

Physiochemical characteristics of alcohol-acid modified sago and rice starches

ABSTRACT

Native starch has limited applications. It has many disadvantages in industrial applications such as insolubility in cold water, loss of viscosity, and thickening power after cooking. In order to overcome these disadvantages, native starch is modified through physical, chemical or biotechnological techniques. Starch is one of the major components in sago but it had not been well explored to the same degree as maize or potato starch especially in the starch modification processes. In this study, the effects of alcohol-acid treatment on the physiochemical characteristics of sago and rice starches were investigated. Sago and rice starches were hydrolysed for 2 hours at 25 °C with hydrochloric acid in the presence of methanol, ethanol, and 2-propanol. They were characterized according to their granular structure, solubility, amylose content, gelatinization temperature and functional group. After treatment, presence of internal fissures or cavities was observed. The degradation activity increased corresponding to carbon number of alcohol. Results also showed that the gelatinization onset temperature (T_o), conclusion temperature (T_c) and peak temperature (T_p) increased with increasing carbon number of the alcohol. The T_p of starches was negatively correlated to the amylose content of starches before and after treatment ($r^2 = 0.954$ for rice and 0.945 for sago). Solubility increased profoundly after treatment and the degree of hydrolysis increased with the increase in carbon number of the alcohol. Rice starch was less soluble than sago starch due to higher amylose content. Rice starch was also found to be less susceptible to alcohol-acid degradation than sago starch, and the unstable properties of native starches improved with 50% increase in solubility at temperature 80 °C. Results concluded that alcohol-acid treatment of sago and rice starches provide a wide range of modified starches with better solubility, higher gelatinization temperatures but lower in amylose content.

Keyword: Alcohol-acid modification; Sago starch; Rice starch