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Diversification of Aren-coconut candy as a local food innovation of Pandeglang Banten

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Abstract

Aren sugar, derived from the sap of the Aren palm tree (Arenga pinnata), is a common sweetener in Indonesia. However, compared to other widely used ingredients like rice, coconut, or spices, the application of Aren in Indonesian cuisine is relatively limited. Diversification of the culinary applications of Aren can bring new possibilities and promote its wider usage in various dishes and products that contribute to food security. In this research, the innovation of local food of Aren-coconut candy with high carbohydrate content (90.3%) and protein content (2.56%) yet low-fat content (1.08%) was developed. The best product, which contained an optimum water (2.59%) and ash content (3.67%), was produced at the optimum condition with 110 mL volume of coconut milk and 100°C as cooking temperature. This product can be beneficial for individuals aiming to reduce their calorie intake, manage weight, or maintain a heart-healthy diet. The high carbohydrate and protein content of this product suggests that the Aren-coconut candy provides a substantial amount of energy when consumed with other nutrient-rich foods.

1. Introduction

Indonesia is renowned for its rich culinary heritage, which includes a diverse range of traditional snacks and desserts. Aren sugar, derived from the sap of the Aren palm tree (*Arenga pinnata*), is a common sweetener in Indonesia, because of its sweetening properties, unique flavour, and cultural significance make it a beloved ingredient in traditional sweets, snacks, and beverages (Abdullah *et al*., 2016). Moreover, Aren offers potential health benefits (Ningrum *et al*., 2022). It is known to have a low glycaemic index, which means it has a slower and more controlled impact on blood sugar levels compared to other sweeteners (Puspareni *et al*., 2022). This characteristic can make Aren a suitable option for individuals concerned about managing their blood sugar.

However, compared to other widely used ingredients like rice, coconut, or spices, the application of Aren in Indonesian cuisine is relatively limited. Diversification of the culinary applications of Aren can bring new possibilities and promote its wider usage in various dishes and products that contribute to food security.

Coconut milk, on the other hand, is a staple ingredient in Indonesian cuisine. It is extracted from the flesh of mature coconuts and adds a creamy and rich taste to dishes. Additionally, the use of coconut milk in some products adds nutritional value. Coconut milk contains healthy fats, essential minerals, and vitamins, making it a more nourishing option compared to candies made with processed sugars and artificial ingredients (Suyitno, 2003).

Combining the flavours of two local ingredients, Aren sugar and coconut milk, can create a potentially nutritious product. In this research, the innovative local food of Aren-coconut candy was developed with varying cooking conditions to achieve the best possible product.

2. Materials and methods

2.1 Materials

The main ingredient in this research was Aren obtained from Munjul, Pandeglang, Indonesia. Other ingredients used were mature coconuts, water, salt, and tapioca as the supplementary material.

2.2 Manufacturing of Aren-coconut candy

The process of making Aren-coconut candy involved extracting the creamy liquid from grated coconut meat.

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First, mature coconuts that are heavy, have a firm shell, and produce a sloshing sound when shaken, were chosen. This indicated that those coconuts were full of water and contained more meat inside. Then, the outer husk of the coconut was removed and cracked. The coconut water was collected.

Next, the coconut meat was grated. The grated coconut was added to warm water with a volume ratio of 1:1. Then, the coconut milk was extracted by a fine-mesh sieve to remove any remaining coconut particles. The production of Aren-coconut candy was carried out by mixing 80 g of Aren sugar with fresh coconut milk (volume varied between 110 mL and 120 mL), tapioca, and salt. The mixture was heated (temperature varied at 80℃, 100℃, and 120℃) and continuously stirred until thickened. Once the mixture had thickened sufficiently, it was poured into moulds.

2.3 Proximate analysis

Proximate analysis was conducted following SNI 01-2891-1992 of Badan Standardisasi National (1992) to evaluate the nutritional composition of Aren-coconut candy, including water, ash, fat, protein, and carbohydrate content. The methods used for analysis are detailed below:

2.3.1 Water content

Total water content analysis was performed using the thermogravimetric test. The samples (2 g) were put into a pre-weighted porcelain dish and then dried for 1 hr in an oven at 130℃, cooled in the desiccator and then weighed. The measurement of the humidity content was obtained by dividing the sample weight before drying and by multiplying the weight loss after drying by 100%.

2.3.2 Ash content

Measurement of total ash content was carried out by putting 5 g of each sample into a pre-weighed porcelain crucible, then ignited in a furnace at 525℃ until it was burned completely. The crucible was cooled at room temperature in a desiccator and then weighed. The overall ash content is equal to the ash weight divided by the initial sample weight multiplied by 100%.

2.3.3 Fat content

Measurement of total fat content was done by the soxhletation method. The samples (2 g) were put into the paper line with cotton. Filter paper containing the sample was dried in an oven at a temperature of no more than 80℃ for 1 hr and put into a soxhlet device that has been connected with a fat bottom flask. After that, it was extracted with hexane solvent for about 6 hrs. Hexane was distilled and the fat extract was dried in an oven at 105℃, then cooled and weighed. Calculation of fat content was done by dividing fat weight and sample weight then multiplied by 100%.

2.3.4 Protein content

Measurement of total fat content was done by the Kjehdahl method. The sample (200-500 mg) was put into the Kjeldahl flask. Concentrated sulfuric acid (10 mL) and 5 g of catalyst (a mixture of K_2SO_4 and $CuSO_4.5H_2O$ at a ratio of 8:1) then destructed (in a fume hood) until the liquid was clear green. After chilling, the solution was diluted with distilled water to 100 mL in a measuring flask. The solution (10 mL) was pipetted and put into the Kjeldahl distillatory and then added 10 mL of 30% NaOH which had been standardized by a solution of oxalic acid. The distillation was carried out for about 20 mins and the distillate was held in a pre-filled Erlenmeyer 25 mL of 0.1 N HCl solution that has been standardized by borax (the tip of the condenser must be immersed in the HCl solution). Then the excess HCl was titrated with 0.1 N NaOH solution with a mixed indicator of bromocresol green and methyl red.

2.3.5 Carbohydrate content

Measurement of the total carbohydrate content in a sample was calculated based on the following equation: carbohydrate (%) = 100% - % (fat + protein + ash + water).

2.4 Sensory evaluation

The sensory evaluation of Aren-coconut candy was conducted to assess its organoleptic properties, including flavor, texture, aroma, and appearance. A panel of 20 assessors, comprising both male and female participants aged 20–40, was selected for this study. Each panellist was provided with four samples of Aren-coconut candy (prepared under varying cooking conditions as described in Section 2.2) and instructed to evaluate the samples using a 5-point hedonic scale, where 1 represented "dislike extremely" and 5 represented "like extremely."

The evaluation process was carried out in a controlled sensory laboratory with standardized lighting and ambient conditions. Panellists were provided with water to cleanse their palate between samples to avoid carry-over effects. Each sample was coded with a random three-digit number to ensure unbiased assessment. The attributes evaluated were as follows:

Flavor: The balance of sweetness and any underlying taste notes, such as coconut or Aren sugar.

Texture: The chewiness and smoothness of the candy.

Aroma: The intensity and pleasantness of the coconut and caramelized sugar scent.

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Appearance: The glossiness, uniformity, and overall visual appeal of the candy.

The scores for each attribute were collected and averaged across all panellists to determine the most preferred sample.

3. Results and discussion

In this research, some possible products of Aren-coconut candies were obtained with the following conditions: 120 mL/100℃ (volume of fresh coconut milk/cooking temperature), 120 mL/120℃, 110 mL/100℃, and 120 mL/120℃. The product of Aren-coconut candies can be seen in Figure 1. In those four conditions, Aren-coconut candies have a brown colour, glossy and smooth surface with a chewy texture. This satisfying appearance indicates the good quality and freshness of the candies.

Figure 1. Aren-coconut candy.

To assess the stability of candies, some characterizations were performed, including water content, ash content, and proximate analysis. Determining the water content of Aren-coconut candies was crucial as it directly affects the texture, shelf life, and overall quality of the candies. Optimal water content ensures that the candy is neither too dry nor too moist, giving it the desired texture and mouthfeel (Ihsani *et al*., 2020). Excessive water content can lead to microbial growth and shorten the shelf life of food products. By monitoring and controlling water content, manufacturers can extend the product's shelf life and maintain its quality over a longer period of time.

Another important parameter for evaluating the quality of food was ash content. The analysis of ash content can serve as an indicator of product purity. Excessive ash content may indicate the presence of impurities. Monitoring ash content ensures that confectionery products meet quality standards and do not contain undesirable substances that could affect safety or sensory properties. The analysis of ash content also helps to assess the stability and shelf life of the candy. The presence of certain minerals can affect the stability and susceptibility of the candy to degradation. Monitoring ash content over time can help detect changes in mineral composition and possible deterioration of the product (Noorfarahzilah *et al*., 2017).

Table 1 shows the results for the percentage of water content and ash content. Referring to the Indonesian National Standardization (SNI) 3547.1:2008, specifically pertaining to "Candy - Part 1: General Requirements" (Badan Standardisasi Nasional, 2008), the maximum allowable water content for hard candy is 3.5% and the maximum allowable ash content is 2%. Based on the water content analysis, only samples 3 and 4 fulfilled the requirement for water content. However, the requirement for ash content was not fulfilled. This could be due to the high mineral content of the samples. A high ash content level indicates a high mineral content.

According to Table 1, the influence of cooking temperature and volume of coconut milk on water content was evaluated. Increasing the temperature and reducing the volume of coconut milk accelerates the evaporation of water. Consequently, increasing the temperature and reducing the volume leads to a decrease in water content. Meeting the water content requirements guarantees that the Aren-coconut candy possesses the desired texture, taste, and shelf stability. Additionally, it demonstrates adherence to applicable standards, ensuring that the candy meets consumer expectations in terms of quality and freshness.

Table 1. Water and ash content of Aren-coconut candy.

Aren-coconut candy sample (volume of fresh coconut milk [mL]: cooking temperature [℃])	Water content (%)	Ash content (%)
120:100	5.55	2.92
120:120	3.81	3.19
110:100	2.59	3.67
110:120	1.77	3.14

Another crucial parameter to be evaluated was the nutritional value of Aren-coconut candy in order to comprehend its compositions and potential health benefits. Assessing the carbohydrate and protein content was vital as it helped determine the energy contribution. Additionally, carbohydrates play a significant role in enhancing the taste and texture of the candy. Protein is essential for growth, repair, and various bodily functions. Knowing the protein content helps individuals incorporate the candy into a balanced diet and determine its role in meeting their protein needs. Therefore, understanding the carbohydrate and protein content of Aren-coconut candy is essential not only in terms of its

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energy contribution but also for its overall nutritional profile. It was highly recommended to consider the candy's carbohydrate content within the context of a well -balanced diet to ensure sufficient nutrient intake and foster healthy eating habits.

Fat plays a crucial role in enhancing the texture, richness, and mouthfeel of food products. Therefore, evaluating the fat content is essential for individuals who want to understand the texture and fat levels in candy. This information is particularly important for those who are monitoring their fat intake, particularly saturated and trans fats, as it helps them make informed choices. Additionally, it assists in determining the overall calorie content of the candy. In Table 2, the carbohydrate, protein and fat content of Aren-coconut candy samples are presented. Samples 3 exhibits a high carbohydrate and protein content indicating that the candy was likely to have a sweet taste and a chewy or soft texture. Carbohydrates and protein serve as the body's primary source of energy. So, the high carbohydrate and protein content suggests that the Aren-coconut candy provides a significant amount of energy.

Sample 3 demonstrates the lowest fat content at 1.08%. The use of coconut milk as a source of fat contributes to the low-fat content of Aren-coconut candy products. Due to its low-fat content, the candy has a lighter and less creamy texture compared to candies with higher fat levels. This may appeal to individuals who prefer candies with a less fatty flavor or those seeking a lighter indulgence. Foods with low-fat content are often favored by individuals looking to manage their overall fat intake or those with specific dietary requirements. Opting for low-fat options can be beneficial for individuals aiming to reduce calorie intake, manage weight, or maintain a heart-healthy diet.

To evaluate the product based on sensory perceptions such as flavor, texture, aroma, and appearance, organoleptic testing was conducted. The results shown in Figure 2 indicate that sample 3 was the most preferred by the assessor. Therefore, considering the water content, ash content, nutritional value and organoleptic testing, sample 3 emerges as the best product. It can be concluded that the optimal condition for producing the best sample involved using 110 mL of coconut milk and cooking temperature of 100°C.

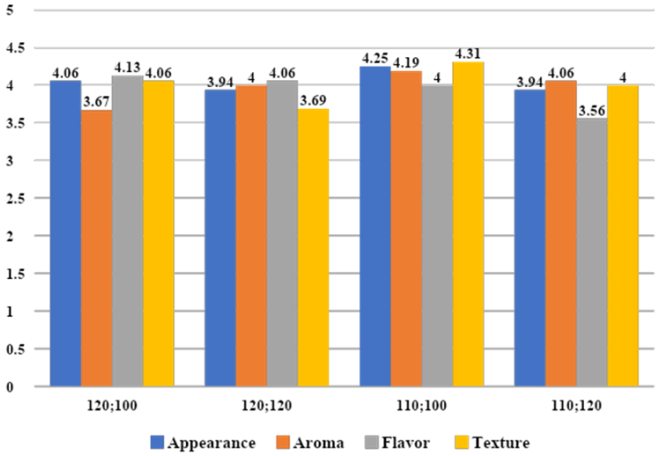

Figure 2. Organoleptic test result of Aren-coconut candy.

4. Conclusion

The use of coconut milk to diversify Aren products, such as Aren-coconut candy results in a more nutritious product with a high carbohydrate content (90.3%) and low-fat content (1.08%). The best quality product is produced under optimum conditions using 110 mL volume of coconut milk and cooking at a temperature of 100°C. The high carbohydrate content of this candy suggests that it provides a significant amount of energy when consumed alongside other nutrient-rich foods.

References

Abdullah, W.G., Rianse, U., Iswandi, R.M., Taridala, S.A.A., Yunus, L., Fausayana, I., Dirgantoro, M.A. and Rianse, I.S. (2016). Mapping and preference of marketing risk of eco sweetener "Aren Sugar." *International Journal of Environmental Science*, 1, 133–139.

Badan Standardisasi Nasional. (1992). Cara Uji Makanan dan Minuman (SNI 01-2891-1992). Indonesia: Badan Standardisasi Nasional. [In Bahasa Indonesia].

Badan Standardisasi Nasional. (2008). Kembang Gula - Bagian 1: Keras (SNI 3457.1:2008). Indonesia: Badan Standardisasi Nasional. [In Bahasa Indonesia].

Ihsani, K., Afifah, D.N., Anantyo, D.T., Mulyono, Nugroho, T.W., Wahyudi, F. and Nuryanto. (2020). Nutrient content and shelf life analysis of freshwater snail (*Pila ampullacea*) instant baby porridge. *Food*

Table 2. Fat, protein and carbohydrate content of Aren-coconut candy.

Aren-coconut candy sample (volume of fresh coconut milk [mL]: cooking temperature [°C])	Fat content (%)	Protein (%)	Carbohydrate content (%)
120:100	1.98	3.35	86.20
120:120	1.19	2.56	89.25
110:100	1.08	2.73	90.30
110:120	1.94	2.36	90.42

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Research, 4(S3), 184–196. https://doi.org/10.26656/fr.2017.4(s3).s20

Ningrum, R.Y., Wardani, H.E. and Katmawanti, S. (2022). Are Cookies Based on Soybeans and Aren Safe for Autistic Children? Proceedings of the 5th International Conference on Sport Science and Health (ICSSH 2021), p. 20–30. USA: Atlantis Press. https://doi.org/10.2991/ahsr.k.220203.004

Noorfarahzilah, M., Mansoor, A.H. and Hasmadi, M. (2017). Proximate composition, mineral content and functional properties of tarap (*Artocarpus odoratissimus*) seed flour. *Food Research*, 1(3), 89–96. https://doi.org/10.26656/fr.2017.3.025

Puspareni, L.D., Fauziyah, A. and Wardhani, S. (2022). Are Glycaemic Response, Glycaemic Index, and Glycaemic Load of Traditional Palm Sugar (Arenga pinnata) Different from Cane Sugar?: An Oral Glucose Tolerance Test. *Amerta Nutrition*, 6(2), 206–211. https://doi.org/10.20473/amnt.v6i2.2022.206-211

Suyitno, T. (2003). Health Benefit of Coconut Milk. *Indonesian Food and Nutrition Progress*, 10(2), 106–112.

