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PHENOLIC COMPOSITION AND BIOACTIVE PROPERTIES OF *CYNARA CARDUNCULUS* VAR. *ALTILIS* AS AFFECTED BY SEASONAL CHANGES

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Cynara cardunculus L., commonly known as cardoon, is an erect, perennial, herbaceous plant native to the Mediterranean area. This specie has been attributed several health-promoting effects mainly associated to its interesting composition in phenolic compounds [1]. In the last years, its commercial and economic value have grown significantly as a result of the multiple industrial applications that it has received in different sectors, including cheese manufacturing and production of biomass, bioenergy and pharmaceuticals [1,2]. For this reason, the study of the effects of seasonal variations on the chemical composition and bioactive potential of different cardoon tissues is important and may contribute to an improved exploitation and more sustainable use of this species. The cardoon samples were collected in Greece; petioles were collected throughout the full growth cycle and flower heads were harvested at the stages of early flower development, full maturity, and seed ripening. The hydroethanolic extracts obtained were studied in terms of polyphenols composition and antioxidant, cytotoxic, anti-inflammatory, and antimicrobial properties. The phenolic profile was characterized by HPLC-DAD-ESI/MS. The antioxidant activity was measured by the TBARS and the OxHLIA cell-based assays. The cytotoxic potential was tested against four human tumour cell lines and a porcine liver primary cell culture using the sulforhodamine B assay. The anti-inflammatory effect was evaluated by the ability to inhibit the production of nitric oxide by liposaccharide-stimulated macrophages. Finally, the antibacterial and antifungal activities were screened via the broth microdilution method. Eleven and ten phenolic compounds were tentatively identified in the petiole and flower head extracts, respectively. In both cases, higher contents were quantified in the immature tissues. In fact, there was a decrease in the content of phenolic compounds as the maturation process progressed; a 54% and 94% reduction were associated to the later harvested petioles and flower heads, respectively. In terms of bioactivity, both petiole and flower head extracts revealed anti-inflammatory and cytotoxic potential, especially the extracts of immature flower heads and those of petioles at intermediate maturation stages. All the tested samples exhibited antibacterial and antifungal activity, but unlike what was verified for the phenolic composition, the extracts of mature flower heads and petioles revealed the best results in terms of minimum inhibitory concentration at the intermediate maturation stage. Regarding TBARS inhibition, immature flower heads and petioles at the senescence stage had the highest activity. Moreover, the mature flower head and immature petiole extracts were those exhibiting higher capacity to protect erythrocytes from free radical-induced haemolysis. In conclusion, this study showed that the phenolic composition and biological activities of cardoon petioles and flower heads are influenced by the harvest stage. However, further studies are needed to correlate the compounds responsible for the bioactive properties associated with the different cardoon tissues, as well as to define the optimum harvest stage for obtaining the highest bioactivity.

References

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