ULST Timisoara
Multidisciplinary Conference on Sustainable Development
15-16 May 2025

Development of functional bakery products based on sunflower meal

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Abstract: *The study developed a bakery product using sunflower flour, with analyses of the nutritional, microbiological, physico-chemical, and sensory values of the breads. Sunflower flour provides proteins, lipids, carbohydrates, and calories, without pathogens or undesirable heavy metals. The use of this flour leads to a better physical quality of the bread, with increased volume, porosity, and elasticity, as well as a favorable height/diameter ratio, allowing improved control of the bread's volume, porosity, and structural integrity. Sensory evaluations show preferences for certain samples, with bread with 10, 20 and 30% sunflower flour being less appreciated.*

Keywords: *sensory study, consumer acceptance, nutritional value*

- Introduction The valorization of sunflower meal, a by-product of vegetable oil extraction, presents a sustainable opportunity to formulate functional bakery products. The utilization of this substance not only enhances products with functional components that promote health benefits, but also contributes to the reduction of agro-industrial waste. This approach is consistent with the principles of a circular economy and sustainable development.
- Material and method Four types of bread with added 10, 20, and 30% sunflower meal (SFM) (Fig. 1) were formulated and characterized from a nutritional, microbiological, physico-chemical, and sensory point of view using ISO methods.

FIG. 1. Types of bread with added 10, 20, 30% sunflower meal (SFM), were formulated and characterized.

- **Results and discussions** Sunflower pomace has 10% humidity, 24% proteins, 10% lipids, 3% ash, 53% carbohydrates, and a nutritional value of 398 kcal/100g. The toxic elements/heavy metals as lead, arsenic, mercury, and cadmium, were found within acceptable limits for food products. The results of the evaluation of physical characteristics of the bread formulas indicate that the control bread registered the lowest values regarding volume (400 cm^3/100 g), porosity (65.250%), elasticity (63.183%) and H/D ratio (0.459) compared to the samples with SFM, which registered high values for these parameters. In the case of bread samples with added BMF, the porosity ranged from 65.434% in the sample with 10% SFM to 63.829% for the sample with 30% SFM, elasticity varied from 64.597% for the sample with 10% SFM to 60.629% for the sample with 30% SFM, and H/D ratio varied from 0.540 for the sample with 10% SFM to 0.470 for the sample with 30% SFM (Fig. 1).

Conclusions: The integration of sunflower meal into the formulation of functional breads signifies an innovative and sustainable approach to valorizing a by-product of the vegetable oil industry. The product's high protein content and absence of pathogens, such as Salmonella, contribute to its nutritional value, thereby addressing the growing demand for healthier food products. Moreover, this recovery contributes to the reduction of agro-industrial waste and the promotion of a circular economy. Nevertheless, the optimization of formulations remains imperative to ensure the technological and sensory integrity of bread.

Acknowledgement: The authors are indebted to the University of Life Sciences "King Mihai I" From Timisoara, Faculty of Food Engineering, Timișoara and SC Prospero SRL, for financial and technical support.