

Abstract

Extraction of Germinated Seeds by Conventional and Modern Methods [†]

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Abstract: The germination process of whole seeds activates and multiplies the composition of amino acids, antioxidants, vitamins, proteins, enzymes, and sugars, and decreases phytate and protease inhibitors concentrations. Furthermore, germination contributes to the improved digestibility of plant proteins; conversion of carbohydrates to simpler forms for easy assimilation; bioavailability of minerals; freeing up of minerals for absorption; and an increase of beneficial enzymes. The aim of this paper was to perform the extraction of alfalfa germinated seeds using conventional and modern methods for the purpose of physical-chemical characterization. The extraction of germinated seeds was carried out by several methods, namely conventional (hydro-alcoholic and autoclave extraction) and modern (ultrasound-assisted extraction) methods. For each method, the following parameters have been set: solvent/substrate ratio, temperature, and reaction time. Hydro-alcoholic extraction was performed according to the method described by Piantino et al. (2008) with minor modifications [1]. The parameters were as follows: ethanol:water ratio 70:30 *v/v*, reaction time 24 h, at room temperature, and stirred at 150 rpm. Autoclave extraction was performed according to the method described by Maurizio D’Auria (2021) using parameters temperature (121 °C), pressure (1 bar), and reaction time (15 min) [2]. Ultrasound-assisted extraction carried out according to the method described by Ahmad and Shehta (2020) with modifications [3]. The parameters were as follows: 70% ethanol, substrat:solvent ratio 1:10, reaction time 10, 20, 30 min, at room temperature in an ultrasonic bath. The proximate chemical composition analysis for each extract was performed, which refers to water content, total nitrogen, crude protein, carbohydrates, ash, and both macro and micro elements using standard methods. Following the comparative analysis of the preliminary results obtained for the four extracts, the modern method ultrasound-assisted extraction was selected. The mean percentage of chemical compounds was: moisture (at 105 °C) 78.2 ± 0.48%, crude protein 23 ± 1%, and ash (at 550 °C) 3.09 ± 0.004%. The preliminary chemical analysis of the extracts served as the basis for the selection of the extraction method. Conventional methods require a long time for extraction and use solvents at high costs. The interest in using modern methods for the extraction of germinated seeds is growing due to reduced reaction time and solvent volume involved and the accuracy of results obtained.

Keywords: germinated seeds; extract; alfalfa



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