

Selective extraction of highly valuable flavonoids: Valorization of *Agave lechuguilla* by-product.

Zoé Pelletier-Morreeuw^a, Daniel Guajardo-Flores^b, Ana G. Reyes^c (agalvarado@cibnor.mx)

^a Centro de Investigaciones Biológicas del Noroeste (CIBNOR), Av. Instituto Politécnico Nacional 195, Col. Playa Palo Santa Rita Sur, 23096 La Paz, B.C.S., México.

^b Tecnológico de Monterrey, Escuela de Ingeniería y Ciencias, Ave. Eugenio Garza Sada 2501, Monterrey, N.L., México

^c CONACYT-CIBNOR Av. Instituto Politécnico Nacional 195, Col. Playa Palo Santa Rita Sur, 23096 La Paz, B.C.S., México.

ABSTRACT

Background: *Agave lechuguilla* waste biomass (*guishe*) is an undervalued abundant plant material with proven health benefits such as anticancer, antioxidant, and anti-inflammatory effects. The biological impacts of *A. lechuguilla* has been mainly attributed to its flavonoid content, mostly obtained by solvent extraction. Therefore, a new valorization strategy is necessary to promote a sustainable use of *A. lechuguilla* by-product. **Objective:** This research aimed to evaluate the use of supercritical carbon dioxide (SC-CO₂) for the selective extraction of anthocyanidins, flavonols, and glycoside flavonoids. **Materials and Methods:** Hydrolyzed by-product from *A. lechuguilla* was used in a Box-Behnken experimental design to determine the influence of temperature (40 – 60 °C), pressure (150 – 350 bar), and co-solvent percentage (ethanol/water, 70/30, 5 – 15%) on flavonoid profile determined by HPLC-DAD-UV. The obtained extracts were also evaluated for their antioxidant activity through DPPH radical scavenging assay. **Results:** The results showed that all factors significantly affected the total extract yield and flavonoid profiles. Also, the flavonoid profile significantly affected the antioxidant capacity of the extracts. Anthocyanidins dominated the extracts obtained with 15% co-solvent, 70°C, and 250 bar resulting in the lower free-radical scavenging capacity (13.8 ±1,91% I DPPH). Flavanols were the majority for 250 bar independently to co-solvent ratio and temperature, although the higher antioxidant potential (41.2 ±2.28 %I) was observed for the fraction obtained with 15% of co-solvent and 40°C. Finally, flavonols were preferentially extracted using 5% co-solvent, 55°C, and 350 bar, and the extracts showed a scavenging capacity of 20.4 ±3,98 %. **Conclusions:** The tested conditions of SC-CO₂ extraction allowed the selective obtention of the three fractions of high-value bioactive compounds from *A. lechuguilla* main by-product. Thus, it can be used as a green alternative to provide high-quality flavonoids to industrial sectors.

Keywords: *Agave lechuguilla* agro-residue, flavonoids, supercritical fluid extraction, antioxidant, natural product.