:: IJEBD ::
(International Journal of Entrepreneurship and Business Development)
Volume 05 Number 05 September 2022
This work is licensed under a Creative Commons Attribution- ShareAlike 4.0 International License.
ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

Sorghum (Sorghum Bicolor) Entrepreneurship Products: Chemical Quality Analysis

Ami Silvia Rusydah, Endang Noerhartati*, Tri Rahayuningsih
Wijaya Kusuma University Surabaya
*Correspondent Author: endang_noer@uwks.ac.id

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.*
Received : September 15th
Revised : September 17th
Published : September 30th

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

This work is licensed under a Creative Commons Attribution- ShareAlike 4.0 International License.
ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

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 90ºC. 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:

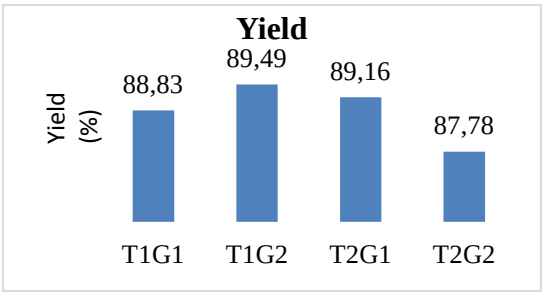

Figure 1. Yield Dodol Sorghum

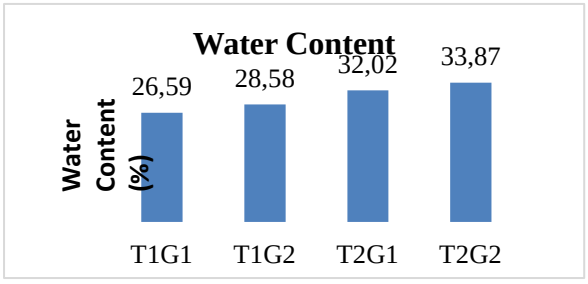

Figure 2. Water Content Dodol Sorghum

The yield test 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 are 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

This work is licensed under a Creative Commons Attribution- ShareAlike 4.0 International License.
ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

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. Where 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).

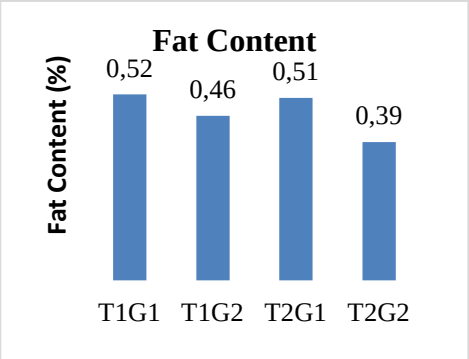

Figure 3. Fat Content Dodol Sorghum

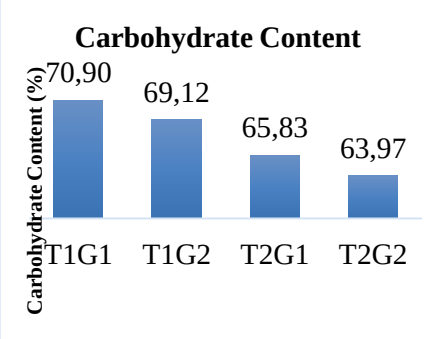

Figure 4. Carbohydrate Content Dodol Sorghum

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

This work is licensed under a Creative Commons Attribution- ShareAlike 4.0 International License.
ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

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).

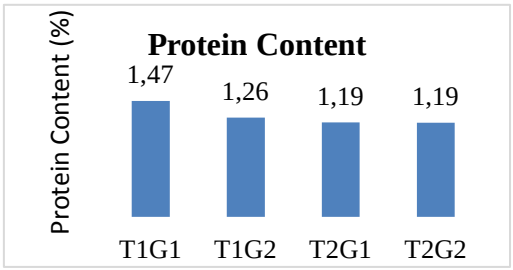

Figure 5. Protein Content Dodol Sorghum

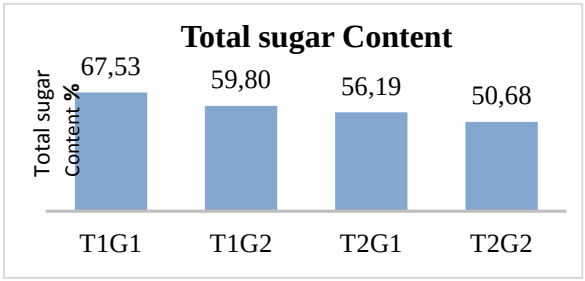

Figure 6. Total Sugar Content Dodol Sorghum

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.

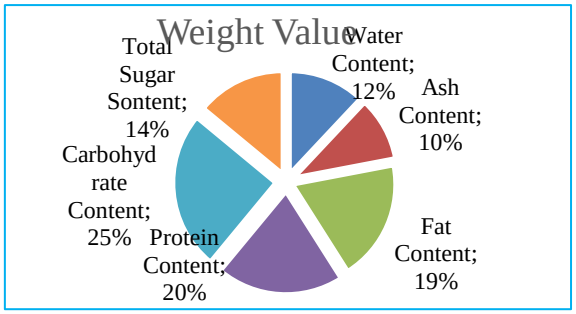

Figure 7. Weight Value Dodol Sorghum

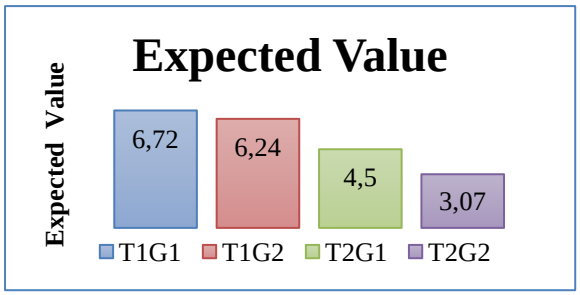

Figure 8. Expected Value Dodol Sorghum

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%.

This work is licensed under a Creative Commons Attribution- ShareAlike 4.0 International License.
ISSN : 2597-4785 (ONLINE)
ISSN : 2597-4750 (PRINTED)

REFERENCES

Abiodun, A. J., Olusegun, A. A., Oluwatoyin, O. G., Abiola, O. A., & Adeola, A. E. (2022). Optimization of process variables for the production of cookies from wheat, fonio, and pigeon pea flour blends. *Journal of Nutritional Health & Food Engineering*, *Volume 12*(Issue 2), 73–77. https://doi.org/10.15406/JNHFE.2022.12.00359

Adeyeye, S. A. O. (2016). Assessment of quality and sensory properties of sorghum–wheat flour cookies. *Cogent Food and Agriculture*, *2*(1). https://doi.org/10.1080/23311932.2016.1245059

Calabrese, F. M., Disciglio, V., Franco, I., Sorino, P., Bonfiglio, C., Bianco, A., Campanella, A., Lippolis, T., Pesole, P. L., Polignano, M., Vacca, M., Caponio, G. R., Giannelli, G., Angelis, M. De, & Osella, A. R. (2022). A Low Glycemic Index Mediterranean Diet Combined with Aerobic Physical Activity Rearranges the Gut Microbiota Signature in NAFLD Patients. *Nutrients 2022, Vol. 14, Page 1773*, *14*(9), 1773. https://doi.org/10.3390/NU14091773

Casulli, L. (2022). What do we talk about when we talk about entrepreneurial mindset training? *Hunter Centre For EntrepreneurshipInnovation and Entrepreneurship*, *20*, 137–156. https://doi.org/10.1007/978-3-030-87865-8_8

Deribe, Y., & Kassa, E. (2020). Value creation and sorghum-based products: what synergetic actions are needed? *Cogent Food & Agriculture*, *6*(1). https://doi.org/https://doi.org/10.1080/23311932.2020.1722352

Domínguez, R., Pateiro, M., Munekata, P. E. S., Zhang, W., Garcia-Oliveira, P., Carpena, M., Prieto, M. A., Bohrer, B., & Lorenzo, J. M. (2022). Protein Oxidation in Muscle Foods: A Comprehensive Review. *Antioxidants*, *11*(1). https://doi.org/10.3390/ANTIOX11010060

Garro-Mellado, L., Guerra-Hernández, E., & García-Villanova, B. (2022). Sugar Content and Sources in Commercial Infant Cereals in Spain. *Children (Basel, Switzerland)*, *9*(1). https://doi.org/10.3390/CHILDREN9010115

Guedes, A. M. M., Freitas-Sá, D. D. G. C., Antoniassi, R., Wilhelm, A. E., de FARIA-MACHADO, A. F., & Torrezan, R. (2021). Nutrıtıonal characterıstıcs and sensory acceptabılıty of reduced-fat french frıes. *Food Science and Technology*, *42*. https://doi.org/10.1590/FST.39220

Hacisalihoglu, G., & Armstrong, P. R. (2022). Flax and Sorghum: Multi-Element Contents and Nutritional Values within 210 Varieties and Potential Selection for Future Climates to Sustain Food Security. *Plants 2022, Vol. 11, Page 451*, *11*(3), 451. https://doi.org/10.3390/PLANTS11030451

Horwitz, W. (2010). *Official methods of analysis of AOAC International. Volume I, agricultural chemicals, contaminants, drugs/edited by William Horwitz.* Gaithersburg (Maryland): AOAC International, 1997.

Karwacka, M., Ciurzyńska, A., Galus, S., & Janowicz, M. (2022). Freeze-dried snacks obtained from frozen vegetable by-products and apple pomace – Selected properties, energy consumption and carbon footprint. *Innovative Food Science & Emerging Technologies*, *77*. https://doi.org/https://doi.org/10.1016/j.ifset.2022.102949

Kim, T.-K., Yong, H. I., Cha, J. Y., Park, S.-Y., Jung, S., & Choi, Y.-S. (2021). Drying-induced restructured jerky analog developed using a combination of edible insect protein and textured vegetable protein. *Food Chemistry*, *373*(1–4). https://doi.org/10.1016/j.foodchem.2021.131519

Li, Y., & Zhang, S. (2022). Statistical Analysis. In *Applied Research Methods in Urban and Regional Planning* (pp. 109–148). Springer.

Mesa-Stonestreet, N. J. de, Alavi, S., & Bean, S. R. (2010). Sorghum proteins: the concentration, isolation, modification, and food applications of kafirins. *J Food Sci.*, *75*(5). https://doi.org/10.1111/j.1750-3841.2010.01623.x

Noerhartati, E., Muharlisiani, L. T., Wijayati, D. T., Riyanto, Y., Mutohir, T. C., Soedjarwo, Handayaningrum, W., Moedjito, & Bin Bon, A. T. (2019). Sorghum-based alternative food industry: Entrepreneurship high education. *Proceedings of the International Conference on Industrial Engineering and Operations Management*.

Savitri, N. A., Masithah, E. D., & Tjahjaningsih, W. (2022). Quality Enhancement in Seaweed Dodol Using Edible Film Carrageenan Packaging. *IOP Conference Series: Earth and Environmental Science*, *1036*(1), 12008.

Sihombing, N., Elma, M., Thala'ah, R. N., Simatupang, F. A., Pradana, E. A., & Rahma, A. (2022). Garlic essential oil as an edible film antibacterial agent derived from Nagara sweet potato starch applied for packaging of Indonesian Traditional Food-Dodol. *IOP Conference Series: Earth and Environmental Science*, *999*(1), 12026.