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Microwave Assisted Synthesis and Characterization of Acetate Derivative Cassava Starch

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Abstract: The aim of this study were to observe the possibility of application of microwave heating in the acetylation of cassava starch and to study the physicochemical properties of the starch acetate obtained. The acetylation was carried out by mixing native cassava starch with chloroacetic acid and sodium hydroxide of a certain weight ratio in a sealed container. The mixture was then sprayed with ethanol and heated using microwave power. The Degree of Substitution (DS), Reaction Efficiency (RE) and some physical properties of the acetylated starches were then analyzed. It was found that microwave assisted acetylation of cassava starch using chloroacetic acid can be done in a very short reaction time. The highest DS and RE obtained were 0.045 and 0.051%, respectively. Acetylation of cassava starch reduced gel hardness during storage. Acetylation also inhibits the retrogradation of starch gel. Cassava starch acetylation changed starch molecular motion, resulting in a decrease in the glass transition temperature. Amylopectin retrogradation was not significantly reduced, indicating that the degrees of modification of the starches in this study were too low to cause enough steric hindrance to prevent retrogradation. The modifications were done on native starch granules; they took place preferentially on the amylose fraction, not the amylopectin fraction, thus leaving amylopectin retrogradation was mostly unaffected. It can be concluded that microwave heating can be applied in the acetylation of cassava starch to obtain significant changes of the properties of starch.

Key words: Cassava starch, microwave, acetylation, physical properties

INTRODUCTION

Indonesia is one of the world's largest cassava producers and cassava has become the most economic source of starch in the country. Cassava starch is appreciated for its paste clarity, low gelatinization temperature, good gel stability and low tendency to syneresis (Sedas and Kubiak, 1994). However, it has disadvantages that would make it unsuitable for food systems and processing such as: narrow peak viscosity range, undesirable texture, poor stability and processing tolerance (Mali and Grossmann, 2001). Modification of native starches is therefore, necessary to improve their desirable functional properties (Han *et al*.,

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