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Formulation of Goroho Banana (Musa acuminafé, sp) Wheat Flour and Tapioca Flour in The Making of Wheel Cakes

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A R T I C L E I N F O

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A B S T R A C T

The purpose of this research is to determine the effect of adding goroho banana flour, wheat flour and tapioca flour on texture, ash content and carbohydrate content as well on wheel cake products. This research method used a completely randomized design with 3 treatments and 3 times repetition, namely K1 = 100 g rice flour + 50 g wheat flour, K2 = 100 g rice flour + 50 g goroho banana flour and K3 = 100 g rice flour + 50 g tapioca flour. Parameters observed were texture analysis, ash content, and carbohydrate content as well as organoleptic tests. The results showed that the highest texture analysis was in treatment K1 (100 g rice flour + 50 g goroho banana flour) with a value of 3.12 kg and the lowest was in the K0 treatment (100 g rice flour + 50 g wheat flour) with a value of 2.74%. The highest ash content was in treatment K1 (100g rice flour + 50g goroho banana flour) with a value of 1.24% and the lowest was in treatment K2 (100g rice flour + 50g tapioca flour) with a value of 0.80%. The highest carbohydrate content was found in treatment K0 (100 g rice flour + 50 g wheat flour) with a value of 46.08% and the lowest in treatment K2 (100 g rice flour + 50 g tapioca flour) with a value of 44.68%.

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INTRODUCTION

Banana production in Indonesia will reach 8.74 million tons in 2021. This number has increased by 6.85% tons compared to the previous year which was 8.18 million tons. Looking at the trend, domestic banana production tends to increase within a decade. In 2013, banana production in Indonesia was only 6.28 million tons. The figure rose to 7.23 million tonnes in 2015. A year later, banana production in Indonesia decreased by 3.04% to 7.01 million tonnes. Banana production increased again from 2017 to 2021, the number then reached its largest level last year(bps, 2021).

According to the Gorontalo Central Statistics Agency (2021), banana production in Gorontalo was recorded at 6,938.00 tons. Bananas are one of the fruits that are often found in rural areas because banana plants can grow well without any special care and are often used optimally.Bananas are tangible objects that are easy to trade and can be stored for a certain period of time. Bananas are easily damaged so they require handling after harvest to maintain their quality. Bananas that are not sold immediately will lose their economic value, so they must be immediately processed into various forms of food such as dodol, sale, chips and banana flour. Banana flour is another option as a substitute for wheat flour (Nurhayati et al., 2015). In Gorontalo Province, especially in Boalemo Regency, bananas are widely consumed by children, teenagers and adults. These bananas are processed in various kinds of preparations such as fried bananas, banana sticks, and various other preparations which are usually found in coffee shops. /coffee shops on the side of the road and usually bananas are often provided in various kinds of restaurants in the Boalemo Regency area.

Banana flour is a powder that is traditionally made from raw bananas by peeling, slicing, drying, then grinding until smooth. A prospective product for local food development is banana flour which has a carbohydrate content (17.2-38%). Banana flour is a functional food. Apart from starch, this flour is also rich in fiber(Nurhayati et al., 2015).Wheel cake is defined as a type of dry cake made with flour as the basic ingredient. In general, wheel cakes are made using rice flour as a basic ingredient. The advantage of wheel cakes compared to other types of pastries is that they have a delicious taste with a balanced combination of sweet and savory flavors, have a distinctive aroma of wheel cakes, have a golden yellow color and have a crunchy and dry texture.(Nurhayati, N., Nafi, A., & Pratiwi, 2015). Goroho banana flour is said to be the type of banana with the highest nutritional content, namely fat, carbohydrates, protein, consisting of amylose and amylopectin. In Goroho bananas there are components of water content such as starch, total sugar and crude fiber so that Goroho bananas have potential in diversifying Goroho bananas as an alternative food as a source of carbohydrates because they have a relatively high starch content.(Mandei & Indriayty, 2017).

Tapioca is often said to be flour. In general, tapioca is often used as a filler in dry cakes and as a thickening agent for sauces. This food ingredient is starch resulting from water extraction from cassava tubers. The name tapioca comes from Brazilian which means food from cassava. In England, tapioca is

associated with the term rice pudding because it is often used as a raw material in making pudding(Mandei & Indriayty, 2017). Tapioca flour contains several nutritional components such as protein, fat, water and carbohydrates. The use of binders aims to assist the gelatinization process, thereby producing products with good sensory value and can influence the nutritional composition of the product resulting from.Flour is a solid particle in the form of fine or very fine granules depending on the grinding process.

In this way, researchers developed goroho bananas into flour. Making wheel cakes with the addition of goroho banana flour had never been done before. Therefore, it is necessary to study the research entitled "Formulation of Goroho Banana Flour (Musa acuminafe, sp), Wheat Flour and Tapioca Flour in Making Wheel Cakes".

THEORETICAL FRAMEWORK

According to the Gorontalo Central Statistics Agency (2021), banana production in Gorontalo was recorded at 6,938.00 tons. Bananas are one of the fruits that are often found in rural areas because banana plants can grow well without any special care and are often used optimally. Banana flour is a functional food. Apart from starch, this flour is also rich in fiber (Nurhayati et al., 2015).

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In England, tapioca is associated with the term rice pudding because it is often used as a raw material in making pudding(Mandei & Indriayty, 2017).

METHODS

A. Tools and materials

Toolfor making wheel cakes, namelyfrying pan, wheel cake mold, stove, plastic baking pan, bowl/container, spoon, analytical scale, stirrer, drainer,penetrometer, sample needle (probe), trigger, digestion flask, porcelain crucible, furnace, desiccator, Erlenmeyer, upright cooler, measuring flask, and pipette.

IngredientsWhat will be used are goroho banana flour, tapioca flour, rice flour, wheat flour, eggs, granulated sugar, coconut milk, butter, vanilla, cooking oil, plastic packaging, boiling stones, NaOH solution, CH3COOH, distilled water, luff solution, H2SO4 , water, and NaS2O3 solution.

B. Research design

The experimental design used was a completely randomized design (CRD) with 3 treatments and 3 replications which modified the research(Uller et al., 2017)(Uller et al., 2017). Treatment consists of:

K0 = Rice Flour 100 g + Wheat Flour 50 g
K1 = Rice Flour 100 g + Goroho Banana Flour 50 g
K2 = Rice Flour 100 g + Tapioca Flour 50 g

C. Research procedure

Making Goroho Banana Flour Peel the goroho banana. Wash using clean water. Cut the goroho banana into 1 mm pieces. Dry the goroho bananas in the sun for 3 days. Grind or puree goroho bananas that have been dried in the sun. Then sieve the Goroho bananas to separate the particles that pass through the 80 mesh sieve.

Wheel Cake Making Mix the ingredients according to the treatment, the ingredients in the wheel cake mixture are 50 g sugar, 15 g margarine, 89 g eggs, 3 g vanilla and 70 ml coconut milk. Stir using a spoon to mix the ingredients uniformly and have a perfect or even distribution. Then mold it using a special wheel cake mold, the mold is previously heated in cooking oil. Then dip it in the batter and fry by shaking the mold until the batter separates from the mold. Continue frying until the wheel cake is cooked and golden yellow, then remove and drain.

D. Research Parameters

Texture Texture can be done using a penetrometer, which is a tool for determining the physical properties of materials or food products which are related to the durability or strength of a material under pressure. The working principle of this penetrometer is to apply a load to the tool, then set the scale needle into the product for a certain testing time. Pressure is applied to the sample using the TA43 probe which forms a ball/sphere with a depth setting until the needle penetrates the sample.

Ash Content Prepare the porcelain crucible that will be used and weigh it initially. The material is weighed 2-5 g in a porcelain crucible, dried at a temperature of 110^{o}C. The material is put into the furnace at a temperature of 300^{o}C. For 5 hours until the color of the ash changes to whitish. The material is then removed from the furnace and put into a desiccator, then after it has cooled, the weight of the ash is weighed.

$$\text{Ash Content (\%)} = \text{x } 100\% \ \frac{\text{the weight is initially} - \text{the end of weight}}{\text{the end of weight}}$$

Carbohydrate Levels Weigh 3 g of sample into a 500 ml Erlenmeyer. Add 200 ml of 3% HCI solution and boiling stones. Simmer for 2 hours using an upright cooler. Cool and neutralize using a 31% NaOH solution, so that the solution is slightly acidic or pH 5-6, add a little CH3COOH3%. Put 500 ml into a measuring flask then add distilled water to the mark, then filter. Pipette 10 ml of the filtered product, put it into a 500 ml Erlenmeyer, then add 26 luff solution

and 16 ml of distilled water and some boiling stones. The mixture is heated using a steady flame, making sure the solution boils within 4 minutes. Boil for 10 minutes counting when it starts to boil, then soak in ice water. Add 25 ml of 25% H2SO4 and 15 ml of 20% Kl slowly.

E. Data analysis

In the treatment of data obtained in analysis of variance, using the Advanced Significant Difference (BNJ) test.This research used a completely randomized design (CRD). Consisting of 3 systematic model treatments with 3 repetitions of variance analysis.

$$Yij = \mu + \tau i + \varepsilon i$$

Information:
Yij = Observed Value
μ = Average Expected Value
τi = Influence of Treatment Factors
εij = Effect of Error

In the treatment of the data obtained in the analysis of variance, using the advanced honest significant difference (BNJ) test.

RESULTS & DISCUSSION

A. Texture

Texture is one of the quality characteristics that influences products and consumer perceptions. Texture depends on the physico-chemical properties of simple and human perception. The aspect of texture is the measurement based on the interpretation of data related to the texture of food. The compression or pressure-based TPA method on the sample along with a penetrometer is used to assess texture objectively by measuring the level of hardness or texture of a food ingredient with the principle of applying force or pressure to a particular food ingredient over time.(Kim, 2014). Texture analysis of wheel cake products can be seen in Figure 1

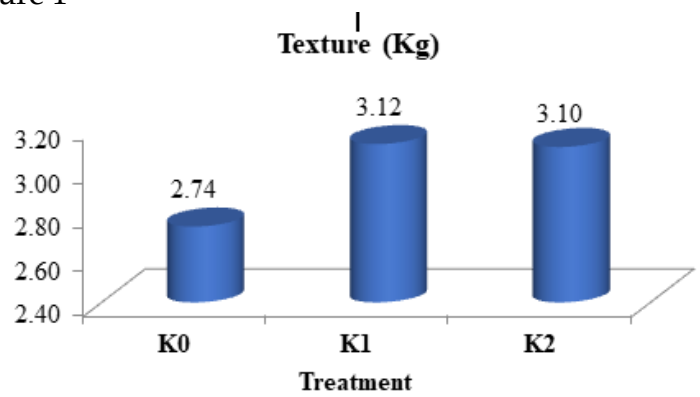

Figure 1: Texture Analysis Test Results on Roller Cakes

Based on Figure 1, it shows that the test results using a penetrometer, the strength of resistance to pressure or the texture of the wheel cake, was highest in the K1 treatment (100 g rice flour + 50 g Goroho banana flour) with a value of 3.12 kg. The cause of the high value of breaking strength in K1 is caused by the level of hardness of the wheel cake which is influenced by the high amylose content in Goroho banana flour. This is in accordance with the statement(Tarigan, AM, 2019)that Goroho banana flour has the highest amylose content compared to other edges, namely 39.59%. Amylose levels greatly influence the level of crispiness and development of a food product. This is because amylose plays a role in increasing hardness, where products with a high hardness value cause lower crispness. Apart from that, the level of crispness of the texture is influenced by the interaction of starch and protein which provide structure to the dough, forming hydrogen bonds depending on the type of flour and flour ratio. This statement is supported by(Supriyadi, 2012), that amylose plays a role in increasing hardness compared to amylopectin so that this causes the consistency of sample hardness to increase if the amylose content is higher while the crispness of the sample decreases.

Meanwhile, the lowest was in the K0 treatment (100 g rice flour + 50 g wheat flour) with a value of 2.74 kg. The low fracture strength value of the wheel cake indicates the higher level of crispness of the product. Rice flour and wheat flour formulations can improve the resulting texture. Choose rice flour and wheat flour because they contain high protein. Flour contains a protein known as gluten which is formed from gliadin and glutenin. Glutenin has a function in forming water volume, therefore it is necessary to add rice flour to provide a crunchy texture(Nurgahani, R. and Yuniartini, 2023).

The results of the further honest real difference (BNJ) test showed that the texture analysis value on the wheel cake had no significant effect.

B. Ash Content

Ash is a component of food. This component consists of minerals such as potassium, phosphorus, sodium, magnesium, calcium, iron, manganese and copper. Determining the ash content is related to the minerals of a food ingredient. Ash content is determined based on losses after combustion with the condition that the end point of combustion is stopped before decomposition of the ash occurs(Tahir, MM, Abdullah, N., Rahmadani, 2014).The ash content test on wheel cake products can be seen in Figure 2.

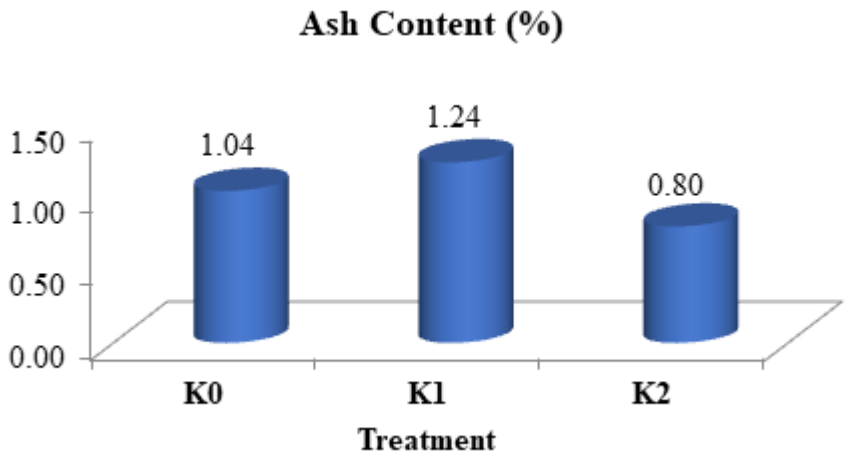

Figure 2:Ash Content Test Results in Roller Cakes

Based on Figure 2, the ash content made from rice flour shows that the highest ash content was found in treatment K1 (100 g rice flour + 50 g goroho banana flour) with a value of 1.24%. The high ash content in treatment K1 was caused by the addition of goroho banana flour with a greater presentation, the ash content value in the wheel cake increased. The ash content of the product is influenced by the ash content of the flour raw material, which means that the ash content of Goroho banana flour is higher than the ash content of wheat flour and tapioca flour.

Meanwhile, the lowest was in the K2 treatment (100 g rice flour + 50 g tapioca flour) with a value of 0.80%. Because obey(Wijana, S. Nurika, I. and Habibah, 2009)that tapioca flour is a flour that is lower in mineral content than other types of flour. The ash content in tapioca flour is around 0.6%. The lower ash content in wheel cakes is thought to be the result of the lower tapioca mineral content, this was also stated by (Winarno, 2008)which shows that the ash content in the wheel cake is lower along with the concentration of tapioca flour added.

The results of the further honest significant difference (BNJ) test showed that the value of ash content in wheel cakes had a very significant effect (α>0.01).

C. Carbohydrate Content

Carbohydrates are natural products that have many important functions in plants and animals. Through photosynthesis, plants convert carbon dioxide into carbohydrates, namely in the form of cellulose, starch and sugars. Carbohydrates in flour consist of carbohydrates in the form of simple sugars, pentose, dextrin, cellulose and starch.(Setiyono, 2011).The amount of carbohydrate content in wheel cakes can be seen in Figure 3.

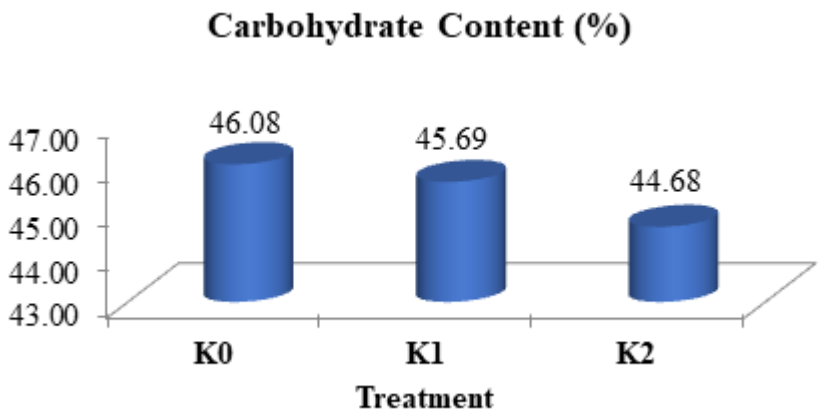

Figure 3:Carbohydrate Content Test Results in Wheel Cake

Based on Figure 3, the carbohydrate content made from rice flour shows that the highest carbohydrate content was found in the K0 treatment (100 g rice flour + 50 g wheat flour) with a value of 46.08%. The high carbohydrate content in the K0 treatment was due to the fact that the carbohydrates in wheat flour were also high compared to goroho banana and tapioca flour.,The largest component in wheat flour is starch, around 70% consisting of amylose and amylopectin, which are the largest components of carbohydrates apart from simple sugars and pectin.(Martinis, 2012) that every stable temperature treatment will result in increased carbohydrate levels.

The low carbohydrate content was found in the K2 treatment (100 g rice flour + 50 g tapioca flour) with a value of 44.68%. Because during the processing process the mineral content decreases during frying. This is in line(Winarno, 2008), which states that carbohydrates calculated using the by different method are influenced by other nutritional components. The lower the levels of other nutrients, the higher the carbohydrate levels will be. Vice versa, the higher the levels of other nutrients, the lower the carbohydrate levels.

The results of the follow-up honest real difference (BNJ) test show that the value of carbohydrate content in wheel cakes has a very significant effect(α>0.01).

CONCLUSIONS AND RECOMMENDATIONS

Based on the research results, it can be concluded thateffect of adding goroho banana flour, wheat flour and tapioca flour mgave a very real influence on the results of the analysis, ash content with a value of 1.24%, carbohydrate content with a value of 46.08%, while the texture analysis test was not significant with a value of 1.12 kg.

FURTHER STUDY

With research limited to variables, researchers recommends that similar research be conducted targeting different variables different groups or contexts. As a result, adding mediating variables can. It can also be studied by future researchers to gain new insight into this matter relationship between variables. The results of this research can help future researchers identify what improvements the company can make in order to improve their operations to

be more sustainable and able to face change. The recommendations above will help researchers to identify what factors have a significant influence.

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