Sorghum (Sorghum Bicolor) Entrepreneurship Products: Chemical Quality Analysis

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Sorghum (Sorghum Bicolor) Entrepreneurship Products: Chemical Quality Analysis

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ABSTRACT

Purpose: The study aims to find to determine the effect of the proportion of sorghum flour: glutinous rice flour and types of sugar on the quality of sorghum dodol products

Design/methodology/approach: This study used a factorial randomized block design (RAK) with factor (T) the proportion of sorghum flour: glutinous rice flour (T1 = 30:70 and T2 = 40:60 and factor (G) the type of brown sugar (G1 = palm sugar and G2 = palm sugar. While each treatment was repeated three times. Data on yield value, water content, ash content, protein content, fat content, carbohydrate content, and total sugar were analyzed using analysis of variance (ANOVA) and if there was a difference The results will be followed by Duncan's test with a confidence level of 95%

Findings: The results will be followed by Duncan's test with a confidence level of 95%. Research results show that product entrepreneurship dodol sorghum treatment T1G1 (proportion of sorghum flour: glutinous rice flour 30:70 and palm sugar) became the selected treatment with an expected value of 8.75. This treatment had a yield of 88.83%, water content 26.59%, ash content 0.52%, protein content 1.47%, fat content 0.52%, carbohydrate content 70.90% and total sugar 67.53%.

Research limitations/implications: This research is specifically for the development of sorghum dodol entrepreneurial products with chemical quality studies

Practical implications: The development of sorghum-based entrepreneurship products must continue to be promoted in order to continue to support food security

Originality/value: This paper is original

Paper type: Research paper

Keywords: *Dodol Sorghum, Palm Sugar, Product Entrepreneurship, Siwalan Brown Sugar, Sorghum Flour.*

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I. INTRODUCTION

Research on the selection of entrepreneurial products continues to be developed to meet the needs of consumers from all walks of life, one of which wants entrepreneurship products that are nutritious and healthy (Casulli, 2022). Dodol is a fairly popular traditional food that has been known since ancient times and is processed traditionally. Dodol is a semi-wet processed product that is dense and chewy, a similar product made traditionally called jenang with a softer and oily texture. The development of sorghum in Indonesia is currently felt to be very necessary both as an ingredient for industry or as an alternative food ingredient, the products of which are used as food, beverages, animal feed, and other industrial interests. One of the products of sorghum is sorghum flour, and one form of diversification of processed food dodol is to substitute glutinous rice flour with sorghum flour. Because one of the advantages of sorghum is that it is gluten-free, contains anti-oxidants, has a low glycemic index, and is high in fiber (Savitri et al., 2022).

Sorghum is a plant from the cereal family, still in the same family as rice, corn, and wheat. The nutritional value of sorghum is not inferior to rice as a staple food. Even sorghum contains protein (8-12%) equivalent to wheat or higher than rice (6-10%), and its fat content (2-6%) is higher than rice (0.5-1.5%). Making dodol also

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requires sweeteners as a source of taste that attracts consumers. Several types of natural sweeteners that can be used for making dodol are brown sugar. Brown sugar is one of the food ingredients made from palm sap including siwalan and palm sugar. Brown sugar has advantages, including a brownish color and a distinctive aroma, and has a lower glycemic index value compared to granulated sugar, which is 35 so it is good for consumption by diabetics or people who want to maintain health (Calabrese et al., 2022; Deribe & Kassa, 2020; Noerhartati et al., 2019; Sihombing et al., 2022).

The purpose of the study was to determine the effect of the proportion of sorghum flour: glutinous rice flour and types of brown sugar on the quality of dodol and to determine the best treatment combination for the proportion of sorghum flour: glutinous rice flour and types of brown sugar on the quality of dodol.

II. METHODOLOGY

The materials used in this study were red sorghum flour (Sorghum bicolor), glutinous rice flour, brown sugar, coconut milk, granulated sugar, salt, and pandan leaves. This study used a Randomized Block Design (RAK) method which consisted of 2 (two) factors with 3 (three) replications. The factor I: the proportion of sorghum flour: glutinous rice flour (T) consists of two levels, namely T1 = 30%: 70% and T2 = 40%: 60%. While factor II is the type of sugar (G), namely palm brown sugar (G1) and siwalan brown sugar (G2). The process of making dodol begins by mixing water, brown sugar, granulated sugar, thick coconut milk, coconut milk, salt, and pandan leaves, heat, and after 10 minutes add sorghum flour and glutinous rice flour which has been mixed with water slowly. The dodol cooking process is carried out for ± 1 hour by heating at a high temperature of 70°C. After that lunkhead is cooled and cut into small blocks before serving. Observations included yield, water content, ash content, fat content, protein content, carbohydrate content, and total sugar (Horwitz, 2010).

Processing with analysis of variance if there is a difference, then the Duncan test is carried out with a 5% confidence level. followed by the selection of alternatives aimed at determining the best alternative process. The concept of the expected value decision is to choose a decision that has the maximum payoff (profit or utility). Furthermore, the value of the weight of the sorghum dodol parameter was determined, and the determination selected treatment using the expected value method (Li & Zhang, 2022).

III. RESULTS AND DISCUSSION

The test results of yield, water content, ash content, fat content, carbohydrate content, protein content, and total sugar content are presented in Figure 1-6 as follows:

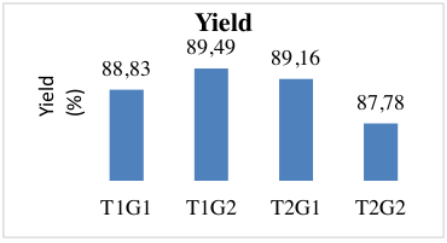

Figure 1. Yield Dodol Sorghum

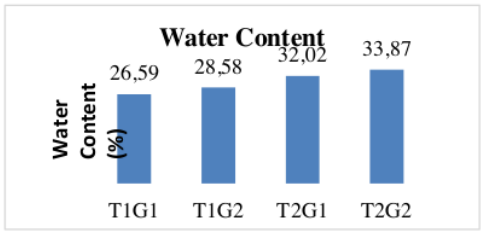

Figure 2. Water Content Dodol Sorghum

The yield results are presented in Figure 1, which shows that the yield of sorghum dodol is between 87,78 -89,49%. The results of the analysis of variance showed that there was no interaction between treatments, besides the proportion of sorghum flour: glutinous rice flour (T) and the type of sugar (G) had no significant effect on the yield of sorghum dodol. This is based on the calculated F value of the proportion factor of sorghum flour: glutinous rice flour (T), namely F count (1.428) < F table (5.99) and F count from the type of sugar (G) factor, namely F count (0.389) < F table (5.99). The yield of sorghum dodol is above 80% (sorghum dodol yield >80%), which means that the sorghum dodol product has the potential to be developed as an entrepreneurial product choice.

The results of the water content test presented in Figure 2, which shows that the water content of sorghum dodol is between 26.59-33.87%. The results of the analysis of variance showed that there was no

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interaction between treatments, besides the proportion of sorghum flour: glutinous rice flour (T) and the type of sugar (G) had a significant effect on the water content of sorghum dodol. This is based on the calculated F value of the proportion factor of sorghum flour: glutinous rice flour (T), namely F count (86,135) > F table (5.99) and F count from the type of sugar (G) factor, namely F count (11,002) > F table (5.99). The difference in water content caused by the difference in the amount of sorghum flour is thought to be due to the difference in the amount of amylose in sorghum flour added to the production of sorghum dodol. The higher the proportion of sorghum flour added, the higher the amount of amylose in the sorghum dodol dough. The amylose molecule in starch affects its functional properties, namely during the formation of the starch gel (Adeyeye, 2016; Karwacka et al., 2022).

While there is a real influence of water content caused by different types of sugar. Allegedly due to differences in the amount of water contained in sorghum dodol due to different types of sugar presumably due to differences in total sugar contained in sorghum dodol itself. While the higher the total sugar in dodol sorghum, the water content contained will also decrease and vice versa. High sugar concentrations will cause an osmotic dehydration process so that some of the water contained in the material will come out. This is consistent with the results of research on total sugar in dodol sorghum products which showed total sugar in dodol sorghum in palm brown sugar factor (61.86%) was greater than total sugar in siwalan brown sugar factor (55.24%) (Hacisalihoglu & Armstrong, 2022; Kim et al., 2021).

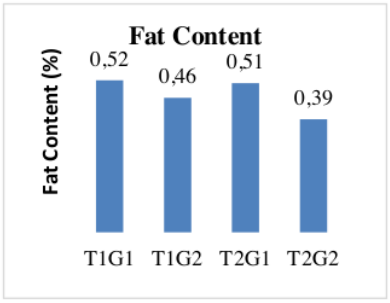

Figure 3. Fat Content Dodol Sorghum

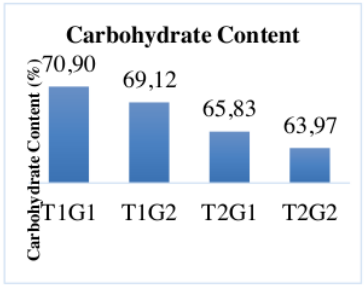

Figure 4. Carbohydrate Content Dodol Sorghum

The results of the fat content test are presented in Figure 3, which shows that the fat content of sorghum dodol is between 0.39-0.52%. The analysis of variance showed no interaction between treatments, besides the proportion of sorghum flour: glutinous rice flour (T) and the type of sugar (G) did not significantly affect the fat content of sorghum dodol. This is based on the calculated F value of the proportion factor of sorghum flour: glutinous rice flour (T), namely F count (0.003) < F table (5.99) and F count from the type of sugar factor (G) namely F count (0.025) < F table (5.99). There was no significant effect on the proportion of sorghum flour: glutinous rice flour (T) and sugar (G) on fat content, presumably because the fat content between sorghum flour and glutinous rice flour were relatively the same, namely 3.3% in sorghum flour and 4% in glutinous rice flour, as well as there was no significant effect of the type of sugar on the fat content of sorghum dodol (Guedes et al., 2021).

The results of the carbohydrate content test are presented in Figure 4, which shows that the carbohydrate content of sorghum dodol is between 63.97-70.90%. The results of the analysis of variance showed that there was no interaction between treatments, besides the proportion of sorghum flour: glutinous rice flour (T) and the type of sugar (G) had a significant effect on the carbohydrate content of sorghum dodol. This is based on the calculated F value of the proportion factor of sorghum flour: glutinous rice flour (T), namely F count (78.439) > F table (5.99) and F count from the type of sugar (G) factor, namely F count (9,901) > F table (5.99). The decrease in carbohydrate content along with the increase in the amount of sorghum flour is thought to be because the carbohydrate content of sorghum flour is lower than the carbohydrate content of glutinous rice flour. The sorghum flour has a carbohydrate content of 70.7%, while the carbohydrate content of glutinous rice flour is 78.4% (Abiodun et al., 2022).

The results of the protein content test are presented in Figure 5, which shows that the protein content of sorghum dodol is between 1.19-1.47%. The analysis of variance showed no interaction between treatments. Besides, the proportion of sorghum flour: glutinous rice flour (T), and the type of sugar (G) did not significantly affect the protein content of sorghum dodol. This is based on the calculated F value of the proportion factor of sorghum flour: glutinous rice flour (T), namely F count (0.087) < F table (5.99) and F count from the type of sugar factor (G) namely F count (0.034) < F table (5.99). There was no significant effect of the proportion of

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sorghum flour: glutinous rice flour (T) and type of sugar (G) on protein content, presumably because the protein content between sorghum flour and glutinous rice flour were relatively the same, namely 10% for sorghum flour and 7% for glutinous rice flour. .4%. While the real effect that occurs in the type of sugar treatment (G) on protein levels is thought to be due to differences in protein content in palm brown sugar and siwalan brown sugar (Domínguez et al., 2022; Mesa-Stonestreet et al., 2010).

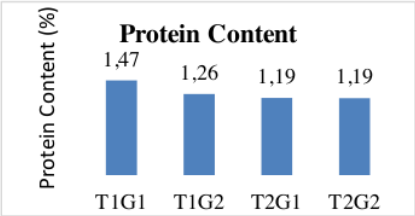

Figure 5. Protein Content Dodol Sorghum

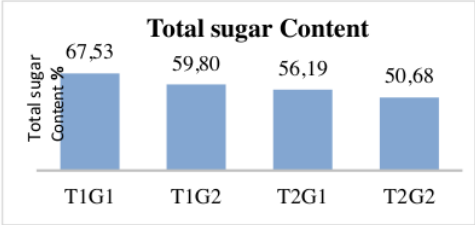

Figure 6. Total Sugar Content Dodol Sorghum

The total sugar test results are presented in Figure 6, which shows that the total sugar of sorghum dodol is between 50.68-67.53%. The results of the analysis of variance showed that there was no interaction between treatments, besides that the proportion of sorghum flour: glutinous rice flour (T) and the type of sugar (G) had a significant effect on the total sugar content of sorghum dodol. This is based on the calculated F value of the proportion factor of sorghum flour: glutinous rice flour (T), namely F count (314,163) > F table (5.99) and F count from the type of sugar (G) factor, namely F count (131.473) > F table (5.99). The higher total sugar content of dodol sorghum is accompanied by the increasing amount of glutinous rice flour in sorghum dodol, presumably because the amount of carbohydrates in rice flour is greater than that of sorghum flour resulting in the total sugar content in sorghum also increases. The carbohydrate content of sorghum flour is 76.64%, while the carbohydrates in glutinous rice flour are 78.4. The different types of sugar also significantly affected the total sugar of dodol sorghum. The sorghum dodol product that uses palm brown sugar is higher than the sorghum dodol that uses siwalan brown sugar, where the palm sugar contains 84% sucrose, so it can provide higher energy than siwalan brown sugar which contains as much as 76.85% sucrose (Garro-Mellado et al., 2022).

The results of calculating the weight value and expected value of dodol sorghum are presented in Figures 7 and 8. The weight value of sorghum dodol, from the highest importance value, is carbohydrate content of 25%, the protein content of 20%, fat content of 19%, total sugar content of 14%, water content of 12%, and ash content of 10%. And based on the calculation of the expected value, the highest expected score was found in the T1G1 treatment (proportion of sorghum flour: glutinous rice flour 30%: 70% and palm sugar) with an expected value score of 6,72.

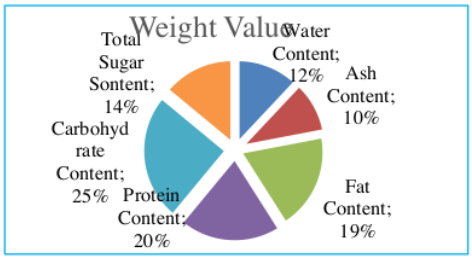

Figure 7. Weight Value Dodol Sorghum

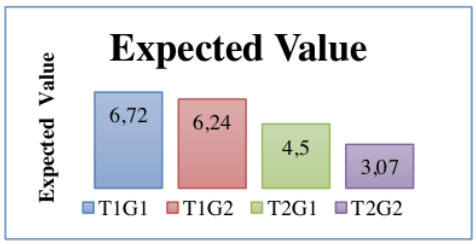

Figure 8. Expected Value Dodol Sorghum

IV. CONCLUSION

Sorghum dodol is one of the sorghum-based entrepreneurship products. T1G1 treatment (proportion of sorghum flour: glutinous rice flour 30%: 70% and palm sugar with an expected value of 6.72. This treatment had a yield of 88.83%, water content of 26.59%, ash content of 0.52%, protein content is 1.47%, fat content is 0.52%, carbohydrate content is 70.90% and total sugar is 67.53%.

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