
Bran alters gluten secondary structure in whole grain dough

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Bran and water

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Control flour	878
14% bran	698
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Control flour	855
14% soaked bran (in 21 mL of water)	830

Reproduced from Lai, Hosney, and Davis (1989)

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If bran is competing with gluten for available water:

- 1) A change in gluten secondary structure should be apparent on bran addition
- 2) A change in bran particle size should result in gluten secondary structure differences

Research objectives

- Develop FTIR methodology to capture changes in water and gluten secondary structure

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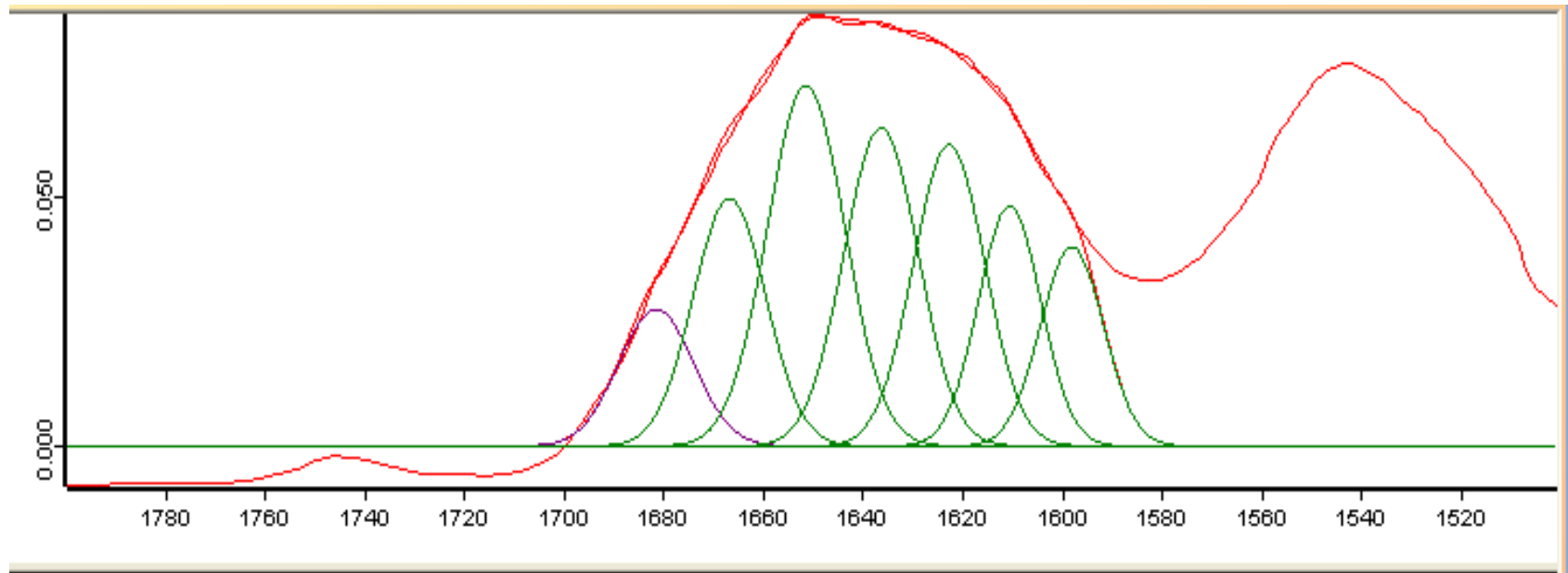
- Develop FTIR methodology to capture changes in water and gluten secondary structure
- Investigate the effect of bran on water and gluten secondary structure in model doughs

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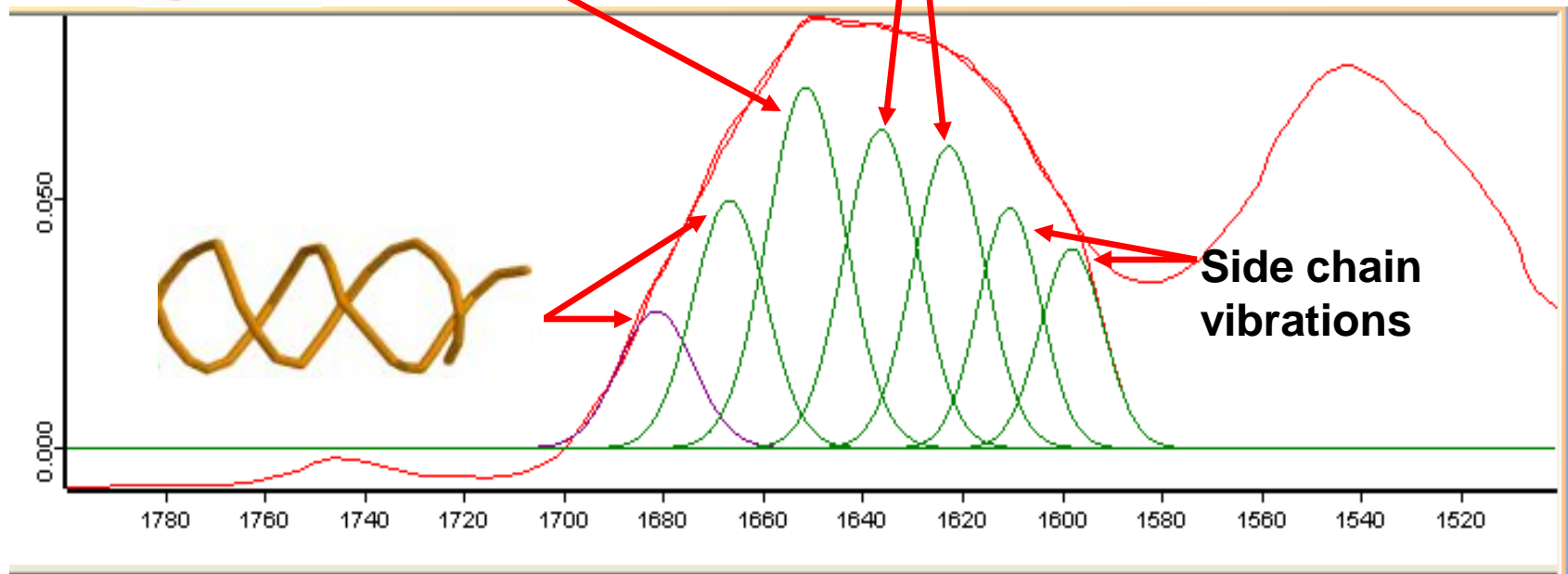
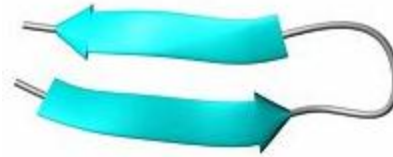
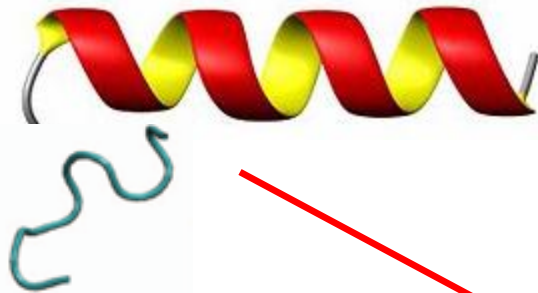
- Develop FTIR methodology to capture changes in water and gluten secondary structure
- Investigate the effect of bran on water and **gluten secondary structure** in model doughs
 - Bran addition level
 - Bran particle size

Spectral analysis

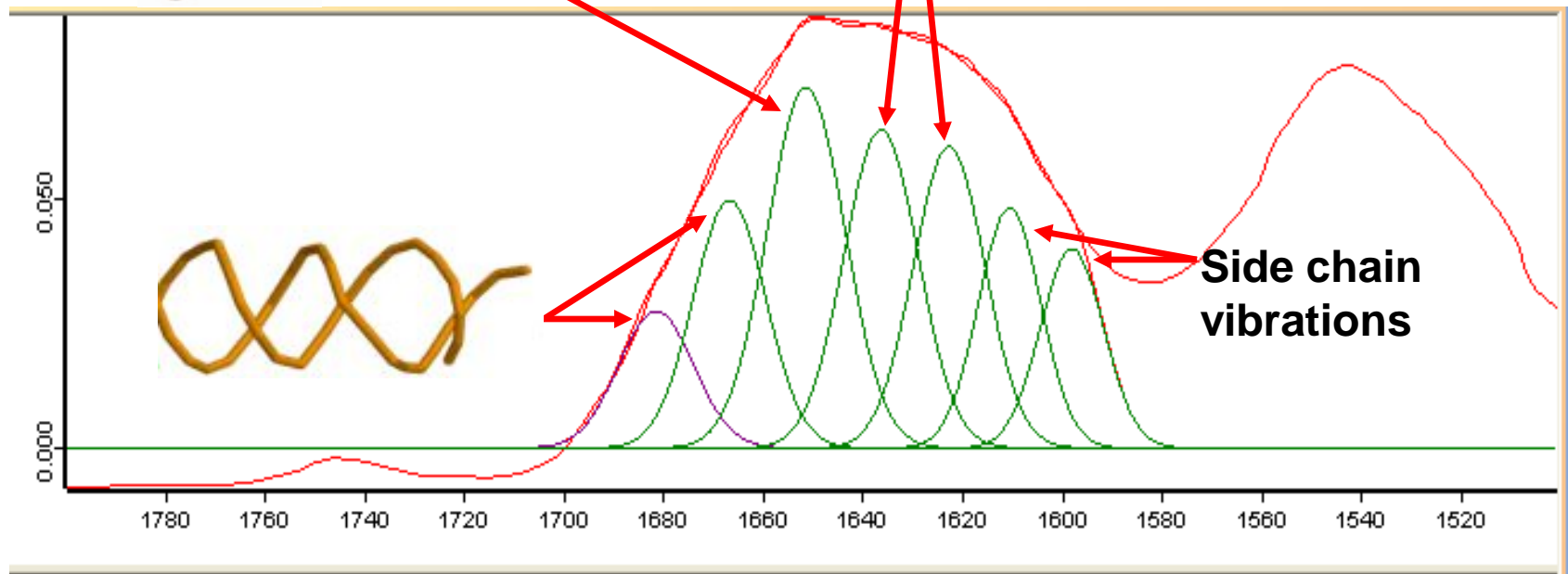
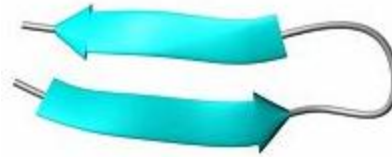
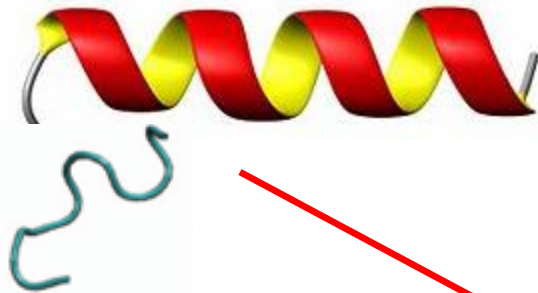
Curve fitting



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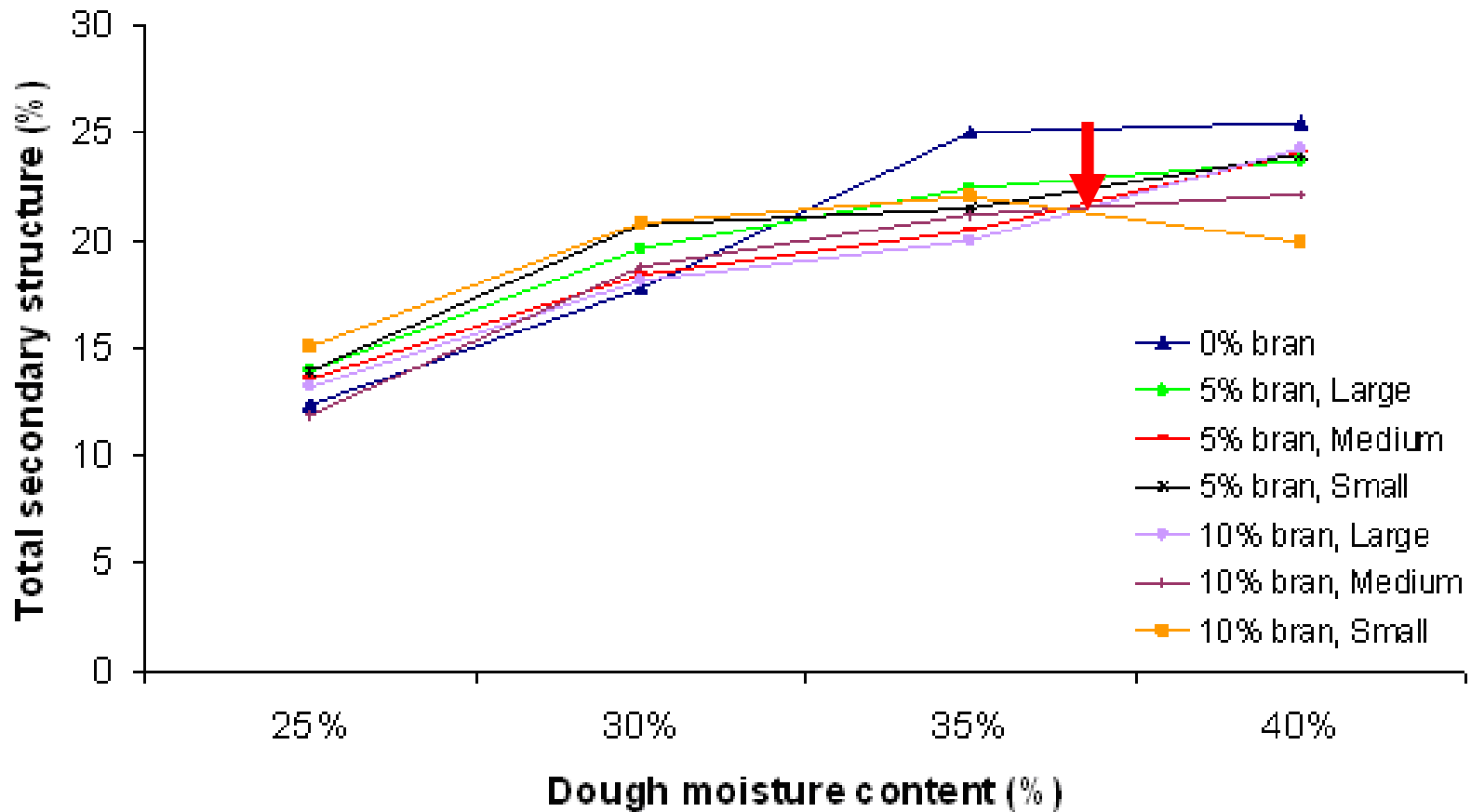
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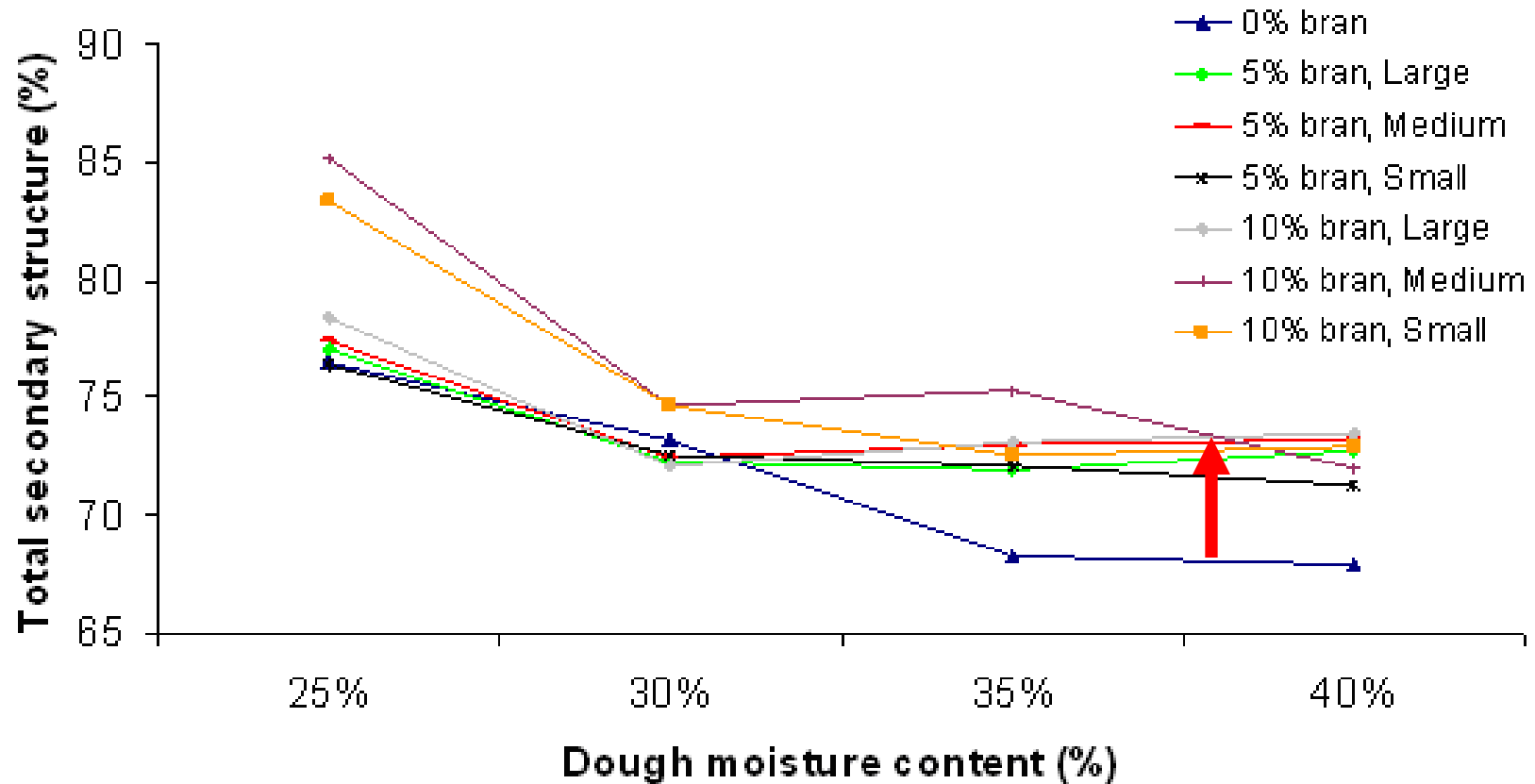
➤ **Qualitative—not quantitative!**

Bran and secondary structure

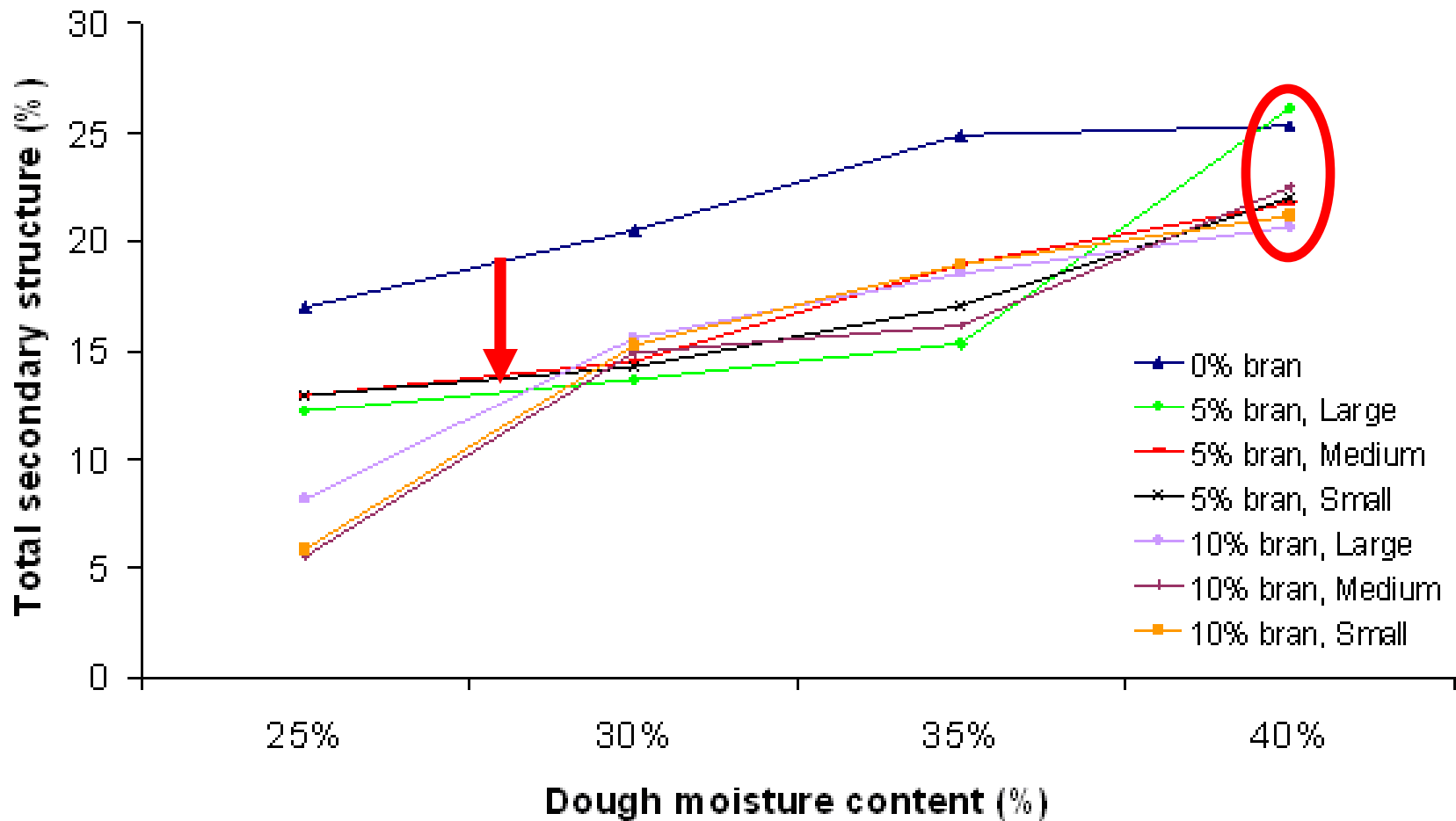
2137 turn structures



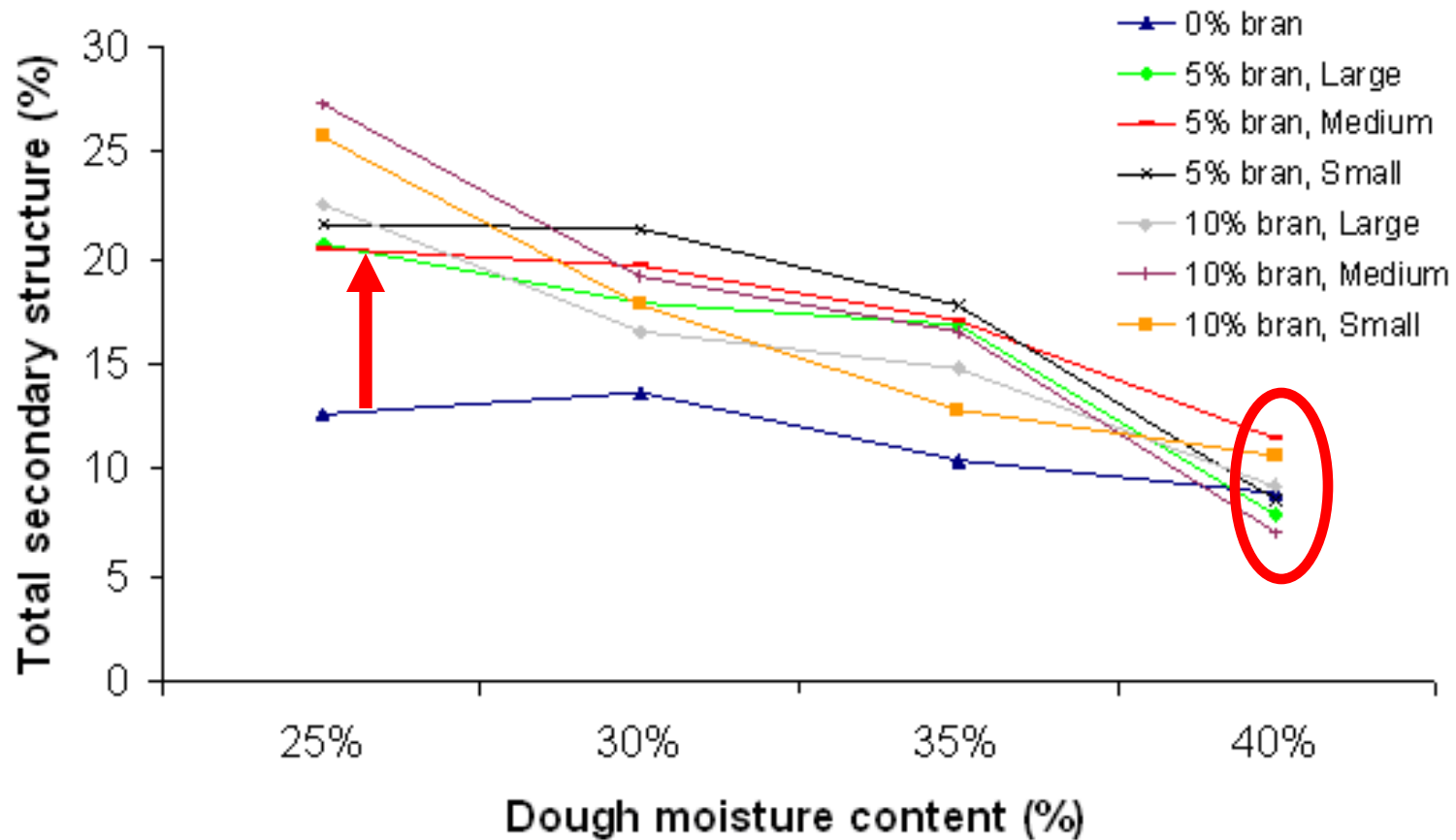
2137 sheet structures



Overley turn structures



Overlay aperiodic structure



Bran and gluten structure

- Bran alters gluten secondary structure in dough
 - Loss of turn structures
 - Indication of gluten hydration status
 - Different structures for good & poor bread-making flours
 - No effect of bran particle size

Conclusions—so what?

The impact of bran

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- 3) **Gluten secondary structure dictates dough rheological properties**

The impact of bran

- 1) Bran alters water structure
- 2) Altered water structure influences gluten secondary structure
- 3) Gluten secondary structure dictates dough rheological properties
- 4) Dough rheological properties determine final bread characteristics

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- Level of bran addition is not as critical as dough moisture content
- Any effect of bran particle size is negligible
- Physical disruption cannot be ruled out as a mechanism

Additional work

- Rheological properties
 - Completed and analyzed
- Gas cell structure
 - In progress
 - Will be combined with results of this study and work on rheological properties

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