Temperature-Associated Proton Dynamics in Wheat Starch-Based Model Systems and Wheat Flour Dough Evaluated by NMR

Wheat starch-based model systems and wheat flour dough with the same water content (close to 45 %) were investigated upon heating (20'90 °C) using time-domain 1H NMR spectroscopy with the aim of assigning each spin'spin relaxation time (T2) measured to a specific proton fraction. On the basis of the signal evolution according to Curie's law for pure starch and pure water, temperature-associated changes for each T2 value and their mass intensity were interpreted and assigned to water and/or biopolymer proton fractions related to the reversible swelling of starch or its gelatinization. The addition of 2 % (w/w) salt to model samples and dough induced few changes during the reversible swelling process but impacted on the measurements performed above 60 °C. Finally, studies performed on starch-based model systems improved understanding of the complex thermal processing of starch in dough by taking into account phenomena other than the starch swelling and gelatinization, such as gluten denaturation and changes in water'biopolymer interactions.

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