

Legume-based aquafaba as an ingredient in sponge cake formulation: physicochemical characterization and consumer acceptability

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INTRODUCTION & AIM

Food sources such as vegetables, whole grains or legumes are excellent sources of nutrients and can contribute to a balanced diet. Bakery products include eggs because of their foaming properties, but eggs possess high price and are not desired in vegan or vegetarian formulation.

Aquafaba, the viscous liquid resulting from boiling leguminous seeds in water, has been widely used by humans as an egg substitute in mayonnaise, desserts and baked goods.

In the current study, sponge cakes were developed by completely replacing eggs in the recipe with legume-based aquafaba foams. Aquafaba (Af), the boiling water from chickpeas (AfC), soybeans (AfS) and lentils (AfL) was standardized at 13°Bx. We obtained egg-free sponge cakes, with good textural properties, similar color parameters to a reference and promising results in terms of acceptability.

The products represents a healthy and tasty alternative, suitable for vegan consumers or an egg-free specific diet.

METHODS FOR ANALYSING AQUAFABA

1. Chemical profile determination (AOAC Methods)

- Protein content determination – Kjeldahl method
- Ash by Calcination in the calcining furnace

2. FTIR analysis

FTIR spectra acquired with Cary630 FTIR Spectrophotometer (Agilent Technologies, Chelmsford., USA)

3. Appearance of Af at a dry matter of 13%



AfC- chickpea aquafaba AfS- soy aquafaba AfL- lentil aquafaba

METHODS FOR ANALYSING THE SPONGE CAKES

4. Sponge cake preparation

Af were whipped for 10 min. and mixed with sugar. 30% of Af was mixed with sunflower oil. The wet ingredients were mixed with flour. The doughs were poured in pans and baked for 45 min. at 180 °C.

5. Textural attributes

TPA test with TA11/1000 probe, 40% compression, with CT3 Texture Analyzer, Brookfield.

6. LAB color Parameters (NHR 300 colorimeter Shenzhen China)

7. Sensory preference:

A hedonic test with a 5 point scale was conducted to evaluate the sensory preference of naïve consumers.

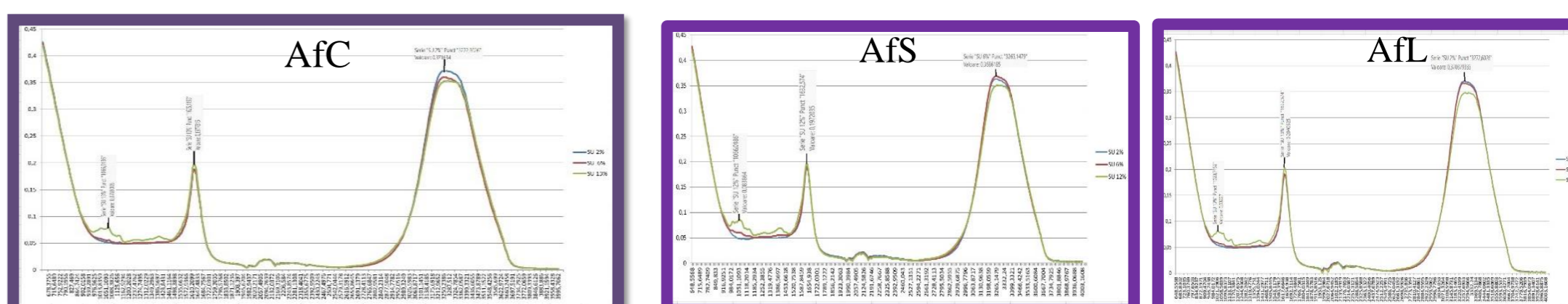
RESULTS REGARDING THE AQUAFABA



PROTEIN AND ASH CONTENT

	Protein content g /100 g	Ash content g /100 g
AfC	2.80±0.09	1.18±0.08
AfS	1.46±0.31	0.77±0.01
AfL	4.83±0.38	1.20±0.01

FTIR SPECTRA OF CONCENTRATED AQUAFABA (2%-blue, 6%-red, 13% -green)



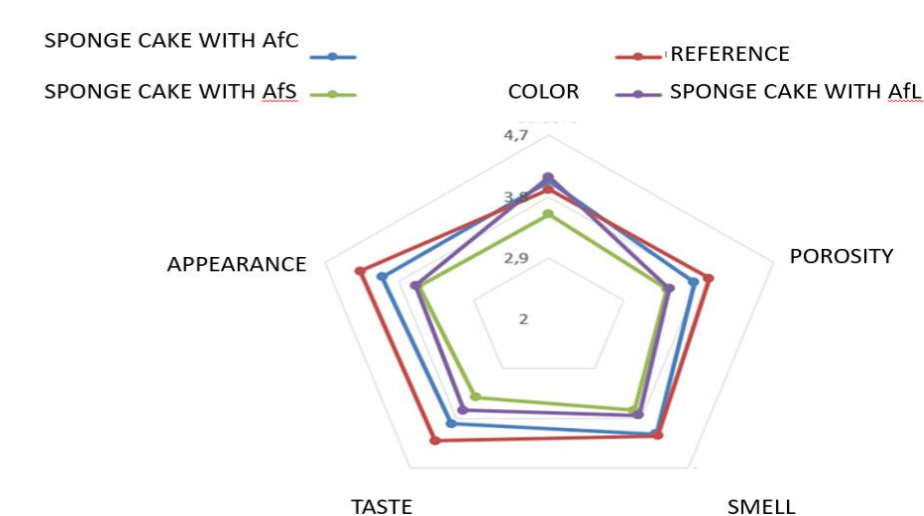
RESULTS REGARDING THE SPONGE CAKES

APPEARANCE AND CODIFICATION



1	PM	Reference
2	PAN	Cake with AfC
3	PAS	Cake with AfS
4	PAL	Cake with AfL

SENSORY PREFERENCE



Textural attributes	Firmness [g]	Adesive force [g]	Elasticity %	Coesiveness %	Color parameters	Whiteness index
PAL	506,25	404	5,73	0,38	PAL	50,63
PAS	479,25	365,75	5,29	0,3	PAS	47,36
PAN	450,75	390	5,73	0,37	PAN	48,01
PM	389,75	363	6,76	0,65	PM	60,29

CONCLUSION

- ✓ Hardness of the cakes varied between 506,25-450,75 g, which is higher than what was registered for the reference.
- ✓ Adhesive force was higher only for cakes formulated with AfL. The elasticity and cohesiveness of the samples can be improved.
- ✓ The value of whiteness index was 60.29±0.99 for the reference, while rest of sample had lower values
- ✓ In the acceptability test, parameters such as color were appreciated with higher score than the reference while for smell AfC was scored similarly with the reference.

REFERENCES

- JUKANTI, A. K., GAUR, P. M., GOWDA, C. L., & CHIBBAR, R. N. Nutritional quality and health benefits of chickpea (*Cicer arietinum* L.): A review. *British Journal of Nutrition*, 108(Suppl. 1), S11. doi:10.1017/S0007114512000797
- KARATAY, G. G. B., REBELLATO, A. P., STEEL, C. J., & HUBINGER, M. D. Chickpea Aquafaba-Based Emulsions as a Fat Replacer in Pound Cake: Impact on Cake Properties and Sensory Analysis.