

## **Black sage (*Varronia curassavica* Jacq.) extracts obtained with pressurized ethanol in an intermittent process**

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Pressurized liquid extraction (PLE) is economically viable, sustainable, and ecologically free of residues of toxic solvents when ethanol is used. In this research, this technology was used to obtain optimized conditions to extract phytochemicals from black sage (*Varronia curassavica* Jacq.). Natural leaves of black sage were obtained from a biological field production. The leaves dried under low-temperature conditions were crushed and passed through sieves to standardize the particles ( $< 1,5$  mm). Dionex ASE 150 Accelerated Solvent Extractor System (ASE) applied at Pressurized Liquid Extraction (PLE) was used in an intermittent extraction process. In the study of the influence of process on the extraction yield, a central composite rotational design (CCRD) was applied for temperature (T), static time (St) (contact time between the solvent and the matrix in each cycle), rinse volume (V), and number of cycles (C) as independent variables. In each experiment, approximately 5g of dried herb was used, and ethanol (99.5%) as solvent. In addition to the extraction yield as a dependent variable, the antioxidant activity was also evaluated by spectrophotometry, using the gallic acid curve pattern in the DPPH reaction (mg/g GAE) and for the inhibition of the ABTS+ radical, Trolox was used as a standard.

Of all the variables studied, temperature was the only one that influenced the extraction. The fact that the rinse volume (V) does not influence the yield, proves once again that this process, in addition to being fast, saves solvent. The best processing yield (11,46 g extract/100 g dry leaves) occurred at 70°C, 4 cycles with 8 min of static time, and rinse volume of 120 % the extractor cell (41 mL). For this extract, the antioxidant activity was 645.14 mg/g GAE and 1,331  $\mu$ g Trolox/g dry leaves.

PLE in an intermittent process using ethanol as a solvent emerges as a fast technology that uses little solvent and is highly efficient in extraction. The use of ethanol characterizes it as a green technology that becomes ideal for the production of phytochemicals with antioxidant properties from black sage.