

The Effect of Whitening Chemical Properties on the Sago Starch Quality in Southeast Sulawesi Indonesia

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Abstract : Sago starch is a staple food in eastern Indonesia and the second staple food after rice so that it becomes favorite local food. But the rate of consuming sago as staple food decrease drastically for the last few year. One of the reason is because of poor quality and not-hygienic sago starch that sold in local market. Poor quality and not hygienic sago starch product is caused by low water quality that uses in the extraction process. Besides that, most of sago supply in the local market is in the form of wet sago. Wet sago has a disadvantage because easy to decrease of quality, taste, and color. So that the improvement and increasing sago starch quality is very important to supply good and health sago starch to fulfill the market need with the high quality of sago starch.

Keywords : sago, staple food, traditional food, whitening, sago starch.

Introduction

Sago palm is a plant that producing carbohydrate as a staple food in eastern Indonesia^{1,2,3} and sometimes it is consumed in combination with red rice⁴. Sago palm is tropical perishable staple foods⁵, an important crop for the starch industry in Southeast Asia^{6,7,8} and the largest sago palm areas is in Indonesia⁹.

Sago starch is an industrial raw material for food industry such as glucose^{10,11}, fructose syrup¹², liquid sugar^{13,14,15} and food flavoring in various food products^{16,17,18,19}. It's also used for non-food industry like bioethanol^{20,21,22,23}, biobutanol^{7,24} and degradable plastics^{25,26}.

Sago starch, however, has not fully exploited because of its low quality²⁷ and one of the most important factors determines the quality of sago starch it is the color. Sago starch produced sometimes has a brown color, due to the browning of the pith. When the pith is chopped to extract the starch, it displays a strong brown color, a starch granule becomes deteriorate, a brownish starch produced and is not suitable for using in industry or other commercial use²⁸. The acceptance and the value of sago starch depend on the quality and particularly depend on its color^{29,30}.

Sago starches extracted from different ecosystems and also different extraction method will vary in color and in its quality. Browning has an important role in deterioration quality of sago starch and has been associated

with the low market opportunity^{27,28,31,32}. The quality of sago starch depends on the quality of sago log and handling extraction^{29,30}.

There are two places sometimes where the browning take place, when debarked of sago pith and when the sago starch extracted. Sago palm when it is debarked, its undergo pink discoloration, followed by the development of brown pigments, when the pith was wounded^{29,30}. The pink discoloration intensity was influenced by the extent of the wounding on the trunk. The deeper and larger the wounds, the widespread of the pink discoloration on the pith more intense^{29,30}. There is a correlation between the color of sago starch and the characteristics of ecosystems where the sago palm grown and harvested^{29,30}. The sago palms grown in fresh water swamp under acidic conditions and high concentrations sulfur in soil yielded the brown sago starch and has a high ash content.

Most of the sago starch marketing in eastern Indonesia especially in Southeast Sulawesi in the kind of wet sago, while the marketing of dried sago is very limited. The commercial sago starches in Southeast Sulawesi has variable and different quality depending upon the ecosystem where the sago palm grew and the extraction process. Much of sago starch marketing has low and poor quality, because of the improper method of extracting, especially in using of non-healthy and sanitary water and facility. Sago starch yielded looks brown and poor quality because of enzymatic browning reactions mediated by polyphenol oxidases and peroxidases²⁸.

The browning reaction occurs when the cell is ruptured and the indigenous phenol compounds are oxidized in the presence of oxygen^{33,34}. Consequently, consumer acceptability to the sago starch is very limited, because the sago starch must give the pre-treatment before it can be used as a staple food or other commercial use.

Several studies have done to improve the quality of sago starch thru the optimization of extraction method and giving pre-treatment on sago starch extracted to prevent the browning, including the choice of whitening formula and drying method.

Experimental

1. Material

The wet sago starch is used come from the traditional process of extraction in Southeast Sulawesi. The wet sago starch first was clean manually several times. After that, the sago starch is whitening using differently formulated water containing sulfur and salt as chemical properties with a different condition. Then sago starch was dried and analyzed.

2. Proximate analyses

The proximate analyses of sago starch it is including the moisture content, ash, crude fiber, color, and particle size were determined as specified by The Indonesian National Standard (SNI) developed by Ministry of Industry Republic of Indonesia.

3. Ash Analyses

Analyses of an ash content of the samples of the sago starch were determined by employing a gravimetric method, base on the Standard American Association of Cereal Chemists (ACCI Method 08-01.01 Ash - Basic Method). The analyses result were compared to those of industrial grade, according to The Indonesian National Standard (SNI) 01-3729-1995 as the standard of reference.

Results and Discussion

1. Quality of Sago Starch

The quality of sago starch is increased as a result of different treatment of whitening formula and chemical compound properties. Research show that the whitening formula has significant in increasing sago starch quality in term of ash content ($F_{\text{value}}=13.62$, $Pr > F 0.001$) and fiber content ($F_{\text{value}}=421.39$, $Pr > F 0.0001$) as displayed in Tabel 1.

Table 1. The effect of a different kind of whitening formula on ash and fiber content of sago starch

No.	Treatment	Weight (gr)	Ash Content (%) w/w	Fiber Content (%) w/w
1.	NaCl	0.5	0.25	0.21
		1.0	0.40	0.27
		1.5	0.95	0.27
2.	Na. Sulphit	0.5	0.29	0.12
		1.0	0.24	0.13
		1.5	0.44	0.18
3.	Chlorine	0.5	0.04	0.32
		1.0	0.72	0.44
		1.5	1.23	0.44

2. Whitening Degrees

The whitening degrees of sago starch is increased as a result of different treatment of whitening formula. The result shows that the whitening formula has a significant effect in increasing sago starch quality in term of whitening degrees ($F_{\text{value}}=10.90$, $Pr > F$ 0.0001) as displayed in Table 2.

Table 2. The effect of different kind of chemical properties to whitening degrees of sago starch

Treatment	Concentration		
	0.50%	1.00%	1.50%
NaCl	91.63	90.63	90.88
Na ₂ S ₂ O ₅	85.13	87.55	89.08
Chlorine	88.93	91.90	86.63
Control	83.25	83.40	83.83

4. Conclusion

The whitening formula has a significant effect on the increasing of sago starch quality, in term of ash content, fiber content and degrees of whitening. The consumer acceptability of sago starch also increases, as a result of increasing in quality especially on the improvement of sago starch color.

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