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Effect of Dual Chemically Modified on Functional Properties of White Corn Starch

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Research Highlights

The purpose of the research was to study functional properties of dual-modified two varieties of white corn starch, namely Anoman and Pulut. Modifications of white corn starch used two treatment factors, namely hydroxypropylation reaction at two levels of propylene oxide concentration (8% and 10%) followed by crosslinking reactions on two combinations of STMP phosphate compounds and STPP (ratio 1%:4% and 2%:5%). The results showed that the dual modification can improve the functional properties of white corn starch Anoman dan Pulut variety compared with its native. The dual modified white corn starches of Anoman variety significantly different with Anoman variety on the characteristic of pasting properties, water absorption capacity, swelling volume, clarity of paste, and freeze thaw stability.

Research Objectives

Local white corn (Anoman and Pulut Uri 1 varieties) contain a high polyphenol compound (Pozo-Insfran, Brenes, Saldivar, & Talcott, 2006). However, the utilization of corn starches in native form has less desirable physicochemical properties. Consequently, there was need to modify of flour properties to increase the utilization. To improve the starch properties, native starches can be modified by the chemically method through a hydroxypropylation and cross-link reaction. The combination of hydroxypropylation and crosslink methods will produce a starch that have stability in acid, heat, and mechanical degradation, and may delay retrogradation during storage (Maulani, Fardiaz, Kusnandar, & Sunarti, 2013) and increase the swelling power (Lee & Yoo, 2011). The objective of the research was to study the functional properties of hydroxypropylated and cross-linked two varieties of white corn starch, namely Anoman and Pulut.

Methodology

The starch used in this study was obtained from two varieties of white corn starch, namely Anoman and Pulut. Starch was extracted by a wet extraction method. The hydroxypropylation

and cross-link method was conducted according to the method described by previous study (Maulani et al., 2013). Modifications of white corn starch used two treatment factors, namely hydroxypropylation reaction at two levels of propylene oxide concentration (8% and 10%) followed by crosslinking reactions on two combinations of STMP phosphate compounds and STPP (ratio 1%:4% and 2%:5%). The functional properties of dual modified white corn starches that were observed are pasting properties, swelling volume, water absorption capacity (WAC), paste clarity, and freeze-thaw stability

Results

Pasting properties of dual-modified starch Anoman and Pulut variety have a type A pattern (Collado, Mabesa, Oates, & Corke, 2001). The final viscosity value of Anoman variety almost the same with the peak viscosity value, but Pulut variety showed that the final viscosity lower than peak viscosity. The breakdown viscosity of white corn starch of Anoman variety that is quite sharp with the value of breakdown viscosity higher than Pulut variety. Dual modified white corn starch of Anoman variety have the setback value higher than Pulut variety, indicating a higher trend of retrogradation. The swelling volume of modified Anoman white corn starch increased with increasing concentration levels of propylene oxide but its value decreased with increasing STPP: STMP ratio. Whereas for modified Pulut white corn starch, the swelling volume decreased compared to its native. The value of WAC of both Anoman and Pulut native starch higher than the value of it's dual-modified starches. The clarity of starch reflected how light is transmitted through the paste (Xiao, Lin, Liu, & Yu, 2012). Compared with the native Anoman and Pulut white corn starch, the paste clarity of dual-modified starch increased significantly. The syneresis value of the modified white corn starch of Anoman variety have significantly lower value than the native and the syneresis of native Pulut white corn starch is low and the value was not significant with it's dual-modified starches.

Findings

From the results obtained in this study, we have found that dual modified white corn starches of Anoman variety significantly different with Anoman variety. Increasing concentration level of propylene oxide and STPP: STMP ratio on the dual modification reaction of white corn

starch can accelerated the gelatinization time, swelling volume, dan paste clarity; and reduced the pasting temperature, swelling volume of Pulut's variety, water absorption capacity, and syneresis. Lower values of syneresis can be used as an indicator that the starch was relatively stable at low temperatures.

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