Impact of non-starch polysaccharides on the textural behavior of processed yam

Dutheil de La Rochère, Dominique Rinaldo, Agnès Rolland-Sabaté

IMPACT OF NON-STARCH POLYSACCHARIDES ON THE TEXTURAL BEHAVIOR OF PROCESSED YAM

Dutheil de la Rochère A.*[a], Rinaldo D.[b], Rolland-Sabaté A.[a]

[a] *INRAE, Avignon University, UMR 408 SQPOV, F-84000, Avignon, France*
[b] *INRAE, UMR 1270 QUALITROP, Domaine de Duclos, F-97170 Petit-Bourg, Guadeloupe*

* alienor.dutheil-de-la-rochere@inrae.fr

Roots, tubers and bananas (RTB) products such as yam are staple food in Africa. Developers and breeders have worked for years to improve their yield and/or composition. However, they did not take into account consumer preferences such as cooking ability. Thus, many new varieties of yams, although resistant to diseases and pests or with higher nutritional quality, have serious problems of acceptability and adoption by the targeted consumers. It is therefore important to provide breeders and developers with tools for the creation and selection of hybrids based on the expected sensory quality. Among the sensory criteria, texture is a primary quality factor for yam products, and it depends on both the initial characteristics of raw material and processing techniques [1, 2]. In highly amylaceous products such as yam, the impact of starch on textural properties has been heavily explored. However, it cannot fully explain the texture and the cooking behaviour of these crops. Non-starch polysaccharides are known to be involved in the texture of non-starchy products such as apples[3]. Yam tuber hardness or mealiness after boiling has been hypothesized to be due to cell wall (CW) thickening, permeability changes and cell adhesion [1, 2]. However there is little knowledge on the link between the texture of raw and boiled yam, and the relationship with cell wall structure and composition still remains to be detailed.

The aim of this work was to determine the CW polysaccharides (CWP) composition of yam tubers to evaluate the relationship between CWP, cooking ability and textural properties. To do so, cultivars and pedoclimatic conditions were varied to obtain yams with different tissue structure. Their cooking ability was evaluated (cooking time, texture). CWP were then extracted from five cultivars of *Dioscorea spp.* raw and steamed tubers, chosen for their highly-contrasted cooking behavior. A specific CW extraction procedure, involving an alcohol insoluble solids (AIS) extraction followed by an enzymatic starch removal procedure, was developed. Starch, lignin, CWP and pectin composition, acetylation and methylation degree were then determined by means of chromatographic and spectroscopic techniques (GC-FID, GC-MS).

AIS content in fresh tubers varies from 24% to 33%. The AIS contains 66% to 85% starch, representing 50 to 70% of the dry matter whereas cell walls weigh about 2%. Raw yam CWP contain 15 to 20% galacturonic acid and 20 to 25% galactose, which correlates with data reported previously for cassava roots[4]. Composition varies according to genotype, soil and cooking process. Steamed yam CWP show a decrease in galacturonic acid content (8 to 12%), which is consistent with β-elimination induced by the cooking process. This characterization of yam CWP in regard to cooking ability is the first of its kind. It gives an overview of West Indies yam composition and opens the way to a better understanding of yam quality traits for the development of new hybrids.

[1] Otegbayo B., Aina J., Sakyi-Dawson E., Bokanga M. & Asiedu R. *Journal of Texture Studies*, 36, 324-332, 2005.
[2] Akissoe N., Mestres C., Handschin S., Gibert O., Hounhouigan J. & Nago M., *LWT - Food Science and Technology*, 44, 321-329, 2011.
[3] Buergy A., Rolland-Sabaté A., Leca A. & Renard C.M.G.C. *Food Hydrocolloids*, 107, 105962, 2020.
[4] Ngea G. L. N., Guillon F., Ngang J. J. E., Bonnin E., Bouchet B. & Saulnier L., *Food Chemistry*, 213, 402.409, 2016.