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Starch Composition and Glycemic Load of Teo Tuber (*Tacca leontopetaloides*) Starch Using Male White Rat (*Rattus norvegicus*) Experimental Models

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Abstract

Teo tuber starch (*Tacca leontopetaloides*) is a local carbohydrate source with potential to be developed as a functional food. However, information about its starch composition and glycemic load is still limited, even though these two parameters are important in determining blood glucose response after consumption as well as the carbohydrate quality of a food. This study aims to determine the amylose and amylopectin content of teo tuber starch and evaluate its glycemic load using male white rats (Rattus norvegicus). The study used a descriptive method with a quantitative approach and a laboratory experimental design. Analysis of amylose and amylopectin content was done using spectrophotometry with the DNS method and an amylose standard curve. Glycemic load was determined by measuring the rats' blood glucose response after giving them teo tuber starch porridge and pure glucose, then calculated using the *Incremental Area Under the Curve* (iAUC) method. Research results show that teo tuber starch contains 15.727% amylose and 64.389% amylopectin, meaning its starch composition is dominated by amylopectin. Rats fed with teo yam flour porridge showed lower and more stable blood glucose responses compared to rats given pure glucose. The glycemic load value of teo tuber starch is 9,315%, which falls into the low category. These findings suggest that teo tuber starch has the potential to be developed as a functional food that can help maintain stable blood glucose levels. Further research is needed to explore starch modification techniques that can reduce glycemic response and enhance its health benefits.

Keywords: Amylopectin; Amylose; Functional Food; Glycemic Load; *Tacca leontopetaloides*.

INTRODUCTION

The tuber *teo* plant is a species of the Taccaceae family that grows in coastal areas (Rachmawati et al., 2022). It is widely distributed across several islands in Indonesia, including Pulau Besar in Torosiaje Village, Popayato Subdistrict, Pohuwato Regency, Gorontalo Province. In this region, the taka plant is commonly found and grows wild, as it has not yet been cultivated by the local community. The taka, referred to by the people of Torosiaje Village as *Teo* Tuber, is a type of tuber that can be processed into flour. The *teo* tuber has a relatively high carbohydrate content, making it a potential alternative food source. In every 100 grams of Teo tuber starch, there are 74.8% carbohydrates, 66.65% starch, 22.77% amylose, 43.88% amylopectin, 6.52% protein, 0.35% fat, 16.96% water, and 1.37% ash (Aatjin et al., 2014). Complex carbohydrates consist of polysaccharides and fiber. Complex carbohydrates are composed of more than 20,000 monosaccharide units, primarily glucose. The complex carbohydrates consumed by humans are generally starches (Almatsier, 2010).

Starch is a complex carbohydrate in the form of a polysaccharide that serves as the primary energy reserve in plants. The structure of starch consists of two main components: amylose and amylopectin. Amylose has a linear structure with α-(1,4) D-glucose bonds, while amylopectin has a branched structure with α-(1,4) and α-(1,6) D-glucose bonds (Putri, 2017; Pramesti et al., 2015). The branched structure of amylopectin causes starch to gelatinize more easily and be hydrolyzed more rapidly by α-amylase enzymes compared to linear amylose. Consequently, foods with high amylopectin content raise blood glucose levels more quickly, resulting in a high glycemic index (Lovegrove et al., 2017). Conversely, foods with high amylose content tend to be digested more slowly, resulting in a gradual release of glucose and a lower glycemic index.

Foods containing carbohydrates can be classified based on the rate at which they raise blood glucose levels. Foods with a high glycemic index cause a rapid rise in blood glucose, whereas foods with a low glycemic index result in a slower and more stable rise in blood glucose (Solang et al., 2020). In addition to the glycemic index, there is the concept of glycemic load, which considers not only the rate of blood glucose increase but also the total amount of carbohydrates in a single serving of food. Glycemic load describes a food's ability to raise blood glucose levels based on the total available carbohydrates consumed (Dewi & Sajiman, 2021; Afifah et al., 2020). Consuming foods with a low glycemic load can slow glucose absorption and reduce insulin secretion from pancreatic beta cells, thereby preventing a significant rise in blood sugar levels. Conversely, continuous consumption of foods with a high glycemic index and load can trigger insulin resistance, which is a risk factor for diabetes mellitus (Soviana & Maenasari, 2019; Widiasari et al., 2021).

The starch composition of carbohydrates and their glycemic load play a crucial role in determining the physical and functional properties of a food ingredient, including *teo tuber starch*, a local carbohydrate source that has long been utilized by coastal communities in Torosiaje Village. However, research on this topic remains very limited to date. Therefore, research on the starch composition and glycemic load of *teo tuber starch* is needed to provide a foundation for the development of healthy, low-glycemic functional local foods.

MATERIALS AND METHODS

Time and Location

This study was conducted from December to May 2026. *Teo tuber starch* were obtained from Pulau Besar in the village of Torosiaje. Analysis of amylose and amylopectin content was performed at the Processing Laboratory, Department of Food Science and Technology, Faculty of Agriculture, Gorontalo State University, and glycemic load analysis was performed at the Pharmacology Laboratory, Department of Pharmacy, Faculty of Sports and Health, Gorontalo State University.

Materials and Equipment

The materials used in this study were *teo* tuber (*Tacca leontopetaloides*), pure starch, DNS, 1 N NaOH, potassium sodium tetrate, 95% ethanol, acetic acid, iodine, distilled water, 7 male white rats, SINTA PSB-22 standard complete pig feed concentrate (PT. Sinta Prima Feedmill), and pure glucose. The equipment used in this study included gloves, a knife, sample containers, label paper, aluminum trays, a grinder, an 80-mesh sieve, a P5 UV-Vis spectrophotometer, an oven, a 1000 µL micropipette, an analytical balance, a hotplate, a vortex mixer, a 100 mL volumetric flask, a 200 mL beaker, measuring cups, test tubes, and test tube racks, as well as spatulas, porcelain dishes, pots, lancets, 5-mL syringes, 5-mL oral feeding tubes, NESCO Multi Check I, blood glucose test strips, mouse food dishes, mouse water bottles, a tray (50 × 40 cm), and wire mesh covers.

Methodology

This study employed a descriptive method using a quantitative approach and a laboratory experimental design. The research was conducted through laboratory testing to measure starch content, amylose content, and amylopectin content

Procedures

Processing of *Tacca leontopetaloides* Starch

Making teo tuber starch starts with washing the tuber, peeling off the skin, and then washing it again until completely clean. Next, the tuber is grated with some added water to make a tuber mash. After that, the mash is squeezed and filtered to separate the starch suspension from the tuber pulp. The leftover pulp is soaked again with water and filtered once more to get the starch suspension. The collected starch suspension is left to settle. The starch sediment that forms is separated from the water on top, and that water is discarded. Fresh water is added to the starch sediment until the water stays clear. Then, the starch sediment is dried in an oven at 80°C until it forms starch flakes. These flakes are then ground using a grinder and sifted through an 80 mesh sieve. The resulting teo tuber starch is stored in plastic (Isra et al. 2024)

Starch Composition Analysis

Total Starch Content

Total starch content was determined by multiplying the reducing sugar content by a conversion factor of 0.9. The reducing sugar content was obtained using a standard curve determined by the DNS method. The DNS reagent was prepared by dissolving 1 gram of DNS in 20 mL of 2 N NaOH solution and 50 mL of distilled water. 30 grams of potassium sodium tetrate is added to the DNS solution, stirred until homogeneous, and distilled water is added until the final volume reaches 100 mL (Elfirta et al., 2023).

The sample solution was prepared by dissolving 40 mg (0.04 grams) of *teo tuber starch* sample in 20 mL of distilled water, then autoclaving for 1 hour until it formed a gel, followed by the addition of 40 mL of distilled water. The sample solutions were pipetted into test tubes at concentrations of 0.25, 0.5, 1.0, 1.25, and 1.5 mL, and 1 mL of DNS solution was added to each. Add 2 mL of distilled water to each tube and homogenize using a vortex mixer. The test tubes were then heated in a water bath for 15 minutes. After 15 minutes, the test tubes were cooled to room temperature, and the absorbance of the test solutions was measured using a P5 UV-Vis spectrophotometer at a wavelength of 540 nm.

Preparation of an Amylose Standard Solution

An amylose standard solution was prepared by placing 40 mg (0.04 grams) of pure amylose into a volumetric flask, then adding 1 mL of 96% ethanol and 9 mL of 1 N NaOH to the 100 mL volumetric flask. The flask was heated for 10 minutes in a water bath at 95°C, then cooled until an amylose gel forms. The solution is then diluted with distilled water to the mark on the 100 mL volumetric flask and homogenized. A 5 mL aliquot of the solution was pipetted and transferred into a test tube. Next, 1 mL of 1 N acetic acid solution, 2 mL of iodine solution, and 5 mL of distilled water were added (Setiarto et al. 2023).

Preparation of the Amylose Standard Curve

The amylose standard curve was prepared by pipetting 0.2, 0.4, 0.6, 0.8, 0.9, and 1.0 mL of distilled water into each tube as a blank. To these solutions, 1 N acetic acid was added in volumes of 0.8; 0.6; 0.4; 0.2; 0.1; and 1.0 mL, respectively. Then, 5 mL of iodine solution (0.2 g I_2 and 2 g KI dissolved in 100 mL of distilled water) was added. The solution was then homogenized and allowed to stand for 20 minutes. Absorbance was subsequently measured using a UV-Vis spectrophotometer at a wavelength of 625 nm (Setiarto et al. 2023).

Determination of Amylopectin Content

The amylose content in the sample can be used to determine the amylopectin content, which is calculated based on the difference between the total starch content and the amylose content (Setiarto et al. 2023).

Glycemic Test Using Male White Rats
Preparation of Test Animals

The test animals used in this study were male Wistar strain white rats (Rattus norvegicus) weighing 180–200 grams, aged 3–4 months, and in good health (no wounds, no defects, and active) and were housed in cages made of wire-mesh trays filled with wood shavings (Dewi et al., 2020). A total of 7 male white rats were used. The male white rats were acclimatized for 7 days. During the acclimatization period, the rats were given free access to food and water.

Preparation of Reference Feed and Test Feed

The reference food used was a pure glucose solution, while the test food was teo tuber starch porridge. The dose of the reference food was set to be equivalent to 25 g of carbohydrates and converted based on the rats' body weight, so each rat received 0.45 g of pure glucose dissolved in 2.5 mL of water. The amount of teo tuber starch given was determined based on carbohydrate equivalence with the reference glucose using the formula from Budijanto et al. (2017). With a carbohydrate content of 84.76% in teo tuber starch, the dose was 0.53 g per rat, dissolved in 2.5 mL of water and cooked into porridge before being given to the test animals.

Feeding the test animals

Glycemic testing was carried out at two different times using a reference food (glucose solution) and a test food (teo tuber starch porridge). Before the testing, the rats were fasted for 10 hours but still had access to drinking water (Nurfitri et al., 2021). Blood glucose levels were measured at 0, 30, 60, 90, and 120 minutes after giving the treatment through an oral probe. The test food was tested 7 days after the reference food using the same procedure. The data obtained were used to calculate the glycemic index and glycemic load.

Glycemic Index Value

Glycemic index data was obtained after carrying out a series of blood glucose measurements in rats that were given porridge made from teo tuber starch and pure glucose. *The Incremental Area Under Curve* (iAUC) method was used to show the magnitude of the blood glucose response after consuming the test food and reference food, calculated using the trapezoid method based on changes in blood glucose levels from the fasting value (baseline) at 0 minutes, 30 minutes, 60 minutes, 90 minutes, and 120 minutes. The area was ignored if the glucose level was below the fasting glucose level (baseline) (Nurdyansyah et al., 2019). Glycemic index values are obtained by comparing the area under the curve of the test food to the reference food and multiplying by 100. The calculation of the glycemic index value uses the following formula (Solang et al., 2023):

$$\text{IG} = \frac{\text{The area under the blood glucose curve of the test food}}{\text{The area under the reference food blood glucose curve}} \times 100$$

Carbohydrates can be categorized as having a low glycemic index if the glycemic index is <55%, a medium glycemic index of 46-69%, and a high glycemic index >70% (Gaylor et al. 2025).

Glycemic Load Analysis

Glycemic load is a useful additional measure for assessing the quality and quantity of carbohydrates in food. Glycemic load is calculated using the following formula (Sagilli et al., 2022):

$$\text{BG} = \text{IG value X amount of available carbohydrates per serving (g)}/100$$

Available carbohydrate and available carbohydrate per serving can be determined using the formula (Agustina et al.2017):

$$\text{Available carbohydrates} = 100\text{ g} - (\text{water\%} + \text{ash\%} + \text{protein\%} + \text{fat\%} + \text{fiber\%})$$

$$\text{Available carbohydrates/serving} = \frac{\text{number of servings (g) x available carbohydrates}}{100\ gram}$$

Food ingredients are categorized as having a low glycemic load if the glycemic load is <11%, medium glycemic load 11-20%, and high glycemic load >20% (Inayah et al.2021).

Data Analysis Techniques

The data on amylose content measurements were presented in tables and charts. Meanwhile, the amylopectin content was determined based on the difference between total starch content and amylose content. The blood glucose levels of male white rats were processed using Microsoft Excel and presented in chart form. Next, the area under the curve was calculated using the *Incremental Area Under Curve* (IAUC) method as a basis for determining the glycemic index and glycemic load. All the obtained parameters, including amylose, amylopectin, and glycemic load, were analyzed descriptively.

RESULTS AND DISCUSSION

Total Starch Content

Total starch content was analyzed using the DNS method (λ = 540 nm), yielding 29.673 mg of reducing sugars. The total starch content was calculated by multiplying by a factor of 0.9, resulting in a total starch content of 80.117% in teo tuber starch. Reducing sugar content was measured to detect the presence of glucose or other simple sugars resulting from starch hydrolysis in food materials (Syafii et al., 2023). Total starch content was measured through the hydrolysis of starch into reducing sugars using the DNS method. The DNS (3,5-dinitrosalicylic acid) method was used because it can detect reducing sugars such as glucose resulting from starch breakdown. In line with the research by Juniarti & Widjaja (2022), the DNS (3,5-dinitrosalicylic acid) method was used to analyze reducing sugar concentration. DNS reacts with reducing sugars to form 5-nitrosalicylamine, which is indicated by the formation of a brick-red color; the more reducing sugars present in the sample, the more 5-nitrosalicylamine is formed, and the solution becomes darker, indicating higher absorbance.

Amylose Concentration

The determination of amylose concentration begins with the preparation of an amylose standard curve. The purpose of this is to obtain a linear regression equation, which is then used to determine the amylose concentration in the sample. The amylose standard curve was obtained by measuring the absorbance of a series of amylose standard solutions with concentrations of 0.2; 0.4; 0.6; 0.8; 0.9; and 1.0 mg/mL. The graph of the amylose standard curve is shown in Figure 1.

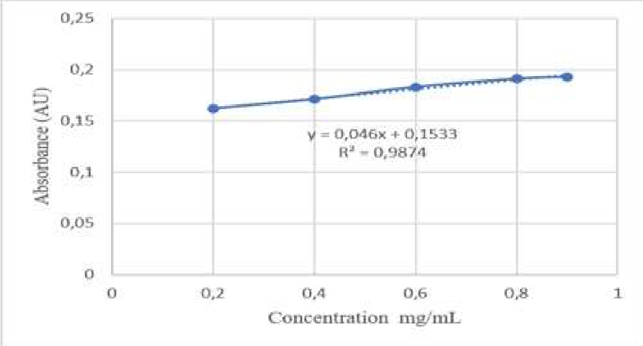

Figure 1. Amylose Standard Curve.

Based on Figure 4.1, the standard amylose curve shows a linear relationship between concentration and absorbance with the regression equation y = 0.046x + 0.1533 and a coefficient of determination (R^2) of 0.9874, which indicates that the obtained standard curve has a good level of linearity and is therefore suitable for calculating the amylose content in the samples. The amylose content in the *teo tuber starch* samples can be seen in Table 1.

Table 1. Results of amylose content analysis of *teo tuber starch* (*Tacca leontopetaloides*).

Replication	Absorbance	Amylose Content (mg/mL)	Average Amylose Content (%)
U1	0,173	27,837	
U2	0,162	12,293	17,475
U3	0,162	12,293	

Based on the analysis results presented in Table 1, the amylose content of teo tuber starch from three replicate measurements yielded an absorbance value of 0.173 for U1 with an amylose content of 27.837 mg/mL, while U2 and U3 had absorbances of 0.162 and an amylose content of 12.293 mg/mL, respectively. The average amylose content in teo tuber starch is 17.475%; subsequently, the average amylose content was converted by a factor of 0.9, resulting in an amylose content of 15.727% in teo tuber starch. This value indicates that *teo tuber starch* has an amylose content in the low category. Based on its classification, amylose can be categorized as low (< 20%), medium (20–25%), and high (>25%) (Carella et al., 2016). This value indicates that the amylopectin fraction dominates the composition of *Tacca leontopetaloides* starch granules compared to the amylose fraction, which is a common characteristic of starch from tuberous plants.

Amylopectin Content

The amylopectin content of tuber flour was calculated as the difference between the total starch content and the amylose content, amounting to 64.389% of the total starch content of 80.117%. These results indicate that tuber flour is dominated by amylopectin, which has a branched structure. Differences in the composition of amylose and amylopectin affect the functional properties of starch, which are also influenced by plant variety, growing environment, region of origin, and starch purity (Nisah, 2017). The more impurities, such as fiber or debris, that are carried over during processing, the lower the starch content obtained (Nisah, 2017). The content of amylose and amylopectin also affects the properties of starch. A low amylose content results in a higher amylopectin content, making the starch thicker, stickier, more water-absorbent, and more prone to gelatinization due to the branched structure of amylopectin (Pramesti, 2015). Conversely, starch with a high amylose content tends to gelatinize more slowly and is digested more slowly because the straight, compact structure of amylose makes starch granules more difficult to hydrolyze by digestive enzymes (Afandi et al., 2019; Isra et al., 2021).

Blood Glucose Response in Male White Mice

The results of the blood glucose level response in male white rats after giving pure glucose and teo tuber starch porridge are presented using a graph, which can be seen in Figure 2.

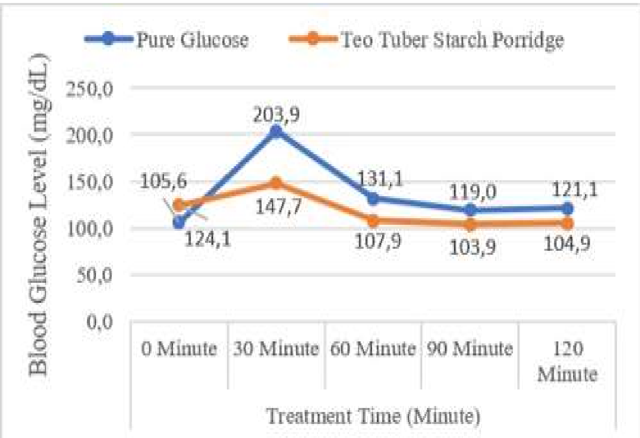

Figure 2. Response of Blood Glucose Levels in Male White Rats

Both treatments showed an increase in blood glucose levels, peaking at the 30th minute. However, the increase in the teo tuber starch porridge group (23.6 mg/dL) was lower compared to the pure glucose group (98.3 mg/dL). This difference is because pure glucose is a monosaccharide that can be directly absorbed by the body, whereas the carbohydrates in teo tuber starch must first be digested into glucose before being absorbed into the bloodstream. According to Sulistiyanto et al. (2017), monosaccharides can be directly used by the body as an energy source, so they increase blood glucose levels more quickly.

The increase in blood glucose levels after giving teo tuber starch porridge shows that the carbohydrates in it have been digested and converted into glucose. Teo tuber starch contains starch composed of amylose and amylopectin, where the presence of amylose slows down the starch digestion process, so the release of glucose into the blood happens more gradually. This aligns with Mado et al. (2020), who stated that the amylose ratio affects the rate of starch digestion.

After reaching a peak at the 30 minute, blood glucose levels in both treatments decreased until the 90th minute. This decrease indicates that the absorbed glucose began to be utilized by body tissues with the help of insulin hormone secreted by pancreatic β cells (Triana et al., 2017). At the 120 minute, there was a slight increase in blood glucose levels in both treatments, but the values were still close to the initial condition. This is suspected to be related to the glucose homeostasis mechanism, which involves a balance between glucose usage by tissues and glucose release from the liver (Nasyafa et al., 2024).

Overall, eating *teo tuber starch* porridge leads to a lower and more stable blood glucose response compared to consuming pure glucose. This pattern suggests that teo tuber starch porridge doesn't cause an excessive glucose load and potentially has a lower glycemic load, making it better for keeping blood sugar levels steady.

Glycemic Load Analysis Results

Based on the results, the average glycemic load value of the teo tuber starch porridge is 9,315%, as shown in Table 2.

Tabel 2 The average glycemic load value of the teo tuber starch.

Test Food	Glycemic Load (%)	Classification	Glycemic Load Categories (Inayah *et al.*, 2021)
Teo Tuber Starch Porridge	9,315	Low	<11% = Low 11-20% = Moderate >20% = High

Based on research results, teo tuber starch porridge has a glycemic load value of 9,315%, which falls into the low glycemic load category. This value indicates that consuming teo tuber starch porridge does not cause excessive blood glucose spikes because the carbohydrates it contains are digested and absorbed gradually. Glycemic load is a parameter that describes blood glucose response by taking into account the glycemic index value and the amount of carbohydrates consumed (Siviana & Maenasari, 2019; Amra, 2018).

Even though *teo tuber starch* has a high amylopectin content, its glycemic load isn't considered high. This shows that a food's glycemic response isn't just influenced by its amylose and amylopectin composition, but also by the physicochemical characteristics of the starch, like granule size and shape, surface traits, and processing methods that can affect the starch hydrolysis rate (Corgneau et al., 2019). Heating can cause starch gelatinization, making it easier for digestive enzymes to break it down and boosting the glycemic response (Kaur et al., 2018).

The low glycemic load value obtained shows that teo tuber starch still has potential to be developed as a functional food through various starch or starch modification techniques. These modifications can improve the physicochemical characteristics of starch, increase resistant starch content, and reduce starch digestibility, thus potentially lowering the glycemic response of foods (Syafii & Yudianti, 2022).

CONCLUSION

Based on the research results, it can be concluded that teo tuber (Tacca leontopetaloides) starch has an amylose content of 15.727% and amylopectin content of 64.389%, so its starch composition is dominated by amylopectin. Giving teo tuber starch porridge to male white rats (Rattus norvegicus) resulted in a lower blood glucose response compared to giving pure glucose, which shows that the carbohydrates in teo tuber starch are digested and absorbed more gradually. In addition, teo tuber starch has a glycemic load value of 9,315% which falls into the low category, this indicates that teo tuber starch is a healthy local source of carbohydrates that produces a controlled glycemic response when consumed.

Competing Interests: The authors declare that there are no competing interests.

REFERENCES

Aatjin, A. Z., Lelemboto, M. B., Koapaha, T., & Mamahit, L. **P.** (2014). *Pemanfaatan Pati Tacca (Tacca leontopetaloides) pada Pembuatan Biskuit*. Cocos, 2(1), 1–8. https://doi.org/10.35791/cocos.v2i1.723

Afandi, F. A., Wijaya, C. H., Faridah, D. N., & Suyatma, N. E. (2019). Hubungan antara kandungan karbohidrat dan indeks glikemik pada pangan tinggi karbohidrat. *Jurnal Pangan*, 28(2), 145–160.

Afifah, D. N., Sari, L. N. I., Sari, D. R., Probosari, E., Wijayanti, H. S., & Anjani, G. (2020). Analisis kandungan zat gizi, pati resisten, indeks glikemik, beban glikemik dan daya terima cookies tepung pisang kepok (*Musa paradisiaca*) termodifikasi enzimatis dan tepung kacang hijau (*Vigna radiata*). *Jurnal Aplikasi Teknologi Pangan, 9*(3), 101–107. https://doi.org/10.17728/jatp.8148

Agustina, A. W., & Anjani, G. (2017). Cookies tepung beras hitam dan kedelai hitam sebagai alternatif makanan selingan indeks glikemik rendah. *Journal of Nutrition College, 6*(2), 128–137.

Almatsier, S. (2010). Prinsip Dasar Ilmu Gizi. Jakarta: PT Gramedia Pustaka Utama.

Amra, N. (2018). Hubungan konsumsi jenis pangan yang mengandung indeks glikemik tinggi dengan glukosa darah pasien DM tipe 2 di UPTD Diabetes Center Kota Ternate. *AcTion: Aceh Nutrition Journal, 3*(2), 110–116.

Budijanto, S., Andri, Y. I., Faridah, D. N., & Noviasari, S. (2017). Karakterisasi kimia dan efek hipoglikemik beras analog berbahan dasar jagung, sorgum, dan sagu aren. *Agritech, 37*(4), 402–409.

Carella, H., Mustikaningrum, S. G. F., & Rauf, R. (2016). *Formulasi food bar sebagai snack bagi penderita diabetes mellitus berbahan ubi jalar ungu (Ipomoea batatas L. Poir) dan kacang merah (Phaseolus vulgaris L.) pratanak dilihat dari kadar amilosa dan gula reduksi* (Skripsi). Universitas Muhammadiyah Surakarta.

Corgneau, M., Gaiani, C., Petit, J., Nikolova, Y., Banon, S., Pertusa, R. L., & Scher, J. (2019). Native starch digestibility with reference to starch granule size, shape and surface features. *International Journal of Food Science & Technology, 54*(6), 2132–2140. https://doi.org/10.1111/ijfs.14120

Dewi, A. C., Widyastuti, N., & Probosari, E. (2020). Pengaruh pemberian tepung sorgum (*Sorghum bicolor* L. Moench) terhadap kadar glukosa darah puasa tikus diabetes. *Journal of Nutrition College, 9*(1), 63–70.

Dewi, Z., & Sajiman. (2021). Kandungan indeks glikemik dan beban glikemik beras lokal hanyar dan usang. *Jurnal Skala Kesehatan Politeknik Kesehatan Banjarmasin, 12*(2), 19–104. https://doi.org/10.31964/jsk.v12i2.318

Elfirta, R. R., Saskiawan, I., Amalia, R. L. R., Zahrah, A., Ikhwani, N., & Widhyastuti, N. (2023). Kadar karbohidrat dan penapisan senyawa aktif dari *Pleurotus pulmonarius* yang diekstraksi menggunakan metode microwave assisted extraction (MAE) dengan beberapa perlakuan suhu. *Jurnal Biologi Indonesia, 19*(1), 65–76.

Gaylor, C. M., Brennan, A., Blagrove, M., Tulip, C., Bloxham, A., Williams, S., Tucker, R., Benton, D., & Young, H. A. (2025). Low and high glycemic index drinks differentially affect sleep polysomnography and memory consolidation: A randomized controlled trial. *Nutrition Research, 134*, 49–59. https://doi.org/10.1016/j.nutres.2024.11.012

Inayah, I., Metty, M., & Aprilia, Y. (2021). Indeks glikemik dan beban glikemik nasi jagung instan dengan penambahan tepung tempe sebagai alternatif makanan pokok pasien diabetes mellitus. *Ilmu Gizi Indonesia, 4*(2), 179–188.

Isra, M., Ahmad, L., & Saman, W. R. (2024). Comparison of results of pulut corn starch modification and sorgum starch by acid hydrolysis method. *Jambura Journal of Food Technology, 6*(1), 117–128.

Kaur, H., Gill, B. S., & Karwasra, B. L. (2018). In vitro digestibility, pasting, and structural properties of starches from different cereals. *International Journal of Food Properties, 21*(1), 70–85. https://doi.org/10.1080/10942912.2018.1439955

Lovegrove, A., Edwards, C. H., De Noni, I., Patel, H., El, S. N., Grassby, T., & Shewry, P. R. (2017). Role of polysaccharides in food, digestion, and health. *Critical Reviews in Food Science and Nutrition, 57*(2), 237–253. https://doi.org/10.1080/10408398.2014.939263

Mado, J. E., Rawung, D., & Taroreh, M. (2020). Bubur instan berbahan dasar pangan lokal sebagai pangan fungsional dengan indeks glikemik rendah. *Media Gizi Pangan, 27*(2), 10–22.

Nasyafa, S. F., Saputra, O., & Zuraida, R. (2024). Homeostasis tubuh. *Medical Profession Journal of Lampung, 14*(2), 249–253.

Nisah, K. (2017). Study pengaruh kandungan amilosa dan amilopektin umbi-umbian terhadap karakteristik fisik plastik biodegradable dengan plastizicer gliserol. *BIOTIK: Jurnal Ilmiah Biologi Teknologi dan Kependidikan, 5*(2), 106–113.

Nurdyansyah, F., Retnowati, E. I., Muflihati, I., & Muliani, R. (2019). Nilai indeks glikemik dan beban glikemik produk olahan suweg (*Amorphophallus campanulatus* BI). *Jurnal Teknologi Pangan, 13*(1), 76–85.

Pramesti, H. A., Siadi, K., & Cahyono, E. (2015). Analisis rasio kadar amilosa/amilopektin dalam amilum dari beberapa jenis umbi. *Indonesian Journal of Chemical Science, 4*(1), 26–30.

Putri, W. D. R., & Zubaidah, E. (2017). *Pati: Modifikasi dan Karakteristiknya*. Universitas Brawijaya Press.

Rachmawati, R., Idroes, R., Suhartono, E., Maulydia, N. B., & Darusman, D. (2022). In silico and in vitro analysis of tacca tubers (*Tacca leontopetaloides*) from Banyak Island, Aceh Singkil Regency, Indonesia, as antihypercholesterolemia agents. *Molecules, 27*(23), 8605. https://doi.org/10.3390/molecules27238605

Sagilli, V. S., Chakrabarti, P., Jayanty, S., Kardile, H., & Sathuvalli, V. (2022). The glycemic index and human health with an emphasis on potatoes. *Foods, 11*(15), 2302.

Setiarto, R. H. B., Isra, M., Andrianto, D., & Widhyastuti, N. (2023). Improvement of prebiotic properties and resistant starch content of corn flour (*Zea mays* L.) Momala Gorontalo using physical, chemical and enzymatic modification. *Tropical Life Sciences Research, 34*(2), 255.

Solang, M., Ismail, Y. N. N., & Uno, W. D. (2020). Komposisi proksimat dan indeks glikemik nira aren. *Biospecies, 13*(2), 1–9. https://doi.org/10.22437/biospecies.v13i2.8761

Solang, M., Latjompoh, M., Butungale, S., & Abdul, A. (2023). Studi susu jagung (*Zea mays saccharata* L.) glycemic index sebagai makanan anti diabetes. *E3S Web of Conferences, 400*, 02010.

Soviana, E., & Maenasari, D. (2019). Asupan serat, beban glikemik dan kadar glukosa darah pada pasien diabetes melitus tipe 2. *Jurnal Kesehatan, 12*(1), 19–29.

Sulistiyanto, B., Kismiati, S., & Utama, C. S. (2017). Perubahan kadar rafinosa, glukosa, manosa, arabinosa dan sukrosa wheat pollard akibat lama steam dan penambahan air yang berbeda. *Jurnal Litbang Provinsi Jawa Tengah, 15*(2), 161–169.

Syafii, F., & Yudianti, Y. (2022). Analisis kadar pati resisten, total serat dan daya terima kabosol tersubstitusi tepung pisang kepok termodifikasi. *Jurnal Kesehatan Manarang, 8*(1), 43–50.

Syafi, S., Pujiasmanto, B., Purwanto, E., & Suryanti, V. (2019). Identification of morphology and analysis of Tacca (Tacca Leontopetaloides L.) medicine plant grown in North Maluku, Indonesia. In AIP Conference Proceedings. 2120 (1). AIP Publishing LLC. https://doi.org/10.1063/1.5115625.

Triana, L., Salim, M. (2017). Perbedaan Kadar Glukosa Darah 2 Jam Post Prandial.Analisis kesehatan polteknes kemenkes Pontianak: Pontianak. Jurnal Laboratorium Khatulistiwa. 1(1).

Widiasari, K. R., Wijaya, I. M. K., & Suputra, P. A. (2021). Diabetes melitus tipe 2: Faktor risiko, diagnosis, dan tatalaksana. *Ganesha Medicina, 1*(2), 114–120.