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Multidimensional approach to understand how physicochemical, technological and nutritional properties affect the quality of gluten-free breads with *N. affinis* flours.

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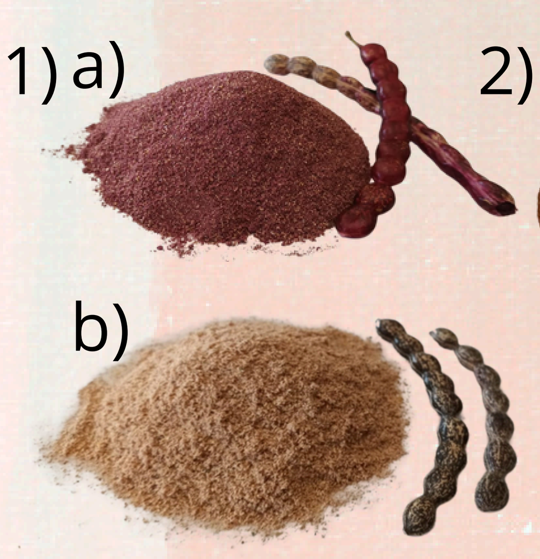


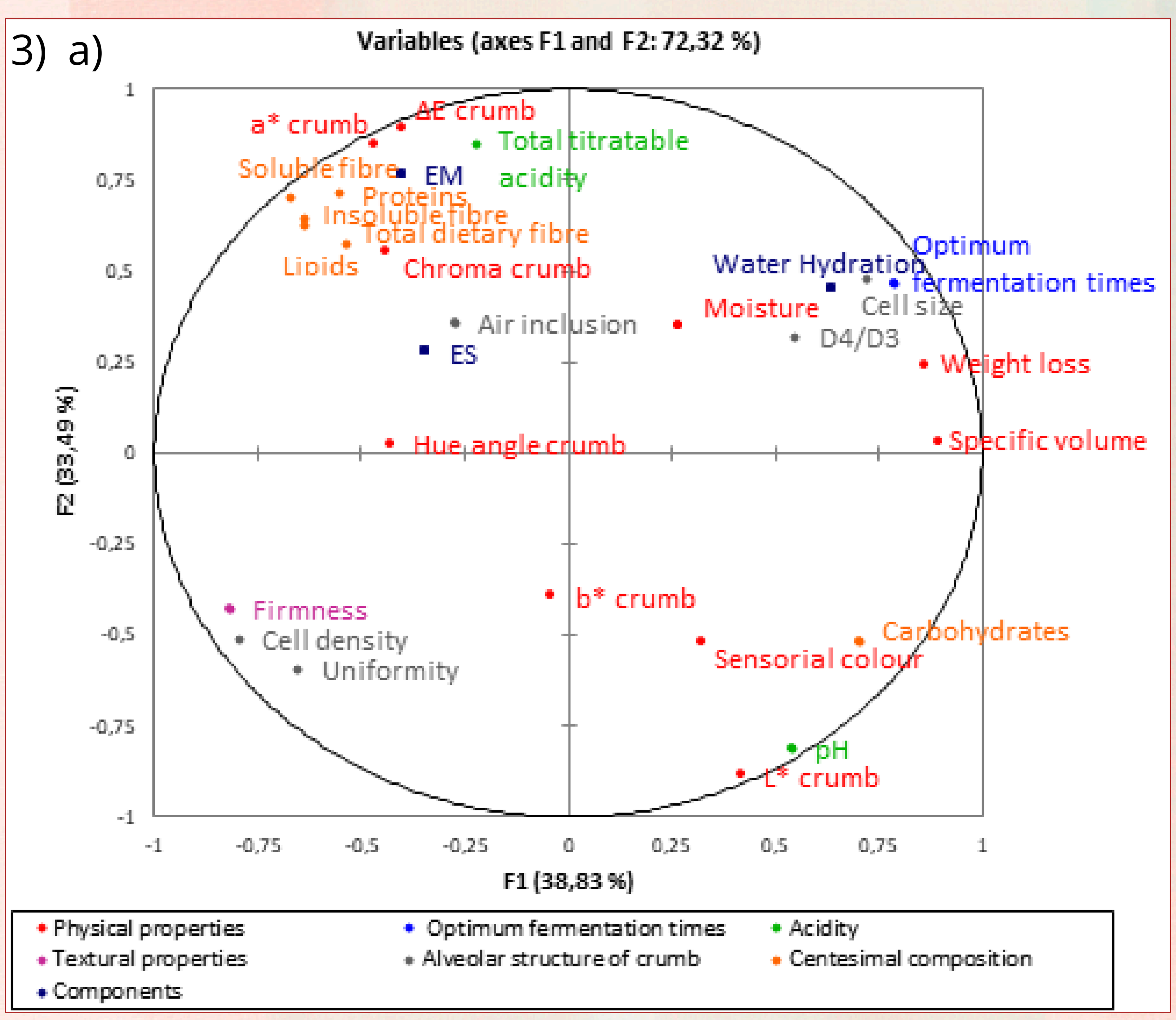
Figure 1. *N. affinis* Flour. a) EM, b) ES. Figure 2. Gluten-free breads.

Introduction & Aim

The design and formulation of gluten-free breads (GFBs) present challenges in improving nutritional and technological characteristics. The addition of unconventional gluten-free flours has been studied to improve the nutritional profile. The aim of this study was to evaluate the interrelationships of the physicochemical, technological and nutritional characteristics of GFB with the addition of *N. affinis* flours (NAF), to comprehensively understand their effect on the loaves quality.

Method

A traditional GFB recipe was used to replace rice flour and corn-starch by fractions of flour obtained from N. affinis grinding (EM: exocarp-mesocarp; ES: endocarp-seed). A Box-Behnken design of three factors [EM, 0-20%; ES, 0-20%; dough water hydration (WH, 70-160%] with three levels (− 1; 0; + 1) was used to obtain the different formulations. Multiple Factor Analysis (MFA) was carried out to correlate instrumental and sensorial data with GFBs formulations.



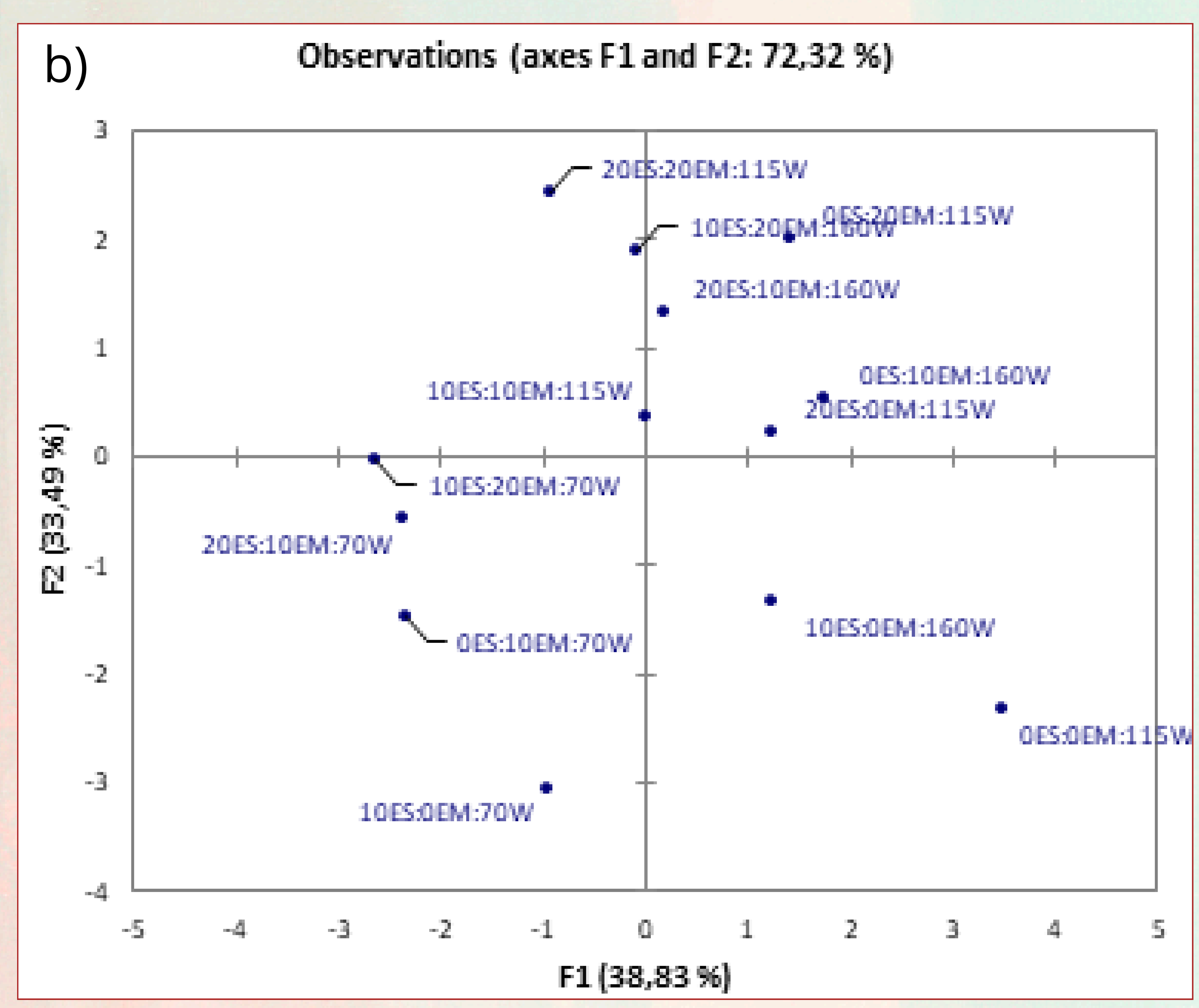


Figure 3. Multiple factor analysis of the physicochemical, technological and nutritional properties of GFBs . (a,b)

Results & Discussion

The largest proportion of the variability was explained by F1, where optimal fermentation time, cell size, weight loss and specific volume were related to WH, discriminating those formulations with higher WH. The latter were negatively correlated to firmness, cell density and uniformity parameters. In F2, EM fraction was correlated to titratable acidity, a*, Chroma, and ΔE, proteins and dietary fibre content, discriminating the formulations with a higher proportion of NAF. These formulations were negatively related to carbohydrates, sensorial colour, L*, and pH. ES fraction was correlated to air inclusion and discriminated the central points of the design. The variables firmness, cell density, and uniformity discriminated the formulations with lower proportions of WH.

Conclusion

Through the MFA, it was possible to deeper understand the interactions between physicochemical, technological and nutritional properties, and identify the relevant parameters that affect the quality of GFBs with NAF.