

Development of fresh pasta with carob-xanthan hydrogel and acorn flour: A promising gluten free and egg-free alternative

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INTRODUCTION & AIM



Pasta is a staple food and a symbol of Italian gastronomy and regional identity.

The growing demand for **plant-based**, **gluten-free**, and **environmentally sustainable** products is driving innovation in pasta formulation, requiring, however, attention to the **structural** and **sensory limitations**.



This study aimed to develop a **gluten-free and egg-free fresh pasta**, using a plant-based **hydrogel** composed of **carob seed flour and xanthan gum**, to simulate the viscoelastic properties of gluten and eggs.



The use of **acorn flour** was proposed as a total or partial substitute for rice flour, providing a strategy to valorize this naturally **gluten-free** ingredient.

METHODS

Gel formulation



Carob seed flour
2.5 g



Xanthan gum
2.5 g



Water
100 mL



Hydrogel

Egg and
Gluten
replacer

Pasta samples

C



100% Rice flour

A50



50% Rice flour
50% Acorn flour

A100



100% Acorn flour

Analyses



Rheological properties



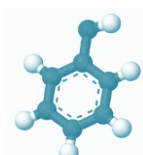
Color



Texture



Nutritional composition

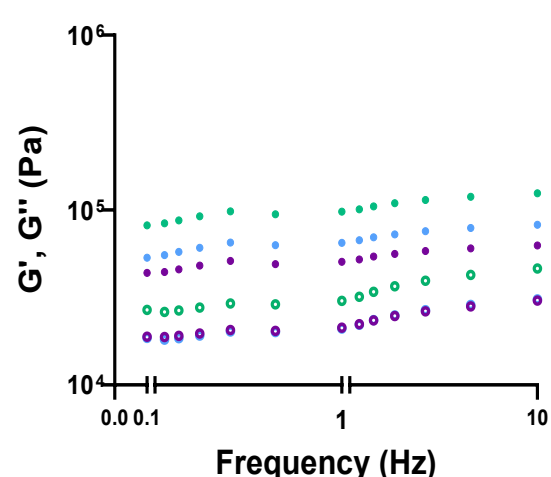


Phenols



Antioxidant activity

RESULTS & DISCUSSION



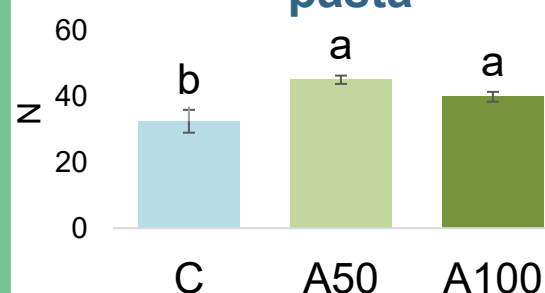
G' was higher than G'', suggesting an elastic behaviour. Both moduli increased with increasing frequency.

The acorn flour increased the elasticity, probably due to the properties of acorn starch, the fiber content and polyphenols.



The optimal cooking time (OTC) was established for the three experimental thesis: All samples required a cooking time of **2 min**.

Hardness of cooked pasta

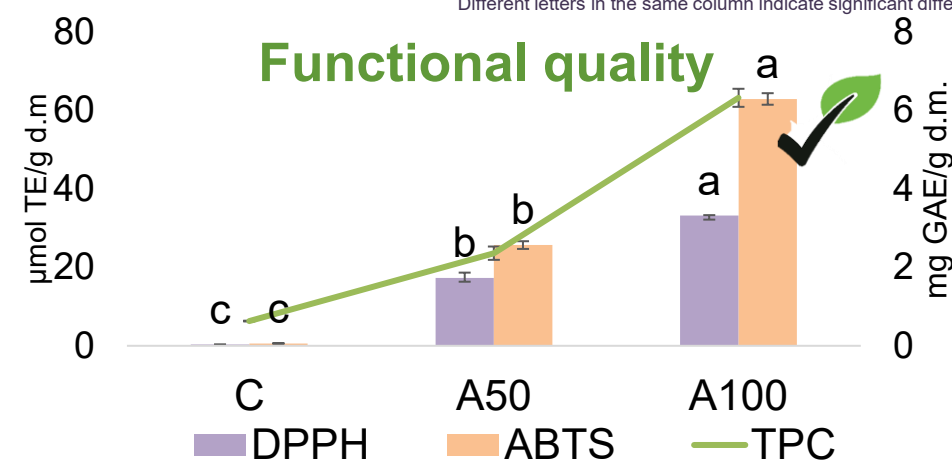


Acorn flour increased cooked pasta hardness and significantly affected the brown index in both raw and cooked pasta.

Brown index	Raw	Cooked
C	10.75±0.50c	27.15±2.30c
A50	34.40±3.14b	48.18±1.45b
A100	46.00±2.82a	52.77±0.72a

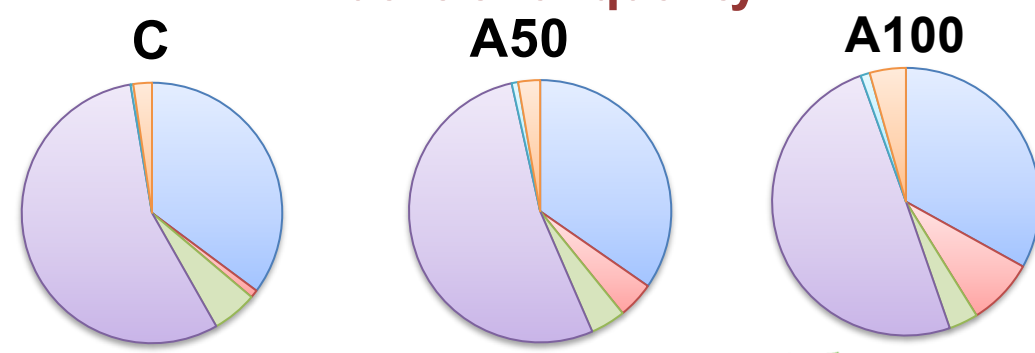
Different letters in the same column indicate significant differences at $p < 0.05$.

Functional quality



TPC = Total phenolic content; GAE = Gallic Acid Equivalent; T.E. = Trolox equivalents; DPPH = 2,2-diphenyl-1-picrylhydrazyl; ABTS = 2,2'-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid. Different letters indicate significant differences at $p < 0.05$.

Nutritional quality



Source of fiber
> 3 g / 100 g

Acorn flour increased the **total phenolic compounds** and consequently the **in vitro antioxidant activity**.

The 100% acorn pasta presented the high lipid content and reached the claim "**source of fiber**", according to Reg. (EC) 1924/2006.

CONCLUSION



Plant-based **hydrogel**, formulated with carob seed flour and xanthan gum, is a good **structural agent** in gluten-free and egg-free fresh pasta



Acorn flour is a valuable ingredient due to its **nutritional** profile and **bioactive** compounds.

ACKNOWLEDGEMENTS

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