

Chapter 4

Physicochemical Characteristics of Indonesian Native Starch

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ABSTRACT

Indonesia has many local starch sources, including rice, taro, arrowroot, sago, corn, konjac, cassava, and elephant foot yam (suweg). Several uses of natural starch have been widely used as the primary raw material or as a food additive. Natural starch generally has some drawbacks limiting its use, such as color, solubility index, retrogradation, and paste stability. Starch modification is needed to improve these limitations. Starch modification is carried out physically and chemically. In this chapter, the authors will discuss the physical and chemical characteristics of several local Indonesian starches, both natural and modified, and their potential to be developed as food ingredients.

DOI: 10.4018/978-1-6684-5629-3.ch004

INTRODUCTION

Starch is a carbohydrate polymer used as the primary source of calories for consumption. Apart from being used as a food ingredient, starch may act as a gelling agent, thickener, foam and emulsion stabilizer, battered and breaded, binder, crispy texture maker, clouding stabilizer, and flavor encapsulant. Starch could also be employed in the paper, textile, and pharmaceutical industries. Various plant sources of starch, such as rice, taro, arrowroot, sago, corn, konjac, cassava, and elephant foot yam (suweg), are growing a lot in Indonesia. They respectively produce starch with different properties. This chapter reviews the physicochemical characterization of several Indonesian starch plants and their roles in controlling food processing. The scientific information from this chapter is expected to enrich the study of starch sources worldwide.

Rice (*Oryza sativa*)

Rice is a carbohydrate source and a staple food for most Indonesians. Rice is mainly consumed as cooked polished grains, whereas rice flour is used as an ingredient in many Indonesian cuisines. Starch is the most significant component in rice grains and determines the quality of rice products. The starch content in rice is in the range of 80% (Hasjim et al., 2013).

Gelatinization characteristic is considered one of the essential properties in evaluating rice starch properties. In particular, gelatinization is the most crucial rheological indicator of the quality characteristics of rice cooking and processing. Amylose content and branch chain length distribution have also been found to impact rice starch's swelling and pasting properties substantially. Rice starch granules with high amylose content act as swelling inhibitors. Amylopectin contributes to swelling, while amylose and amylose-lipid complex inhibit swelling. In addition, low swelling levels and solubility tend to increase with the increasing temperature of amylose molecules in rice. Studies show that a higher level of long chain amylopectin in rice starch is associated with firmer rice after cooking. Retrogradation was also found higher in rice starch with a longer amylopectin chain (Yoon et al., 2012).

Taro (*Colocasia esculenta*)

Taro has a starch content of about 80%. The characteristics of taro starch have been evaluated based on swelling power and solubility index. The swelling behavior of starch can be influenced by amylose and amylopectin compositions. According to Aboubakar et al. (2008), the swelling power of taro starch will increase along with starch cooking level, indicated by an increase in Water Absorption Capacity (WAC).

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