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**Testing of Chemical and Physical Properties Test of Egg Cane Crackers
(*Saccharum Edule*) with Variations of Wheat Flour and Tapioca Flour**

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Abstract

Egg sugarcane (*Saccharum edule*) is a vegetable plant that is widely found in Indonesia, especially in Sanggau Regency, West Kalimantan. This plant resembles sugar cane with bulging shoots and yellowish-white strands like fish eggs. Its use has been limited as a processed vegetable ingredient. To increase economic value and extend its shelf life, processed innovations in the form of egg sugarcane crackers are carried out. This study aims to determine the chemical properties, fertility, and preferences of the panelists for egg sugarcane crackers with variations of wheat flour and tapioca flour. The observed parameters included moisture content, ash, protein, fat, crude fiber, carbohydrates, fertility, and hedonic organoleptic test. The results of the study showed that the chemical properties of egg cane crackers varied. The highest moisture content values were in A2 treatment (9.26% wb; 8.79% db), the highest ash content in A2 (3.35% wb; 3.64% db), the highest fat content in A2 (2.10%), the highest protein content in A1 (8.46%), the highest crude fiber in A3 (6.70%), and the highest carbohydrate in A3 (73.72%). The best flowering power was found in the A1 treatment (76.84%). The panelists' preference for color was highest at A3 (5.77), aroma at A2 (5.40), taste at A3 (5.87), and texture at A3 (5.67). These results show that the variation of wheat flour and tapioca affects the chemical quality, floweriness, and preference of panelists for egg cane crackers, making it an innovative product with potential economic added value.

Keywords: crackers, chemistry, sugarcane, eggs

INTRODUCTION

Egg sugarcane (*Saccharum edule*) is a vegetable plant that is easy to find in Indonesia. This plant is similar to sugar cane, but has shoots that look bubbling and when peeled there are strands like yellowish-white fish eggs. According to Chaniago, (2019) Egg cane has many local names, namely Tobu Bunga (Simalungun), Saylor Lilin (Manado), Sayur Trubu (Maluku), Egg Cane, Tubu Telor Ikan (Maluku), Kembang Tobu (Lampung), Tiwu Turubus, Turubus (Sunda), Endog Sugar Cane (Java), Bambiada (Talaud), Bembiade (Sangihe), Tebiyane (Buru), Dodilibu (North Halmahera), Idawaho (Ternate), Dolawaho (Tidore).

Egg sugarcane plants thrive in soil conditions with a pH of 5-6. This plant can be propagated by cuttings, as it does not produce seeds. The stem cuttings will form roots and flowers inside the stem (young panicles) and are encased in fronds/leaf shells. This

plant is rich in nutrients, because it contains substances that are beneficial to the body, namely minerals, especially calcium and phosphorus. Egg cane can be harvested at the age of five months after planting (Muharram, 2019).

Especially in Sanggau Regency, West Kalimantan, egg sugarcane is quite easy to find. However, its use is limited to processed vegetables. For this reason, it is necessary to carry out processed egg sugarcane innovations, so that they have a longer shelf life and can increase the economic value of egg sugarcane. One of them is processed into egg cane crackers.

Crackers are a type of snack that undergoes volume development so that it forms a porous product with low density during frying (Chaniago *et al.* 2019). The main content of crackers is starch, a little protein, and several types of minerals and vitamins. Assessment of the quality of fried crackers based on crispiness, color, taste, etc. (Dasir *et al.* 2020). Based on research Chaniago *et al.* (2019) The best flowering power of terubuk crackers is shown in the treatment of 100 grams of wheat flour, 200 grams of tapioca flour, and 100 grams of terubuk, which is 75.58%. With the best treatment based on the panelists' assessment on the treatment of wheat flour 150 grams, tapioca flour 100 grams, and terubuk 150 grams. In addition to the flowering power and organoleptic test, it is necessary to carry out chemical testing on egg sugarcane crackers so that the quality of the crackers produced is better. So this research is important to be carried out to determine the nutritional value content of egg sugarcane crackers.

The purpose of this study was to determine the chemical properties, fertility, and level of preference of the panelists for egg sugarcane crackers made with variations of wheat flour and tapioca flour. This research is considered important because of the large amount of egg sugarcane in Sanggau Regency that has not been processed optimally and is only used as a vegetable ingredient. Through the innovation of processed products in the form of crackers, egg sugarcane is expected to have higher economic value and a longer shelf life. The resulting crackers will also be tested for their nutritional value, fertility, and the level of preference of the panelists. The novelty of this research is that it utilizes egg sugarcane, which has only been used as a vegetable, into an innovative processed product in the form of crackers. It is hoped that the results of this research can provide added value for the community, both in the form of products of economic value and information on the nutritional content of egg cane crackers.

Previous Research

Potential quality of terubuk plants (*Saccharum edule*) from East Luwuk District, Banggai Regency, Central Sulawesi contains 13% dry matter, 3.15% crude protein and 1.28% crude fat and contains 41.27% crude fiber, 42.41% BETN and 11.89% ash content, so it is good for use as animal feed (Chaniago, 2015). Based on the results of the study Pentury *et al.* (2017) shows that the nutritional value of wax vegetables (*Saccharum edule* Hasskarl) from North Halmahera, North Maluku before processing, namely with a moisture content of 88.64%, a fat content of 1.44%, a protein content of 4.4%, an ash content of 1.25%, a carbohydrate content of 4.25% and a crude fiber content of 0.63%. The nutritional value of wax vegetables after processing was with a moisture content of 77.39%, a fat content of 11.81%, a protein content of 3.77%, an ash content of 1.66%, a carbohydrate content of 5.37% and a crude fiber content of 1.07%. Results Yasri *et al.* (2019) showed that the substitution of egg sugarcane in the making of shredded lokan had an effect on the protein content, crude fiber and the level of preference of the panelists for the color, taste and texture parameters of shredded lokan. In addition, Chaniago *et al.* (2019) Making processed food from terubuk, which is making terubuk crackers from a

combination of wheat flour and tapioca flour. The best flowering power in the treatment of 100 grams of wheat flour, 200 grams of tapioca flour, and 100 grams of terubuk was 75.58%. With the results of organoleptic tests, it has an unreal influence on color, taste, and texture and has a real influence on the aroma of terubuk crackers.

RESEARCH METHODS

Research Time and Location

This research will be carried out for 4 months, starting from June to September 2024. The research location is at the Engineering and Chemistry Laboratory of the D3 Plantation Product Management Study Program (Sanggau Regency Campus) at the PSDKU Campus of the Pontianak State Polytechnic in Sanggau Regency.

Tools and Materials

The tools used in making egg cane crackers are a basin, knife, baking sheet, dough grinder, drying container, pan, stove, frying spoon, oil slicer, and cake scale. The equipment used in the chemical property testing is a weighing bottle (Iwaki Pyrex), a porcelain cup (30 ml capacity), a Buchner funnel (Iwaki Pyrex), a vacuum pump, a desiccant (50 liter capacity), an E-816 buchi extraction unit, a hot plate (Joan Lab), a Kjelmater buchi K-375, an analytical balance (BEL Engineering), an oven (Memmert), a pipette ball (Grasfirm pi. pump 2500), an electric furnace (furnace 1100 ASTM D3174).

The ingredients used in making egg cane crackers are wheat flour, tapioca flour, egg sugarcane, garlic, flavoring, salt, water, and cooking oil. Meanwhile, the materials used for chemical properties testing are egg cane crackers, Aquades, concentrated Sulfuric Acid (H₂SO₄), CuSO₄, concentrated HCl, NaOH, Hexane, Ethanol 96%, and Whatman Filter Paper No 41.

Data Collection Methods

The type of data that will be taken is in the form of primary data from experiments conducted in the laboratory by referring to the existing manual instructions. And secondary data to make comparisons from various literature sources. The data collection method carried out is an experimental method on test samples with various treatments that will be tested in the laboratory, namely the physical properties and chemical properties of egg cane crackers. The observed physical characteristics include hedonic organoleptic tests (preference tests) and developmental power analysis,

Data Analysis Methods

The data analysis method used in this study used a Complete Random Design (RAL), with the treatment formulation can be seen in Table 1.

Table 1. Formulation of egg cane cracker treatment

Material	Treatment		
	A1	A2	A3
Flour	100 grams	150 grams	100 grams
Tapioca flour	200 grams	100 grams	150 grams
Egg cane	100 grams	150 grams	100 grams
Garlic	10 gr	10 gr	10 gr
Flavoring	3 gr	3 gr	3 gr
Salt	3 gr	3 gr	3 gr
Water	200 ml	200 ml	200 ml

By Chaniago *et al.* (2019) The observed physical characteristics are the hedonic organoleptic test (preference test) and the analysis of fertility. Hedonic organoleptic

(preference) test by measuring human sensory sensitivity based on human subjective responses and flower power analysis by measuring the surface area of raw crackers and crackers after frying plagiarized on boxed paper.

RESULTS AND DISCUSSION

Chemical Properties of Egg Cane Crackers

Table 2. Chemical properties of egg cane crackers

It	Treatment	Chemical Properties Testing							
		Moisture Content (%)		Ash Content (%)		Fat Content (%)	Protein Content (%)	Crude Fiber Content (%)	Total Carbohydrate Content (%)
		WB (%)	db (%)	WB (%)	db (%)				
1	A1	7,81	8,00	2,79	3,01	1,82	8,46	5,77	72,93
2	A2	9,26	8,79	3,35	3,64	2,10	6,67	6,17	72,62
3	A3	8,83	8,40	2,24	2,42	0,88	7,88	6,70	73,72

Information:

A1 : Treatment 1 (egg sugarcane 100gr + wheat flour 100gr + tapioca flour 200gr)

A2 : Treatment 2 (egg sugarcane 150gr + wheat flour 150gr + tapioca flour 100gr)

A3 : Treatment 3 (egg sugarcane 100gr + wheat flour 100gr + tapioca flour 150gr)

The egg sugarcane cracker products produced in this study have a relatively low moisture content, namely in the A2 treatment with the highest wb moisture content of 9.26% and db moisture content of 8.79%. This shows that the cracker products produced are in accordance with SNI standards, which are 6.97% to 9.6%. Crackers that have a low moisture content will have a longer shelf life, because the moisture content is very closely related to the shelf life of a product. The higher the moisture content, the shorter the shelf life of the product. On the other hand, the lower the moisture content of a product, the longer the shelf life of a product will be (Yuliani and Maryanto, 2018).

The A2 treatment has the highest moisture content compared to the A1 and A3 treatments because the A2 treatment is the treatment with the most addition of egg sugarcane compared to other treatments. With the addition of a lot of sugarcane, eggs and wheat flour, it will also increase the moisture content of an ingredient. According to Chaniago (2015) Wax vegetables (*Saccharum edule* Hasskarl) before processing has a moisture content by 88.64%.

The highest ash content can be seen in Table 1 also in the A2 treatment, namely ash content of 3.35% wb and moisture content db 3.64%. The ash content of a substance is an inorganic residue from the process of burning or oxidation of organic components of a food ingredient (National Standardization Agency, 1992). Ash content indicates the total minerals in a food. The increase in ash content is due to the addition of egg sugarcane protein which is able to increase the ash content of the cracker products produced (Fitrawati *et al.* 2017).

The highest fat content in Table 1 was also seen in the A2 treatment, which was 2.10%. Based on research Pentury *et al.* (2017) Egg sugarcane has a fat content of 1.44%. In the A2 treatment, it is the variation of the treatment with the highest addition of egg cane, so that with the fat content in egg cane, it will also increase the fat content in the

egg cane crackers produced.

The highest protein content was obtained in the A1 treatment, which was 8.46%. High protein content in A1 treatment. According to Pentury *et al.* (2017), protein content in *Saccharum edule* Hasskarl before processing with a protein content of 4.4%. The high protein produced from cracker products due to the addition of sugarcane, eggs and wheat flour will increase the amount of protein in cracker products (Dasir *et al.* 2020).

The highest crude fiber content was in the A3 treatment, at 6.70%, with the addition of the most tapioca flour. The addition of tapioca flour is able to increase the fiber content in a food product. Crude fiber is the part of carbohydrates as fractions left over after being digested with acidic and alkaline solutions (Muliani *et al.* 2022). Tapioca flour has amylose and amylopectin which are also data to increase the fiber content of food products (Chaniago *et al.* 2019).

The total carbohydrate content in the A3 treatment was 73.72%. This is because the A3 treatment is the treatment with the highest addition of tapioca flour. Tapioca flour has properties as a binding agent by helping the gel formation process, so that it is able to increase the carbohydrate levels in the ingredients (Lekahena, 2016).

The Flower Power of Egg Cane Crackers

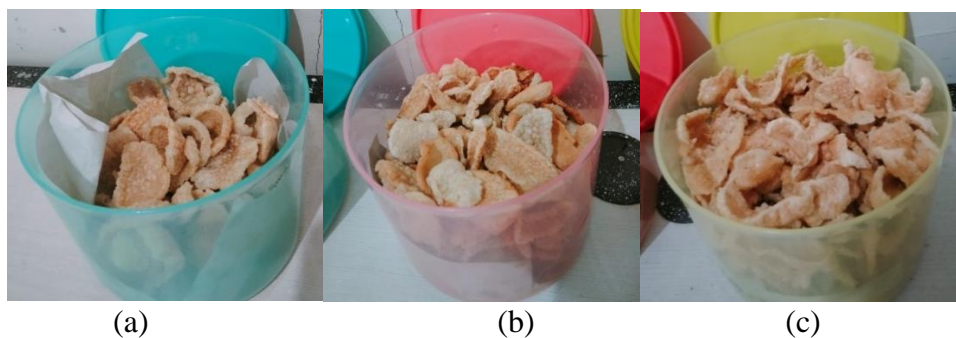


Figure 1. Egg sugarcane crackers (a) treatment A1; (b) A2 treatment; (c) A3 treatment

The test on the flowering power of egg sugarcane crackers can be seen as follows.

Table 3. Flower power of egg cane crackers

Material	Treatment		
	A1 (cm)	A2 (cm)	A3 (cm)
Before frying (LP1)	7,6	9,45	7,6
After frying (LP2)	13,44	9,6	12
Difference (LP2-LP1)	5,84	0,15	4,4
Yield (%)	76,84	1,58	57,89

According to Susilawati *et al.* (2024) The flowering power is the result of the average measurement of the length of the diameter of the cracker development and the calculation of the average diameter of the cracker sample. According to Chaniago *et al.* (2019) The flowering power of crackers is influenced by the addition of tapioca flour and wheat flour.

The highest yield of crackers in the A1 treatment was 76.84%. This value was obtained because the A1 treatment was the treatment with the highest addition of tapioca flour compared to other treatments, which was as much as 200gr. Tapioca flour has an amylopectin content of 83%, so it is able to have high flowering. The higher the

amylopectin content, the higher the development (Susilawati *et al.* 2024).

Hedonic Organoleptic Test (Favoritism)

The results of the hedonic organoleptic test can be seen in Table 5. The organoleptic test carried out was a hedonic test (liking) including color, aroma, taste, and texture by 30 panelists.

Table 4. Hedonic organoleptic (favorite) testing of egg cane crackers

It	Treatment	Average value of hedonic organoleptic testing			
		Color	Aroma	Taste	Texture
1	A1	5,00	5,07	5,57	5,60
2	A2	5,07	5,40	5,57	5,47
3	A3	5,77	5,33	5,87	5,67

Organoleptics is the assessment and observation of the color, aroma, taste, and texture of a food, drink, or medicine, which requires panels, both individuals and groups in assessing the quality of an object from a subjective impression (Chaniago *et al.* 2019).

The color of the product in food serves as an indicator of the ripeness, freshness, and perfection of the processing process of a product, for example in the frying process, with the appearance of brown color can be used as the final indicator of the maturity of a food product (Chaniago *et al.* 2019). From the results of the panelists' testing of color, Table 5 shows that the panelists prefer color in the A3 treatment, namely with the Egg sugarcane 100gr + wheat flour 100gr + tapioca flour 150gr with an average value of 5.77 rounded to 6 (likes) and the lowest in the A1 treatment with egg sugarcane treatment 100gr + wheat flour 100gr + tapioca flour 200gr with an average of 5.00 (somewhat liked). According to Chaniago *et al.* (2019) This is due to the influence of several factors, such as the presence of enzymatic reactions and the process of frying crackers. There is also a protein content in wheat flour that affects the intensity of the browning reaction of egg cane crackers. The color change is caused by the browning process (*Browning*) from proteins and carbohydrates in wheat flour, so that starting from the boiling process and the process of frying crackers, it can cause a change in the color of the dough.

Aroma is an odor produced from the presence of chemical stimuli touched by the sense of smell, which can be one of the parameters of attraction by the panelists in determining whether a food is delicious or not (Kadir *et al.* 2021). The aroma is released after the product has been processed, which has a very important role, not only by a single ingredient, but also by a number of components that give rise to the distinctive odor of the different components. From the test results by the panelists, the highest aroma preferred in the A2 treatment was with 150gr egg sugarcane treatment + 150gr wheat flour + 100gr tapioca flour of 5.40, and the lowest in A1 treatment with 100gr egg sugarcane treatment + 100gr wheat flour + 200gr tapioca flour with an average of 5.07. If rounded to 5 (somewhat liked). This is because there are ingredients in the ingredients for making egg cane crackers that interact with each other, namely wheat flour and egg sugarcane which contain a lot of carbohydrates and protein. According to Chaniago *et al.* (2019) The aroma component is closely related to the concentration of the aroma in the vapor phase in the mouth. This concentration is influenced by the volatile nature of the aroma, as well as the natural interaction between aroma components and nutrients such as carbohydrates, proteins and fats as well as very relative consumer acceptance.

The taste of a food does not only include one taste, but a combination of various different flavors from the composition of ingredients that create a complete taste of food

(Susilawati *et al.* 2024). The results of the panelists' assessment of egg cane crackers showed that the panelists liked the taste of egg cane crackers the highest in the A3 treatment, which was as large as 5.87 rounded to 6 (likes). This is because of the influence of the main ingredients and additional ingredients in making egg cane crackers. The taste caused is due to the addition of spices mixed during the making of crackers. The existence of a composition with the addition of appropriate spices will provide a taste that is liked by the panelists. According to Chaniago *et al.* (2019) The way of cooking, the addition of salt, spices and flavorings will give a different chemical composition, resulting in a distinctive taste.

The way the ingredients are cooked will affect the assessment of whether a product is accepted or not (Nurhayati and Putri, 2016). The results of the assessment of the texture of egg sugarcane crackers that have been carried out by the panelists show that the most preferred texture in the A3 treatment is by Egg Sugarcane 100gr + Wheat Flour 100gr + Tapioca Flour 150gr by 5.67 rounded to 6 (likes) and the lowest in the A2 treatment with the addition of 150gr egg sugarcane + 150gr wheat flour + 100gr tapioca flour 5.47 rounded to 5 (somewhat liked). According to Chaniago *et al.* (2019) high and low grades *Hardness* In crackers, it is caused by the characteristics of the ingredients in the crackers, the thickness of the crackers, the process of homogenization or mixing of ingredients, the content of other most important ingredients, starch and moisture content that the ingredients have. The texture is also affected by the amount of water that evaporates at the time of cooking. The more water content is non-volatile, the more it reduces the crispiness of the crackers, thereby reducing the crispiness of the crackers (Chaniago *et al.* 2019).

CONCLUSION

The conclusion of this study shows that egg sugarcane crackers with variations of wheat flour and tapioca flour have varying chemical properties. The highest moisture content value was found in A2 treatment with a water content of 9.26% and a moisture content of 8.79%. The highest ash content was also found in the A2 treatment, namely the wb ash content of 3.35% and the db ash content of 3.64%. The A2 treatment produced the highest fat content of 2.10%, while the highest protein content was found in the A1 treatment of 8.46%. The highest crude fiber content was obtained from the A3 treatment of 6.70%, and the highest total carbohydrate in the A3 treatment was 73.72%. The best cracker bloom was obtained in the A1 treatment of 76.84%. In terms of the panelists' preferences, the most preferred color was found in the A3 treatment with a score of 5.77, the best aroma in the A2 treatment with a score of 5.40, the best taste in the A3 treatment with a score of 5.87, and the most preferred texture in the A3 treatment with a score of 5.67. These results showed that flour variation had a significant effect on chemical properties, flammability, and the level of preference of panelists for egg cane crackers.

BIBLIOGRAPHY

- National Standardization Agency. (1992). SNI 01.2891:1992 Food and Beverage Testing Methods. *Indonesian National Standards*. Jakarta, 1992, 1–39.
- Chaniago, R. (2015). The Potential of Terubuk (*Saccharum edule* Hasskarl) Biomass as Fodder for Added Cow Body Weight. *Journal of Tropical Galung*, 4(2), 68–73.
- Chaniago, R. (2019). *A variety of processed indigenous vegetables typical of Luwuk*. Deepublish.
- Chaniago, R., Lamusu, D., & Samaduri, L. (2019). The Combination Of Wheat Flour

- And Tapioca Flour To The Ability To Swell And Organoleptic Properties Of Terubuk (*Saccharum edule* Hasskarl) The Combination Of Wheat Flour And Tapioca Flour To The Ability To Swell And Organoleptic Properties Of Terubuk (*Saccharum e.* *Journal of Food Processing* , 4(1), 1–8.
- D'Oench, N. (2021). *Flower Arranging the American Way: A World Association of Flower Arrangers Book*. Abrams.
- Dasir, Utami, D., & Yuniarti, E. (2020). *Cracker and Kemplang Processing Technology*. 1–83.
- Kadir, D., Sudirman Akilie, M., & Anto, D. (2021). Study on making oci fish crackers (*Rastrelliger* sp). *Agercolere Journal*, 3(2), 63–69. <https://doi.org/10.37195/jac.v3i2.117>
- Lekahena, V. N. J. (2016). Effect of additional tapioca flour concentration on nutritional composition and sensory evaluation of red meat nuggets of Madidihang fish. *Agrikan: Journal of Fisheries Agribusiness*, 9(1), 1–8. <https://doi.org/10.29239/j.agrikan.9.1.1-8>
- Muharram. (2019). Terubuk Farming Performance. *Resma*, 3(2), 13–22.
- Muliani, S., Asriany, A., & Lahay, N. (2022). Analysis of crude protein and crude fiber content in market vegetable waste (cabbage, mustard, corn husks) with the addition of Em4 as an alternative feed. *Nutrition and Animal Feed Bulletin*, 16(1), 10–17.
- Nurhayati, I., & Putri Sundari. (2016). Organoleptic Quality Analysis of Shrimp Crackers with the Addition of Carrots. *Nasuwakes Journal of Scientific Health*, 9(1), 9.
- Pentury, M. M., Koleangan Harry S.J., & Runruwene Max R.J. (2017). Nutritional Value Content in Wax Vegetables (*Saccharum edule* hasskarl) Typical Food in North Halmahera, North Maluku Before and After Processing. *Pharmacon Scientific Journal of Pharmacy*, 6(4), 249–254.
- Rahmi Fitrawati AM1*, M. M., Muliadin1, Hermawan1, R., Renol1, & Moh. Akbar. (2017). Effect of Catfish Protein Concentration on Effect of Catfish Protein Concentration on Chemical. *ISSN Journal of Food Processing:2527-5631*, 3(1), 28–31.
- Susilawati, A., Kurnia Utami, V., & Farid, U. M. (2024). Swellability and Organoleptic Test of Breadfruit Crackers (*Artocarpus altilis*) with the Addition of Different Flour. *TAPE: Journal of Agricultural Product Technology*, 1(1), 1–9.
- Y. Yuliani1, M. Maryanto, N. N. (2018). Physical and Chemical Characteristics of Merang Mushroom Flour *Journal of Agrotechnology* Vol. 12 No. 02 (2018). *Agrotechnology*, 12(2).
- Yasri, B., Hikmah, K. N., & Rosandhi, M. (2019). ISSN : 2407 – 1315 AGRITEPA, Vol. VI, No.1, July – December 2019. *Agritepa*, VI (1).



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