Reduction of antinutritional factors during *Pinus halepensis* seeds beverage processing, a focus on phytates and oxalates

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Amina Abbou, Nabil Kadri, Georgia Giovanetti, Gilles Morel, Omar Aoun, Adrien Servent, Khodir Madani, Manuel Dornier, Nawel Achir

Abstract

The purpose of this study was to screen for the first time, Pinus halepensis seeds for their antinutritional factors (ANFs) and to reduce them through processing. Results of ANF screening showed that Aleppo pine seeds contained negligible amounts of tannins, saponins and alkaloids, and no amylase and trypsin inhibitory activities. However, they contained significant amounts of phytates and oxalates with values of 2.63 ± 0.21% and 1.07 ± 0.09% respectively. A dehulling operation to remove the adhering coat was implemented which contributed to a reduction of 25% of phytates and 46% of oxalates. Soaking seeds were studied and optimized using a Box Behnken experimental design, varying soaking time, temperature, and pH. The desirability study allowed the determination of optimal conditions of 10.6 h soaking time, 57.6 °C soaking temperature and 5.54 pH that decreased oxalate and phytate content by 72% and 61% respectively. Production of a plant-based beverage with these optimal process conditions markedly reduced the antinutrient content while maintaining expected dry matter, color, stability and pH.

Keywords: Pinus halepensis seeds; Antinutritional factors; Phytates; Oxalates; Plant-based beverage