

THERMAL PROPERTIES OF STARCH FROM HARD-TO-COOK BEANS

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High temperatures and relative humidity during storage cause a postharvest problem known as “hard-to-cook” (HTC) on beans, resulting in increased cooking time. The study of the thermal properties allows evaluating the gelatinization temperature of starch. The aim of this study was to expose different types of beans to accelerated aging and evaluate the thermal properties of their starches. Samples of White, Carioca, Fradinho and Black Beans, purchased from farmers and/or local market (Ponta Grossa, PR, Brazil) were dried for 24 hours at 45 °C and stored in capped plastic bottles in the dark. A portion of each sample was exposed to accelerated aging at 40 °C and 75 % RH for 45 days. The samples were ground in a mill and the starch was extracted by alkaline method. For analyzing the thermal properties of the starch, 2-3 mg (dry basis) of sample was weighed in aluminum pan and 6 microL of water was added. The pans were hermetically sealed and held for one hour at room temperature to equilibrate the moisture. The analysis was performed in a Perkin-Elmer Differential Scanning Calorimeter, at the range 25-100 °C, at a heating rate of 10 °C min⁻¹. The parameters evaluated were: onset, peak and conclusion gelatinization temperatures (T₀, T_p and T_c) and enthalpy change (ΔH). Applying analysis of variance on the data, all the samples presented significant differences among themselves, for all the parameters. The T₀ ranged from 61.1 (new White bean) to 67.7 °C (new Fradinho bean), whereas T_p ranged from 69.7 (new White bean) to 72.4 °C (aged Carioca bean). The enthalpy changes ranged from 10.3 (new Black bean) to 16.7 J g⁻¹ (new Fradinho bean). Differences in thermal properties were found by others authors, in a study with starches from 11 types of beans. Analysis of each variety regarding to aging treatments (new x aged) by Student's t-test showed that accelerated aging did not cause changes in the thermal properties of starches. Only the enthalpy change of the Fradinho bean presented a significant difference, from 16.5 to 13.1 J g⁻¹, for the new and aged samples,

respectively. Some authors attributed the difference in ΔH of new and aged bean starch to a decrease in the crystallinity of the granules during storage. The present study demonstrates that differences in the thermal properties of starch can be attributed to different varieties, but not to accelerated aging treatment.

Palavras-chave: starch bean, accelerated aging, gelatinization