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Analysis of Primary Metabolic Compounds in Durian Seed Flour (*Durio zibethinus Murr*) Typical of Central Sulawesi (Parigi Moutong)

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Abstract

This study aims to determine the carbohydrate, protein, and fat content of durian (Durio zibethinus Murr) seeds from Parigi Moutong. This study consisted of two samples, namely, sample A (crushed durian seeds) and sample B (mashed and sifted durian seeds)—Soxhlet method. The results obtained in sample A for carbohydrate content of 52.8 %, protein 3.50 % and fat 2.06 % while in sample B for carbohydrate content of 43.2 %, protein 2.27 % and fat 2.25 %. Based on the results obtained, durian seed flour can be used as processed food and can be of economic value if it is further processed and traded.

Keywords: Durian seeds, carbohydrates, protein, and fat

Introduction

Durian is a fruit that has quite complete nutrition. In addition to the flesh, the seeds also contain various nutrients. However, most people only eat the fruit; the seeds are unused and thrown away. In general, durian skin and seeds have not been utilized optimally. A small portion is only used as animal feed, and most is thrown away (Wati et al., 2017).

Durian seeds are part of the durian fruit contained in the durian flesh, which has a small shape. People do not eat durian seeds because it can cause the tongue to become itchy. This is because durian seeds contain mucus. According to Djaeni & Prasetyaningrum (2010), the starch content of durian seeds is higher than that of sweet potatoes. If durian seeds are used and processed further, they will be helpful and valuable as raw materials for various processed foods.

After most people eat durian flesh, the seeds are not used. They are thrown away, so we often encounter durian seed waste that can damage environmental health even though durian seeds contain many good nutrients for the body. Carbohydrates are organic compounds composed of elements C, H and O which have the primary function as a source of biocalories in foodstuffs, as a sweetener (sucrose, glucose and fructose. Factors that affect the amount of carbohydrates needed by each person) people, namely age, weight and activity (heavy work or casual life) (Tandra, 2015).

According to Natsir (2018), protein is a vital substance for the body because protein, in addition to functioning as fuel, also functions as a building material, regulating metabolism in the body, transport, immune protection, and as a biocatalyst. Benefits for the body and the health of the body, one of which is that protein can activate insulin without increasing blood glucose. This is due to insulin secretion, which can convert glucose into energy distributed throughout the body. Protein influences the glycemic index because the higher the protein in a food, the lower the glycemic index (Wolever, 2017). Protein consists of elements C, H, O, and N, which are not owned by carbon or fat elements.

Fat is the body's second source of energy after carbohydrates. Fats are composed of the elements O, H, and C and are insoluble in water, so they require organic solvents to dissolve them (Santika, 2016). Fat can add to the delicacy of food; for example, fried food is certainly more delicious than cooked or steamed food in general.

Fat acts as a food reserve for the body. Therefore, based on the above review, it is interesting to research the analysis of carbohydrate, protein, and fat levels in durian seeds from Parigi Moutong.

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Methods

Tools and materials

The tools used in this study were round bottom flask, digital balance, dropper, spatula, funnel, reflux apparatus, burette, stative, 250 mL Erlenmeyer, measuring flask, measuring cup, beaker, stirring rod, pH meter, a set of destruction tools, a set of kjehdal tools, burette, funnel, 250 mL erlenmayer, 10 mL measuring cup, 100 mL volumetric flask, hot plate, 10 mL measuring cup, oven, tongs, desiccator, Soxhlet micro extraction apparatus, water bath, thimbel from filter paper, fat-free cotton, and round bottom squash.

The materials used in this research are durian seed samples, luff school solution, 3 % HCl, 40 % NaOH, aquades, 25 % H_2SO_4, 15 % KI, 1 % starch, 0.1 N $Na_2S_2O_3$, selenium, H_2SO_4, 30 % NaOH, NaOH 0.1 N, HCl, and n-hexane.

Sample preparation

The samples used were durian seeds typical of Central Sulawesi, more precisely, durian seeds from Parigi Moutong. First, the durian seeds are washed and then peeled, or the skin of the durian seeds is separated so that all that is left is the durian seed flesh. Furthermore, it was cut into smaller pieces and then baked at a temperature of 105 °C until a constant weight was obtained. In the next step, the durian seeds were crushed into smaller pieces using a mortar and pestle (sample A). A sample of A was taken, mashed using a blender, and sieved (sample B) (Fadjria et al., 2019).

Analysis of carbohydrate levels

Making luff school solution

A total of 5 grams of $C_6H_8O_7.H_2O$ was dissolved in 2 mL of distilled water as solution A, 2.5 grams of $CuSO_4.5H_2O$ dissolved in 10 mL of water as solution B, and 14.38 grams of Na_2CO_3 in boiling distilled water as solution C. Solutions A and B were mixed in a flask measuring 100 mL. Solution C was added little by little, then distilled water was added to the mark, left overnight, and then filtered (Ifmaily, 2018).

Determination of blank solution

5 mL of distilled water was added to the Erlenmayer, then 2 mL of Luff school was added, then 3 mL of 15 % KI and 5 mL of 25 % H_2SO_4 were homogenized and titrated with 0.1 N $Na_2S_2O_3$, then one drop of starch was added, which acted as an indicator.

Sample analysis

Samples A and B were weighed as much as 0.3 grams, then each was put into an Erlenmayer, which was then added 12 mL of 3 % HCl. The solution was neutralized to pH 7 with 40 % NaOH, refluxed for 2.5 hours, cooled, and diluted into a 100 mL volume flask.

The sample that has been diluted is taken as much as 5 mL and then put into an Erlenmayer. Then, 2 mL of Luff Schoorl solution, 5 mL of 25 % H_2SO_4, and 3 mL of 15 % KI are added. Next, it was titrated with 0.1 N $Na_2S_2O_3$ solution until the color was brownish white, then 2 mL of 1 % amylum was added, and the titration was continued slowly. Stop the titration until the solution is milky white. Record the used 0.1 N $Na_2S_2O_3$ solution. The treatment was repeated 3 times. The formula for carbohydrate levels is:

$$\text{Glukosa level} = \frac{(W_1 \times fp)}{W} 100\% \quad (1)$$

Carbohydrate levels = 0.9 x glucose levels (Fadjria et al., 2019).

Protein analysis

Digestion: Samples A and B weighed as much as 1 gram. Each sample was then put into a Kjehdal flask, and 15 mL of concentrated H2SO4 was added. The selenium table was then homogenized and destroyed for 3 - 5 hours. The destruction was stopped after the solution became clear and then cooled.

Distillation: The results of the destruction of samples A and B were then diluted with 100 mL of distilled water and homogenized. After that, 50 mL of 30 % NaOH was added, and distillation was carried out. The distillation was accommodated into a 250 mL Erlenmayer flask containing 50 mL of 0.1 N HCl solution. The distillation process was completed if the distillate accommodated approximately 75 mL.

Titration: To the remaining 0.1 N HCl solution that does not react with the distillate, two drops of methyl orange are added, and then the solution is titrated with 0.1 N NaOH. Blank titration is carried out with the same treatment without using a sample (Syafruddin et al., 2016). The formula for carbohydrate content is.

$$\% \text{ Protein} = \frac{V_1 - V_2}{W} \times N\ NaOH \times 14.008 \times fk \times 100\% \quad (2)$$

Fat analysis

The Soxhlet method determined the fat content in which the soxhlet flask contained the extracting solvent. The extracting solvent used in this study was n - hexane. The solvent is heated to evaporate. The solvent vapor will rise through the return cooling pipe and drip on the sample previously in the sleeve. If the solvent has soaked the sample and the height has passed through the solvent flow pipe, the extract flows into the soxhlet flask. The extract collected in the flask is heated again and evaporates so that only the fat remains in the flask. This process will occur repeatedly (Melwita et al., 2014).

The working procedure is, first, the soxhlet flask in the oven, then put in a desiccator, then weighed the empty flask, then sample A and sample B were weighed as much as 2 grams, then the sample was wrapped in filter paper and tied. Connect the lower end of the soxhlet microtube with the drained Soxhlet flask. Then, the filter

paper is inserted into the micro - soxhlet and poured with n - hexane approximately 2 times the tube volume (150 mL). Afterward, the condenser is installed, and the heater is set until the n - hexane boils. The extraction process lasted 3.5 hours. After that, the pumpkin containing fat was placed in the oven for 20 minutes and then put into a desiccator, then the pumpkin containing fat was weighed (Pargiyanti, 2019). The formula for fat content is:

$$\% \text{ Fat} = \frac{w - w_2}{w_2} \times 100\% \quad (3)$$

Results and Discussion

The research results obtained regarding the analysis of carbohydrate, protein, and fat levels in durian seeds for samples A and B are presented in **Table 1**.

Table 1. % carbohydrates, fat, and protein in durian seed flour

Sample code	% carbohydrate	% protein	% fat
Sample A	52.8	3.50	2.06
Sample B	43.2	2.27	2.25

The results of the analysis of carbohydrate, protein, and fat content in sample A obtained results for carbohydrate content of 52.8 %, protein content of 3.50 %, and fat content of 2.06 %, while the results of the analysis of carbohydrate, protein, and fat content in sample B obtained results for carbohydrate content of 43.2 %, protein content of 2.27 %, and fat content of 2.25 %.

Analysis of carbohydrate

The results of the carbohydrate research were based on the titration data obtained, and the average carbohydrate content for sample A was 52.8 % and for sample B an average of 43.2 %. According to Sulistiyono (2014), Changes in nutritional value often occur in carbohydrates due to the handling, preservation, and storage processes. Jiron (2020) stated that the longer the boiling time, the higher the carbohydrate content in a sample due to the swelling of the starch granules, which can increase the total value of the carbohydrates. In the process, the saccharides break down into smaller ones to produce simple starches (Uhrig at al., 2019). In heating, starch will cause the granules to expand so that they break and crumble. In addition, it can also be influenced by the characteristics of the soil material, climate, and the area where durian seeds grow.

Sample A has a higher carbohydrate content than sample B because the texture of sample A is slightly rougher than sample B. This Luff-Schoorl method goes through a destruction process where there is an overhaul or decomposition of starch into simpler molecules, namely glucose (Rinaldi, 2021). One of the factors that affect the destruction process is the length of heating time, so sample A, which has a finer texture, will decompose faster than sample B. By the time it reaches 2.5 hours, sample B has exceeded the optimum time limit, which results in the starch decomposition process being damaged Because the heating is too long so that a relatively more minor concentration is obtained. In comparison, sample A, which was heated for 2.5 hours, was the optimum time to decompose starch into glucose so that a higher concentration was obtained.

Protein analysis

The study results of protein content based on titration data obtained 3.50 % for sample A, while sample B obtained 2.27 %. The results obtained are lower than previous studies, namely in research by Sistanto et al. (2017), which obtained protein levels in durian seed flour ranging from 6.05 % to 6.53 %, while based on SNI quality requirements, the protein content in wheat flour was at least 7.0 %. The difference in the results obtained is influenced by the elements of soil material, climate, and the area where the durian seeds grow. In addition, it can also be caused during heating, namely the process of destruction and distillation, where it is known that the nature of nitrogen is volatile (Nurmalasari, 2011).

Like carbohydrates, the protein content in sample A was higher than in sample B due to the destruction and distillation involving heating. Sample B's texture is smoother than sample A's, so sample B's elements are more straightforward to decompose during the destruction process. The specified time is about 3 hours; at that time, sample B has exceeded the optimum time limit while sample A has just reached its optimum time. One of the elements that decomposes during heating is Nitrogen (N), which significantly affects protein content. The higher the nitrogen, the higher the protein content. The nature of this nitrogen is volatile, so if the heating process exceeds the optimum time, the nitrogen element will evaporate (Sayara et al., 2020). That is why sample B's protein content is less than sample A's.

Fat analysis

The results obtained for sample A were a fat content of 2.06 %, while sample B obtained the results of 2.25 %. The results obtained are slightly larger than the previous research, namely in the study Sistanto et al., (2017) where in his research stated the fat content was obtained not more than 1 % and based on the SNI quality requirements the fat content in wheat flour was not more than 1 % The difference in the results obtained is influenced by the elements of soil material, climate and the area where the durian seeds grow. It could also be influenced by the lack of time while roasting the pumpkin, which contains fat, so a lot of n-hexane has not evaporated as a result, and a higher fat content is obtained.

Unlike the carbohydrate and protein content, sample B's fat content was more

significant than sample A's. This happened because the soxhlet method used an organic solvent, namely n - hexane, to dissolve the fat in the sample (Quitério et al., 2022). The fat in sample B is more soluble because it has a finer texture than sample A, which has a slightly coarser texture, so the concentration of sample B is greater than that of sample A.

Conclusions

From the results of the analysis of research samples that have been carried out, it can be concluded that the carbohydrate content of sample A is 52.8 %, and the carbohydrate content of sample B is 43.2 %. The protein content of sample A was 3.50 %, and the protein content of sample B was 2.27 %. The fat content in sample A is 2.06 %, and the fat content in sample B is 2.25 %.

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