UNIVERSITI TEKNOLOGI MARA

RHEOLOGICAL PROPERTIES OF CASSAVA STARCH-KAFFIR LIME FILM SOLUTION

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ABSTRACT

Rheological properties of biodegradable film are very important because it effects the final properties of film solutions. Rheological behaviour of cassava starch-kaffir lime film solutions was studied with the shear rate range of 1-50 s-1 at different concentration (3.0, 3.5, 4.0, 4.5 and 5.0 wt.%) and temperature (30, 40, 50, 60 and 70℃) using a controlled stress rheometer. To describe the rheological behaviour of film solutions, a power law model equation was used while for the effect of temperature, Arrhenius equation was used to evaluate. To determine the effect of starch concentration on viscosity, the exponential model was used. From this study, it is shows that the flow behaviour index (n) value decrease with the increasing of concentration where film solutions with various concentration shows shear-thinning or pseudoplastics behaviour. For consistency index (K) value, it is shows increasing with concentration while decreased with the increasing of temperature. The amount of starch and temperature effect the activation energy (Ea) of film solutions. It can be concluded that concentration of starch and temperature had a huge and significant effect on the rheology properties of cassava starch-kaffir lime film solutions.

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INTRODUCTION

1.1 Research Background

Biodegradable film solution or coating are widely used in the food preservation including packaging technology fields in various country. Biodegradable movies are characterized as a slight layer of material which can be utilized and gives an obstruction to dampness, oxygen and solute development for the sustenance. After a long period for the product to reach the consumer, a "fresh-like" quality of product will disappear and maybe not safe to eat anymore. With the application of biodegradable film as coating, the product is safe to eat and has acceptable taste, texture and appearance even after being removed from its natural environment (Huo, Savitskaya, Gotina, Reznikov, & Grinshpan, 2015). Biodegradable film is known for its useful application including to prevent loss of mixture and make a gleaming organic product surface for tasteful purposes (Paviath & Orts, 2009). Most food consumed come directly from nature. When these products were removed from its nature environment, rate of respiration changes immediately after processing and the product becoming immediately more perishable. With the increasing of demand for the products, it takes time for a food product to reach to the consumer. During that time, there are many steps involves including handling, storage and transportation and these long steps will makes the products start dehydrate, deteriorate, and lose appearance, flavour and nutritional value. (Paviath & Orts, 2009). Along these lines, for some sorts of sustenance, covering with biodegradable film is the best approaches to keep up their quality and wellbeing.

Different starch composition used in film-forming solution can affect the rheological properties of films solution. Starch is a natural polymer that can easily be cast into films. It consists of (1-4) linked α-D-glucopyranosyl unit, two kinds of chain are present in natural starch: amylopectin and amylose. The linear polymer, amylose, makes up about 20 wt.% of granules, and the branched polymer, amylopectin, the remainder. Amylose is crystalline and can have an average molecular weight as high as 500,000, while amylopectin is highly branched and have very high molecular weight (Abdou & Sorour, 2014). Cassava starch-based biodegradable film has a comparable mechanical properties with plastic and