

Evaluation of the antioxidant, antiinflammatory and antihyperglycemic activities of black bean extract (*Phaseolus vulgaris* L.) obtained by supercritical CO₂.

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Background: Black beans (*Phaseolus vulgaris* L.) are highly consumed in Mexico. These varieties contain higher amounts of bioactive compounds such as saponins and phenolic compounds, which have been widely studied due to their protective role against metabolic syndrome diseases such as diabetes. The extraction of saponins and phenolic compounds can be achieved by conventional techniques such as liquid-solid extraction using organic solvents. However, supercritical fluid extraction is a green technology that has been developed with the purpose of reducing environmental impact. **Objective:** This research aimed to evaluate the feasibility of obtaining an extract rich in saponins using green technology, from the by-product (seed coat, cotyledon and sprout) of black beans (*Phaseolus vulgaris* L.) with antioxidant, anti-inflammatory and antihyperglycemic properties. **Materials and Methods:** A box-Benhken design was used to evaluate the influence of pressure, temperature and co-solvent percentage on the total extract yield and saponins recovery. Identification and quantification of saponins were performed using HPLC-DAD-ELSD, whereas total phenolic compounds were quantified using Folin-Ciocalteu reagent. Moreover, antioxidant activity of extracts was evaluated chemically and *in vitro* assay with caco-2 cell line. Anti-inflammatory response of extracts was evaluated in an *in vitro* assay with RAW264.7 macrophages cell line. Finally, antihyperglycemic activity of extracts was evaluated in digestive enzymes (α -amylase and α -glycosidase). **Results:** The variation of pressure and co-solvent percentage showed that at higher co-solvent percentage and lower pressure a higher total extract yield was obtained, while the temperature showed not effect. The results showed that the preferential extraction of group B saponins and conjugates of DDMP was at 70°C, 100 bar and 10% co-solvent. Supercritical fluid extracts rich in saponins and phenolic compounds showed better antioxidant, antiinflammatory and antihyperglycemic activities than conventional extracts with methanol. **Conclusions:** Supercritical CO₂ can be used as a selective technique to obtain extracts with higher content of saponins and phenolic compounds that could have a food and pharmaceutical industry application for the prevention and control of hyperglycemic, oxidative stress and inflammation.

Keywords: Saponins; Phenolic compounds; *Phaseolus vulgaris* L.; supercritical CO₂; *In vitro* assays.