COOKING TIME AND WATER IMBIBITION OF BLACK BEANS TREATED WITH HIGH HYDROSTATIC PRESSURE

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ABSTRACT

The effect of high hydrostatic pressure (HHP) on water imbibition, cooking time, and microstructure of black beans were evaluated. Black beans (*Phaseolus vulgaris*) were placed in polyethylene bags containing deionized water and treated at 275, 410, 550 or 690 MPa for 5 min using an isostatic pressure system. Water imbibition of HHP treated black beans was determined after 3, 6, 9, and 12 h of soaking, while untreated beans were soaked 24 h. Microstructure of black beans was observed with light microscopy and scanning electron microscopy (SEM). The cooking times were determined using a Mattson bean cooker. The HHP treated black beans were completely hydrated in less time than untreated black beans. High pressure treatments reduced the cooking times from 26 to 40%. The amount of water absorbed and the cooking times were highly correlated ($r = 0.9707$). Light micrographs of HHP treated beans demonstrated protein aggregation, dense cell walls, and partial loss of birefringence of starch granules, whereas SEM micrographs exhibited compact cell walls, swelling of starch granules, and collapsed cells. Absence of smooth surface, swelling of palisade, hourglass, and parenchyma cells of bean seed coats were also observed. HHP treatments increased the rate of water imbibition and decreased the cooking times of black beans. Structural modifications of seed coats, protein aggregation, modifications of crystalline stated and swelling of starch granules may determine the increased rate of hydration and decreased cooking times of HHP treated black beans.