MICROBIAL CONVERSION OF SAGO SUGARS INTO LACTIC ACID

Kopli Bujang
Director, Centre of Excellence for Sago Research (CoESAR)
Universiti Malaysia Sarawak, 94300 Kota Samarahan
Sarawak, Malaysia

INTRODUCTION

In Malaysia, most sago palm estates are found in Sarawak, where peat swamp covers about 75% of the state (Adeni and Bujang, 1998; Bujang *et al*., 2001). The number of sago palm plantations has increased due to emergence of subsidized plantations by the state government along with the existing wild stands in the coastal area. Sago palm (*Metroxylon sagu*) is able to thrive in swampy areas and grows naturally without the need for pesticide and herbicide (Pei-Lang *et al*., 2006).

In Sarawak, the production of sago starch is reported to be approximately 2-5 tons/ha and 10-25 tons/ha for uncultivated (wild) regions and sago palm plantation, respectively. In order to sustain the systematical exploration of sago resource along with providing sufficient amount of sago palm for increasing demand of sago starch in the global market, the state government of Sarawak has instigated two large plantations located at Dalat and Mukah districts at a total of 22,000 ha (Singhal *et al*., 2008).

Previous estimation revealed that a sago palm plantation can yield up to 25 tons of sago starch/yr/ha, contributing as the main starch source for the food and industrial products (Ishizaki, 1997). Sago starch is used in the production of food delicacies such as noodles, cookies, fish crackers, syrups, fructose and monosodium glutamate (MSG). Sago starch has also been used as adhesives and can be potentially used as the main substrate in the production of ethanol, lactic acid, kojic acid, cyclodextrin (CD) and biodegradable polymers (Bujang and Ahmad, 2000; Singhal *et al*., 2008.).

ENZYMATIC HYDROLYSIS OF SAGO STARCH

Between the years 1998 to 2000, numerous researches on the enzymatic hydrolysis of sago starch into sago sugars was performed at UNIMAS at lab-scale levels. The hydrolysis were executed using different parameters as in pH of the liquefaction and saccharification mixtures, starch concentrations and hydrolysis of different types of starch, and comparing these with sago starch.

Enzymatic hydrolysis was performed using the enzymes (Novo) Termamyl-120L (a thermostable α-amylase from *Bacillus licheniformis,* 120 KNU/g) and Dextrozyme (a mixture of glucoamylase from *Aspergillus niger* and pullulanase from *Bacillus acidopullulyticus,* 225 AGU/ml). Liquefaction was carried out by adding 0.5μl Termamyl -120L (per gram of starch) to the starch slurry (at different concentrations and pH) and incubated at 90^{o}C for 2hr. For saccharification, 0.6μl Dextrozyme (per gram of starch) was added to the liquefied