
Textural, nutritional and sensorial characterization of cookies fortified with almond okara, the by-products of almond milk production

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Objective:

Dairy alternatives market will grow in the next years at an estimated rate of 9.9% by 2025 and almond milk is expected to grow at a CAGR rate of 15.2%. Almond okara (AO) is the solid residue by-product derived from almond milk production containing the water insoluble components of almonds (dietary fiber, lipids and proteins). From the perspective of promoting the re-use of food industry by-products, AO obtained from two almond cultivars and subjected to two drying methods was characterized and used as functional ingredient for biscuit preparation.

Methods:

AOs derived from the production of almond milk from two cultivars (Texas cv and Filippo Ceo cv) and subjected to two drying methods (oven vs freeze-dried), was characterized in terms of chemical composition, technological properties and quality of the lipid fraction. The freeze-dried AO (FdAO) was then used at three level of incorporation (15%, 25% and 35%) in substitution to wheat flour to produce biscuits. Considering the lipid content of AO, the sunflower oil used in the biscuit formulation was adjusted to avoid the increase of the lipid content and the energetic value. The biscuits were characterized in term of textural, nutritional and sensorial features.

Results:

The almond cultivars and the drying method significantly influence the chemical composition and technological properties of the AO. The AO from Texas cv showed a significantly higher protein and lower lipid content compared to the Filippo Ceo cv (16 vs 11% and 42 vs 46 % respectively). The freeze-drying process allowed to obtain higher water absorption capacity probably explained by the formation of a more porous structure during the process. The addition of the FdAO at 25 and 35% of incorporation significantly improves the quality of the lipid fraction and the fibre content of the fortified biscuits that become harder. The sensory evaluation highlights the little impact of the AO on the almond odor, taste, and flavor of the biscuits.

Conclusion:

The AO is a valuable ingredient to be used to improve the nutritional features of food. The biscuits formulated with AO showed improved nutritional composition, with a minimal impact on the sensorial aspects.