

Physicochemical and techno-functional properties of pumpkin seed (*Cucurbita pepo* var *styrica*) flour

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INTRODUCTION & AIM

The food industry produces substantial quantities of by-products. Within a circular economy framework, these by-products can be converted into value-added ingredients. **Pumpkin seed flour (PSF)** is a nutritious by-product obtained from **milling the press cake** remaining after pumpkin seed oil extraction. The **aim** of this work was to characterize the **techno-functional, physicochemical, nutritional, and microstructural** properties of pumpkin seed flour.

Nutrition Facts

2.5 servings per container

Serving size 100 g (3.5 oz)

Amount per serving

Calories

500

% Daily value*

Protein 41 g **27%**

Total Fat 35 g **31%**

Saturated Fat 6.5 g **14%**

Trans Fat 0 g -

Carbohydrate 5 g **0%**

Dietary Fiber 4.3 g **8%**

Sodium 10.7 mg **0%**

[1] * Based on a 2000-calorie diet

METHOD

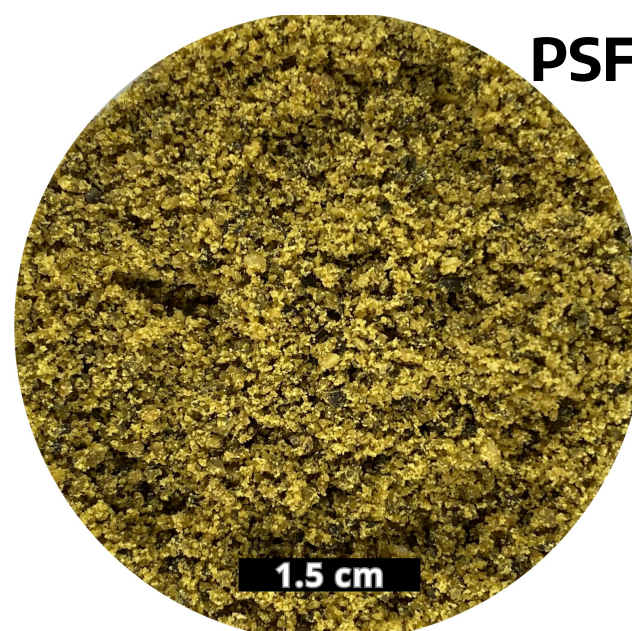
Pumpkin seed flour (Aceites del Desierto S.R.L, Argentina). **Techno-functional properties:** **water holding capacity** (10% w/w suspension in water), **oil absorption capacity** (10% w/w suspension in sunflower oil), **emulsion activity** and **thermal stability** [2]. **Physicochemical properties:** **moisture** (constant weight at 60 °C, 55 mbar), **water activity** (25 °C), **instrumental color** (L^* , a^* , b^*). **Spectroscopic analysis:** ATR-FTIR spectra of PSF and defatted PSF (**D-PSF**, defatted with hexane at a solid-to-solvent ratio of 1:5). **Nutritional properties:** PSF **fatty acid composition** using gas chromatography. **Oxidative stability:** by Rancimat apparatus (induction time at 140 °C). **Microstructural properties:** by confocal scanning laser microscopy [3].

RESULTS & DISCUSSION

PSF showed low moisture content (**5.1%**) and water activity (**$a_w = 0.523$**). It also demonstrated **good emulsion activity (55%)**, **high thermal stability (51%)**, and **good water (1.14 g/g)** and **oil retention (0.74 g/g)**.

Overall, these are excellent techno-functional properties for a by-product.

RESULTS & DISCUSSION



Pumpkin seed flour

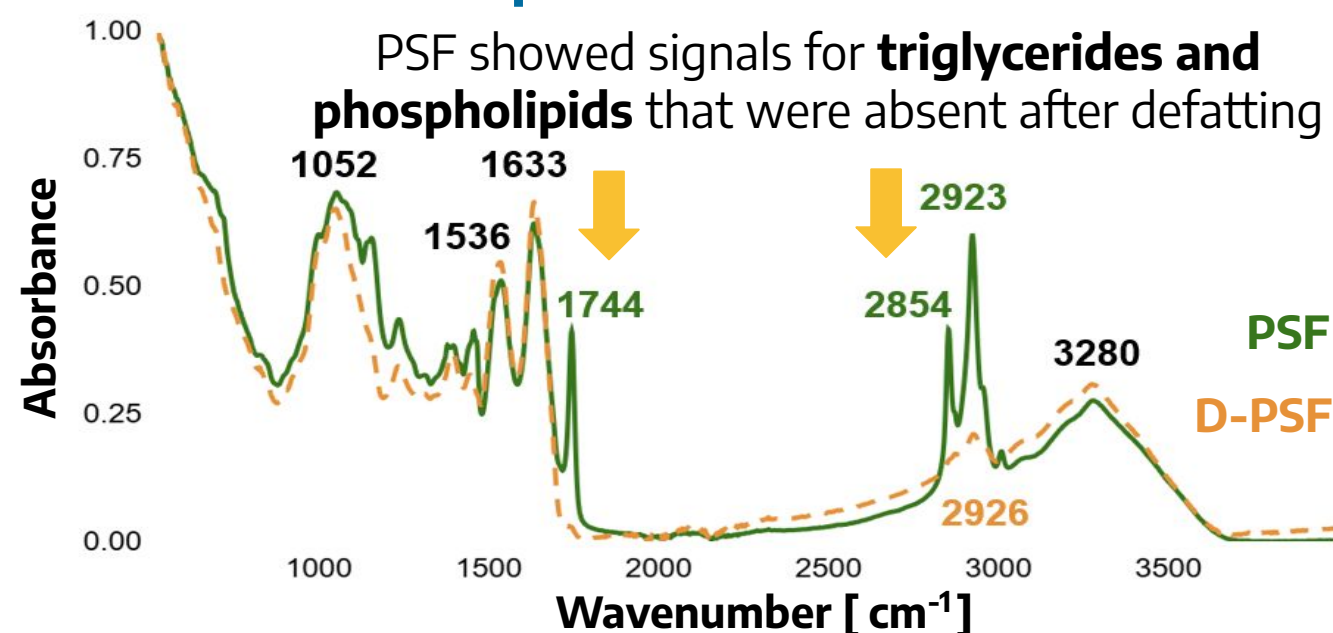
PSF exhibited an intense green color (L^* : **47,6**; a^* : **1,1**; b^* : **21,6**), and its use will affect the color of final products.

Fatty acids in PSF

were **18%** saturated lipids and **82%** unsaturated lipids.

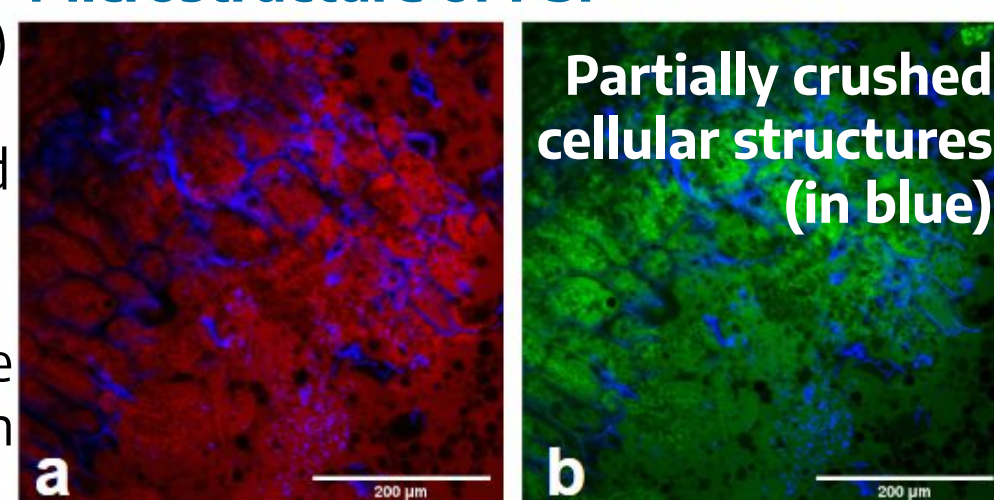
However, PSF showed high stability (**~10 hours at 140 °C**)

ATR-FTIR spectra of PSF and D-PSF



Microstructure of PSF

Protein (in red) and **lipids** (in green) appeared highly **interrelated**, explaining the good emulsion properties.



CONCLUSION

These results demonstrate the potential of **pumpkin seed flour** to be included as an **ingredient** in more complex matrices, which could improve its **nutritional** and **technological properties**. This, in turn, will contribute to the circular economy approach by valorizing this industrial **by-product** in the development of new food products.

FUTURE WORK / REFERENCES

Acknowledgments: Aceites del Desierto S.R.L. (Argentina) for providing the pumpkin seed flour. **References:** [1] Aceites del desierto S.R.L. 2024. [2] J. J. Burbano and M. J. Correa, Plant Foods Hum Nutr, 2021, 76, 233–239. [3] J.J. Burbano, D. M. Cabezas and M. J. Correa, Plant Foods Hum Nutr, 2024, 79, 810–818.