

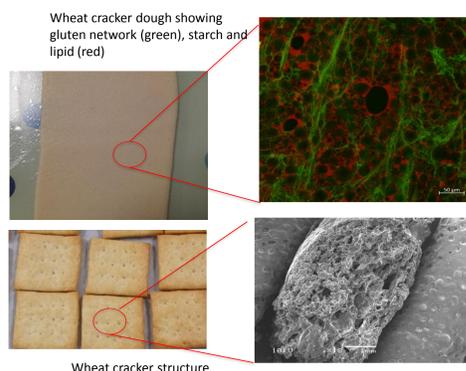
Texture-improving approaches for low moisture gluten free bakery products - hydrocolloids and modified starch

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For the purpose of dealing with gluten intolerance and meeting the trend of “free from” food, gluten free products are becoming a new challenge, especially the foods with gluten network developed.

Compare to other biscuits, cracker formulations usually contain lower amount of lipid (10 to 20%), lower amount of sugar, and higher amount of water (20%). Therefore, moderate gluten network is formed which give dough preferable sheetability and rising ability.



Typically, gluten free crackers are mostly formulated based on non-wheat flour and starch which forms crumbly doughs and fragile end products due to absence of gluten.

Aim

To improve gluten free cracker quality, psyllium, methylcellulose (MC), and two types of modified starch (pre-gelatinised (PreG) and cool water swelling (CWS)) were incorporated and compared in rice cracker formulations.

Process

Dough mixing, resting, sheeting, cutting and shaping, baking, cooling

Analysis

Pasting properties

Oscillation tests

Three point bending with acoustic data recording

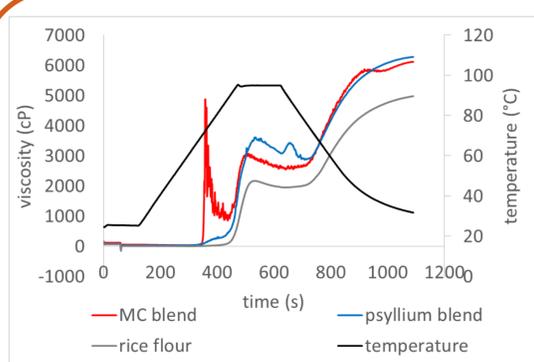


Figure 1a, 2.5g of rice flour mixed with 0.1g of MC or psyllium in 24g of water

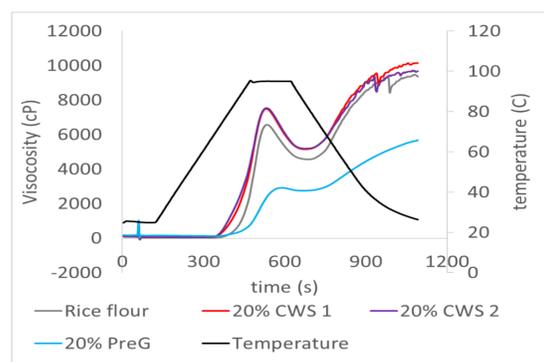


Figure 1b, 3.125g of flour (blends) in 21.875g of water

Figure 1a, b. pasting properties of flour blends

- Both hydrocolloids and CWS decrease pasting temperature while PreG increase it, opposite effects are seen in terms of overall viscosity
- A small peak is observed during breakdown of psyllium blend indicates possible interactions with broken starch granules.
- PreG significantly reduce the viscosity indicating possible decrease of flour hydration or prevention of the breakdown of starch in rice flour
- no significant difference between two types of CWS starch

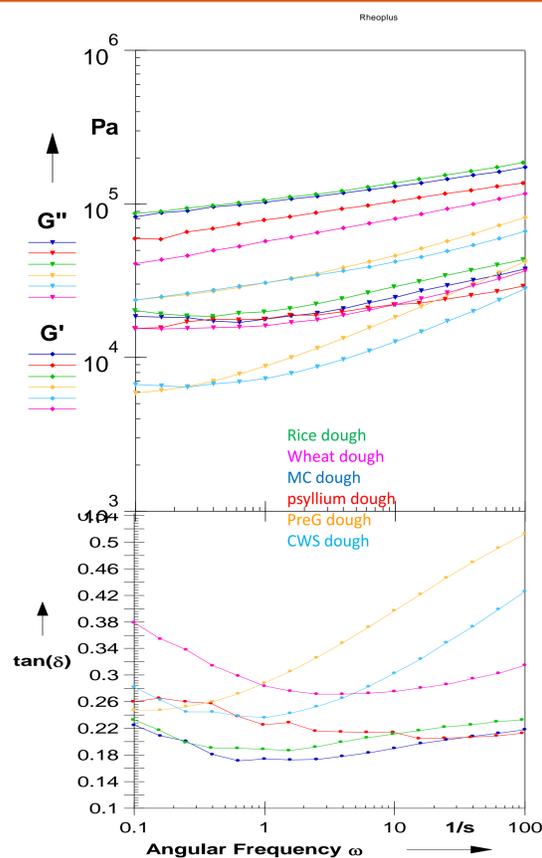


Figure 2. mechanical spectra of gluten free doughs with optimised formula. Upper part shows G' and G'' and lower part shows $\tan\delta$

Figure 2. rheological properties of cracker doughs

- No significant difference between rice dough and MC dough
- Moduli of PreG and CWS doughs are lower than wheat dough
- Storage moduli of rice dough and hydrocolloid dough is higher than wheat dough.
- PreG dough is more shapable (higher $\tan\delta$) at short time scale (higher frequency)

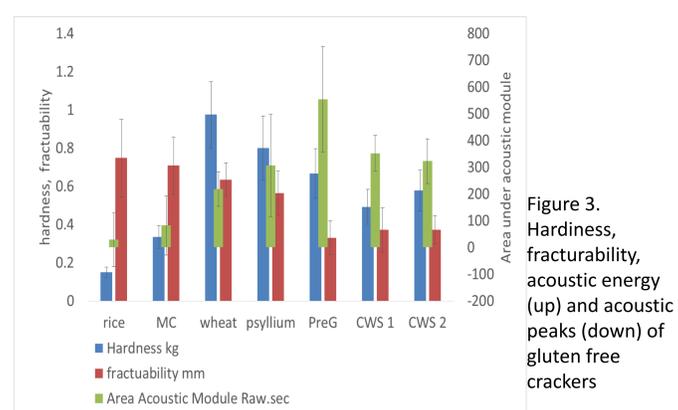


Figure 3. Hardness, fracturability, acoustic energy (up) and acoustic peaks (down) of gluten free crackers

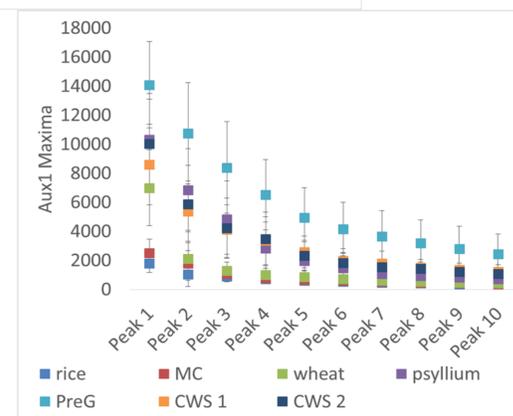


Figure 3. Hardness, fracturability, acoustic energy (right) and acoustic peaks (left) of gluten free crackers

- Psyllium crackers are harder and more flexible.
- Breaking psyllium crackers generates medium amount of sound.
- MC is NOT functional in cracker production.
- Compare to wheat cracker, gluten free crackers are not evenly broken during test as the second and following acoustic peak is relatively close to the first peak
- PreG cracker is more crispy or crunchy (higher hardness, lower fracturability, more sound generated during first bit and over the whole process of crushing)

Conclusions

- Psyllium and PreG starch are preferable in gluten free cracker production
- Psyllium crackers are harder and more flexible.
- Increasing the addition level of psyllium required higher water addition level
- Incorporation of CWS starch cause dough shrinkage
- PreG starch might reduced flour hydration
- Pre-gelatinised starch cracker is more crispy or crunchy

Acknowledgement

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