Nutriceuticals & Functional Foods

Polyphenols Composition and Bioactive Properties of Moringa Oleifera Lam. Beverages

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Moringa (*Moringa oleifera* Lam.) is a fast-growing deciduous tree whose leaves, flowers, fruits and seeds have been used as a sustainable alternative for preventing and alleviating/relieve malnutrition in many tropical countries, where it is known as "tree of life" due to its medicinal properties and health-promoting effects. Given the multiple applications of moringa as food and medicine, this study was carried out to provide a detailed characterization of bioactive constituents and properties of herbal beverages prepared with seeds, flowers and fruits of this plant. The samples were collected in Guinea-Bissau and prepared in infusions and decoctions, following traditional recipes of folk medicine, and hydroethanolic extracts. The phenolic profiles were analysed by HPLC-DAD-ESI/MS. Antioxidant, anti-inflammatory and cytotoxic activities were evaluated *in vitro* using different cell-based assays and antimicrobial effects were screened against food-borne fungi and bacteria by serial microdilution methods. Flavonoids were the most abundant group of phenolic compounds identified in the moringa samples, with glycosylated derivatives of quercetin having a numerical expression superior to other flavonoid aglycones. In general, hydroethanolic extracts contained more phenolic compounds and were more active against lipid peroxidation, nitric oxide production, and tumour cells growth. Antimicrobial effects against the tested microorganisms were displayed by both hydroethanolic and aqueous extracts. These results highlighted the biological properties of moringa preparations, thus validating the functional effects of these beverages.

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Development of Natural Hypocholesterolemic Agents: Application in Cottage Cheese

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This work aimed at exploiting mushroom bioresidues, namely *Agaricus bisporus* L. to obtain mycosterols and develop hypocholesterolemic functional foods. Mycosterols enriched extracts were obtained by ultrasound assisted extraction, characterized in terms of mycosterols through HPLC-UV, evaluated for their toxicity in non-tumor cells (PLP2) and hypocholesterolemic capacity using a $CaCo_2$ cell line. After incorporation of the active dose in cottage cheeses, and to evaluate the incorporation effects and the bioactivity maintenance, the nutritional value of the developed cheeses was evaluated, as also the physical parameters, and the microbial load over a shelf life of 9 days. The color of the cheeses incorporated with the extract was the brownest compared to the other two samples (cottage cheese with ergosterol and control cottage cheese). Palmitic was the prevalent fatty acid, followed by oleic and capric acid, being the saturated fatty acids the major ones. Lactose and glucose were the two found soluble sugars; being glucose observed only in cheese incorporated with *A. bisporus*. Also, the incorporations did not cause any significant alterations to the normal flora found in the cottage cheese.

The cheese with pure ergosterol and the cheese incorporated with *A. bisporus* extract reduced cholesterol absorption by 21.1%, and 30.24%, respectively, thus validating thehypocholesterolemic potential of mycosterols while promoting sustainability through the use of food waste/by-products.

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Improvement of Bakery Products Functional Properties with the use of Non-Conventional Seeds Flour

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The flours obtained from the seeds of niger, millet, and birdssed, unconventional food plants (PANC) [1, 2], were assessed regarding physical and nutritional characteristics (AOAC methods). The bioactive properties (antioxidant, antimicrobial) of their hydroethanolic extracts were also assessed. Finally, bread samples were prepared with partial replacement of the wheat flour (20% of PANC's flour) to compare the final characteristics of the breads. The three flours presented high granulometry, associated with a high-water absorption index, indicating a necessary complementation with other flours for bakery application. Niger seed stood out with the best nutritional profile, and its extracts presented the highest antioxidant and antimicrobial properties. Niger and millet presented a strong antifungal capacity (greater than the positive controls). None of the samples presented hepatotoxicity. The breads obtained with millet and birdseed flour presented a similar behavior to the control samples (100% wheat flour) regarding the texture, specific volume, and color. This study proved the beneficial contribution that PANC flours can bring for the development of new bakery products.

[1] Kinupp, V.F., & Barros, I.B.I. Horticultura brasileira v. 22(2004), 17–25.

[2] Leal, M.L. (2015). Repositório Institucional UFSC. https://repositorio.ufsc.br/handle/123456789/174789

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Mini Review on Meat Based Functional Food

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Dietary supplements, nutraceuticals, and functional foods are the terms, that are frequently used interchangeably. However functional food is food, which can be consumed as a part of a regular dietary regimen and not merely a capsule, tablet, or pill. The use of functional food has gained momentum in today's world with the development in the health sector. In this COVID-19 pandemic, the perception of health and nutrition has turned people more towards the natural means of regulating health including food. Nutritional science has its roots in ancient Ayurvedic practices which date back to the 12th century BC. Food is praised to be superior to all medicines (*Mahabheshaja*) as it is essential in both health and disease equally. Sick persons cannot survive on medicines alone, they need food.

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