Assessing changes in lentils texture during hydrothermal treatment.

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The changes of lentils texture during cooking obey different mechanisms, increase of water content in the seed, starch melting, cell-walls disrupting, the complexity of which is increased by the heterogeneity of the seeds, their genetic and environmental diversity. The aim of this work is to develop a method for measuring texture in order to tackle these mechanisms, by testing different lentil batches.
Three lentils batches, with different canning behaviors (A= conform, B, C = non conform, nc) were provided by Cofigeo (F12-Capdenac). Their compositions, especially in cell wall polysaccharides (CWP), was determined by chromatography and spectrophotometry. Hydration kinetics were determined by soaking at 25 and 95°C and fitted by Peleg's model. Cooking time distribution was measured using a specific device recently developed in our laboratory, inspired from Mattson cooker.
Cooking time distributions, fitted by a Gompertz model, showed that both nc batches (B, C) display shorter characteristic cooking time (tc < 10mn) than conform batch (A) (tc >10mn). Moreover, hydration kinetics showed that, at 95°C, the water content MC (dry basis) =1.3 was reached after 25mn, 15 and 12 mn for A, B and C, respectively. These differences may be attributed to the larger content of A in CWP (14%db) than of B and C (8.2 and 11.5 resp.), since CWP are supposed to act as water barriers.
Texture was assessed by compression test using disk (ø10 mm) applied to one lentil, the most repeatable from the systems tested. From the linear part of the stress/strain curve, apparent modulus Ea value was derived. Surprisingly, for the same MC value (=1.3) and for the three batches, Ea values of cooked lentils at 95°C (2.7 to 4 MPa) were about twice larger than those of the lentils soaked at 25°C (Ea =1.7 to 2 MPa). This result might be explained by two mechanisms: first, the strengthening effect of starch swelling at large temperature, and second, the hydrolysis of CWP by endogenous enzymes that were (re-)activated at low temperature (25°C). Whatever the mechanism, the implementation of biochemical and physical methods allowed us to explain the difference of behaviors of lentils during industrial processing.