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To cite this article: Sri Rejeki Retna Pertiwi *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **1097** 012005

Sensory Properties of Snack Noodles Made from Canistel Flour and Mocaf with Addition of Guar Gum

Sri Rejeki Retna Pertiwi*, Noli Novidahlia, Aminullah Aminullah, Titi Rohmayanti, and Kurniati Siwi

Djuanda University, Bogor, Indonesia

* sri.rejeki.pertiwi@unida.ac.id

Abstract. Canistel flour contains no gluten protein, and the key to success in making gluten-free products is the use of a combination of alternative flours and binders. The aim of this research was to analyze the sensory properties of snack noodles made from canistel flour, mocaf (modified cassava flour), and guar gum in different concentrations. The proportions of composite flour (canistel flour:mocaf) used in this research were 100%:10%, 90%:10%, and 80%:20%, and guar gum was at the concentrations of 1% and 2%. Analysis included yield, moisture content, and sensory properties such as color, surface texture, aroma, salty taste, umami taste, crispiness, and aftertaste. Results show that the proportion of composite flour significantly affected the yield, moisture content, and some sensory properties, including color, surface texture, and crispiness. The concentration of guar gum and the interaction of composite flour proportion and guar gum concentration did not significantly affect all the attributes measured. Increasing the proportion of mocaf resulted in higher yield, higher moisture content, and better sensory properties in terms of color, surface texture, and crispiness. The snack noodle made from composite flour in the proportion of 90% canistel flour to 10% mocaf with an addition of 1% guar gum was selected as the best one.

Keywords: egg-fruit; mocaf; modified flour; noodles, snack

1. Introduction

The canistel fruit (*Pouteria campechiana)* is a tropical fruit native to Southern Mexico, Belize, Guatemala, and El Salvador. It is also called egg-fruit or yellow sapote. The canistel may be eaten fresh, although it is more commonly used to make milkshakes, custards, or ice cream [1]–[2] and spread [3]. In Indonesia, we can find canistels in West Java under the names *campolay*, *alkesa*, *sawo belanda*, and *sawo mentega*. When ripe, the fruit is bright yellow to bright orange. The pulp is relatively firm, smooth, creamy, and sweet, similar to boiled sweet potato. Some Indonesians do not like to eat this fruit because it leaves a yellow color that sticks to the teeth. It has a relatively short shelf life of about 10 days. To improve its economic value, it is possible to process canistel fruit into flour. In the form of flour, it has an even wider range of usage.

A report on a canistel study done by Paragados [4] stated that canistel fruit could be processed into flour by sun-drying method and could be used to make cookies that were favored by panelists. Successful processing of canistel fruit into flour was also carried out by Pertiwi *et al.* [5] with pretreatment of soaking in 7.5% NaCl solution for 30 minutes, followed by drying in a tray dryer at 40 ºC for 6 hours. This procedure resulted in better taste and aroma. Canistel flour had 10.55% moisture content, 51.78% starch, and 4.20% protein. It was used by Aminullah *et al.* [6] as a raw material for noodle making. It was reported that canistel flour could form noodle strands, but the texture quality was

very poor. When the noodles were boiled, they were crumbled and sticky because of the absence of gluten. As stated by Padalino *et al.* [8], gluten-free flour produced noodles with physical quality not as good as noodles from wheat flour due to the absence of gluten. In the production of gluten-free noodles, starch component plays a role in the formation of the noodle structure. The use of combined flour and specific hydrocolloid such as guar gum could improve the texture quality of gluten-free products [7]. Mocaf or modified cassava flour is an innovation flour that uses the principle of modifying cassava cells in cassava fermentation. Mocaf has characteristics almost the same as wheat flour, so it can be used as a substitute ingredient in the preparation of food products based on wheat flour. In noodle production, mocaf can be used for wheat substitution in a proportion of up to 25% [8] or 30% [9].

Based on the scientific literature described above, the aim of this research was to analyze the sensory properties of snack noodles made from a mixture of canistel flour and mocaf with an addition of guar gum in different concentrations.

2. Methodology

The research consisted of two parts, canistel flour preparation and snack noodle samples preparation. For the canistel flour preparation, canistel fruits were purchased from an association of farmers in Cipatat, Padalarang, West Java. The fruits were ripe, as marked by yellowish green skin and hard texture. The materials for snack noodle samples were mocaf, salt, mushroom broth, and vegetable oil that were bought at a grocery store as well as guar gum that was bought at a chemical store in Bogor.

Canistel flour was made according to Pertiwi's procedure [5]. The fruits were peeled, and the flesh were sliced using a peeler all the way to a layer that covers the seeds. The sliced flesh was soaked in 7.5% salt solution for 30 minutes, and then drained, washed under running water, drained again, and air-dried until no water dripped. After that, drying was carried out at 40 ºC for 6 hours using an electrical food dehydrator type MKS-DR6 as much as 100 grams of sliced flesh per tray. The chips were then ground using a disc mill type FFC-15 equipped with a 100 mesh siever. The canistel flour was then put in a tightly closed container until it was used.

Meanwhile, snack noodle samples were prepared in three variants of canistel and mocaf proportions (100%:0%, 90%:10%, and 80%:20%) and two variants of guar gum concentrations (1% and 2%). The other ingredients added to all the snack noodle samples were 3% salt, 2.5% mushroom broth, and 42.5% water, which were calculated based on a 100% flour mixture. All dry ingredients except flour were mixed, then added with water until they dissolved. After that, the flour was added gradually in small amounts. After being mixed well, the dough was steamed for 15 minutes and immediately put into automatic noodle maker Oxone OX-356 to be molded into noddle strands. The noodle strands were separated and fried at 150 ºC for 3.5 minutes.

The analysis carried out for snack noodles included the yield, moisture content, and sensory properties. The yield was determined by dividing the weight of the snack noodle produced by the weight of all the ingredients used for each formula. The moisture content was determined following Hakoda *et al.*'s procedure [10], that is, by subtrating the dry weight from the initial weight, and the amount of water was then calculated as the amount of water divided by the initial weight. The sensory properties were analyzed following Meilgaard's procedure [11]. The analysis of sensory properties was done by 10 trained panelists from the noodle industry, covering the color, surface texture, aroma, salty taste, umami flavor, crispiness, and aftertaste. The panelists used 10 cm unstructured line scale by placing marks on scales to represent the perceived intensity of the atrribute in question. The marks from the line scales were converted to numbers by manually measuring the position of each mark on each scale using a ruler. The higher the value the better the quality of each attribute being assessed. The description for each attribute is as follows: color being from brown to brownish yellow, surface texture being from rough to smooth, aroma being from sour to not sour, salty taste being from not salty to salty enough, umami flavor being from not umami to umami enogh, crispiness being from firm to crispy, and aftertaste being from bitter to not bitter.

3. Results and Discussion

The result of the statistical analysis of sensory properties data was that the ratio of canistel flour to mocaf affected the sensory properties of color, surface texture, and crispiness but did not affect the aroma, salty taste, umami flavor, and aftertaste. The concentration of guar gum and the interaction did not affect the sensory properties of snack noodles.

Table 1. Sensory properties of snack noodles

Treatment	Color	Surface Texture	Aroma	Salty Taste	Umami Flavor	Crispi-ness	Aftertaste
Canistel flour:mocaf							
100%:0%	8.15[b]	6.57[a]	7.36[a]	7.02[a]	7.51[a]	7.13[a]	8.81[a]
90%:10%	7.70[ab]	7.27[a]	7.48[a]	7.04[a]	7.65[a]	7.98[a]	9.05[a]
80%:20%	7.15[a]	7.43[b]	7.21[a]	7.22[a]	7.46[a]	8.45[b]	8.36[a]
Guar gum concentration							
1%	7.39[a]	7.39[a]	7.41[a]	7.14[a]	7.53[a]	7.92[a]	8.79[a]
2%	7.96[a]	7.09[a]	7.29[a]	7.04[a]	7.55[a]	7.79[a]	8.87[a]
Canistel flour:mocaf; guar gum concentration							
100%:0%; 1%	8.34[a]	6.39[a]	7.61[a]	7.10[a]	7.52[a]	7.04[a]	8.75[a]
90%:10%; 1%	7.32[a]	7.29[a]	7.61[a]	7.02[a]	7.61[a]	8.04[a]	8.96[a]
80%:20%; 1%	6.50[a]	7.60[a]	7.01[a]	7.32[a]	7.47[a]	8.68[a]	8.66[a]
100%:0%; 2%	7.95[a]	6.75[a]	7.11[a]	6.95[a]	7.51[a]	7.22[a]	8.86[a]
90%:10%; 2%	8.13[a]	7.25[a]	7.35[a]	7.07[a]	7.70[a]	7.93[a]	9.14[a]
80%:20%; 2%	7.80[a]	7.26[a]	7.41[a]	7.12[a]	7.44[a]	8.22[a]	8.61[a]

Note: Different superscript letters in the same column for each effect indicate a significant difference at $\alpha = 0.05$

It can be seen in the Table 1 that higher levels of mocaf use resulted in snack noodles with lower values of color, higher values of surface texture, and higher values of crispiness. This means that the use of mocaf decreased the quality of color because it increased the intensity of the brown color. It was presumably caused by a Mailaard reaction during frying because mocaf contains amino acid and reducing sugar. However, given that the color value lay at the value of 7–8, the snack noodles were considered to still have a good color. The use of mocaf improved the surface texture and the crispiness: it became smoother and crispier. The surface texture improved from 6 (regular) to 7 (good), and the crispiness improved from 7 (good) to 8 (very good). These results agree with the statement of Sulistyo and Nakahara [9] that the use of mocaf can improve the texture of gluten-free products.

An additional analyisis conducted for the snack noodles covered the yield and moisture content. The yield is the amount of final product after the raw material was processed, and the moisture content is the weight of the water contained in the product. These two measurements are important because of their relevance to packaging and storage.

Table 2. The yield and moisture content of snack noodles

Treatment	Yield (%)	Moisture content (%)
Canistel flour:mocaf		
100%:0%	74.045[a]	1.088[a]
90%:10%	75.933[b]	2.070[b]
80%:20%	78.018[c]	2.058[b]
Guar gum concentration		
1%	76.355[a]	1.822[a]
2%	75.642[a]	1.655[a]
Canistel flour:mocaf; guar gum concentration		
100%:0%; 1%	74.580[a]	1.095[a]
90%:10%; 1%	76.020[a]	1.095[a]
80%:20%; 1%	78.465[a]	2.230[a]

100%:0%; 2%	73.510[a]	2.140[a]
90%:10%; 2%	75845[a]	1.080[a]
80%:20%; 2%	77.570[a]	1.910[a]

Note: Different superscript letters in the same column for each effect indicate a significant difference at $\alpha = 0.05$

As with the sensory properties, only the ratio of canistel flour to mocaf affected the yield and moisture content. The data in Table 2 show that the higher the use of mocaf the higher the yiled and moisture content. Mocaf has a hydrophilic group that can hold water, so it does not evaporate during a drying or frying process.

Based on the sensory properties, yield, and moisture content, it can be concluded that only the ratio of canistel flour to mocaf influenced the sensory properties of color, surface texture, and crispiness, but it did not affect the aroma, salty taste, umami flavor, and aftertaste. It is also concluded that the ratio of canistel flour to mocaf affected the yield and moisture content. Table 1 shows that sensory properties of snack noodles made with 10% mocaf and 20% mocaf were not significantly different. Therefore, the selected ratio of canistel flour to mocaf was 80% to 20%. And the selected concentration of guar gum was 1% because there was no differences found in the sensory properties, yield, and mosture content made with 1% and 2% guar gum.

4. Conclusion

Increasing the use of mocaf in the formula of snack noodles tends to decrease the quality of color and improve the surface texture and crispiness, yield, and moisture content, but it does not influence the aroma, salty taste, umami flavor, and aftertaste. Guar gum does not affect the sensory properties, yiled, and moisture content of snack noodles. Snack noodles have a sensory value of 6.50 (regular) to 9.14 (excelent), a yield value of 73.51% to 78.47%, and moisture content of 1.08% to 2.23%. The selected formula for snack noodles is 90% canistel flour to 10% mocaf and 1% guar gum, 3% salt, 2.5% mushroom broth, and 42.5% water.

Acknowledgements

This research was funded by the Grant of Penelitian Terapan Unggulan Perguruan Tinggi with contract number 1868/E4/AK.04/2021 from the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia.

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