

## PERCEIVED QUALITY OF COCONUT SUGAR BY PRODUCERS, TRADERS AND DOWNSTREAM INDUSTRIES IN INDRAGIRI HILIR DISTRICT, RIAU PROVINCE, INDONESIA

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### ABSTRACT

*Coconut sugar (gula kelapa) production is a common economic activity of coconut farmers in the Indragiri Hilir District. It is concentrated in the Tempuling sub-district. The producers have low bargaining positions compared to that of the traders or wholesalers. Producers' lack of knowledge about end-consumers' perceptions of good quality coconut sugar makes the situation worse. The study was aimed at identifying the perceived quality by the producers, traders and buyers of coconut sugar. Aspects of quality assessed were colour, texture, aroma, flavour, hygiene, weight, shape, shelf-life and packaging. In general, the producers, traders and industries shared similar quality perceptions of coconut sugar which is similar to the Industrial Standard of Indonesia (SII). However, there were differences in colour preferences. The majority of producers preferred pale colour coconut sugar while the majority of the traders and industries preferred reddish brown coconut sugar. These findings offer guidelines for the producers to reconsider the use of sodium metabisulphite which has been used to enhance pale-colour coconut sugar.*

**Keywords:** Brown sugar, coconut sugar, perceived quality, consumer preference, *gula kelapa*, SII

### INTRODUCTION

Coconut sugar (coco sap sugar, brown sugar or *gula kelapa*) is produced from fresh coconut sap, which is tapped from the coconut flower stalks and boiled (Prakobsil et al., 2010). This type of sugar has been widely used as an ingredient in daily food and beverages in Asian communities (Singsoong et al., 2010). Although there are other kinds of palm sugar such as *arenga* sugar and *nypa* sugar, coconut sugar is the most popular one. According to Prihatini (2008), it serves as a sweetener with a distinctive flavour which is not easily substituted by other kinds of sugars. It also serves as a natural brown colouring agent for a variety of food and beverages.

Coconut sugar is getting more attention nowadays due to worldwide interest in traditional taste and research findings about new health facts of sugar, especially organic palm sugar.

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Coconut sugar has a low Glycaemic Index (GI) so it is good for diabetics and suitable for weight maintenance (Agribusinessweek, 2008; Philippine Coconut Authority, 2004). Some coconut sugar producing countries are Malaysia, Thailand, Philippines, Cambodia, India and Indonesia.

Coconut trees grow all over Indonesia, in plantation areas or around the houses. Most of the trees (97%) belong to small-scale farmers with average area of one hectare per household (Budianto & Allorerung, 2003 in Supadi & Nurmanaf, 2006). Riau Province in Sumatra is the largest coconut centre in Indonesia covering 547 hectares, producing about 630 tonnes of coconut a year. In this province, the coconut plantation area with the highest production is Indragiri Hilir District. In 2005, this district had 448 hectares of coconut planted area comprising 82 per cent of the total coconut planted area in Riau province, contributing 479 tonnes (73% of the total coconut production in the district) (Central Bureau of Statistics, 2006).

Nowadays, the coconut farmers mostly still rely on copra-based products with a lower price in the market. Therefore, for the last 30 years, there is no significant improvement on the income of coconut farmers. In such condition, coconut sugar production provides opportunity for the coconut farmers as it can provide relatively better income than that of copra-based products for small scale farmers (Tarigans, 2005; Damanik, 2007).

Coconut sugar production is a family economic activity of the majority of coconut farmers in Indragiri Hilir District which is mostly concentrated in Tempuling sub-district. In spite of the relatively better income, the coconut sugar producers still live in poverty. This condition is partly related to very low bargaining position of producers compared to the power of intermediate sellers or wholesalers (*tokel/tengkulak*).

Almost all coconut sugar produced is distributed through intermediate sellers who are the price-makers (Romdhon, 2003; Anonymous, 2008; Maharani, Edwina & Kusumawaty, 2009). Previous research in Indragiri Hilir District indicated when traders are the price makers and coconut sugar producers face monopsony market, price transmission to producers will not occur even though the price in higher level market increases. This condition will decrease producers' revenue and will increase poverty (Aris, 2011).

Another problem in coconut sugar production is quality. In terms of exported sugar, problems of the quality are the use of sodium bisulphite and product type. Most producers make ordinary brown sugar while worldwide market needs crystallized sugar. In terms of local consumption, the problem is the use of chemical preservatives which started about 20 years ago to replace natural preservatives (Kompas, 2003). This affects sugar attributes such as colour, taste and shelf-life. It may relate to producers' lack of knowledge in good quality attributes according to end-consumers and industries.

Improving the market opportunity by improving the quality of coconut sugar should take into account the consumers' perception of quality. Consumers' acceptance of coconut sugar is determined by the quality conformance of products to their needs. Previous research by Maharani et al. (2009) on the local consumers' attitudes toward Tempuling coconut sugar indicates a difference in perception of quality. Some consumers prefer darker-coloured

(brown) coconut sugar while others prefer light-coloured (yellowish) coconut sugar. The description of product quality must be tailored to the criteria of quality desired by consumers. One important source of information is the existing marketing institutions, such as brokers/traders who act as intermediaries between producers and consumers. Besides the traders' point of view, it is also important to identify the quality criteria according to industrial consumers as the end-users of coconut sugar, as these industries have a significant role in absorbing the products.

Therefore, this study was aimed at identifying the description of quality according to traders and industrial consumers (small-scale traditional food industries) of coconut sugar. The criteria will be of great value to keep the farmer-producers informed of what is expected from their coconut sugar product. Having known the expected criteria, the producers will be motivated to improve the product quality. With better quality, including longer shelf-life, producers will have more opportunity to find other traders/customers to sell their products at better prices or have better bargaining positions towards a more prosperous condition.

## **LITERATURE REVIEW**

### **Coconut Sugar Industry**

Coconut sugar production in Indragiri Hilir District is a common source of income for many of the local households. In this district, Tempuling sub-district is the production centre of coconut sugar. Similarly in many other Asian countries, most production of coconut sugar is a traditional production which is on small scale, and the steps and methods relying on experience or indigenous knowledge (Prakobsil et al., 2010). Coconut sugar is a prospective product due to high demand for domestic use and export. According to Disperindag of Riau Province (2009), the demand for coconut sugar in Riau Province was 30,000 tonnes for 2009 while monthly demand was 5,000-6,000 tonnes.

The main markets for the coconut sugar industry are industrial customers and households. The approximate percentage for households is 50 per cent, sweet soy sauce industry 30 per cent, food industry 10 per cent and other industry 10 per cent. Almost all production, high or low quality are absorbed by the markets. Low-quality coconut sugar is commonly supplied to the sweet soy sauce industry. Indonesian coconut sugar is exported to some countries such as Japan, Canada, The Netherlands, Germany, Singapore and Saudi Arabia. The demand from Japan is 200 tonnes per month, which can only be fulfilled 26 tonnes each month or 13 per cent of the total demand (Regional Management Barlingmascakeb, 2011).

In the Tempuling production centre of Riau Province, the production process starts with filtering the previously tapped fresh coconut sap. The sap is boiled and then stirred occasionally for about 2-4 hours to evaporate the water. The boiling time depends on the quantity of the sap cooked in a large metal wok. When the cooked sap becomes very sticky with brownish colour, it is moulded in dried bamboo tubes until the texture becomes hard. The cylindrical coconut sugar is ready to be taken out of the moulds to be packed. The products will be arranged vertically in a large clear plastic bag of 25 kilograms (local term: *kampit*).

In the process of tapping the sap in the Tempuling sub-district, producers use sodium metabisulphite and *resak* wood chips as preservatives. According to Richter and Dallwitz (2000), *resak* wood (*Cotylelobium* spp.) is a kind of commercial timber with brown red colour. The doses of both preservatives vary among the producers; however, many of the producers applied about 1.5 teaspoons of sodium metabisulphite combined with 1 tablespoon of *resak* wood chips into the sap containers (jerry cans). Similarly, coconut sugar production in Thailand is also modernized with the use of chemical preservatives to prevent the coconut sap from deterioration (Singsoong et al., 2010).

### **Coconut Sugar Quality**

The high demand for coconut sugar in the local and export markets has not been supported by product quality. Previous research in Java showed that the use of sodium metabisulphite by coconut sugar producers exceeded the maximum threshold, which can certainly cause negative effects to the health of consumers. However, there is an opportunity for an alternative preservative, as based on organoleptic tests carried out, coconut sugar with the addition of 150 ppm sodium benzoate is the preferred palm sugar for consumers in terms of texture and flavour (Christian, 2011).

In general, coconut sugar quality in the market is determined by the aspects of colour and shelf-life. Well-regarded coconut sugar is reddish brown, while those considered to be of poor quality is dark (blackish) or white. Good quality coconut sugar lasts up to two months if tightly wrapped in plastic, while the low-quality coconut sugar will melt after one month. Quality is affected by the freshness of palm sugar sap, cooking and the use of preservatives. Longer cooking time and excessive use of natural preservative (limestone) resulted in blackish coloured sugar, while the use of chemical preservatives (sodium metabisulphite) resulted in pale/white coloured sugar (Kompas, 2003).

According to the Indonesian Government, the standard of quality for coconut sugar covers the physical appearance, aroma and taste, and chemical content such as water and sucrose. The standard does not specify a particular shape of coconut sugar, as long as it is in proper and normal solid (firm) condition. The colour can also vary from yellowish brown to brown, while the taste and aroma are expected to be natural. The standard code is the Industrial Standard of Indonesia (SII) 0268-85 (Table 1) which is the revised version of SII 0286-80.

There are many variations of traditional coconut sugar production which affect its overall quality. Problems in the production processes are generally caused by lack of knowledge of the producers about good manufacturing techniques (Hori, Surjoseputro, Purnomo, Foe, & Hashimura, 2001). In the majority of the coconut sugar production areas, the production process has not been standardized among the small scale producers. A producer might produce different quality of coconut sugar in different times due to internal and external factors (Supomo, 2007).

According to Susilo (2008), this is also the case with the quality of coconut sugar in the Tempuling production centre. In terms of size, coconut sugar produced is also not uniform, because producers use dried bamboo tubes of different diameters as moulds to shape the

sugar. The colour, flavour and texture also vary depending on the length of cooking and the use of sap preservatives. Another quality problem is the presence of contaminants in the sugar produced. The coconut sugar often contains the remains of *resak* wood chips (used as natural preservatives), coconut pulp and clay.

**Table 1: Standard of Quality for Coconut Sugar of SII 0268-85**

No.	Quality Criteria	Requirements
1	Appearance	
	Shape	Normal solid condition
	Colour	Yellowish brown to brown
2	Taste and aroma	Specific
3	Water	Maximum 10%
4	Ash	Maximum 2%
5	Sugar as sucrose	Minimum 77%
6	Water insoluble part	Minimum 1%
7	SO <sub>2</sub> residue	Maximum 300 mg/kg

Source: SPFS (2007)

However, most producers only have marketing access through the village level traders where there is no price difference for low and high quality products. This condition provides no motivation for the producers to improve the product quality as they can still sell lower-quality sugar to the traders at the same price as high quality sugar. In the long term, this poor quality will give impact on the perception of consumers towards coconut sugar from Tempuling area (Susilo, 2008).

## METHODOLOGY

From the literature review, it became apparent that there was a paucity of information regarding the coconut palm sugar industry in general and quality assessment of coconut sugar in particular. According to Chamhuri (2011), in the absence of any empirical literature, an initial qualitative research approach was considered to be the most appropriate means of addressing the research problems. The primary data was collected by interviews using questionnaires with coconut sugar producers/farmers, traders and industrial customers (food industries). The questionnaire was developed by the authors based on their previous research (Maharani et al., 2009). The questionnaire assessed the quality aspects of coconut sugar which were colour, texture, aroma, flavour, hygiene, weight, shape, shelf-life (durability) and packaging.

Research was conducted in the Tempuling sub-district, Indragiri Hilir District of Riau Province. The justification to choose this location is that this area is the centre of coconut sugar agro-industry in Riau Province. The research was conducted over one year starting from November 2009 to November 2010. In the Tempuling area, Tunas Jaya Village was chosen purposively as it is the area with the most producers (with the population of 154 producers from the total of 273 producers).

This research used a sampling frame of 32 producers (20% of the 154 producers). Sample was drawn from the population using snowball sampling. For traders and industrial consumers, the respondents were also gathered by snowball sampling with the producers as the starting point. The snowball sampling is most applicable in small population which is difficult to access (Wilson 2010). For this research, there was no data available regarding the contact for producers, traders and industrial customers for coconut sugar. There were 7 traders and 5 local traditional food industries interviewed.

## FINDINGS

This section will describe quality description of coconut sugar based on the perceptions of the farmer-producers, traders and industrial customers or small scale traditional food industry (Table 2).

**Table 2: Comparison of Coconut Sugar Quality Description**

<b>Quality Criteria</b>	<b>Producers</b>	<b>Traders</b>	<b>Industrial Consumers (food industry)</b>	<b>National Standard</b>
<b>Colour</b>	pale colour yellowish brown (40%) reddish brown (38%)	reddish brown (60%)	dark reddish colour, dark brown or yellowish and reddish brown according to food product colour which is required	yellowish brown to brown
<b>Aroma</b>	typical and natural fragrance	natural distinctive aroma	natural distinctive aroma	naturally typical
<b>Texture</b>	tough and sandy / brittle, easy to cut	hard, dry and not mushy	brittle texture (sandy), easy to cut	normal solid condition
<b>Taste/ flavour</b>	typical and natural sweetness	natural sweet flavour	natural sweet taste	naturally typical
<b>Weight</b>	light weight / small portion	light weight	light weight (small to medium size)	unspecified
<b>Shape</b>	small cylindrical (not uniform in diameter)	smaller cylindrical	cylindrical	unspecified
<b>Durability</b>	2 months	2-6 months	2 months	unspecified
<b>Packaging</b>	clear plastic bag	clear plastic bag	clear plastic bag	unspecified
<b>Hygiene</b>	pay less attention to the hygiene of production	clean, not mixed with external non-food objects	clean, contaminant-free	unspecified

### Quality Description of Coconut Sugar According to the Producers

In general, the coconut sugar produced in the Tempuling area by the different producers is quite homogenous. Quality of sugar produced is determined by several factors, among others are the quality of coconut sap, preservative (sodium metabisulphite and *resak* wood), technical capability and weather condition. According to the producers, the colour of the sugar they produce quite diverged, but most of the producers prefer pale coloured coconut sugar, which is yellowish brown (40%) or reddish brown (38%).

The colour of coconut sugar can be influenced by various factors such as preservatives and duration of cooking. Longer cooking time will also affect the colour of coconut sugar as it will result in black/darker coloured sugar. The more wood preservative used, the darker the colour of the sugar, while the addition of chemical preservatives (sodium metabisulphite) tends to produce coconut sugar with pale (yellowish) colour.

The producers in the Tempuling area often use excessive sodium metabisulphite powder to produce pale coconut sugar that they prefer. They probably get the result they intend to, but this preservative will reduce the natural fragrance of the sugar, causing a slightly bitter taste and shorter shelf-life as it will melt quickly. The other concern is the sulphite residue in the product which will probably be over the limit of SO<sub>2</sub> residue permitted by the national quality standard (cf. Table 1). This restriction is due to the possible health risks of sulphites. The sulphite sensitivities can manifest in symptoms as mild as a headache or as severe as breathing difficulty (McMilan, 2011).

In general, producers of coconut sugar have the opinion that good quality coconut sugar has tough and sandy texture. Tough texture will affect the shelf-life because it does not melt quickly while the sandy texture of coconut sugar leads to brittle texture and can be easily cut. Referring to the aroma and flavour, the producers consider typical and natural fragrance and sweetness of coconut sugar as the criteria of good quality sugar.

Hygiene is important in the production of coconut sugar. The sap-tapping container used must be clean to produce quality coconut sugar. The majority of producers mentioned that coconut sugar should be clean from any contamination. However, they are paying less attention to hygiene in the production process. Most of them do not clean the sap container regularly and do not filter the fresh sap so contaminants are often found in the coconut sugar produced.

In terms of weight, coconut sugar producers prefer smaller light weight sugar as the light weight makes it easy for packing and transportation. Based on the shape, the coconut sugar produced in the Tempuling area is cylindrical as the moulds used are made of bamboo. The producers think cylindrical sugar is a suitable shape as they are familiar with this shape. Dried bamboo moulds are heat resistant, non-sticky and it is easily available in nature.

The coconut sugar is usually stored in clear plastic bags to protect from open air exposure, as this exposure will cause melting of the sugar. Coconut sugar producers generally assume that good quality sugar will stay in a good condition for about two months. The use of plastic packaging is considered quite effective because it can protect the sugar from



the open air; it is easily available and relatively inexpensive. Good quality coconut sugar will have the shelf-life of about two months if properly packaged.

### **Quality Description of Coconut Sugar According to the Traders**

The marketing agencies involved in the marketing of coconut sugar in Indragiri Hilir District are composed of village-level traders, large-scale traders, wholesalers and retailers. Each trader has a different description of good quality coconut sugar. In general, there are differences between traders' and producers' descriptions of the colour of good quality coconut sugar. The majority of traders (60%) prefer reddish brown colour whereas the majority of producers (40%) choose yellowish colour.

The term of quality for coconut sugar colour according to the Industrial Standard of Indonesia (SII) is yellowish brown to brown. At the village level, these differences are acceptable and do not affect the selling price of coconut sugar. This is because each customer has different colour criteria, such as wholesalers for export to Singapore who prefer pale colour coconut sugar while the wholesalers from Tanjung Pinang, Batam and Pekanbaru areas prefer reddish brown coconut sugar.

The texture of coconut sugar which is considered good by the traders is hard, dry and not mushy. This is consistent with the description of the quality of sugar palm by producers as well as other standards by Liptan (1993), which classified the hard palm sugar into superior quality. Referring to aroma and flavour, natural distinctive aroma and sweet flavour are preferred. Based on the requirements of SII, the aroma and taste of coconut sugar are naturally typical, because it is difficult to definitively describe the resulting aroma and taste of coconut sugar. The aroma and flavour of coconut sugar are distinctive so it is hard to be replaced by other types of sugars.

Cleanliness is a very important factor to consider at different levels of production, ranging from tapping the coconut sap to packaging and distribution. All traders require clean palm sugar which is free from various contaminants. However, one of the problems faced by the coconut sugar producers is low quality coconut sugar because it is mixed with external non-food objects. Actually the producers are aware that cleanliness is a good quality criterion for coconut sugar, but in fact, some producers were found to put intentionally some materials such as clay, beetles, coconut pulp, and wood chips into the coconut sugar to increase the weight of the products.

In terms of weight and size of coconut sugar, some traders prefer smaller size coconut sugar which is lightweight, as it has better texture. In fact, in the Tempuling area, the majority of the coconut sugar units produced is generally large and heavy. This is due to the producers' effort to put all the sugar cooked into larger bamboo moulds so as not to harden in the cooking wok before it is shaped. The bamboo moulds resulted in cylindrical shape which suits the preference of the traders and producers. In the SII standard, the required appearance is normal solid coconut sugar, but the shape is not specified.

The other factor considered is the smooth appearance (no white spots at the surface). The village level traders do not make any price differentiation between high and low quality



coconut sugar in terms of appearance. However, the wholesalers require visually appealing products without the white spots. If the coconut sugar has a blemished appearance, it will be separated and the price will be reduced by IDR 100 - 200 per kg.

The durability (shelf-life) of coconut sugar varies, according to the traders. Good quality coconut sugar can have a shelf-life of two to six months, which is also supported by effective packaging. According to the traders, the suitable packaging is clear plastic bags for ease of packaging, ability to be closed tightly and relatively cheaper price. The SII standard does not specify requirements for packaging.

### **Quality Description of Coconut Sugar According to the Industrial Customers (Food Industry)**

For the downstream food industries that use coconut sugar as an ingredient for different varieties of traditional snack foods, colour is the most significant factor which will give impact on the end result of their food products. For example, the *Dodol* (sweet semi-solid traditional snack) industry prefers dark reddish colour to produce an attractive product. Meanwhile, sweet and sour peanut and ring-shaped cookie industries prefer yellowish and reddish brown as the most suitable colour for their snacks. For the sweet black cake industry, the coconut sugar preferred is dark brown to get the desirable colour for the cake.

The range of colours preferred by the food industries are red, yellow and brown. However, the coconut sugar producers are not aware of these as the majority of producers (40%) think that the best quality is yellowish/cream coloured coconut sugar while the majority of food industries (60%) preferred reddish coconut sugar. Both of these preferences are in accordance with the Industrial Standard of Indonesia (SII) which requires coconut sugar of yellowish brown to brown colours.

In terms of texture, almost all of the industries considered that brittle texture (sandy) coconut sugar, which is tough but easy to cut are the characteristics of good quality coconut sugar. These characteristics suit the description of the texture by the producers and traders as well as Liptan (1993), which classified the hard-texture coconut sugar as superior-grade sugar.

In terms of aroma, coconut sugar does have a distinctive aroma. This is in accordance with the opinion of industry owners who consider the natural distinctive aroma as the best aroma of coconut sugar. This also suits the description of the scent of coconut sugar by producers and traders. In relation to the aroma, taste is also important for the industries in selecting the coconut sugar. The natural sweet taste of coconut sugar is needed to enrich the flavour of the food products they produce, so the preferable coconut sugar should feature the natural sweet taste.

In terms of hygiene factor of coconut sugar, obviously the food industries require clean, contaminant-free coconut sugar. The industries also preferred small to medium size coconut sugar with light weight. However it is hard for the producers to meet these criteria as they need to quickly shape all the cooked sugar before its texture becomes hard. The industries accept the cylindrical shape of coconut sugar as the traders do. In

terms of packaging, a clear plastic bag is considered appropriate by the industries, similar to producers' and traders' perceptions. In terms of shelf-life, similar to the perceptions of producers and traders, downstream industries describe that good quality coconut sugar will last for about two months.

## **CONCLUSION**

In general, there are similarities between the quality description of coconut sugar according to the producers, traders and industrial customers in the aspects of appearance, texture, aroma, taste, cleanliness, shape, shelf-life and product packaging.

The quality requirement of the Industrial Standard of Indonesia (SII) does not provide a detailed requirement for physical appearance of coconut sugar and these requirements can be fulfilled by the coconut sugar produced in the Tempuling area.

In terms of the colour criteria for coconut sugar, there are differences in colour which is considered to be good quality by producers, traders and industry. The majority of producers (40%) prefer a paler colour (yellowish). This does not match the colour criteria preferred by both the traders and food industries, as the majority of traders (60%) and food industries (60%) require reddish brown coconut sugar.

It is crucial to make the producers aware of the colour criteria preferred by traders and food industry. Today the producers use excessive sodium metabisulphite to produce light coloured coconut sugar. If the producers are aware that the consumers prefer darker colour, they can improve the quality by simply refraining from using the chemical preservatives, using safer alternatives such as natrium benzoate or by using sodium metabisulphite with caution.

The excessive use of sodium metabisulphite by producers indicates the need for further research on the chemical components of the coconut sugar produced in the Tempuling area to find out whether the products fulfil the national quality standard. Further research is also needed regarding quality perceptions of coconut palm sugar using a quantitative approach.

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