Jurnal Akademika Kimia, 14(2): 97-102, May 2025
ISSN (online) 2477-5185 | ISSN (print) 2302-6030
http://jurnal.fkip.untad.ac.id/index.php/jak/

OPEN ACCESS

Proximate Composition Study of Biscuits from Durian (Durio Zibethinus Murr.) Seed Flour as Food Innovation

***Andi C. D. Pati, Irwan Said, Purnama Ningsih, Sitti Aminah, & Sri Mulyani**
Chemistry Education Study Program/Faculty of Teacher Training and Education – Universitas Tadulako, Palu – Indonesia 94119

Received 02 April 2025, Revised 14 April 2025, Accepted 06 May 2025
doi: 10.22487/j24775185.2025.v14.i2.pp97-102

Abstract

Biscuits are one of the most popular snacks for the public, with the primary raw material being wheat flour. However, the high dependence on wheat flour encourages the need to find alternative ingredients that are more diverse and have high nutritional value. This study aims to analyze the proximate content (carbohydrate, protein, and fat) of biscuits made from durian seed flour (TBD), which is compared with cornstarch (TM) and wheat flour (TT). Proximate analysis methods included UV-Vis spectrophotometry for carbohydrate analysis, the Kjeldahl protein method, and Soxhlet fat extraction. The formulations used consisted of: F1 (100% TBD), F2 (100% TM), F3 (50% TBD:50% TM), and F4 (50% TT:50% TM). The results showed that the highest carbohydrate content was found in F1 at 70.07%, while the highest protein content in F4 at 13.65%. The highest fat content was found in F2 at 21.69%. The best formulation was obtained in F3 (50% TBD:50% TM) because it has a balanced nutritional composition and potential as a functional food product, especially for people with diabetes. In addition, this biscuit product has the potential as a contextual learning medium in food science and nutrition, especially in introducing proximate concepts and utilizing tropical fruit seed waste.

Keywords: Biscuits, durian seed flour, Kjeldahl method, proximate analysis, Soxhlet method, UV-Vis spectrophotometry

Introduction

Central Sulawesi is one of the largest durian-producing regions in Indonesia. The availability of durian is almost all year round, especially in the Palu area (FAO, 2023). This shows great potential in using this durian fruit as a consumption commodity and raw material for the food industry (Said et al., 2024). Durian fruit spread in areas such as Toli-Toli, Parigi Moutong, and Poso has unique characteristics based on its growing location, both in terms of taste, size, and chemical content, which makes this fruit widely known as the "king of fruits" (Ashari, 2017). According to the Directorate of Seeds of the Ministry of Agriculture, until 2023, 102 durian varieties have been released nationally, strengthening the durian position as one of the national superior fruits (Bayu & Ashari, 2019).

However, consumption of durian fruit is generally limited to the flesh, while the seeds are often considered waste (Gamay et al., 2024). In fact, durian seeds have great potential as an alternative food source due to their high carbohydrate content, even reportedly exceeding the carbohydrate content of sweet potatoes (Firmansyah et al., 2022). Unfortunately, the utilization of durian seeds is still minimal; they are usually only boiled, steamed, or burned. Processing durian seeds into flour can be one of the innovative solutions in diversifying local food and reducing organic waste (Ningsih et al., 2022). Durian seed flour can be processed into various food products such as dodol, pastries, and even biscuits, which have high economic value if developed and marketed appropriately (Misrah, 2020).

Biscuits are a popular processed food product favored by people from all walks of life. Biscuits are classified into four types: hard biscuits, crackers, cookies, and wafers (Hu et al., 2022). These products are generally made from wheat flour, so the dependence on wheat flour is still very high. With the global food crisis and the local food diversification movement, developing biscuits from non-wheat flour, such as durian seed flour, is very relevant (Widiastuti & Himawan, 2021). In addition, durian seed flour formulations that contain complex carbohydrates have potential as functional foods, especially for diabetics and the elderly who need low sugar and high fiber foods (Ningsih et al., 2020).

*Correspondence:
Andi C. D. Pati
e-mail: andicitradewipati@gmail.com

Even though durian seeds' potential as a source of carbohydrates has been extensively documented, there is currently very little research specifically looking at the chemical makeup of biscuits made with durian seed flour, especially about the proximate content (carbohydrates, protein, fat, and ash) (Khaksar et al., 2024). Most earlier research has only characterized raw durian seed flour; it has not been applied to processed goods like often-consumed biscuits (Firmansyah et al., 2022). Furthermore, little research has been done to assess how variations in the proximate values of biscuits are affected by the amount of durian seed flour substituted. Choosing the appropriate wheat flour substitution is crucial to creating high nutritional value and good physical quality biscuits (Aly et al., 2021). It can alter the end product's moisture, fat, and fiber contents.

This study analyzes proximate levels, namely carbohydrate, protein, fat, and ash content, in biscuit products made from durian seed flour. This analysis is important to determine the nutritional value and potential of the product as an alternative functional food and educational resource, especially in contextual learning in food science and nutrition.

Methods

Tools and materials

The equipment used in this study includes: plastic container (*A650*), baking sheet (*Cheffy*), knife, blender (*Miyako BL-151 PF/AP*), sieve 70 Mesh (*RETSCH*), spoon, drying oven (*Memert UN110*), oven plate ((*SN1535*), gas stove (*Rinnai RI-202 S*), microwaves (*Sharp R-220MAWH*), water bath (*Memmert Wnb 45*), UV-Vis spectrophotometer (*Shimadzu UV-1280*), analytical balance (*Sartonius CP224S*), Erlenmeyer (*Pyrex*), petri dish (*Pyrex*), measuring cup (*Iwaki*), drop and micro pipettes, measuring flask (Iwaki), centrifuge (*Hettich EBA 200*), test tube (*Pyrex*), tube rack, substance spoon, clamp (*gegep*), desiccator (*Duran*), round bottom flask (*Iwaki*), rotary evaporator (*IKA RV10*), and a set of Soxhlet extraction tools (*Iwaki*). The materials used in this study include durian seed flour (Durio zibethinus Murr.), cornstarch (*Maizenaku*), powdered sugar (*Rose Brand*), margarine (*Palmia*), milk powder (*Dancow*), and fresh milk (*Diamond*), baking powder (*Koepoe-Koepoe*), baking soda (*Koepoe-Koepoe*), salt (*Kapal*), and vanilla (*Bidadari*). Chemicals for analysis: Bovine Serum Albumin (BSA) standard solution (*SIGMA*), 0.1 M NaOH solution (*E-Merck®*), distilled water (*E-Merck®*), Biuret reagent (ROFA), n-hexane (*E-Merck®*), and filter paper (*Whatman*).

Preparation of durian seed flour

Fresh durian seeds are cleaned and washed, then blanched at 80°C for 20 minutes. After that, the seeds are thinly sliced, aerated until they are not wet, and dried in an oven at 60°C for 2 hours. The dried seeds are pulverized using a blender and sieved with a 70-mesh sieve until a smooth and homogeneous durian seed flour is obtained (Sutanto et al., 2024).

Formula and preparation of biscuits

Biscuits were made with three formulation variations, namely: F1: 100% durian seed flour; F2: 100% cornstarch; F3: 50% durian seed flour, 50% cornstarch; and F4: 50% wheat flour, 50% cornstarch. Margarine (65 g), powdered sugar (30 g), milk powder (15 g), and a little liquid milk are mixed until evenly distributed. Next, the flour mixture according to the formulation is added, ½ teaspoon of baking powder, baking soda, salt, and vanilla. The dough is mixed well, molded into the desired shape, and then baked in the oven at 80°C for 30 minutes. Once cooked, the biscuits were cooled and stored for proximate analysis (Sutanto et al., 2024).

Proximate analysis

Carbohydrate

Carbohydrate content is calculated indirectly with the formula:

$$Carbohydrate(\%) = 100 - (Protein + Fat + Ash + Water)$$

Protein (Kjedhal/biuret method)

Protein analysis was performed using the Biuret method and a BSA standard solution. The BSA standard solution was made in the concentration range of 1000-10000 ppm (0.1-1 mL), diluted to 1 mL total volume, and then 3 mL of Biuret reagent was added. After standing for 30 minutes, the absorbance was measured using a UV-Vis spectrophotometer at the maximum wavelength. A calibration curve was made to determine the protein content of the samples (Yusuf & Musali, 2021).

Fat (Soxhlet method)

Fat was extracted from a 5 g sample and put into a porous paper sleeve. Extraction was performed using a Soxhlet device with n-hexane solvent for ± 6 hours. The solvent was evaporated using a rotary evaporator. The fat extract was dried in an oven at 105°C for 1 hour, cooled in a desiccator, and then weighed to a fixed weight (Yusuf & Musali, 2021).

Ash (gravimetric method)

Ash content describes the total amount of inorganic minerals remaining after burning the material at a temperature of 550°C. In this study, ash content was used to determine carbohydrate content. A total of 1 g of sample was put into a porcelain cup with a known weight (Verawati & Yanto, 2019).

Results and Discussion

Carbohydrate content analysis of biscuit samples

As the percentage of durian seed flour in the formulation rose, the findings of analyses of the carbohydrate content of different biscuit formulations made with a combination of wheat

flour, cornstarch, and durian seed flour improved. The highest carbohydrate content was found in biscuits using 100% durian seed flour with an average of 70.07%, followed by formulations of 50% wheat flour and 50% cornstarch (66.78%), 100% cornstarch (66.21%), and a combination of 50% durian seed flour and 50% cornstarch (64.59%). The complete results can be seen in **Table 1**.

Table 1. Carbohydrate content data

Sample	Carbohydrate Content (%)		Average (%)
	Repeat 1	Repeat 2	
F1	70.17	69.57	70.07
F2	65.36	67.06	66.21
F3	65.30	63.87	64.59
F4	66.06	67.50	66.78

According to the analysis, biscuit recipes with durian seed flour contain more carbohydrates than those made with wheat flour and cornstarch. This high carbohydrate content indicates that durian seed flour is a potential source of energy, which can be utilized in processed food products such as biscuits (Septiaji et al., 2017). This finding is in line with the results of Verawati & Yanto (2019), who reported that durian seeds contain 85.4 grams of carbohydrates per 100-gram material, which shows the consistency of the chemical characteristics of the raw materials despite the processing into flour. This high carbohydrate content consists mainly of complex carbohydrates, such as polysaccharides and dietary fiber, rather than simple sugars (Conia et al., 2024). Due to their high protein and fat content, alternative flour substitutes, such as jackfruit seeds Palamthodi et. al., 2021) and mango seeds (Saleem et al., 2023), actually lower the carbohydrate level, which is different from these results. As a result, durian seed flour has exceptional qualities as a source of high carbohydrates that could raise the energy content of biscuits.

According to Verawati & Yanto (2018), complex carbohydrates containing dietary fiber are classified as non-starch polysaccharides, which the human digestive system does not completely digest. As a result, the fiber does not directly increase blood glucose levels, so it plays an important role in controlling the glycemic response to food (Sakung et al., 2020). This makes durian seed flour a potential raw material for functional food products aimed at people with metabolic diseases, such as Type-2 Diabetes Mellitus (Ningsih et al., 2020). The explanation of the basic structure of carbohydrates, consisting of the elements carbon (C), hydrogen (H), and oxygen (O), underlies the understanding of the metabolic role of this macronutrient in the body (Siregar, 2014). However, carbohydrates' chemical composition and form largely determine their impact on health (Fitria & Prameswari, 2022). In this case, the soluble and insoluble fiber content in durian seed flour can provide additional benefits in the form of regulating the rate of digestion and glucose absorption, as well as increasing satiety, which is important in weight management and blood sugar levels (Ningsih et al., 2020). Biscuits containing durian seed flour are believed to have a lower glycemic index, making them safer for people with diabetes to consume (Sulastri et al., 2018). This is based on fiber's ability to slow down glucose absorption in the gut and modulate insulin levels (Gumolung & Mamuaja, 2018).

Thus, from the aspect of carbohydrate content, durian seed flour not only contributes energy but also offers significant functional benefits (Mukarramah et al., 2021). Using this flour in biscuit formulations can be an innovative solution in developing healthy, functional, and value-added local foods, while supporting efforts to diversify national carbohydrate sources (Mahirdini & Afifah, 2016).

Analysis of protein content in biscuit samples

Table 2 shows the results of laboratory analysis of protein content in various biscuit formulations. This study aims to determine the potential of durian seed flour as a substitute ingredient for increasing nutritional value, especially protein content, in biscuit products.

Table 2. Protein content data

Sample	Protein Content (%)		Average (%)
	Repeat 1	Repeat 2	
F1	6.85	7.13	6.99
F2	4.27	4.38	4.32
F3	9.81	9.86	9.83
F4	13.42	13.89	13.65

The biscuit formulation with 50% wheat flour and 50% cornstarch showed the highest protein content (13.65%), per the characteristics of wheat flour as a medium protein source food. However, in the formulation with 100% durian seed flour, the protein content reached 6.99%, higher than that of 100% cornstarch, which only contained 4.33% protein. A significant increase was seen in the formulation of 50% durian seed flour and 50% cornstarch, which resulted in a protein content of 9.84%. This shows that substituting cornstarch with durian seed flour can significantly increase the protein content in biscuit products (Kusriani et al., 2014). These findings are consistent with a study on avocado seed flour biscuits by Novelina et al. (2020), which found that at a 30% substitution rate, the protein content increased from 7.5% to 9.2%. The moderate protein-enhancing potential of durian seed flour is enough for dietary diversity but not as potent as soy flour, a plant-based protein source, as demonstrated by Nadhifah et al., who showed a rise in soy flour substitution of up to 13.2%.

The increased amount of organic nitrogen in durian seed flour instead of wheat flour is the direct cause of this rise. Verawati & Yanto (2019) state that

the protein content of durian seeds is between 9 and 10% and is made up of albumin and globulin fractions high in arginine and lysine, two important amino acids. Kjeldahl analysis converts the material's total nitrogen content into protein content; hence, the higher the nitrogen content, the higher the protein value.

Protein is an important macromolecule consisting of long chains of amino acids connected by peptide bonds. The arrangement of atoms in protein molecules generally consists of carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and a little sulfur (S), with the proportion of nitrogen atoms around 12-19% (Sihotang, 2019). This nitrogen content makes protein one of the essential nutrients that cannot be replaced, because it plays a role in forming body tissues, hormones, enzymes, and the immune system (Yusuf & Musali, 2021).

Durian seed flour is proven to have good nutritional potential, especially as an alternative protein source. These results are reinforced by research by Verawati & Yanto (2019), which shows that durian seeds contain important nutrients, including protein. Thus, using durian seed flour to make biscuits contributes to local food diversification and reduces dependence on wheat flour, which is currently in very high demand in Indonesia (Putri et al., 2024). In addition, the high protein content in durian seed flour-based formulations is also beneficial for the growth and development of children under five, making it a good alternative in functional or fortified food products (Verawati & Yanto, 2019).

Analysis of fat content in biscuit samples

Fat is important in biscuit formulation because it provides flavor and a crunchy texture, and it extends the product's shelf life (Siregar, 2014). This study aims to analyze the fat content in biscuits made with various flour combinations, including durian seed flour as a substitute ingredient. Fat content data can be seen in **Table 3**.

Table 3. Fat content data

Sample	Fat Content (%)		Average (%)
	Repeat 1	Repeat 2	
F1	13.27	12.97	13.12
F2	22.02	21.36	21.69
F3	6.17	17.82	17.00
F4	13.26	12.29	12.77

The results showed that the biscuit formulation with 100% cornstarch had a % fat content of 21.69%. The 100% durian seed flour formulation had a fat content of 13.12%, slightly higher than the mixed formulation of wheat flour and cornstarch (12.77%). The 50% durian seed flour and 50% cornstarch formulation produced a fat content of 17.00%, between the two raw material components.

Interestingly, the fat content in durian seed flour can reach 31.35%, but the final product of biscuits using this flour did not show such high fat content. This may be due to the biscuit dough's processing, baking, and interactions between ingredients that affect fat extraction and stability (Nadhifah et al., 2020).

Monounsaturated fatty acids (oleic acid, C18:1) and saturated fatty acids (stearic acid, C18:0) make up the majority of the fat content in durian seeds, whereas triolein and tripalmitin are the primary triglyceride components (Sihotang, 2019). After the biscuits are baked, most of these lipids can still be detected in Soxhlet analysis since they are stable against oxidation at moderate temperatures (up to 180°C). The type of durian seeds used, the methods for drying and grinding them, and the makeup of other ingredients in the dough all affect how much fat is in the finished biscuit product. Prior studies by Kole et al. (2020) demonstrated that while durian seed flour's fat level can reach 23.03% in some formulations, this does not accurately represent the final fat content of processed foods like biscuits.

This phenomenon aligns with the findings of Saleem et al.'s (2023) study on mango seed flour biscuits, which found that at a 30% substitution rate, the fat content increased from 8.5% to 11.2%. Furthermore, Palamthodi et al. discovered that biscuits made with jackfruit seed flour had a rise in fat to 11.0%. As a result, biscuits made with tropical seed flours high in vegetable lipids frequently exhibit rising fat content.

According to Amin & Arshad (2009), fat in biscuit dough surrounds the flour particles and breaks the gluten network formed, thus providing a crunchy texture and crumbling easily in the mouth. Therefore, the type and amount of fat used in biscuit products must be calculated to produce products that consumers like (Sigiro et al., 2020).

Fat also contains minor compounds such as phospholipids, sphingolipids, cholesterol, and phytosterols that have a role in the body's metabolism, although the levels are minimal (Sutanto et al., 2024). The combination of cornstarch and durian seed flour in the 50:50 formulation resulted in a high fat content (17.00%), but not as high as pure cornstarch, and more balanced regarding health aspects.

The difference in fat content in the final biscuit product is also influenced by the type of durian seeds used, drying and flour milling techniques, and the composition of other additives in the dough. Previous studies by Kole et al. (2020) showed that the fat content of durian seed flour can reach 23.03% in some formulations, but it does not directly reflect the final fat content in processed products such as biscuits.

Conclusions

The results showed that formulation of a mixture of 50% durian seed flour and 50% cornstarch, which amounted to approximately 64.59% carbohydrates, 9.835% protein, and 17.00%

fat. Overall, the formulation of a mixture of 50% durian seed flour and 50% cornstarch provides a balanced nutritional composition and can be an alternative to increase the nutritional value of biscuits, reduce dependence on wheat flour, and utilize local food sources that have not been widely used.

Conflict of Interest

The authors confirm that there are no conflicts of interest regarding the publication of this research.

Acknowledgment

The authors sincerely thank the chemistry laboratory, mathematics and natural sciences faculty, Tadulako University.

References

Aly, A. A., El-Deeb, F. E., Abdelazeem, A. A., Hameed, A. M., Alfi, A. A., Alessa, H., & Alrefaei, A. F. (2021). Addition of whole barley flour as a partial substitute of wheat flour to enhance the nutritional value of biscuits. *Arabian Journal of Chemistry, 14*(5), 1-10.

Amin, A. M., & Arshad, R. (2009). Proximate composition and pasting properties of durian (durio zibethinus) seed flour. *International Journal of Postharvest Technology and Innovation, 1*(4), 367–375.

Ashari, S. (2017). *Durian: king of the fruits*. Malang: Universitas Brawijaya Press.

Bayu, E. M., & Ashari, S. (2019). Analisis klaster durian (durio zibethinus murr.) unggul lokal di Kecamatan Kasembon. *Jurnal Produksi Tanaman, 7*(7), 1347–1353.

Conia, V., Sulandari, L., Miranti, M. G., & Purwidiani, N. (2024). Pemanfaatan tepung biji durian dalam pembuatan kulit choux paste. *Concept: Journal of Social Humanities and Education, 3*(1), 219–236.

FAO. 2023. *Durian global trade overview 2023*. Retrieved January 3, 2024, from https://openknowledge.fao.org/server/api/core/bitstreams/84bbf2cb-d119-48c2-b4f1-f22bf802a7af/content.

Firmansyah, G., Purnama, F., Mairiza, L., & Rinaldi, W. (2022). Pengaruh penambahan gliserol dan sorbitol terhadap sifat ketahanan air dan biodegradablilitas bioplastik berbahan pati biji durian. *Jurnal Inovasi Ramah Lingkungan, 3*(3), 19–22.

Fitria, S. N., & Prameswari, G. N. (2022). Analisis kandungan zat gizi dan daya terima cookies tepung lentil (lens culinaris) sebagai PMT ibu hamil. *Indonesian Journal of Public Health and Nutrition, 2*(1), 122–130.

Gamay, R. A. J., Botecario, P. M. N., Sanchez, P. D. C., & Alvarado, M. C. (2024). Durian (Durio zibenthinus) waste: A promising resource for food and diverse applications—a comprehensive review. *Food Production, Processing and Nutrition, 6*(1), 1–20.

Gumolung, D., & Mamuaja, M. N. (2018). Analisis proksimat tepung jonjot buah labu kuning. *Fullerene Journal of Chemistry, 3*(2), 40–43.

Hu, X., Hu, L., Zheng, J., & Rong, J. (2022). Classification, processing procedures, and market demand of Chinese biscuits and the breeding of special wheat for biscuit making. *Journal of Food Quality, 2022*(1), 1–12.

Khaksar, G., Kasemcholathan, S., & Sirikantaramas, S. (2024). Durian (durio zibethinus l.): nutritional composition, pharmacological implications, value-added products, and omics-based investigations. *Horticulturae, 10*(4), 1–23.

Kole, H., Tuapattinaya, P., & Watuguly, T. W. (2020). Analisis kadar karbohidrat dan lemak pada tempe berbahan dasar biji lamun (enhalus acoroides). *Biopendix: Jurnal Biologi, Pendidikan Dan Terapan, 6*(2), 91–96.

Kusriani, R. H., Rahmawati, I., & Musfiroh, I. (2014). Karakterisasi pati biji buah durian, biji buah nangka, dan biji buah alpukat. *Jurnal Farmasi Galenika, 1*(1), 8-11.

Mahirdini, S., & Afifah, D. N. (2016). Pengaruh substitusi tepung terigu dengan tepung porang (amorphophallus oncopphyllus) terhadap kadar protein, serat pangan, lemak, dan tingkat penerimaan biskuit. *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition), 5*(1), 42–49.

Misrah. (2020). Pemanfaatan biji durian sebagai produk olahan makanan kerupuk. *Jurnal Abdi Mas Adzkia, 1*(1), 56–63.

Mukarramah., Mestawaty., Nurdin, M., & Lilies, L. (2021). Analisis kadar karbohidrat tepung biji nangka (artocarpus heterophyllus) sebagai makanan tambahan. *Journal of Biology Science and Education, 9*(1), 711–714.

Nadhifah, E. I., Suhartiningsih, S., & Purwidiani, N. (2020). Pengaruh proporsi tepung garut dan tepung beras merah terhadap kesukaan sifat organoleptik biskuit durian. *Jurnal Tata Boga, 9*(2), 736–744.

Ningsih, P., Said, I., Hamzah, B., Tangkas, I. M., & Bissin, I. K. (2020). The potential of durian seed flour as an alternative source of carbohydrate for diabetes mellitus sufferers. *European Journal of Molecular & Clinical Medicine, 7*(6), 728–734.

Ningsih, P., Said, I., & Rahmawati, S. (2022). The use of durian seeds (Durio zibethinus Murr) as flour products from Tolitoli and Donggala Regencies. *Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan (Journal of Natural Resources and Environmental Management), 12*(3), 478-484.

Novelina., Asben, A., Nerishwari, K., Hapsari, S., & Hari, P. D. (2022). Utilization of avocado seed powder (persea americana mill.) as a mixture of modified cassava flour in making cookies. *IOP Conference Series: Earth and Environmental Science* (pp. 1-8). Inggris: IOP Publishing.

Palamthodi, S., Shimpi, S., & Tungare, K. (2021). A study on nutritional composition and functional properties of wheat, ragi and jackfruit seed composite flour. *Food Science and Applied Biotechnology, 4*(1), 63–75.

Putri, S. N., Winahyu, D. A., & Retnaningsih, A. (2024). Uji hedonik dan kandungan protein cookies buah durian (durio zibenthinus l) kombinasi tepung biji durian. *Jurnal Analis Farmasi, 9*(2), 26-38.

Said, I., Hijrah., Hamzah, B., & Virgianti, S. H. (2024). Analisis kadar magnesium dan natrium pada biji durian dari Kabupaten Parigi Mautong Sulawesi Tengah. *Media Eksakta, 20*(1), 1–4.

Sakung, J. M., Rahmawati, S., Nursafitri., & Muhtar, H. (2020). Analysis of flavanoids in flour and biscuit based on chayote. *Jurnal Akademika Kimia, 9*(4), 219–223.

Saleem, M., Hafeez, H. T., Chen, Q., Xu, Y., Hafeez, H., Ali, U., & Hayat, H. K. (2023). Utilization of mango peel and kernel powder for the development of phytonutrient-enriched biscuits. *Food and Nutrition Insights, 1*(1), 22–34.

Septiaji, R. L., Karyantina, M., & Suhartatik, N. (2017). Karakteristik kimia dan sensori cookies jahe (zingiber offcinale roscoe) dengan variasi penambahan tepung biji alpukat (persea americana mill). *Jurnal Ilmiah Teknologi Dan Industri Pangan Unisri, 2*(2), 134–142.

Sigiro, O. N., Sukmayani., Habibah, N., & Kristiandi, K. (2020). Potensi bahan pangan tepung biji durian setelah melalui masa penyimpanan. *Agro Bali: Agricultural Journal, 3*(2), 229–233.

Sihotang, W. (2019). *Pengaruh kombinasi tepung biji durian terhadap mutu fisik dan mutu kimia (kalsium, protein) bakso ikan tamban (lemuru)*. Unpublished undergraduate's thesis. Medan: Politeknik Kesehatan Jurusan Gizi.

Siregar, N. S. (2014). Karbohidrat. *Jurnal Ilmu Keolahragaan, 13*(2), 38–44.

Sulastri., Laenggeng, A. H., & Masrianih. (2018). Kadar serat kasar pada produk susu biji nangka (artocarpus heterophyllus) dan pemanfaatannya sebagai media pembelajaran. *Journal of Biology Science and Education, 6*(1), 316–320.

Sutanto, T. A., Dealyn, D. C. G., Sukweenadhi, J., & Purwanto, M. G. M. (2024). Sifat fisikokimia dan formulasi tepung biji durian (durio zibethinus Murr.), tepung biji pepaya (carica papaya), dan aplikasinya dalam crispy cheese cookies. *Teknologi Pangan: Media Informasi Dan Komunikasi Ilmiah Teknologi Pertanian, 15*(2), 181–194.

Verawati, B., & Yanto, N. (2018). Daya terima biskuit tinggi protein dengan penambahan tepung biji durian (high protein biscuits received power with the addition of durian seed flour). *Prepotif: Jurnal Kesehatan Masyarakat, 2*(2), 1–7.

Verawati, B., & Yanto, N. (2019). Substitusi tepung terigu dengan tepung biji durian pada biskuit sebagai makanan tambahan balita underweight. *Media Gizi Indonesia, 14*(1), 106–114.

Widiastuti, I., & Himawan, H. (2021). Analysis of food diversification policy in overcoming the food crisis. *Aksara: Jurnal Ilmu Pendidikan Nonformal, 7*(3), 999-1008.

Yusuf, N., & Musali, F. (2021). Karakteristik mutu hedonik dan proksimat nugget ikan lele dumbo (clarias gariepinus) menggunakan tepung biji durian (durio zibethinus murr). *Jambura Fish Processing Journal, 3*(1), 38–45.