# Ultrasonically modified enzyme activity, antioxidant capacity and physicochemical properties of cereal brans and their application in flat bread production

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Oat and barley bran are rich in ?-glucan and are a good source of minerals and polyphenols. The presence of endogenous ?-glucanase leads to a significant reduction in the molecular weight of ?-glucan and, consequently, its physiological effects. The challenge is to minimize the degradation of ?-glucan while maximize the reduction of phytates which obstruct the mineral bioavailability. Ultrasound, as an environmentally friendly and non-toxic food processing technology, is increasingly being used to modify enzyme activity, functional and rheological properties of foods. The aim of this work was to investigate the influence of high intensity ultrasound (24 kHz, 400 W, 100% amplitude) treatment at three specific energies (87, 217.5, and 348 J/g) with or without pulse mode of oat and barley bran. The ?-glucanase and phytase activity, concentration of phenolics and phytates, antioxidant capacity, hydration and rheological properties of cereal brans were assessed. Ultrasonic treatment with higher specific energy and temperature significantly decreased the activity of ?-glucanase and phytase in both bran types. In addition, longer treatment (i.e., higher energy and temperature) significantly decreased antioxidant capacity (DPPH), total phenolics, and phytate concentration. Ultrasonic treatment increased water swelling capacity (WSC) and water retention capacity (WRC) and changed the dynamic viscoelastic characteristics of cereal bran. Treatment at 217.5 J/g without pulse mode resulted in the best desirable parameters for oat bran with 69.2% inactivation of ?-glucanase activity and 17.4% phytate reduction. For barley bran, it was 348 J/g in pulse mode with 35.6% ?-glucanase activity and 38.7% phytate reduction. The addition (10 % of flour mass) of oat and barley bran did not significantly affect the physical properties of flat bread, except for its hardness and chewiness. This study suggests that ultrasound, as an energy-saving technique, has the potential to alter enzyme activity, bioactive compounds, antinutrients and functional properties of cereal bran for their application in bakery products.