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Nutritional Value and Sensory Properties of Brown Rice Flour Cookies with Green Spinach (*Amaranthus Tricolor* L.) Incorporation as Gluten-Free Food Alternative

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Abstrak

Terjadi peningkatan dalam produk makanan gluten-free dikarenakan meningkatnya angka pasien yang menderita penyakit celiac. Gluten adalah protein dalam gandum yang terdapat di setiap produk olahan tepung terigu. Cookies merupakan salah satu produk olahan tepung terigu yang tingkat konsumsinya cukup meningkat. Sebagai pengganti tepung terigu, terdapat produk lokal yang bisa digunakan seperti tepung beras merah. Cookies beras merah ini ditambahkan bayam hijau dalam upaya meningkatkan konsumsi sayur di Indonesia. Penelitian ini menganalisis kandungan gizi dan daya terima cookies tepung beras merah dengan penambahan bayam hijau. Dilakukan empat taraf perlakuan dengan perbandingan tepung beras merah dan bayam hijau yaitu, 100:0, 90:10, 85:15, 80:20. Terdapat terdapat perbedaan signifikan terhadap kadar protein, lemak, dan karbohidrat diantara empat perlakuan dan perbedaan signifikan terhadap aspek warna dan rasa pada uji hedonic. Perlakuan terbaik adalah pada rasio 90%:10%. Hasil cookies yang terbaik mengandung kadar air 3,83%; kadar abu 1,48%; kadar protein 10,97%; kadar lemak 31%; karbohidrat 52,7%; dan kadar serat 17,3%. Kesimpulan : Daya terima dan kandungan gizi cookies tepung beras merah dengan penambahan bayam hijau dapat ditentukan baik dengan menemukan formula terbaiknya, yaitu 90%:10%.

Abstract

Cookies are one of the wheat-based snack products with increasing rate of consumption by years. Wheat flour used in Indonesia is fully imported. Local crop product such as brown rice flour with respective nutritional aspect can be utilized for wheat substitution. Addition of spinach as green leafy vegetable with numerous nutrients gives more functional value to the product. This research aimed to investigate the acceptability (sensory properties) and nutritional content of brown rice flour cookies with the addition of green spinach. Four formulations made with ratio of brown rice and green spinach were 100:0, 90:10, 85:15, and 80:20. There were significant differences in protein, fat, and carbohydrate content among the four cookies samples There were significant differences in colour appearance and taste between all samples. The best treatment is at the ratio of brown rice flour 90: green spinach 10, containing moisture content of 3.83%; ash content 1.48%; protein content 10.97%; fat content 31%; carbohydrates 52.7%; and crude fiber content of 17.3%.

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INTRODUCTION

There has been a surge in demand for gluten-free foods such as bread and healthful pastries to replace some cereal-based products in the early twenty-first century. The rising number of individuals with celiac disease, autism, and gluten intolerance is driving demand for gluten-free products. The pooled sero-prevalence of CD among low risk group in Asia–Pacific region was 1.2% (Ashtari *et al.*, 2021). The prevalence of celiac disease in is estimated to be around 0.5-1%, with the people of Western Sahara, Africa, having the highest prevalence at 5.6% (Cairano *et al.*, 2018). The disease is uncommon in countries with low gluten consumption such as Indonesia, but it is becoming more likely to occur as peoples's lifestyles become more contemporary and advanced. Among developing countries, celiac disease is increasing case regarding the intention of people to adopt highly gluten in their diet pattern (Plugis & Khosla, 2015; Cummins & Thomson, 2009).

Celiac disease is an immune-mediated systemic disorder that attacks the digestive system as a form of intolerance to gluten. Gluten is the primary source of protein in wheat, and it can be found in bread, noodles, biscuits, pasta, cakes, pastries, and other processed wheat products. Cookies are a sort of wheat-based pastry food that comes in variety of flavors and varieties that appeal to people of all ages, including children and adults. Cookies are also convenient to consume and have a longer shelf-life. Cookies were consumed 194 kg per year in 2016, according to the Central Agency on Statistic Republic of Indonesia (BPS), and 228 kg per year in 2020.

Wheat flour as the main ingredient in cookies, is an imported product becoming more popular, and Indonesia is currently ranking as the world's second-largest importer of wheat. According to the Indonesian Wheat Flour Producers Association (APTINDO), Indonesian wheat imports increased by nearly 9% to 11.48 million tons in 2017, compared to the previous year. In 2017, the selling price of wheat increased by 9.9% to US$ 2.65 billion. Substituting raw materials from local products as a one of the approaches to reduce the usage of wheat.

Rice is the most cereal flour used for gluten-free products development (Gobbetti *et al.,* 2018). Brown rice flour is one of the local foods that could be used as a wheat substitution. Brown rice flour has more durable time than the seeds form and it has a longer shelf life. Protein, unsaturated fatty acids, iron, fiber, vitamins, and minerals can be found in brown rice. Recent studies have shown that brown rice has a wide range of biological activities, including antioxidant, anti-carcinogenic, antiallergenic activities, anti-atherosclerosis and amelioration of iron deficiency anaemia in the body (Mir *et al.,* 2015). For people who have celiac disease, they can consume breads and other bakeries due to the absence of gluten forming proteins in brown rice (Morita, 2007). Rice flour offers potential for new and traditional baked products (Islam *et al.*, 2012). A certain inherent properties have been identified by providing the most suitable flours for traditional products or as substitution for wheat flour in breads and cakes.

In addition to brown rice, green spinach is a type of food containing numerous nutrients for human's body. Spinach is one of the most important and nutritious vegetables. It provides a very good amount of vitamins B6, riboflavin, folate, niacin, soluble dietary fiber, omega 3-fatty acid and minerals. Spinach is also rich with iron; it prevents from some of diseases like osteoporosis, and anemia (Patricia *et al*, 2014). In adding to its food value, spinach has a numeral therapeutic benefit. According to the Indonesian Individual Food Consumption Survey from 2014, the average daily consumption of vegetables and processed foods among Indonesians aged 13 to 18 years was 45.8 grams per person. This figure is still significantly below to the recommended vegetable consumption in Indonesia, which is between 150 and 200 grams per person per day. Low vegetable intake can also be caused by easily destroyed vegetable qualities after harvesting and how consumers treat vegetables.

To reduce wheat imports, and to increase vegetable consumption, as well as to prevent various degenerative diseases in Indonesia, the development of gluten-free cookies with the essential ingredients of brown rice flour and the addition of green spinach as a functional food could be an alternative way.

METHODS

Preparation of samples

This research consisted of four levels of green spinach addition. A control group in this study used brown rice flour as a primary material. Four substitution levels of brown rice flour with green spinach are at 100%:0% as control (C0), 90%:10% (F1), 85%:15% (F2), 80%:20% (F3). The brown rice flour, green spinach, and all ingredients were obtained from Mantingan, Ngawi, East Java – Indonesia. The instruments were digital food scales (Ideal life) and baking oven (Kirin and Oxone) in preparation for making cookies. The analysis instruments were analytical scales (ACIS), sterilizing oven (Memmert), electric stoves (Maspion), furnace (Thermolyne F48020), and glassware from Pyrex Iwaki. The chemical materials were H2SO4, HCl, NaOH, K_2SO_4 (Sigma), kjeldahl powder, N-Hexane (Emsure), K2SO4, Alcohol 96% (Mercks) and aquadest.

The fresh green spinach washed thoroughly, then blanched for two minutes, and chopped into small pieces. The dough formulation consisted of 300 g brown rice flour (control), 125 g butter, 100 g sugar, 13 g powder milk, 50 g, and 0.4 g of salt. The brown rice flour was added gradually according to each formulation. The dough that had been homogenously mixed was added with leafy slices of green spinach and stirred evenly. Then the dough was put on a baking sheet with baking paper, and it was baked in an oven to 180°C for 20 minutes. Then, the cookies were kept and sealed in aluminum pouch prior to analysis.

Sensory Properties

Sensory properties were evaluated by hedonic test. The test was performed by 30 semi-trained panelists, both male and female. Panelists were familiarized with the used questionnaire form. The samples were measured for the taste, color, aroma, and texture. This test used a five scale (1: dislike extremely, 2: dislike, 3: neither like nor dislike, 4: like, 5: like extremely).

Proximate Analysis

Moisture content, ash, crude fat, and crude protein content were analyzed according to the methods by AOAC (2005). Carbohydrate content was determined by difference method by subtracting the sum of the percentage of crude protein, fat, moisture, and ash content from 100%. All the ingredients has been examined and guaranteed for halal label.

Statistical Analysis

All samples were run in triplicates, except the sensory evaluation. The data were expressed as mean ± standard of deviation. Data was analyzed for variation using one-way analysis of variance (ANOVA) and the means separated by Duncan's multiple-range test. Significance between related samples was analyzed at the level of 0.05 ($p < 0.05$). The data that were not normally distributed were analyzed using the Kruskal-Wallis method to determine the influence on each treatment parameter, then followed by the Mann-Whitney method to determine the level of treatment for making a significant difference.

RESULTS AND DISCUSSION

Nutritional Properties

The highest moisture content was found in the control treatment, with an average value of 5.33% (Table 1). This was thought to be due to water content bond with the mineral content in the product (Ardin *et al.*, 2019). F1 treatment has the lowest average moisture content, with an average of 3.83%. According to Indonesia National Standard (SNI) SNI-01-2973-1992, a maximum of 5% moisture content in cookies was suggested. The moisture content of F1, F2, and F3 treatments was less than 5%, indicating that their moisture content met the established SNI-01-2973-1992 requirements. However, the C0 (control) treatment did not met the established SNI-01-2973-1992 requirements. All of the moisture content from four samples had lower value, compared to the previous study by Dhillon *et al.*, 2021, that investigated cookies made from 100% wheat flour had a moisture content of 9.79%, while cookies with a proportion of 100% brown rice flour had a lower moisture content of 7.35%.

There was no significant difference between the control and cookies sample with green spinach addition ($p>0.05$). With an average of 1.65%, the C0 (control) treatment had the highest ash levels of the four treatments. According to Herawati *et al.*, (2018), the formulation of cookies with a higher brown rice flour ratio has the highest ash content. Aside from C0, all treatments have the same 1.48% ash content. The maximum ash concentration in cookies was 1.5%, according to SNI 01-2973-1992 on quality criteria for cookies. The ash content of brown rice flour cookies with green spinach treatment F1, F2, and F3 were less than 1.5%, it indicates that the cookies met the specified requirements of SNI 01-2973-1992.

Table 1. Nutritional Value of Brown Rice Cookies with Green Spinach

Parameter	**Formulation**			
(wb %)	**C0**	**F1**	**F2**	**F3**
Water	5.33 ± 1.15^{a}	3.83 ± 0.28^{b}	4.0 ± 0.00^{b}	4.66 ± 0.28^{ab}
Ash	1.65 ± 0.28^{a}	1.48 ± 0.00^{a}	1.48 ± 0.02^{a}	1.48 ± 0.01^{a}
Protein	10.6 ± 0.68^{a}	10.97 ± 0.43^{a}	11.0 ± 0.48^{a}	12.1 ± 0.48^{b}
Fat	40.8 ± 0.76^{c}	31.0 ± 0.50^{b}	29.6 ± 1.25^{ab}	28.1 ± 0.76^{a}
Crude fiber	12.3 ± 3.51^{a}	17.3 ± 5.68^{a}	17.0 ± 2.64^{a}	17.3 ± 8.62^{a}
Carbohydrate	41.49 ± 0.37^{a}	52.7 ± 0.40^{b}	53.84 ± 1.25^{b}	53.5 ± 1.03^{b}

Values were expressed as mean±SD (n = 3); means with the same superscript letters in the same rows are not significantly different ($p < 0.05$) compared to control (100% brown rice flour cookies).

F3 treatment had the highest average protein levels (Table 1). With an average protein concentration of 10.6%, the C0 treatment had the lowest average protein content. The minimum cookie protein level is 9%, according to SNI 01-2973-1992, where all the four samples already fulfilled the cookie quality requirements. Guennouni *et al.*, 2020, explained that removing gluten that act as protein from food items reduces the variety of ingredients compared to similar gluten goods. As a result, the levels of energy, macronutrients, and micronutrients will be altered. It is said that gluten-containing food had twice as much protein as gluten-free products in 57% of cases. These brown rice flour cookies with spinach already exceed SNI guidelines, yet had lower protein content than gluten-containing items.

Table 1 showed significant differences in fat content amongst the cookies ($p<0.05$), where control (C0) had the highest fat content 40.8%. This was considered owing to the substantial amount of margarine used in the dough. The inclusion of margarine contributes to the fat in cookies, and egg yolks had a fat level of 31-32%, according to Yudhistira *et al.* (2019), in preparing green spinach cookies with tomatoes. The F3 treatment, which contains a higher amount of green spinach (28.1% on average), had the lowest fat content. This was similar to Octaviyanti's (2017) research on powdered chicken broth with green spinach juice, which showed a decrease in the fat content of siring with the addition of green spinach juice. This was due to the low-fat content of green spinach veggies. The minimal fat level of cookies is 9.5%, according to SNI 01-2973-1992 on cookie quality requirements. This means that all treatments were carried out in compliance with SNI 01-2973-1992. The higher fat content of the flours leads to their ability to absorb and retain oil, improves the structure and mouth feel, and helps to enhance the flavor retention, also reducing moisture and fat losses of food products (Sreerama *et al.*, 2012).

F2 sample had the lowest carbohydrate levels, with an average of 41.49 % (Table 1). In this study, the carbohydrate content of cookies was measured using the by difference method. Water content, ash content, fat content, and protein levels in cookies all affecting carbohydrate levels (Herni *et al.*, 2018). The minimal carbohydrate level of cookies, according to SNI 01-2973-1992 on the quality requirements of cookies, is 7%. All samples were carried out in compliance with the established SNI 01-2973-1992. In Naqash's (2017) study, it was discovered that gluten-free products had higher carbohydrate and fat content while having lower protein content. Gluten-free products offer twice as much fat, mostly saturated fat, compared to gluten-containing food. On the other hand, there was no significant difference between the control sample and green spinach addition (F1, F2, F3) ($p>0.05$). The use of materials for cookie manufacturing impacts high fiber levels. In Sabila's study (2020), the cookies product with a proportion of 100% brown rice flour had the highest crude fiber content.

The sensory properties based on hedonic evaluation of cookies displayed in Table 2. There was an average difference in preference for color in brown rice flour cookies with the addition of green spinach. the highest level of preference for the colour of cookie products was found in the treatment F3 (80 % brown rice flour and 20 % green spinach) which had a dark brown colour with an average preference of 3.87 (like) and the lowest cookie colour hedonic test was found in the treatment C0 (100 % brown rice flour) had a light brown colour with an average preference of 3.2 (neither dislike or like). The color of cookies was generally caused by a Maillard reaction, which occurs during the roasting process (Jaswir *et al.*, 2020). Caramelization caused by the heating process could also affect the colour of cookies (Bolarinwa *et al.*, 2019). The colours of cookies were primarily brown. This was because brown rice flour had a brownish-red colour, and it was thought that flavonoid chemicals give brown rice its colour (Herawati et al., 2018).

Table 2. Sensory properties of brown rice flour cookies with a green spinach addition

Indicators	**Acceptability score**				***p-value****
	C0	**F1**	**F2**	**F3**	
Color	3.2 ± 0.99^{b}	3.67 ± 0.75^{a}	3.73 ± 0.74^{a}	3.87 ± 0.81^{a}	0.028
Aroma	3.77 ± 1.04^{a}	3.67 ± 0.80^{a}	3.63 ± 0.85^{a}	$3,43 \pm 0.89^{a}$	0.411
Taste	2.67 ± 0.95^{b}	3.6 ± 1.10^{a}	3.5 ± 1.00^{a}	3.30 ± 1.02^{a}	0.003
Texture	2.87 ± 1.07^{a}	3.57 ± 0.89^{a}	3.43 ± 1.1^{a}	3.33 ± 1.12^{a}	0.057
Average Score	3.12	3.62	3.57	3.48	

Values were expressed as mean±SD (n = 3); means with the same superscript letters in the same rows are not significantly different ($p < 0.05$) compared to control (100% brown rice flour cookies).

The hedonic test findings in Table 2 showed that panelists had the highest preference for the aroma control sample (100 % brown rice flour), with an average preference for the aroma of 3,77 (like). Flour's ability to absorb fat could give better aroma on cookies (Susilawati *et al.*, 2018). The lowest preference of aroma found in the treatment of F3 (80% brown rice flour and 20% green spinach). This was similar to previous research by Rasyid *et al.*, 2020, that exposed the higher the increase in the concentration of green spinach, the lower acceptability of product.

Table 3. Organoleptic quality test result

Criteria	Formulation	Highest score		Rating Category	*p-value**
		n	%		
Color	C0	10	33	Light brown	0.001
	F1	17	56.7	Brown	
	F2	16	53.3	Dark brown	
	F3	16	53.3	Dark brown	
Taste	C0	18	60	Brown rice	0.002
	F1	13	43.3	Brown rice and peanut	
	F2	10	33.3	Brown rice and peanut	
	F3	9	30	Brown rice and green spinach	
Aroma	C0	13	43.3	Brown rice	0.021
	F1	10	33.3	Peanut	
	F2	15	50	Brown rice and peanut	
	F3	11	36.7	Green spinach	
Texture	C0	10	33.3	Slightly Cripsy	0.013
	F1	12	40	Crispy	
	F2	12	40	Crispy	
	F3	18	60	Slightly Cripsy	

The highest score taste of cookies products found in F1 sample (90 % brown rice flour and 10% green spinach) with value of 3.6. (like). The lowest cookie flavour hedonic test revealed in the treatment of C0 (100 % brown rice flour) that had a noticeable brown rice taste, with a panelist preference for the score of 2.67 (neither dislike or like). This research was comparable to Ardin's (2019), with a value of 2.37, regarding the formulation of cakes using only the essential ingredients of brown rice flour receives an average favorability value toward the lowest taste. The addition of other raw materials such as sugar, margarine, eggs, and milk in the manufacture of cookies also improves the taste of cookies.

The most favorite texture of cookies product was in F1 formulation (90 % brown rice flour and 10% green spinach) that had a crisp texture with score of 3.57 (like). Meanwhile, the lowest texture preference found in the treatment C0 (100 % brown rice flour) that had a slightly crisp texture (neither dislike or like). According to a prior study, the more green spinach used, the less crisp the result (Syafitri *et al.*, 2019)) Cookies with the more percentage of brown rice flour had lower texture ratings that might be due to gluten-free grain products color, texture, and gas retention, such as brown rice (Dhillon *et al.*, 2021).

Table 3 showed the result of organoleptic quality evaluation of brown rice cookies with incorporation of green spinach. F3 and F4 had the significantly darker brown color regarding the more addition of green spinach. This fact might be attributed to the Maillard reaction products which are formed from amino acids and reducing sugars during baking the cookies (Walker *et al.*, 2014). The taste and aroma cookies on F2 and F3 had the impression of peanut-like. For the crispness aspect, F2 and F3 also resulting 'crisp' texture.

CONCLUSION

From the sensory evaluation, the best brown rice flour cookie formulation with green spinach addition was F1 (90% brown rice flour and 10% green spinach), which had the highest average score of 3.62 (like) compared to other samples. The nutritional value reveals that the C0 formulation still fails to fulfil water, ash, and crude fiber content standards (SNI 01-2973-1992). While the fiber levels in F1, F2, and F3 did not satisfy the criteria. The mostly liked cookies had a moisture content of 3.83%, ash content of 1.48%, protein content of 10.97%, fat content of 31%, carbohydrate content of 52.7%, and fiber content of 17.33%.

REFERENCES

Ardin, L., Karimuna, L. and Amrullah, P.M. (2019). Formulasi tepung cangkang telur dan tepung beras merah terhadap nilai kalsium dan organoleptik kue karasi. Jurnal Sains dan Teknologi Pangan, 4(1), 1892–1904.

Ashtari, S., Najafimehr, H., Pourhoseingholi, M.A., Rostami, K., Asadzadeh-Aghdaei, H., Nejad-Rostami, M., Tavirani, M.R., Olfatifar, M., Makharia, G.K., and Zali, M.R. (2021). Prevalence of celiac disease in low and high risk population in Asia–Pacific region: A systematic review and meta-analysis. Sci Rep 11, 2383 DOI: https://doi.org/10.1038/s41598-021-82023-8

Bolarinwa, l.F., Lim, P.T., and Kharidah, M. (2018). Quality of gluten-free cookies from germinated brown rice flour. Food Research, 3(3), 199-207. DOI: https://doi.org/10.26656/FR.2017.3(3).228

Cairano, M.D., Galgano, F., Tolve, R., Caruso, M.C., Condelli, N. (2018). Focus on gluten free biscuits: ingredients and issues. Trends in Food Science & Technology, 81, 203-212. DOI: https://doi.org/10.1016/j.tifs.2018.09.006

Cummins A.G. & Roberts-Thomson, I.C. (2009). Prevalence of celiac disease in the Asia-Pacific region. Canadian Journal of Gastroenterology and Hepatology, 24(8), 1347-51. DOI: https://doi.org/10.1111/j.1440-1746.2009.05932.x

Dhillon, B., Sodhi, N.S., Aneja, E., Kumar, A., Jaiswal, S. (2021). Physico-chemical and textural (sensorial and electromyographic) evaluation of cookies formulated using different ratios of brown rice flour and refined wheat flour. Journal of Food Measurement and Characterization, 15(1), 219–227. DOI: https://doi.org/10.1007/s11694-020-00625-8

Gobbetti, M., Pontonio, E., Filanninob, P., Rizzellob, C.G., De Angelis, M., and Di Cagnoa, R. (2018). How to improve the gluten-free diet: The state of the art from a food science perspective. Food Res. Int., 110, 22–32. DOI: https://doi.org/10.1016/j.foodres.2017.04.010

Guennouni, M., El Khoudri, N., Bourrhouat, A., and Hilali, A. (2020). Nutritional quality of gluten-free products in Moroccan supermarkets and e-commerce platforms. Cereal Chemistry, 97(5), 912-920. DOI: https://doi.org/10.1002/cche.10313

Herawati, B.R.A., Suhartatik, N., and Widayanti, Y. A. (2018). Cookies tepung beras merah (*Oryza nivara*) – mocaf (modified cassava flour) dengan penambahan bubuk kayu manis (*Cinnamomun burmanni*)'. Jurnal Teknologi dan Industri Pangan, 3(1), 33–40.

Herni, S., Tamrin, and Asyik, N. (2018). Penilaian organoleptik serta proksimat biskuit tinggi serat berbasis tepung kaopi fermentasi dan ampas kelapa. Journal Sains dan Teknologi Pangan, 3(3), 1379–1392.

Islam, M., Taneya, M., Shams-Ud-Din, M., Syduzzaman, M., & Hoque, M. (2012). Physicochemical and functional properties of brown rice (*Oryza sativa*) and wheat (*Triticum aestivum*) flour and quality of composite biscuit made thereof. The Agriculturists, *10*(2), 20–28. DOI: https://doi.org/10.3329/agric.v10i2.13135

Jaswir, I., Rahayu, E.A., Yuliana, N.D., and Roswiem, A.P. (2020). Daftar referensi bahan-bahan yang memiliki titik kritis halal dan substitusi bahan non-halal. Jakarta: Komite Nasional Ekonomi dan Keuangan Syariah.

Kuhns E., and Coulter, K. (2009). The effect of replacing white flour with brown rice flour in chocolate chip cookies.

Mir, S.A., Bosco, S.J.D., Shah, M.A., Santhalakshmy, S., and Mir, M.M. (2017). Effect of apple pomace on quality characteristics of brown rice based cracker. Journal of the Saudi Society of Agricultural Sciences, 16(1), 25-32. DOI: https://doi.org/10.1016/j.jssas.2015.01.001

Morita, N., Maeda, T., Watanabe, M., and Yano, S. (2007) Pre-germinated brown rice substituted bread: Dough characteristics and bread structure. International Journal of Food Properties, 10, 779-789. DOI: https://doi.org/10.1080/10942910601183643

Naqash, F., Gani, A., Gani, A., Masoodi, F.A. (2017). Gluten free baking: Combating the challenges – A review. Trends in Food Science and Technology, 66, 98-107. DOI: https://doi.org/10.1016/j.tifs.2017.06.004

Octaviyanti, N., Dwiloka, B., and Setiani, B. E. (2017). Mutu Kimiawi dan Mutu Organoleptik Kaldu Ayam Bubuk dengan Penambahan Sari Bayam Hijau. Jurnal Aplikasi Teknologi Pangan, 6(2), 2–5.

Patricia, O., Zoue, L., Megnanou, R.-M., Doue, R., & Niamke, S. (2014). Proximate composition and nutritive value of leafy vegetables consumed in northern Côte D'ivoire. European Scientific Journal, 10(6), 212-227. DOI: https://doi.org/10.19044/esj.2014.v10n6p%p

Plugis N.M. & Khosla, C. (2015). Therapeutic approaches for celiac disease. Best Pract Res Clin Gastroenterol., 29(3), 503-21. DOI: https://doi.org/10.1016/j.bpg.2015.04.005

Rasyid, N., Hartono, R., and Sunarto. (2020). Daya terima serta analisis kadar protein dan fosfor pada nugget cumi-cumi dengan penambahan bayam. Media Kesehatan Politeknik Kesehatan Makassar, 8153, 147–157.

Sabila, M., Siter, I.K., Timur, P.I. (2020). Pengaruh perbandingan tepung terigu dan tepung beras merah (Oryza nivara) terhadap karakteristik kue lumpur. Jurnal Ilmu dan Teknologi Pangan (ITEPA), 9(2), 161-169. DOI: https://doi.org/10.24843/itepa.2020.v09.i02.p06

Sreerama, Y.N., Sashikala, V.B., Pratape, V.M., and Singh, V. (2012). Nutrients and antinutrients in cowpea and horse gram flours in comparison to chickpea flour: Evaluation of their flour functionality. Food Chem., 131, 462–468. DOI: https://doi.org/10.1016/j.foodchem.2011.09.008

Susilawati, B.S., Syam, H., and Fadhilah, R. (2018). Effect of modified pragelatinization corn flour on quality cookies. Jurnal Pendidikan Teknologi Pertanian, 4, 27-48.

Syafitri, S., Priawantiputri, W., and Dewi, M. (2019). Produk biskuit sumber zat besi berbasis bayam dan tepung sorgum sebagai makanan tambahan ibu hamil. Jurnal Riset Kesehatan Poltekkes Depkes Bandung, 11(2), 13–21.

Walker, R., Tseng, A., Cavender, G., Ross, A., Zhao, Y. (2014). Physicochemical, nutritional, and sensory qualities of wine grape pomace fortified baked goods. J. Food Sci., 79, 1811—1822. DOI: https://doi.org/10.1111/1750-3841.12554

Yudhistira, B., Sari, T. R. and Affandi, D. R. (2019). Karakteristik fisik, kimia dan organoleptik cookies bayam hijau (*Amaranthus tricolor*) dengan penambahan tomat (*Solanum lycopersicum*) sebagai upaya pemenuhan defisiensi zat besi pada anak-anak. Warta Industri Hasil Pertanian, 36(2), 83-95. DOI: https://10.32765/wartaihp.v36i2.5286