

Characterization and Quantification of Relatives Amounts of Phosphorylated Glucosyl Residues in C6 and C3 Position in Banana Starch Granules by 31P-NMR

Authors : Renata Shitakubo, Hanyu Yangcheng, Jay-lin Jane, Fernanda Peroni Okita, Beatriz Cordenunsi

Abstract : In the degradation transitory starch model, the enzymatic activity of glucan/water dikinase (GWD) and phosphoglucan/water dikinase (PWD) are essential for the granule degradation. GWD and PWD phosphorylate glucose molecules in the positions C6 and C3, respectively, in the amylopectin chains. This action is essential to allow that β -amylase degrade starch granules without previous action of α -amylase. During banana starch degradation, as part of banana ripening, both α - and β -amylases activities and proteins were already detected and, it is also known that there is a GWD and PWD protein bounded to the starch granule. Therefore, the aim of this study was to quantify both Gluc-6P and Gluc-3P in order to estimate the importance of the GWD-PWD- β -amylase pathway in banana starch degradation. Starch granules were isolated as described by Peroni-Okita et al (Carbohydrate Polymers, 81:291-299, 2010), from banana fruit at different stages of ripening, green (20.7%), intermediate (18.2%) and ripe (6.2%). Total phosphorus content was determinate following the Smith and Caruso method (1964). Gluc-6P and Gluc-3P quantifications were performed as described by Lim et al (Cereal Chemistry, 71(5):488-493, 1994). Total phosphorous content in green banana starch is found as 0.009%, intermediary banana starch 0.006% and ripe banana starch 0.004%, both by the colorimetric method and 31P-NMR. The NMR analysis showed the phosphorus content in C6 and C3. The results by NMR indicate that the amylopectin is phosphorylate by GWD and PWD before the bananas become ripen. Since both the total content of phosphorus and phosphorylated glucose molecules at positions C3 and C6 decrease with the starch degradation, it can be concluded that this phosphorylation occurs only in the surface of the starch granule and before the fruit be harvested.

Keywords : starch, GWD, PWD, 31P-NMR

Conference Title : ICFSN 2015 : International Conference on Food Science and Nutrition

Conference Location : London, United Kingdom

Conference Dates : June 28-29, 2015