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Gelatinization Properties and Bread Quality of Flours Substituted with Hydroxypropylated, Acetylated and Phosphorylated Cross-linked Tapioca Starches

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Three kinds of chemically modified tapioca starches, *i.e.*, hydroxypropylated tapioca starch (HTS), acetylated tapioca starch (ATS) and phosphorylated cross-linked tapioca starch (PTS), were substituted for 20% (w/w) of wheat flour, and gelatinization and breadmaking properties of the substituted flour were compared with those characteristics of the flours with native tapioca starch (NTS) or without any tapioca starches (control). Gelatinization temperatures (T_{o1} , T_{p1} and T_{f1}) and endothermic enthalpy change (ΔH_1) of the dough with 20% of HTS were quite similar to those of the control on DSC curves. NTS, HTS and ATS swelled and collapsed easily during heating as compared with wheat starch, while PTS hardly swelled and was difficult to disperse as compared with NTS, HTS, ATS and wheat starch. The substituted flours except HTS significantly decreased water absorption measured by a Farinograph as compared with the control. With regards to the mixing times obtained from a Farinograph, doughs made from the substituted flours were shortened, but the mixing tolerance was the same as compared with the control. Specific volume of loaves baked from the substituted flours decreased distinctly, but that of HTS was the largest among the substituted samples. The bread crumbs baked with HTS were softer than those with NTS or the control during storage, whereas bread crumbs with ATS or PTS were harder. Among the three kinds of chemically modified tapioca starches, HTS was the most suitable substitution for wheat flour in breadmaking.

Key words: hydroxypropylated tapioca starch, acetylated tapioca starch, phosphorylated cross-linked tapioca starch, bread, dough

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