

CYNARA CARDUNCULUS L. BY-PRODUCTS AS A SUSTAINABLE SOURCE OF BIOACTIVE COMPOUNDS FOR INDUSTRIAL APPLICATIONS

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Cynara cardunculus L. (cardoon) is a versatile perennial crop that thrives in challenging environments with high productivity. Its flowers are valued for their coagulating properties in cheesemaking, while its leaves, rich in bioactive compounds, are normally discarded. This study aimed to assess the antioxidant and antimicrobial potential of ethanolic and methanolic extracts from fresh and dried cultivated cardoon var. *altilis* DC leaves (FCC and DCC, respectively) to evaluate the impact of oven-drying with forced air circulation on the bioactive profile of the leaves.

Dried cultivated cardoon leaf extracts exhibited stronger antioxidant activity than fresh leaf extracts, although fresh leaves contained a greater variety of polyphenolic compounds. Among the 16 identified compounds, chlorogenic acid, apigenin, and luteolin were the most abundant. The best antioxidant activity was observed in dried leaf extracts for both methanolic (EC₅₀ = 0.8 mg/mL, AAC = 279.67) and ethanolic (EC₅₀ = 2.1 mg/mL, AAC = 448.06) solvents.

Regarding antimicrobial properties, Gram-positive bacteria showed higher sensitivity to both ethanolic and methanolic extracts compared to Gram-negative bacteria. The dried leaf ethanolic extract demonstrated stronger antimicrobial activity, with lower minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values (125–2000 µg/mL) across most tested microorganisms. Dried leaf extracts exhibited better antimicrobial efficacy than fresh leaf extracts, although only mild inhibition was observed against *Aspergillus fumigatus*.

In conclusion, the findings suggest that dried cardoon leaves are a valuable by-product as a source of bioactive compounds for various industrial applications, particularly in the food industry, as well as in cosmetic and pharmaceutical industries. In this sense, the use of active compounds obtained from cardoon leaves is aligned with the concepts of circular economy and sustainability. More specifically, it is aligned with the United Nations Sustainable Development Goal 12, Ensure sustainable consumption and production patterns. This approach promotes both environmental and economic sustainability by transforming high-value by-products into innovative applications.

Keywords

Cardoon; Antimicrobial properties; Antioxidant properties; Circular economy; Chlorogenic acid

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