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Characterization of Starches from Tuber of *Pinellia ternata* (Thunb.) Breitenbach, Rhizome of *Alisma orientale* Juzepczuk and Seed of *Coix lacryma-jobi* Linné var. *ma-yuen* Stapf

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Various physicochemical properties were investigated to assess the potential of starches from the residual crude drugs after extraction. The powdered crude drugs (C) differed from each other in harvest time or district of cultivation. Starches (S) were prepared from tubers of *Pinellia ternata* (Thunb.) Breitenbach (PT), rhizomes of *Alisma orientale* Juzepczuk (AO) and seeds of *Coix lacryma-jobi* Linné var. *ma-yuen* Stapf (CL). C-PTs, C-AOs and C-CLs contained 41.1-77.5, 12.5-40.5 and 1.5-5.8% starch, respectively. S-PT, S-AO and S-CL granules measured were 8.2 ± 0.2 - 16.0 ± 0.4 , 6.1 ± 0.2 and 11.5 ± 0.4 - 13.5 ± 0.4 μm , respectively, in average diameter. S-PTs, S-AOs and S-CLs were classified as CA-type. The amount of P in S-PTs, S-AOs and S-CLs was 62-330, 93-110 and 75-210 $\mu\text{g/g}$, respectively. That of Ca was 320-530, 48-260 and 18-33 $\mu\text{g/g}$, respectively. S-PT-1, S-AO-2 and S-CL-2 showed endothermic curves from 67.3 to 85.0, 58.9 to 84.2 and 59.2 to 81.0°C, their enthalpy being 3.4 ± 0.3 , 4.2 ± 0.0 and 4.5 ± 0.2 J/g, respectively. S-PT-1, S-AO-2 and S-CL-2 are expected to be available for starch gelatinized at low energy. The digestibility of raw S-PTs, S-AOs and S-CLs by α -amylase was 35.3 ± 2.4 , 38.3 ± 2.3 and $62.2 \pm 5.2\%$, respectively, at 72 h. The main oligosaccharide products from the raw starches (digestibility: S-PT-1, 2.4% ; S-AO-2, 5.8% ; S-CL-2, 7.1%) digested by α -amylase were maltotriose (35.8-40.0%) and maltose (35.8-42.8%). The main product from the starches (digestibility: S-PT-1, 4.8% ; S-AO-2, 12.1% ; S-CL-2, 18.7%) digested by glucoamylase was glucose (97.6-99.5%). The digested S-PT-1, S-AO-2 and S-CL-2 granules (digestion time, 1 h) were roughly eroded by α -amylase all over the

surface and the starches digested by glucoamylase maintained their original form with a few fine grains on their surface. A few granules of S-CL-2 digested by glucoamylase lost their original form. The S-PT-1(A), S-AO-2(A) and S-CL-2(A) digested by α -amylase are expected to be available as an adsorbent, because of their porosity. The results of gelatinization temperature and enthalpy suggest that the thermostability of S-PT-1, S-AO-2 and S-CL-2 digested by α -amylase was higher than that of the starches digested by glucoamylase.

Key words: pinellia tuber starch, alisma rhizome starch, coix seed starch, physicochemical property, digestibility by amylase

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