EVALUATIONOF ANTIOXIDANT, ENZYME INHIBITORY, AND UV-PROTECTIVE PROPERTIES OF ECHINOPSSPHAEROCEPHALUS L. EXTRACTS OBTAINED BY ACCELERATED SOLVENT EXTRACTION

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Echinops sphaerocephalus L. (glandular globe-thistle) is a medicinal plant belonging to the Asteraceae family, traditionally known primarily as a melliferous species. Phenolic compounds such as apigenin, chlorogenic acid, catechin, and quinic acids are recognized as key plant-derived bioactive compounds with strong antioxidants, anticancer, antibacterial, antiviral, and cardioprotective properties. However, the extraction of bioactive compounds from E. sphaerocephalus has been insufficiently investigated, and only limited information is available regarding the properties of its extracts. In this study, the phenolic content, antioxidant capacity, and sun protection factor (SPF) of E. sphaerocephalus extracts were evaluated using accelerated solvent extraction (ASE). Ethanol, water, and ethanol–water mixtures were selected as food- and pharmaceutical-grade solvents to obtain hydrophilic, antioxidant-rich extracts. ASE was performed under four conditions: 100% H_2O, 100% EtOH, and EtOH/H2O mixtures at 70/30% (v/v) and 50/50% (v/v). The extraction time was 45 minutes, and the temperature was set at 70 °C for EtOH and EtOH/H2O mixtures, while for 100% H_2O it was increased to 110 °C. The results demonstrated that ASE significantly enhanced extraction yield, which ranged from 15.4 to 41.6 g/100 g dry weight. Extracts obtained under different conditions exhibited variable total phenolic content (25–43 mg GAE/g extract) and in vitro antioxidant capacity (199.4–302.4 mg TE/g extract), as well as notable UV-protective potential (SPF > 8 at 0.1 mg/mL). These findings highlight ASE as an efficient approach for producing high-value extracts from E. sphaerocephalus with potential applications in the pharmaceutical and nutraceutical fields. Furthermore, the PLE–EtOH extract exhibited pronounced superoxide scavenging activity in the PCL assay (122.2 mg TE/g E), significant antiglycation activity (IC50 = 0.74 mg/mL), and inhibitory effects against α-amylase, α-glucosidase, and pancreatic lipase (IC50 = 1.64–15.14 mg/mL). These bioactivities suggest that E. sphaerocephalus extracts may help reduce inflammation and oxidative stress and modulate pathways associated with metabolic disorders.

Keywords: Echinops sphaerocephalus; accelerated solvent extraction;