CARBOHYDRATE AND FAT CONTENT IN RED BEAN FLOUR AND BLACK RICE FLOUR SUBSTITUTION *COOKIES*

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ABSTRACT

Blood sugar control in diabetes mellitus patients can be achieved by consuming foods with a low glycemic index. Red peanuts and black rice are included in the category of low glycemic index foods. An alternative snack made from a mixture of red peanut flour and black rice flour can be processed into cookies. This study aims to determine the effect of substituting red peanut flour and black rice flour in cookies on carbohydrate and fat levels. Above" is incorrect. You can use "This study is an experimental research using a Completely Randomized Design (CRD) consisting of 4 treatment levels with 6 replications, Namely, the ratio of wheat flour: black rice flour: red peanut flour at P0 (100:0:0), P1 (0:25:75), P2 (0:50:50), and P3 (0:75:25). The research results indicate an increase in carbohydrate and fat levels according to the cookie formulation. P1 is the most appropriate formulation for individuals with diabetes who suffer with level low carbohydrate and fat levels.

Keywords: Black Rice Flour; Cookies,Flour; Diabetes Mellitus; Peanut Red; Proximate Test

1. INTRODUCTION

Blood glucose levels in diabetes mellitus patients can be determined through fasting blood glucose $\geq$ 126 mg/dl, random blood glucose $\geq$ 200 mg/dl, oral glucose tolerance test $\geq$ 200 mg/dl, or HbA1C $\geq$ 6.5% (Adi, 2019). High and uncontrolled blood sugar levels over a long period in diabetes mellitus patients can lead to various complications, good macrovascular among them freezing blood in the brain, coronary heart disease, and stroke, as well as microvascular among them nephropathy, retinopathy, and amputation. (R. W. Astuti et al., 2024).

In 2021, around 19.46 million people in Indonesia were diagnosed. With diabetes, an 81.8% increase since 2019 (IDF, 2021). Based on the East Java Health Profile, the prevalence of diabetes mellitus in East Java in 2021 is around 6.8% of the population, while in Tuban Regency the prevalence of diabetes mellitus is 1.7% and is ranked second in degenerative diseases Health Center Cross own case highest with 1924 diabetes sufferers, while ranking second is Tuban Health Center with 1892 cases of diabetes mellitus (Jatim, 2021) .

In the research, Kurniasari (2022) shows that 93.3% of respondents, diabetes sufferers, have a pattern of eating something that is not Healthy with a level of glucose in their blood that is not controlled. Uncontrolled eating patterns such as consuming food high in fat, high sugar, and little

fiber can cause an increased level of glucose, and rapid blood sugar after eating. This can trigger diabetes mellitus disease, especially when consuming processed food, Ready servings, and sweet drinks, which often contain simple, and low fiber (Yusnanda et al., 2018). Based on research conducted shows that the majority of diabetes mellitus patients exhibit a noticeable pattern of eating well , like consuming sweet tea 3x a day, eating fried foods, and sweet bread as *snacks* daily.

The recommended diet for diabetes patients involves eating small but frequent meals, with healthy snacks containing a low glycemic index, high fiber, and high protein. (Puspita et al., 2020). Snacks or food recommended interlude for a Diabetes Mellitus sufferer is 10-15% of total calories per day. (Adi, 2019). Food ingredients used in making food interlude must contain low GI, levels fiber, and high protein that can increase insulin sensitivity / stimulate insulin secretion so that they can control sugar levels in blood. (Manullang et al., 2020)

One of the convenient and portable snacks is cookies. However, commercially available cookies still contain high levels of sugar and fat. (Damayanti et al., 2020). Therefore, it is necessary to substitute wheat flour as the main ingredient in cookies with red peanut flour and black rice flour, which have a low glycemic index and are rich in fiber and protein. (Loza et al., 2017).

Black rice (Oryza sativa L. Indica) is a low glycemic index food (19.04) and high in fiber, making it suitable for diabetes patients. (Warman et al., 2016). Other food ingredients with a low glycemic index are peanut red of 26, the lowest among type nuts, such as peanut green (76) and soybeans (31). Low index glycemia will prevent an increase in blood sugar levels that are too high, fast after eating (R. W. Astuti et al., 2024). Based on the description above , so objective of the study is to know the level of carbohydrate and fat content in the formulation product *cookies* as an alternative food interlude for diabetes mellitus sufferers with substitution flour rice black and flour peanut red.

2. METHOD AND ANALYSIS

This study employs a true experimental design using a completely randomized design (CRD) (Sugiyono, 2016). The treatment involves creating variations of black rice flour and red peanut flour mixtures in cookies. Subsequently, proximate analysis is conducted to assess carbohydrate and fat levels. This study uses 4 treatment levels with 6 replications, namely the comparison of wheat flour: black rice flour, red peanut

flour at P0 (100:0:0), P1 (0:25:75), P2 (0:50:50), and P3 (0:75:25).

The preparation of cookies substituted with black rice flour and red peanut flour was carried out in the Culinary and Food Processing Laboratory, Bachelor of Nutrition Study Program, Faculty of Health Sciences, Nahdlatul Ulama Tuban Institute. The analysis of carbohydrate and fat content in cookies substituted with black rice flour and red peanut flour was conducted at the Chemistry Laboratory, Faculty of Science and Mathematics, Satya Wacana Christian University.

3. RESULT AND DISCUSSION

Carbohydrate Content Analysis

The carbohydrate content test was conducted using the Antron method following standard procedures. The results of the carbohydrate content test in cookies indicate that the highest carbohydrate content is found in the P3 formulation, amounting to 54.97 grams (25% red peanut flour and 75% black rice flour). This may be attributed to the higher carbohydrate content in black rice flour.

The lowest carbohydrate content is found in the P1 formulation, at 44.68 grams (75% red peanut flour and 25% black rice flour). This may be due to the lower carbohydrate content in red peanut flour compared to black rice

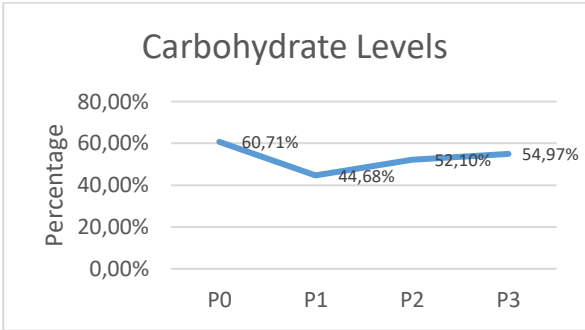flour. The laboratory test results for carbohydrate levels can be seen in Table 1.

Figure 1. Lab test for carbohydrate levels

Fat Content Analysis

Based on laboratory test results, the highest fat content in cookies with black rice flour and red peanut flour substitution is found in the P3 formulation, amounting to 23.03 grams (25% red peanut flour and 75% black rice flour). This may be due to the significant fat contribution from red peanut flour. Conversely, the lowest fat content is found in the P1 formulation, at 20.77 grams (75% red peanut flour and 25% black rice flour). This may be due to the lower fat content in red peanut flour. The result can be seen in Figure 2.
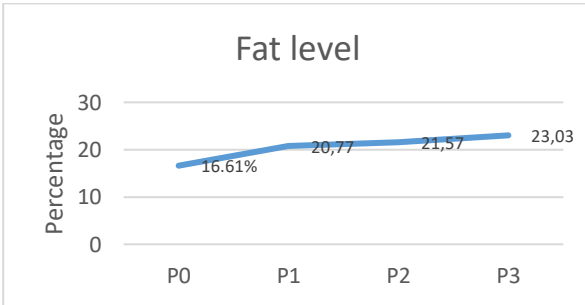

Figure 2. Lab test for fat content

DISCUSSION

a.   Carbohydrate

The results of carbohydrate content analysis in cookies with black rice flour and red peanut flour substitution show an increase in carbohydrate levels in each treatment group according to the formulation. The highest carbohydrate content is found in P3 cookies (25% red peanut flour and 75% black rice flour) due to the carbohydrate content in black rice flour, which is 54.97 g/100 g. In the second order, there are P2 *cookies* with 50% flour formulation, peanut red and 50% flour rice black, with a carbohydrate level of 52.1 g/100 g. Meanwhile, the lowest level of carbohydrate lowest contained in *cookies* P1 with 75% flour formulation, peanut red and 25% flour rice black, which has a level of carbohydrate of 44.68 g/100 g. The increased level of carbohydrates that occur in P3 formula *cookies* can happen along with an increasing proportion of flour, rice black in the cookies formula. This is in line with research by (Lalu et al., 2019). Which states that the more black flour rice is used, increasingly tall content in products sausage produced. Flour rice black own content more carbohydrates , namely by 67.7% (Lalu et al., 2019), compared to flour, peanut red only own level of carbohydrate by 62.6% (S. D. Astuti et al., 2014). Meanwhile, although the level of carbohydrate in *cookies* with substitution in the P3 formula is high, compared to that of control *cookies* (P0) still lower. This is caused by the level of carbohydrates in flour rice, black and flour peanut, more red low compared to flour wheat flour, which has carbohydrate level of 77.2% (Kementerian Kesehatan RI, 2017). Based on the research results, the carbohydrate content of cookies increases as the proportion of black rice flour substitution increases. This is due to the higher carbohydrate content in black rice flour compared to red peanut flour. This is especially caused by the content of more carbohydrates in rice flour compared to peanut flour. The content of more carbohydrates in rice flour makes his contribution to the total carbohydrate content of *cookies* more big. Therefore, substitution of flour rice black with flour peanut red in a significant way can influence the carbohydrate content in the product *cookies.*

b. Fat

Fat content measurement was carried out to analyze the fat content in food samples or food ingredients. Results of the analysis of the substitution fat content test flour rice black and flour peanut red on *cookies* show existence improvement in fat content in formulations P1, P2, and P3 sequentially. The highest fat content increase in the P3 cookie formulation

can occur along with the increase in black rice flour proportion in the cookie formula. One of factors affecting is the height and fat content in flour rice black compared to flour peanut red, namely 3.5 grams (Lalu et al., 2019). This result is in line with research conducted by (Hidayat et al., 2019) which stated that on the product bakpao, the highest fat content is contained in the formula with composition flour rice black the most. The same thing was also confirmed by (Megadianti et al., 2020) who stated that the taller the addition or substitution of flour rice black, more and more the fat content is also high in the product *butter cookies*.

Another factor is the high fiber content in black rice flour. Fiber has the ability to absorb and retain fat and water during the mixing and baking process. Fiber has ability to absorb and retain fat and water during the mixing and baking process. The ability fiber allows fat to bind in a way evenly in dough, prevent separation of fat, and maintains texture as well as softness *cookies*, so that it produces higher fat content in product. (Loaloka et al., 2021) in the P1 formulation, it also experienced improvement compared to with *cookies* control (P0), p This can be due to Because Fat content of flour peanut red more higher, namely 2.7 g/100 g (R. W. Astuti et al., 2024), compared to with flour flour (*cookies* control/P0), which only has a fat content of 1.0 g/100 g (Kementerian Kesehatan RI, 2017).

This result is in line with research by (Simanullang et al., 2023), which states that the taller proportion of flour peanut red is used, then the more the fat content produced in the cake is also high syringe. Additionally, the increase in fat content is also due to the addition of other ingredients such as eggs and margarine, which contribute to the fat content of the cookies. (Megadianti et al., 2020). Margarine contains high fat content, which is 80 to 81% of total fat, while the fat content in egg yolk is 30% (Rosida et al., 2020).

4. CONCLUSION

There is an influence of the formulation using black rice flour and red peanut flour substitution on the increase in carbohydrate and fat levels in cookies. The most suitable formulation as a snack for diabetes sufferers is cookies with low carbohydrate and fat content, namely the P1 formulation (25% black rice flour and 75% red peanut flour), with carbohydrate levels of 44.68 g/100 g and fat levels of 20.77 g/100 g.

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