Physical-chemical Characterization of Lobeira (Solanum lycocarpum) Starch

Pascoal, A.M.; Di-Medeiros, M.C.B.; Batista, K.A.; Fernandes, K.F.

Laboratório de Química de Proteínas, Departamento de Bioquímica e Biologia Molecular, ICB II, Universidade Federal de Goiás, Goiânia-GO, Brasil.

The selection of starch for industrial uses is made by considering its availability and its physico-chemical characteristics that vary depending on the source. Solanum lycocarpum (Solanaceae), a climatic and hydric stress resistant plant from Brazilian Cerrado, produces starch-rich fruits weighing around 400-900g, which made S. lycocarpum very attractive for biotechnological exploitation. In this study, the composition, structure, and physico-chemical properties of S. lycocarpum starch (SL-starch) were assessed by metal composition, nuclear magnetic resonance, viscosity and molecular weight measurements, X-ray diffraction and crystallinity degree. SL-starch presented 16.6 mg 100g\(^{-1}\) sodium, 17.5 mg 100g\(^{-1}\) potassium, 8.64 mg 100g\(^{-1}\) calcium, and 8.58 mg 100g\(^{-1}\) magnesium and lower content of manganese (0.7 mg 100g\(^{-1}\)), zinc (0.63 mg 100g\(^{-1}\)) and copper (0.006 mg 100g\(^{-1}\)). The \(^{13}\)C NMR spectrum revealed a correlation among the peaks and the carbons of the anhydroglucose units in the polysaccharide chain. In the spectrum were present the signals d-99.98 and d-99.76 ppm related to the anomeric carbon involved in the (1→4) and (1→6) D-glycosidic bond, respectively; the signals d-77.32, d-73.10, d-72.91 and d-71.52 ppm assigned to the C-4, C-3, C-2 and C-5, respectively; and the signals d-70.19 and d-60.69 ppm attributed to C-6. The intrinsic-viscosity of SL-starch was 3515 mPa.s, and the molecular weight estimated in 645.69 kDa. The X-ray diffractograms showed strong reflection at 2θ about 15.3°, 17.2°, 19.6°, 22.2°, 26.3° and 34.3° indicating that the SL-starch is classified as C-polymorph. Furthermore, a reflection at 2θ about 19.6° evidences the presence of V-polymorph structures. The crystallinity degree SL-starch was 38%, value higher than those observed for a typical A-polymorph and lower than B-type starches, which gives evidence of the mixed character of the S. lycocarpum starch. These results are very promising and open perspectives of using this starch.

Keywords: lobeira, X-ray diffraction, starch RMN, starch crystalinity, starch C-polymorph.