Development of Sago Starch Processing Equipment

Indonesia has the largest potential of sago palm (*Metroxylon sagu*) in the world with the total area of about 1,471,232 ha. The sago starch production potential in this country is about 12,035,555 tons/year, however, the sago starch production and utilization is very low comparing with its potential. This is because of farmers in this area still use traditional method to process sago starch which are inefficient and ineffective. The most time consuming and labor intensive stages of sago starch processing are pith disintegration and starch extraction. The objective of this study was to develop mechanical sago starch processing equipment which consists of sago rasper and sago starch extractor in order to improve their performance.

In the first experiment which is aimed to develop cylinder type of sago rasper, five levels of cylinder rotation speed i.e. 745 rpm, 1490 rpm, 2235 rpm, 2980 rpm and 3725 rpm, and three levels of teeth density i.e. 2.2 cm × 2 cm, 2.2 cm × 3 cm, 2.2 cm × 4 cm were examined. The rasping performance test was carried out by measuring torque requirement, rasping efficiency, starch percentage, starch yield, power requirement and starch yield efficiency. The experimental results showed that the higher the cylinder rotation speed, the lower the rasping torque requirement, while the higher the cylinder’s teeth density the larger the rasping torque requirement. The highest rasping efficiency (378.53 kg/hour) was achieved under experimental condition at teeth density 2.2 cm × 4 cm with cylinder rotation speed of 2235 rpm; The highest starch percentage (26.44%) was obtained at experimental condition at teeth density 2.2 cm × 4 cm with cylinder rotation speed of 1490 rpm; The highest starch yield was 84.94 kg/hour resulted under experimental condition at teeth density of 2.2 cm × 4 cm with cylinder rotation speed of 2235 rpm. The highest starch yield efficiency (92 kg/kWh) was obtained at the condition of teeth density 2.2 cm × 3 cm with cylinder rotation speed of 1490 rpm. Therefore, teeth density 2.2 cm × 4 cm with cylinder rotation speed of 2235 rpm is recommended for rasping operation.

Second experiment was purposed to develop stirrer rotary blade type of sago starch extractor. In the experiment, three levels of stirrer blades rotating speed i.e. 100 rpm, 150 rpm and 200 rpm, and four levels of stationary blade numbers i.e. no blade, 4 blades, 8 blades, and 12 blades were examined. The extractor performance test was carried out by measuring extraction rate,
starch percentage, starch yield, and starch left in sago pith waste. Results showed that the higher the rotating speed the higher the extraction rate, starch percentage, and starch yield. Meanwhile, the higher the rotating speed the lower the starch left in sago pith waste. Likewise, the greater the number of stationary blade the higher the extraction rate, starch percentage, and starch yield while the starch left in sago pith waste was lower. The highest extraction rate of 491 kg/hour, starch percentage of 20.54 %, and starch yield of 101 kg/hour and not at all starch left in waste was resulted at the condition of 12 stationary blades and rotating speed of 200 rpm. Therefore, the best condition to achieve highest extraction performance was 12 stationary blades and rotating speed of 200 rpm.

From this study it can be concluded that the developed sago starch processing equipment both sago rasper and sago starch extractor work properly and have higher performance compared with previous prototype.