.81

1. Means and standard deviations of 18 replicates
2. Expressed as ferulic acid equivalents (ug/g bran)
3. Means in a row with the same letter are not significantly different at  $\alpha = 0.05$

## Phenolic acid content of 2% red and white bran infusion



- Trained panel
  - Objective evaluation of intensity of sensory properties of a food/ingredient
  - Small numbers of individuals (n=10)
  - Trained to be sensitive to small differences in samples
  - Relative differences between products

# Sensory method

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## Definition

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Bitter	Basic bitter taste associated with caffeine and other bitter compounds; bitterness lingers long like an aftertaste
Astringent	A sensation that lingers and coats, dries and numbs the mouth, palate and tongue

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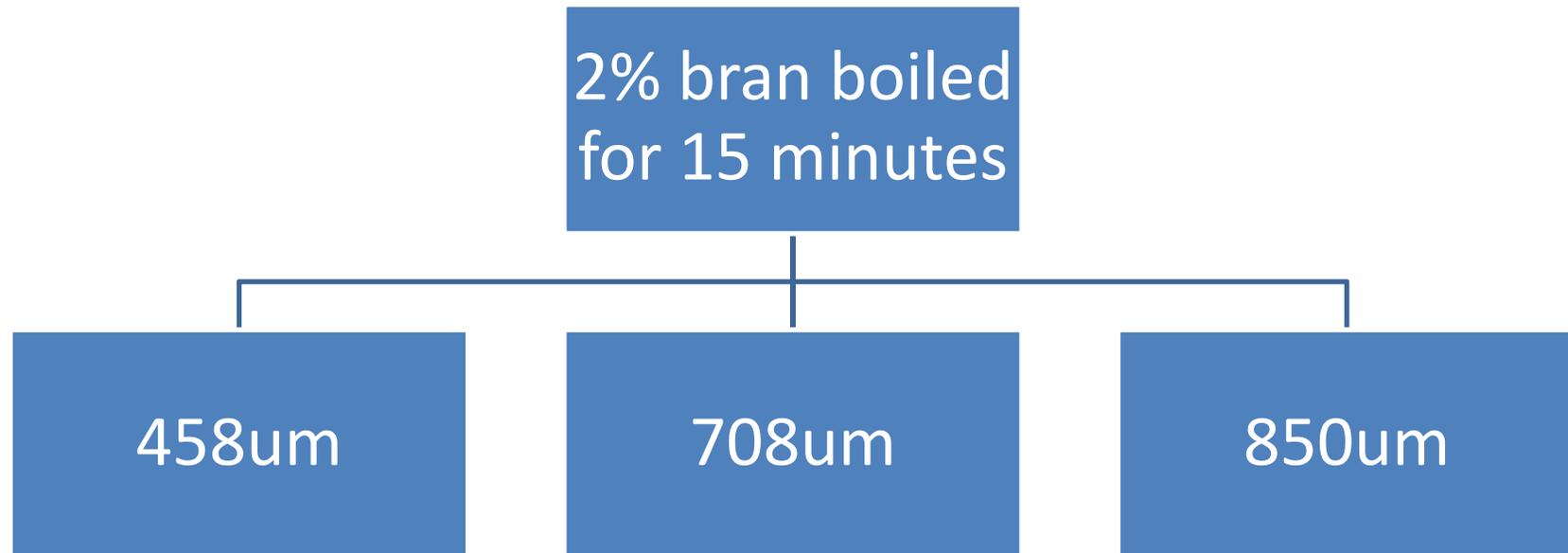
15 cm line scale: 0=weak, 15=strong

Means<sup>1</sup> and Tukeys allocation of astringency and bitterness perception (2%  
bran infusions boiled for 15 minutes)

		<b>Red</b>	<b>White</b>
<b>Astringent</b>	Mean	5.2a <sup>2,3</sup>	5.2a
	SD	2.19	2.12
<b>Bitter</b>	Mean	2.5a	2.5a
	SD	1.49	1.51

1. Means and standard deviations of three replicate experiments for 10 panellists
2. Means in a row with the same letter are not significantly different at  $\alpha = 0.05$
3. All data input on a 15 cm line scale where 0=weak and 15=strong

# Bran infusions in water



Means<sup>1</sup> and Tukeys allocation of astringency and bitterness perception (2% bran at three particles sizes)

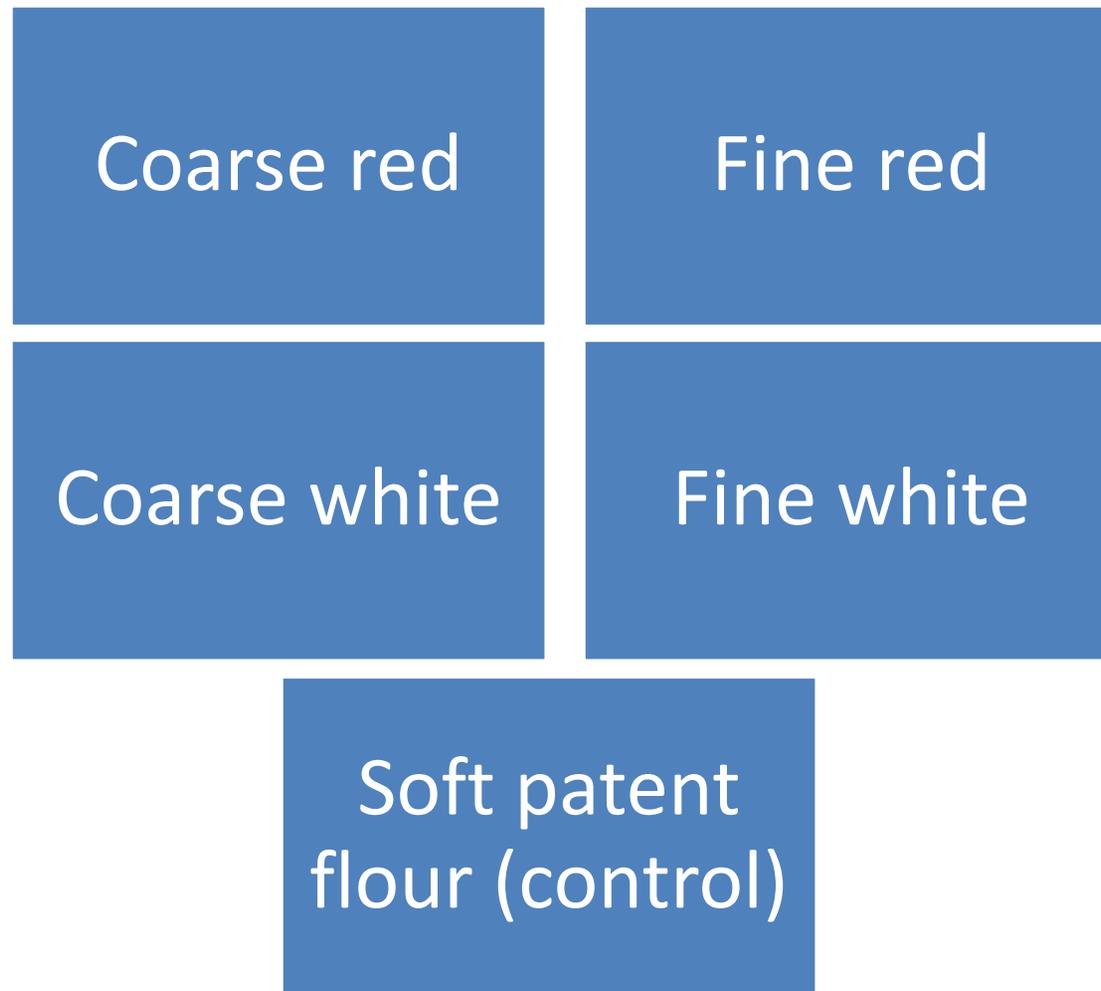
Particle Size (um)	458	708	850
<b>Astringent</b>			
Mean	5.0a <sup>2,3</sup>	5.4a	5.2a
SD	1.97	2.33	2.16
<b>Bitter</b>			
Mean	2.4a	2.5a	2.6a
SD	1.44	1.58	1.48

1. Means and standard deviations of three replicate experiments for 10 panellists
2. Means in a row with the same letter are not significantly different at  $\alpha = 0.05$
3. All data input on a 15 cm line scale where 0=weak and 15=strong

# Summary: Infusions

- Particle size
  - Does not affect phenol content or sensory perception
- Colour of bran
  - Affects total phenol content of wheat
    - Higher in white wheat infusions than in red
  - Does not affect perceived astringency and bitterness

# Intermediate moisture products



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<b>Sensory Attribute</b>	<b>Definition</b>	<b>Rating Scale</b>
Sweet	The taste sensation perceived on the tongue as stimulated by sucrose and other sugars	0 = Not sweet and 15 = Very sweet
Salt	The taste sensation perceived on the tongue as stimulated by sodium salts, such as chloride and in part other salts	0 = Not salty and 15 = Very salty
Sour	The taste sensation perceived on the tongue as stimulated by acids such as citric acid	0 = Not sour and 15 = Very sour

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<b>Sensory Attribute</b>	<b>Definition</b>	<b>Rating Scale</b>
Grainlike	A general term used to describe the dusty or musty aromatics associated with grains such as corn, wheat and oat	0 = Not grainy and 15 = Very grainy
Yeasty	The smell of yeast dissolved in water	0 = Not yeast and 15 = Very yeasty
Wheaty	A light, baked wheat flour note	0 = Not wheaty and 15 = Very wheaty
Toasted	The flavour associated with baked flour	0 = Not toasted and 15 = Very toasted
Malted	Sweet, slightly fermented or sour grain noted associated with freshly kilned malt	0 = Not malted and 15 = Very malted
Molasses	A note associated with molasses, has a sharp, slight sulfur and/or caramelized character	0 = No molasses flavour and 15 = Strong molasses flavour

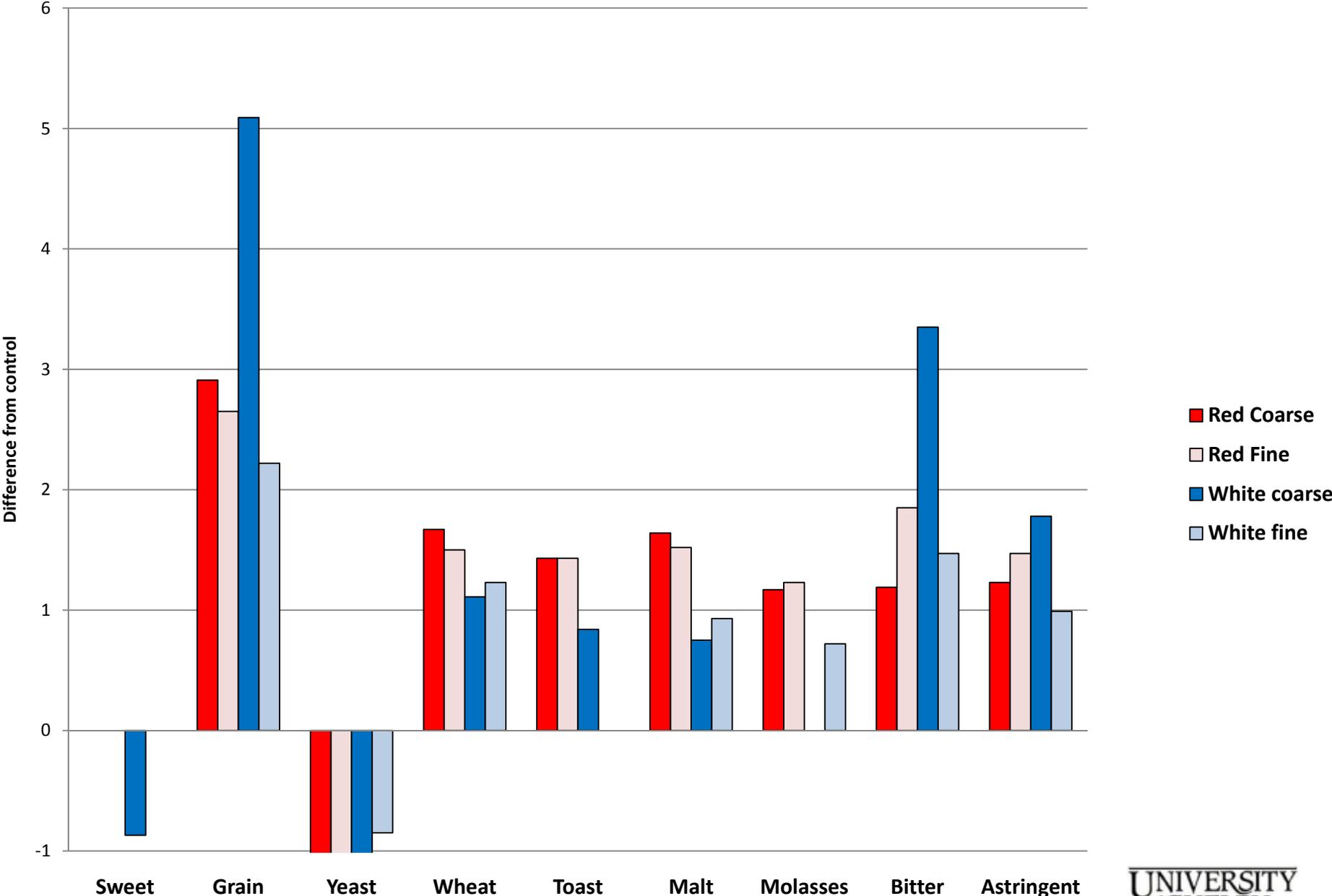
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<b>Sensory Attribute</b>	<b>Definition</b>	<b>Rating Scale</b>
Bitter	Basic bitter taste associated with caffeine and other bitter compounds; bitterness lingers long like an aftertaste	0 = Not bitter and 15 = Very bitter
Astringent	A sensation that lingers and coats, dries and numbs the mouth, palate and tongue	0 = Not astringent and 15 = Very astringent

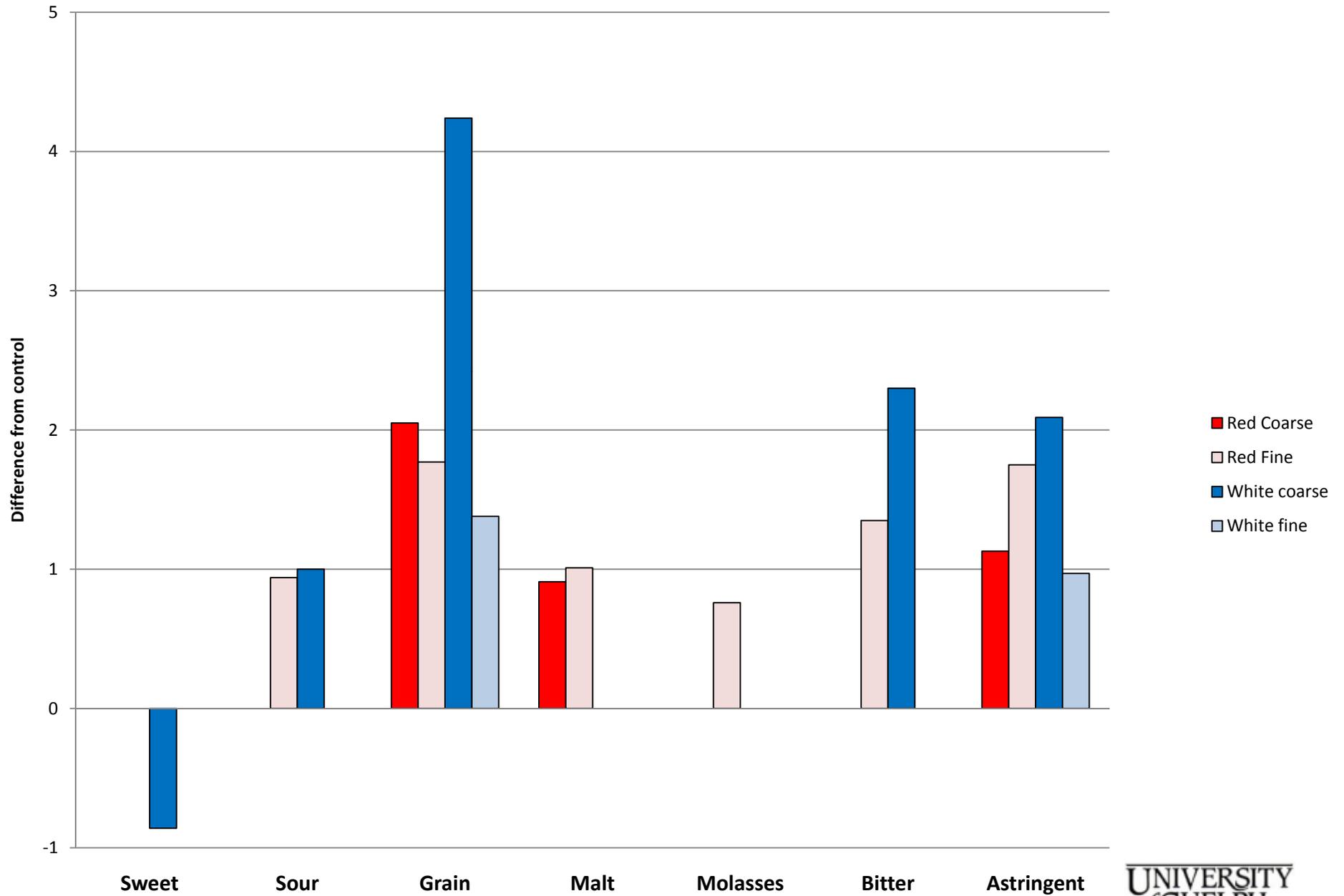
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- Are sensory properties of test products different from control?
  - Crumb
  - Crust

# Significant sensory differences from patent flour: Crumb

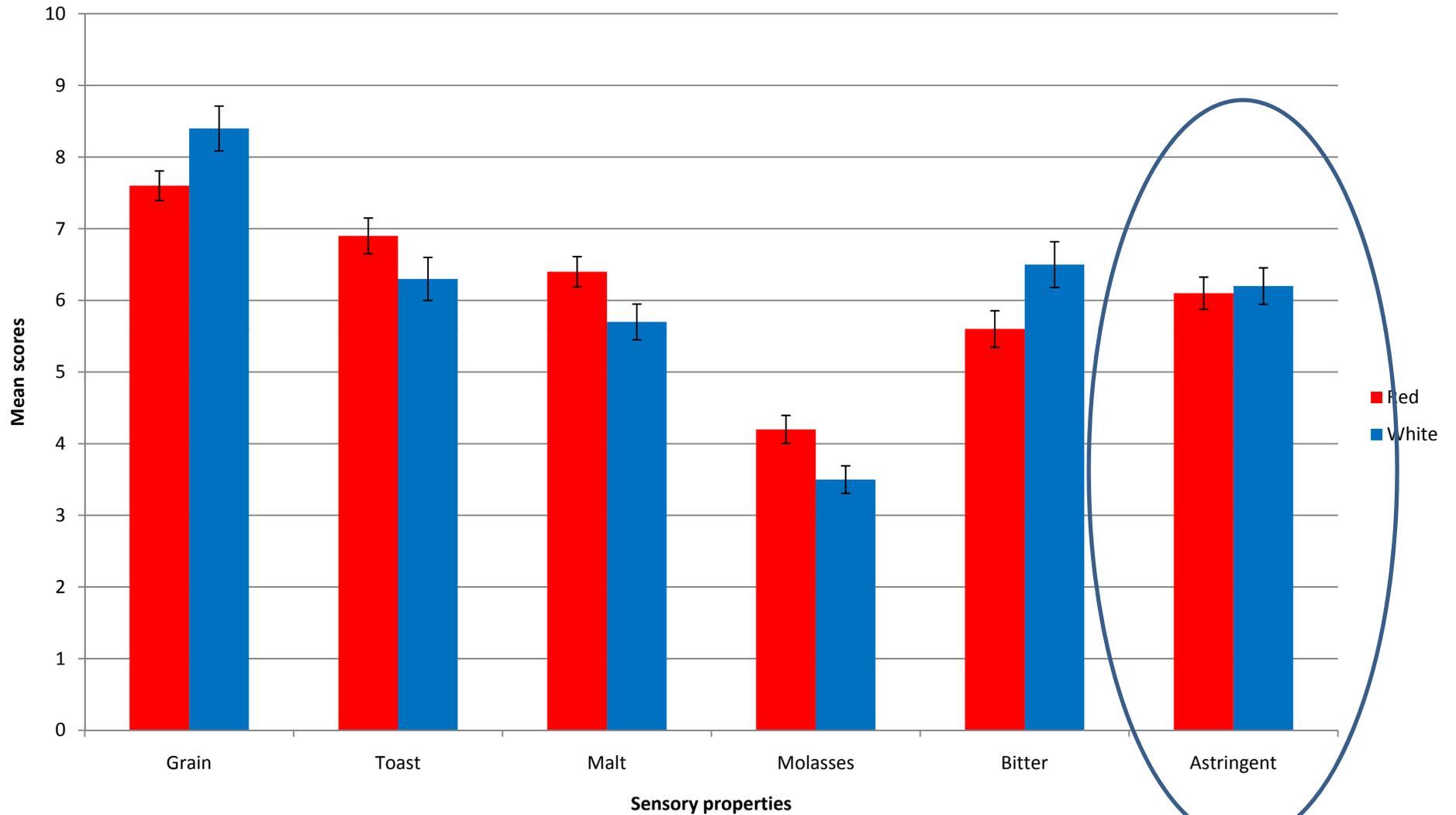


## Significant sensory differences from patent flour: Crust

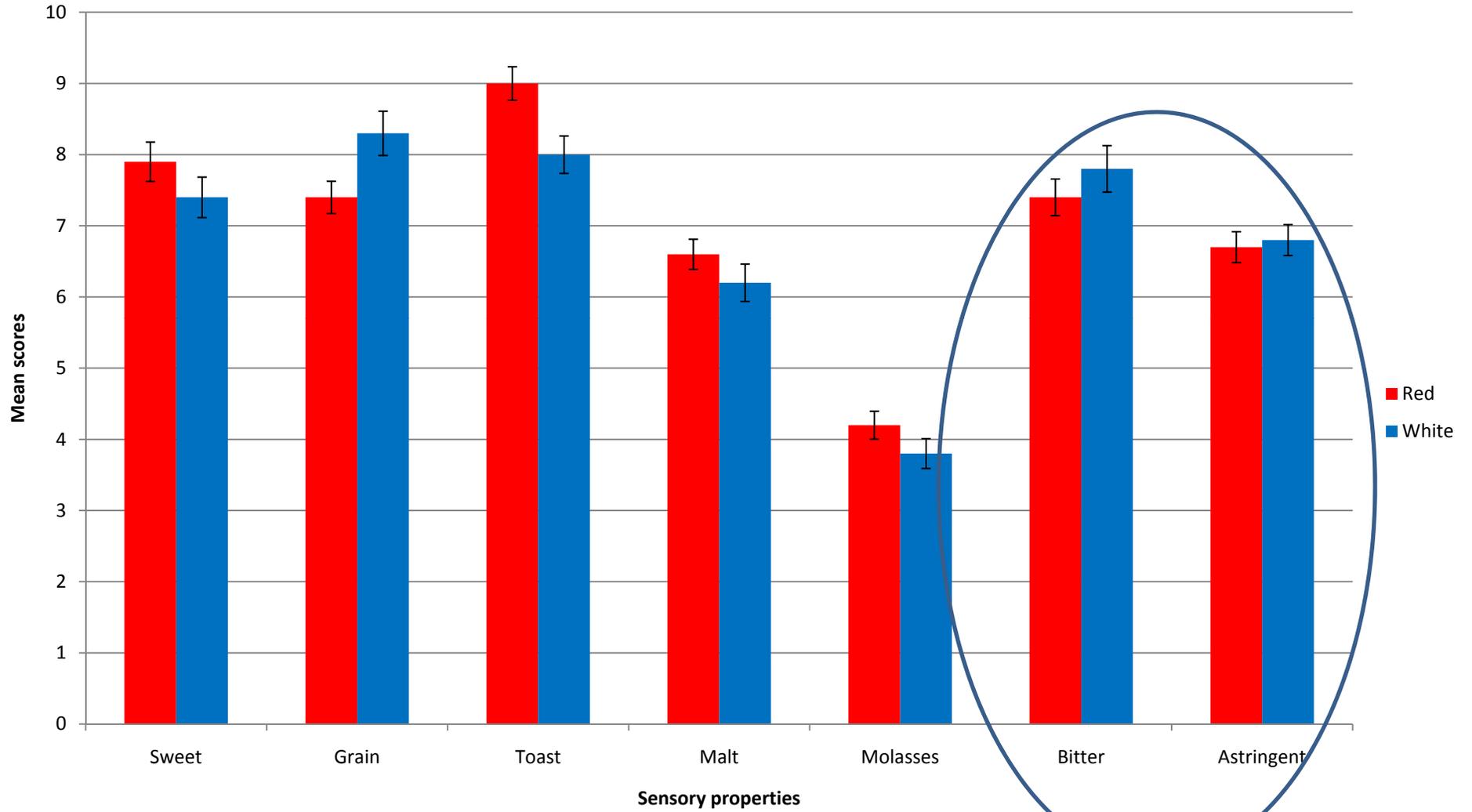


- Do the sensory properties of the crumb and crust differ
  - Based on particle size?
  - Based on colour?
  - Based on a colour\*particle size interaction?

## Effect of colour on sensory properties: Crumb



## Effect of colour on sensory properties: Crust



# Effect of particle size

Crumb:

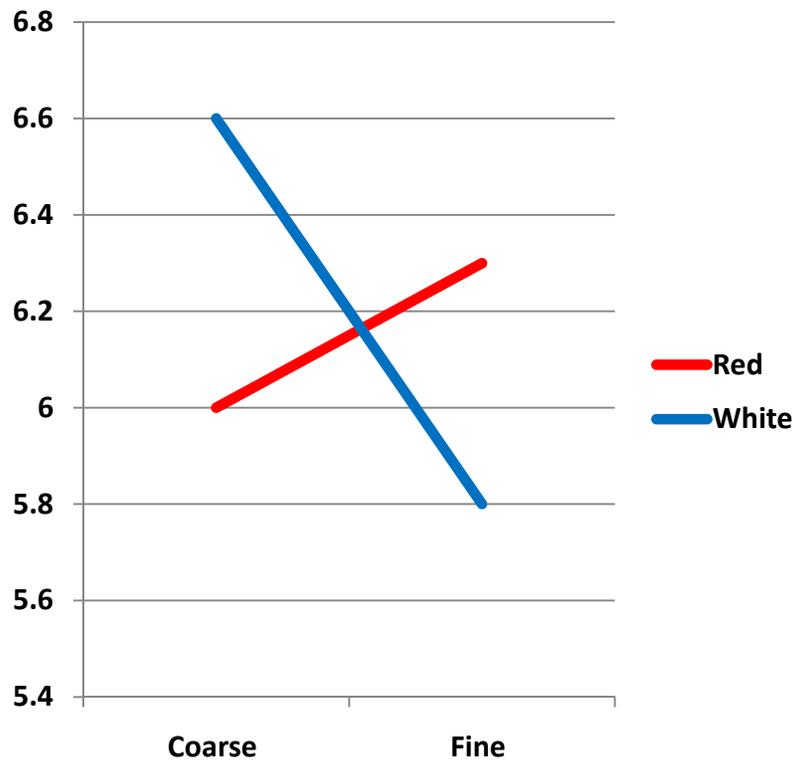
	Coarse	Fine
Sweetness	7.7a	6.8b
Graininess	8.8a	7.2b

Crust:

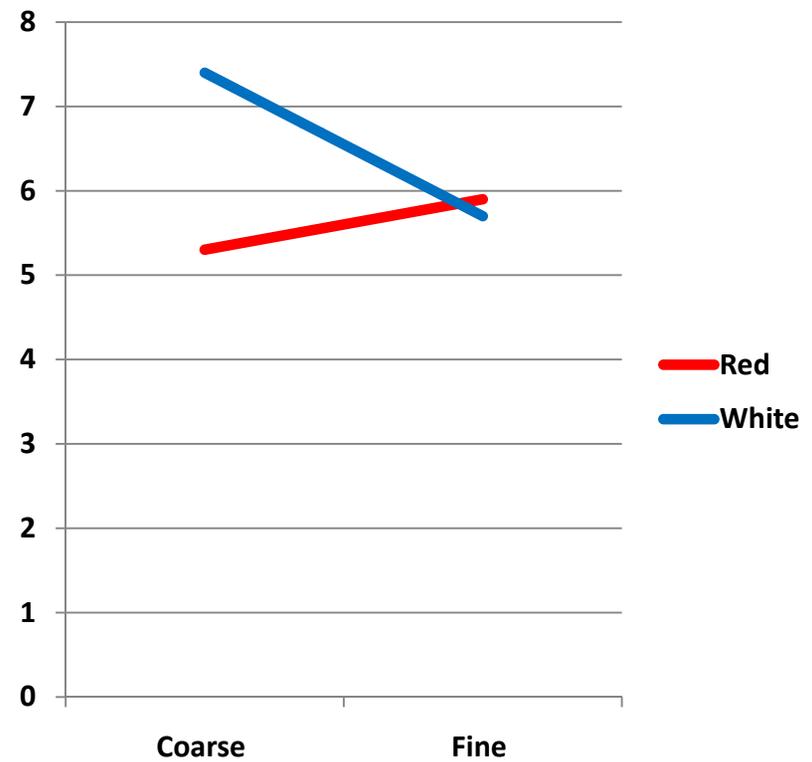
	Coarse	Fine
Molasses	3.8b	4.2a
Graininess	8.6a	7.0b

# Interactions

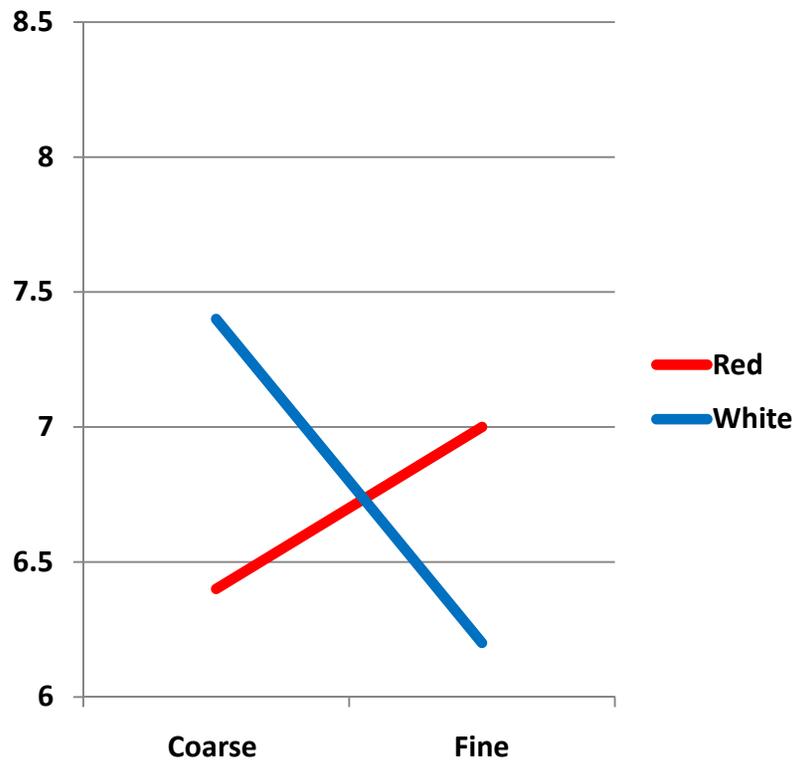
Particle size\*colour interaction:  
Astringency of crumb



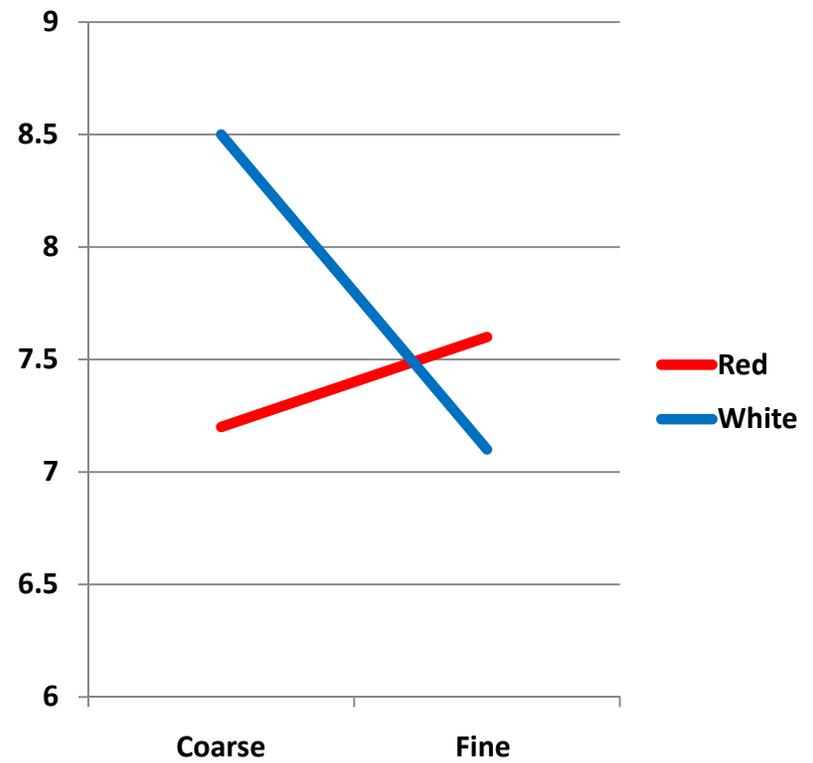
Particle size\*colour interaction:  
Bitterness of crumb



**Particle size\*colour interaction:  
Astringency of crust**



**Particle size\*colour interaction:  
Bitterness of crust**



# Other significant particle size\*colour interactions

- Crumb and crust
  - Sweetness
  - Graininess
  
  - Fine white and coarse red significantly lower

# Summary: Intermediate moisture products

- Sensory properties differ based on:
  - particle size
  - colour
- Astringency, bitterness, graininess and sweetness are affected by interactions
  - Coarse red and fine white have lower scores

# Pending Research....

- Intermediate moisture products:
  - Total phenol content
  - HPLC analysis of phenolic acids
- Low moisture products:
  - Sensory
  - Total phenol content
  - HPLC analysis of phenolic acids

## Determine consumer acceptability

- Relate descriptive data from trained panel to consumer data
  - Preference map analysis

# Thanks to:



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  - Carolyn Challacombe
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