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# Mechanistic insight into softening of Canadian wonder common beans *(Phaseolus vulgaris)* during cooking.

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Chemical compounds in the article

1. Aluminum oxide _PubChem CID 9989226
2. 1-Butanol _PubChem CID 263
3. Indium _PubChem CID 5359967
4. Sodium bicarbonate _PubChem CID 516892

**Abstract**

The relative contributions of cotyledons and seed coats towards hardening of common beans *(Phaseolus vulgaris)* were investigated and the rate-limiting process which controls bean softening during cooking was determined. Fresh or aged whole beans and cotyledons were soaked and cooked in demineralised water or 0.1 M $NaHCO_3$ solution, and texture evolution, microstructure changes and thermal properties were studied. Fresh and aged whole beans cooked in demineralised water had significantly different softening rate constants and so did fresh and aged cotyledons. The comparable softening rate constants of aged whole beans and cotyledons indicated an insignificant role of the seed coat in hardening during storage. All samples cooked faster in 0.1 M $NaHCO_3$ solution. Disintegration of cooked tissues followed by microscopic examination revealed a transition from cell breakage through a phase of cell breakage and separation to complete cell separation with increased cooking time wherefore texture decayed. Therefore, progressive solubilisation of pectin in the middle lamella greatly promoted texture decay. While residual birefringence even after substantial cooking time suggested some order of the starch, calorimetric analyses revealed complete starch gelatinisation before complete cell separation occurred. This implies an insignificant role of starch in texture decay during cooking but its hindered uncoiling into a viscous gel after gelatinisation due to the restricting cell wall could promote its retrogradation. Therefore,