Comparisons of the physicochemical and functional properties of commercially and traditionally processed sago starch

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Abstract. Commercial sago starch was obtained from nearby supermarket while traditional sago starch (lemantak) was obtained from local wet-market. In this study, the physicochemical (moisture content, colour, particle size and microstructure) and functional properties (FT-IR spectrometer) of both types of starch were compared. Traditional sago starch (lemantak) exhibits moisture content two times higher than the commercial sago starch. Providing that commercial sago flour has been bleached in the factory, its LAB value also shows higher value than lemantak. Moreover, the particle size of sago flour is also smaller than lemantak, as the effect of multiple-refining in the factory. Meanwhile, the microstructural analysis shows significant difference that is cluster-form-granule in lemantak and disassociated-form-granule in commercial sago flour, which proof that commercial sago flour has been in an extensive process. Finally, the FT-IR results indicated that both sago flour and lemantak has similar spectrometer patterns but differ in the peak intensities, which also indicates the changes in functional properties of sago flour. Results obtained here show that the modern processing equipment as well as the chemical and drying treatment in factory, had led to the loss in some of the purity and functional characteristic in sago starch.

1 Introduction

Sago starch, derives from the stem of sago palm (*Metroxylon sagu*) or commonly called as "rumbia"; a tropical plant with huge trunk that may reach height up to 25 m and a diameter of 40cm; with pinnate-leaves up to 9 m long; though can tolerate wet-swampy lands such as peat soil (flood-immuned); however, it reaches commercial maturity after 9 to 12 years of planting (Karim, Tie, Manan, & Zaidul, 2008). According to Singhal et al. (2008), sago palm has been known as the highest in productivity among the starchy crops in the world (250kg per palm) and also considered as the 'starch crop of the 21st century' by many scientists, as it is economically acceptable, environmentally friendly, and it promotes a socially stable agroforestry system. Sago starch contains mainly carbohydrate, which is higher than rice and wheat flour; therefore, it has becomes the staple food since ancient times, It is an important raw materials in food industry, especially in Asian region.

In the food industry level, it is predicted that demand of sago in the future will increase as it has becomes an important raw food material (Articles & Issues, 2016). Malaysia is one of the world's leading sago producer, while Sarawak is the largest sago-growing areas in Malaysia. Until year 2000, there are 21 modern sago processing plants all around Sarawak (Palm, 2016). In addition to sago industry in Sarawak, it is the only state in Malaysia known to produce sago starch both commercially with modern techniques and traditionally for local needs (Shin & Collins, 2015). However, these modern sago processing plants had slowly wiped-out the production of traditional sago starch called "lemantak", a wet-type sago flour (Palm, 2016). This may be due to the low quality standards of 'lemantak' produced by local people. The raw material of both materials is the same but 'Lemantak' that is mixed with warm water will produce certain viscosity, which cannot be obtained using the commercial sago flour. This characteristic of 'lemantak' making it becomes favourable than the commercial sago flour among users for certain application. Sago flour is not only used as food, but also used in the processing of glue cosmetics. Hence, understanding the characteristics of sago flour, which may be influenced by the processing steps, can be important that will determine its appropriate applications.

The principles and methods in commercial sago processing are quite similar with the methods used in traditional level, but differing in the scale of operation and drying stage. The commercial sago flour manufacturer needs to meet the Malaysian standard for food product, therefore, some technique's modification as well as new technologies had been adapted in sago processing (Karim et al., 2008). In brief, the processing of sago started by feeding a segment of sago log into a slicer to separate

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