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Bitterballen Formulation of Chicken Meat, Sorghum Flour, and Green Spinach as an Alternative Additional Feeding For Stunted Toddlers Age 12-23 Months

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ABSTRACT

Lack of nutrition in children and stunting may be caused by several interrelated factors. One of the factors that can influence the emergence of growth retardation in children under five is a lack of food intake such as protein, energy, and zinc children failing to grow. This research analyzes the nutritional values, organoleptic quality, and best level of treatment for Bitterballen with a formulation of chicken meat, sorghum flour, and green spinach as an alternative for providing additional food to stunted toddlers aged 12-23 months. The approach used is quantitative and qualitative by analyzing the organoleptic quality results of Bitterballen, determining the best formulation treatment, and calculating the nutritional value using the yield factor and retention factor for each treatment. The manufacturing procedure was first carried out by formulating three treatments with a ratio of chicken meat, sorghum flour, and green spinach. Of all the treatments, treatment 1 had the highest acceptability, namely containing 287.86 kcal of energy with a nutritional value of 12.71 grams of protein, 17.93 grams of fat, and 19.48 grams of carbohydrates. The organoleptic quality produced by T1 is that it has a light brown color, the aroma is savory, not fishy, and not rancid, the taste produced by T1 is savory and not unpleasant, with the inner texture produced by T1 is not gritty and the outer part is crunchy. The aftertaste is savory and slightly gritty.

KEYWORDS: formulation, *Bitterballen*, stunting, toddlers, additional food, the best treatment

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I. INTRODUCTION

Stunting is a condition of failure to grow in children resulting in chronic malnutrition so that the child is too short for his age. According to WHO (2020), stunting is short or very short based on length/height for age which is less than -2 standard deviation (SD) on the WHO growth curve which occurs due to irreversible conditions resulting from inadequate nutritional intake and/or recurrent/chronic infections which occurs in 1000 HPK. Then according to Minister of Health Regulation no. 2 of 2020 concerning Child Anthropometric Standards, toddlers are said to be short if their z-score value is -3 SD to <-2 SD and categorized as very short if the z-score value is <-3 SD.

The causes of stunting in toddlers are divided into two factors, namely direct and indirect factors. Insufficient food intake, lack of energy and protein intake, and several micronutrients as well as the presence of infectious diseases are one of the direct factors causing stunting. Meanwhile, indirect factors include parenting patterns, the mother's knowledge, food availability, and other factors that are the root of the problem, namely the education and economic status of the toddler's parents (Diana, et al, 2019).

The problem of lack of nutrition in children and stunting may be caused by several interrelated factors. One of the factors that can influence the emergence of growth retardation in children under five is a lack of food intake such as protein, energy, and zinc. Food intake plays an important role in the development of toddlers. The nutrients that come from food are needed by the body to stimulate cell division during development, most importantly protein. Protein is one of the main nutrients that play a role in the growth and development process of children under five. The

increase in protein intake is approximately 15% in line with the rapid development of children. Therefore, during the growth and development period of toddlers, food sources are needed that can meet the nutritional needs of toddlers (Solikhah and Dewi, 2022).

Bitterballen is a Dutch-style snack that uses beef as its basic ingredient and is round and covered in breadcrumbs or bread on the outside. Generally, this cake contains a mixture of sliced beef or minced beef, meat stock, butter, wheat flour to thicken the dough, parsley leaves, and salt cooked in a thick flour mixture (roux). Most recipes use nutmeg and some variations use curry powder or add finely chopped vegetables such as carrots (Van Den Berg, 2019).

II. OBJECTIVE

This research objective is to analyze the nutritional values, organoleptic quality, and determine the best level of treatment. Bitterballen with a formulation of chicken meat, sorghum flour, and green spinach as an alternative for providing additional food to stunted toddlers aged 12-23 months.

This research will be beneficial in being able to provide an alternative for providing additional food to meet energy and other nutritional needs by using local food that is cheap, easy to obtain, and affordable by all levels of society so that it can be implemented directly in the community and help in overcoming these problems nutritional stunting in Indonesia.

III. MATERIALS AND METHOD

The material for this research is Bitterballen. Bitterballen formulation was carried out with 3 treatments. Each treatment had different proportions of chicken meat, sorghum flour, and green spinach. In treatment 1 (75:15:10), chicken meat had the highest proportion (75%) compared to the other treatments compared to the proportion of sorghum flour (15%), treatment 2 (65:25:10), had a proportion of chicken meat of 65% with the proportion of sorghum flour was 25%, and treatment 3 (55:35:10), had a proportion of chicken meat of 55% with the highest proportion of sorghum flour compared to the other treatments at 35%.

Chicken meat was chosen as the main ingredient in processed products because it has high nutritional value, besides that the meat fiber is soft, easy to chew and digest, easy to find anywhere at an affordable price, and has the potential for a unique taste. generally preferred taste. Sorghum flour is a local food ingredient that has the potential to replace wheat flour because it is still in the same family as wheat and rice. Sorghum is very suitable for food diversification because its seeds contain relatively high levels of carbohydrates as the main food source, and have no less protein, calcium, minerals, and vitamins than rice and corn. All food ingredients are obtained from local shops. The tools used in the process of making the Bitterballen formula are digital scales, plates, basins, bowls, spoons, knives, cutting boards, pans, pans, blenders/choppers, and stoves.

This research uses a quantitative and qualitative approach using IBM SPSS Statistics 22, namely carrying out the Kruskall Wallis test followed by the Mann-Whitney Test if differences are found, analyzing the results of the organoleptic quality of Bitterballen, determining the best formulation treatment, and calculating the nutritional value using yield factors and retention factor of each treatment. The liking test assessment in this study used a 1–4 Likert scale, namely 1 Very Dislike, 2 Dislike, 3 Like, and 4 Very Like on the level of liking based on color, aroma, taste, and texture. This tool consists of people or groups called panels who are tasked with assessing the nature or quality of food based on subjective impressions. In this study, the panelists used were 25 semi-trained panelists who were students of the Malang Health Polytechnic Nutrition Department. This research was carried out from March 2023 to April 2023 at the Kedungkandang Community Health Center, Malang City.

Formula Processing Procedures

A. How to Make the Roux

1. Prepare the onion and garlic, finely chop, sauté in margarine.
2. When it smells good, add the chopped chicken, and stir well.
3. Add spices, namely salt, ground nuts, and mushroom stock, stir-fry until cooked, and set aside.
4. Prepare a new frying pan, roast the sorghum flour until it is slightly dark in color, then add the low-fat liquid milk, and stir well.
5. If it is even and not lumpy, add the sautéed chicken and spinach that has been boiled, and stir until evenly mixed.
6. Let the Bitterballen roux cool slightly, then shape it into small balls.

B. How to Layer the Roux

1. Once it is round, coat the Bitterballen roux with a solution of flour and water, then coat again with breadcrumbs.
2. Once coated, fry the Bitterballen over medium heat until golden brown, then drain the oil.
3. Bitterballen is ready to be served.

IV. RESULTS

Nutritional Values of Each Treatment

The results of the nutritional value analysis of Bitterballen using the Calculated Value method through Yield Factor and Retention Factor calculations are presented in Table 1.

Table 1. Nutritional Values of Bitterballen per serving (110 grams)

Parameter	Nutritional Values of *Bitterballen per serving size*			Standard
	T1	T2	T3	
Energy (kcal)	287,86	282	281,06	225 – 275
Protein (g)	12,71	11,98	11,47	4,5 – 11
Fat (g)	17,93	16,32	15,05	5,6 – 17,9
Carbohydrate (g)	19,48	22,77	26,33	-

Tabel description: T1 (Treatment 1), T2 (Treatment 2), T3 (Treatment 3)

The increase in energy value increases as the proportion of sorghum flour used compared to chicken meat and green spinach increases. The increase in energy is more influenced by the ingredients used to make it, namely mainly carbohydrate sources in the form of sorghum flour, milk, wheat flour, and bread flour. Based on the Technical Instructions for Providing Additional Food (PMT) for Local Food for Toddlers and Pregnant Women based in the Ministry of Health of the Republic of Indonesia (2023), especially for toddlers aged 12 - 23 months, the energy value requirement for snacks per day is 275 kcal. Fulfilling energy needs for snacks per day can be met with the recommended consumption of 2 servings per meal (220 grams), where each serving weighs 110 grams or the equivalent of 3 pieces per serving.

Food sources with protein content used in this formulation are chicken meat, sorghum flour, green spinach, UHT milk, margarine, chicken eggs, wheat flour, and bread flour. The protein value is influenced by the different proportions of chicken meat in each treatment. The greater the proportion of chicken meat added, the higher the Bitterballen protein content will be. Animal foods are a good source of protein, in quantity and quality. Animal protein generally has higher nutritional value compared to vegetable protein (Norra, et al, 2021).

Sources of high-fat food ingredients in the Bitterballen formulation are chicken, milk, margarine, and cooking oil. Bitterballen products use the deep frying method, where large amounts of oil are used for frying and the product is submerged in hot oil. Products using the deep frying cooking method have certain desired sensory properties in terms of color, aroma, taste, and texture (crisp porous structure) due to various chemical reactions such as browning, gelatinization, denaturation, and others (Ozkoc, et. al, 2015).

A. Protein Quality Analysis

Protein quality assessment consisting of SAA, Digestibility Quality, NPU, and BV. Determining the essential amino acid profile can be done using chromatographic methods, including using High-Performance Liquid Chromatography (HPLC) or an Amino Acid Analyzer. Foods containing high-quality protein are assessed based on the completeness of their composition and the amount of essential amino acids compared to standard protein. One evaluation of protein quality is carried out by determining the essential amino acid (AAE) profile. A protein is said to have high nutritional value if it contains essential amino acids whose composition is complete and whose composition is in the body's needs and these amino acids can be used by the body (available or available) (BPOM RI, 2019).

Table 2. Results of Protein Quality Analysis for Each Treatment

Treatment	Amino Acid Score	Theoretical Digestibility Quality	Net Protein Utilization (NPU)	Biological Value (BV)
T1	100	97	97	100
T2	100	96,7	96,7	100
T3	100	96,3	96,3	100

Tabel description: T1 (Treatment 1), T2 (Treatment 2), T3 (Treatment 3)

The chemical score is expressed by the lowest amino acid score number. In calculating this formulation, the lowest amino acid score is lysine, so the lysine value is used to determine the amino acid score for each treatment 1, treatment 2, and treatment 3. With each amino acid score, namely T1 124.8, T2 124.6, and T3 124.5, where the calculation results are above 100. This shows that the limiting amino acid can meet the daily requirement for amino acids. This is in line with the theoretical digestibility quality value of the Bitterballen formulation which has a high number with T1 of 97, T2 of 96.7, and T3 of 96.3.

In this formulation, the main food ingredients used are animal protein with additional food ingredients which also contain vegetable protein. According to Norra, et. al (2021), animal protein generally has a higher quality (nutritional value) compared to vegetable protein. However, a mixture of several food sources of vegetable protein can produce an amino acid composition that is overall quite high quality. Therefore, to get good quality protein intake, it is important to consume a variety of foods at the same time. So that the composition of amino acids that enter the body can complement each other by combining protein from various sources in the right amounts to provide sufficient amino

acids with a higher portion of protein (Gorissen, et. al, 2018).

Organoleptic Quality Analysis

Sensory testing or testing with the senses also known as organoleptic testing has been around since humans began using their senses to assess the quality and safety of food and drinks. Human taste is very determined by the acceptance and value of a product. Goods that respond positively to the human senses, because they produce and satisfy consumer expectations are said to have high sensory quality. Organoleptic tests are very important to use in assessing the quality and safety of food and beverage products. Human senses are instruments used in organoleptic tests, which include sight, smell, taste, touch, and hearing (Ismanto, 2023). The results of the organoleptic test analysis of the Bitterballen formula for chicken meat, sorghum flour, and green spinach are presented in Figure 1.

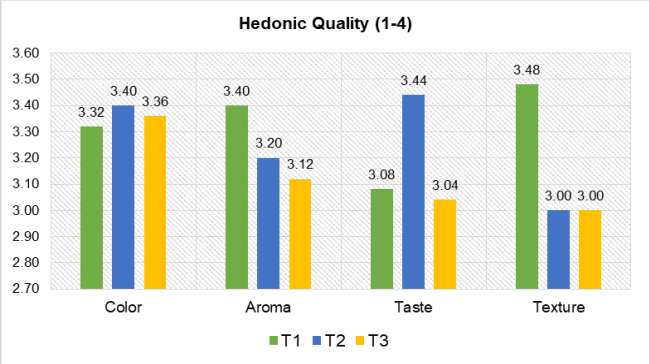

Figure 1. Hedonic Mean Result

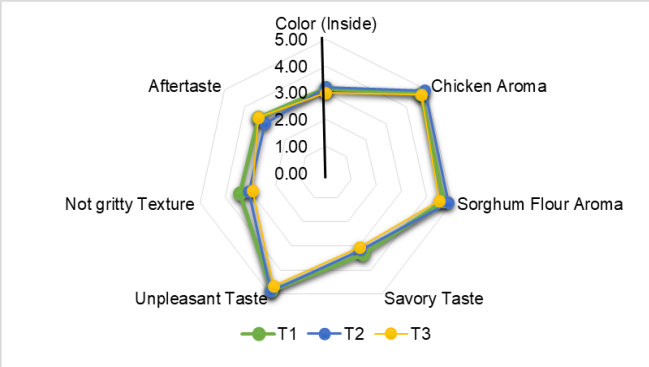

Figure 2. Descriptive Radar

Figure description: T1 (Treatment 1), T2 (Treatment 2), T3 (Treatment 3)

A. Color

Color is the first impression received by panelists before recognizing other factors. Color is very important for all types of food because it can affect the panelist's level of acceptance. Attractive colors can cause a feeling of liking first before consumers consume a food product (Ningsih and Noerhartati, 2019). Based on the results of the acceptability test on the Bitterballen formula for chicken meat, sorghum flour and green spinach on the color aspect, it was found that the highest score was in treatment T1 (75:15:10) at 3.40 (like), then in treatments T2 and T3 it was still included in the likes category with a score of T2 (65:25:10) of 3.20 and T3 (55:35:10) of 3.12. The color parameters state that TI, T2, and T3 produce a light brown color. This is influenced by the color produced as a result of the different proportions of sorghum flour in each Bitterballen product treatment. This is in line with research by Ningsih and Noerhartati (2019) where the addition of sorghum flour concentration affects color parameters. Sorghum flour will produce a product with a slightly brownish color. This is because sorghum flour contains tannin compounds which cause the product to be dark or brownish (Suarni, 2002 in Muna, et al, 2023).

B. Aroma

Aroma parameters are one of the important indicators for consumers to choose food products. Food aroma is also an important indicator in determining the quality of food ingredients. Where consumers generally prefer food ingredients that have a distinctive aroma and do not deviate from the normal aroma (Ningsih and Noerhartati, 2019). Based on the hedonic scale organoleptic test on the aroma of the Bitterballen product, it was found that the panelists' liking level for the Bitterballen aroma was the highest score in treatment T2 (65:25:10) at 3.40 (like), then in treatments T1 and T3 it was still included in the like category. with a score of T1 (75:15:10) of 3.12 and T3 (55:35:10) of 3.20. The aroma of Bitterballen products is influenced by other aromas such as the aroma of chicken, the aroma of sorghum flour, and the aroma of spices. The aroma produced from Bitterballen products is produced from nutmeg due to the main chemical components that cause the characteristic smell of nutmeg, namely myristicin, elemicin, and safrole. Myristicin smells like spices, the aroma is sharp and evaporates easily (Hasmita, 2021).

C. Taste

The taste of a product is a parameter that cannot be ruled out. Taste is the tongue's response to stimulation provided by a food ingredient, which is an important factor and can influence consumer evaluation of a food product. Based on the hedonic scale organoleptic test on the taste of the Bitterballen product, it was found that the panelists' liking level for the Bitterballen taste was the highest score in treatment T2 (65:25:10) at 3.44 (like), then in treatments T1 and T3 it was still included in the like category. with a score of T1 (75:15:10) of 3.08 and T3 (55:35:10) of 3.04. The taste of the Bitterballen product shows a savory taste that is dominated by the taste of chicken and milk which are used as complementary ingredients. The savory taste is obtained from a mixture of chicken meat, sorghum flour, and other complementary ingredients. The spice in the form of garlic also influences providing a savory taste because garlic

contains 33 sulfur components, 17 amino acids, and many minerals, vitamins, and lipids (Moulia, 2018)

D. Texture

The texture and consistency of a food ingredient will affect the taste of that ingredient. From previous research, it was found that changes in the texture or viscosity of the material can change the taste and odor that arises because it can affect the speed of stimulation of olfactory receptor cells and salivary glands (Putri, 2021). Based on the hedonic scale organoleptic test on the texture of the Bitterballen product, the panelists' liking level for the Bitterballen texture was obtained, namely the highest score was in treatment T1 (75:15:10) at 3.48 (like), then in treatments T2 and T3 it was still included in the like category. with a score of T2 (65:25:10) of 3.00 and T3 (55:35:10) of 3.00. The texture of the Bitterballen product shows a soft and sandy texture. This can be caused by the proportion of raw materials where in T2 and T3 the use of more sorghum flour compared to T1, which can cause an increasingly gritty texture. The sandy texture is caused by the increasing proportion of sorghum flour in treatment 3. Sorghum has a weakness, namely the characteristic texture of sorghum which is slightly rough, dry, gritty, and crumbs that harden quickly (Yusra and Putri, 2022).

The Kruskall Wallis statistical test for the texture aspect shows that the value of $p=0.048$ ($p<0.05$) means there is a significant difference in the texture aspect of the Bitterballen formulation for chicken meat, sorghum flour, and green spinach. The statistical test was then continued with the Mann-Whitney test to find out which treatments there were differences. Based on statistical test data, it shows that there is a real difference between formula T1 and formula T2 and formula T1 and formula T3 with a value of $p=0.032$ ($p<0.05$). The texture of the Bitterballen product is influenced by the proportion of sorghum flour, whereas in formula T1 (75:5:10) the proportion of sorghum flour is less, so the resulting texture is softer and slightly sandy. This is in line with the research of Ningsih and Noerhartanti (2019), the higher the concentration of sorghum flour and the addition of yeast concentration, the grittier and denser the texture of sorghum pukis because the sorghum flour is gluten-free, so it can influence the panelists' assessment in the texture organoleptic test.

Best Level of Treatment

The best level of treatment is carried out using a questionnaire using a 1-8 Likert scale as an assessment of the importance index. The value used to determine the best treatment level is the highest number of yield values (Nh). The yield value (Nh) above shows that the highest value was at treatment level 1 (T1) with a proportion of chicken meat, sorghum flour, and green spinach of 75:15:10. In treatment 1, the energy value was 287.86 kcal with a nutritional value of 12.71 grams of protein, 17.93 grams of fat and 19.48 grams of carbohydrates. Treatment 1 also had the highest acceptability, followed by treatment 2 and treatment 3 with the lowest acceptability. The color produced from T1 is light brown. The aroma produced by T1 is spiced, not fishy, and not rancid. The taste produced from T1 is savory and flavorful and not unpleasant. The inner texture produced by T1 is not gritty and the outer part is crispy. The aftertaste is savory and slightly gritty.

CONCLUSIONS

The Bitterballen formulation of chicken meat, sorghum flour, and green spinach showed no significant differences in color, aroma, and taste. However, it shows a real difference in texture. Bitterballen provides differences in energy value and quality of macronutrients in each treatment. The best treatment was obtained based on the results of organoleptic tests, descriptive analysis, energy value, and nutritional quality with the best results obtained in treatment 3 with a proportion of chicken meat, sorghum flour, and green spinach of 75:15:10.

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REFERENCES

I. WHO. 2020. World Health Organization (WHO), www.who.int.
II. Kementerian Kesehatan RI. 2020. Peraturan Menteri Kesehatan No. 2 tahun 2020 tentang Standar Antropometri Anak. Kementerian Kesehatan Republik Indonesia.
III. Diana R. Y., Hadisuyitno, J,, Riyadi, B. D. 2019. Pengaruh Pendampingan Gizi Terhadap Tingkat Konsumsi Energi, Protein Pada Balita Stunting (6-59) Bulan di Desa Kuwolu Kec. Bululawang Kab. Malang. Jurnal Vidya, Vol. 27, No. 2.
IV. Solikhah, A., dan Dewi, R. 2022. Peranan Protein Hewani dalam Mencegah Stunting pada Anak Balita. Jurnal Riset Sains dan Teknologi, Volume 6, No. 1, Maret 2022, 95 – 100.
V. Van Den Berg, J. 2019. Bitterballen, Biking, and Buildings: Negotiating Dutch Identities in Travel Vlogs about Netherlands. Radboud University: Master Thesis Tourism and Culture.

VI. Kementerian Kesehatan RI. 2023. Petunjuk Teknis: Pemberian Makanan Tambahan (PMT) Berbahan Pangan Lokal untuk Balita dan Ibu Hamil. Jakarta: Kementerian Kesehatan Republik Indonesia.

VII. Norra, B.I., Hendrika, T.P., Rohmah, A.A., dan Nabinya, I. 2021. Identifikasi Pemahaman Umum Ayam (Gallus gallus) dan Ikan Mujair (Oreochromis mossambicus) Pada Mahasiswa UIN Walisongo Semarang. Program Studi Pendidian Biologi, Bio-Lectera: Jurnal Pendidikan Biologi, Vol. 8, No. 1, April 2021.

VIII. Ozkoc, S. O., Sumnu, G., and Sahin, S. 2015. Emerging Technologies for Food Processing (Second Edition): Chapter 20 (Recent Developments in Microwave Heating. Academic Press, Pages 361-383.

IX. BPOM RI. 2019. Pedoman Evaluasi Mutu Gizi dan Non Gizi Pangan. Badan Pengawas Obat dan Makanan.

X. Gorissen SHM, et, al. 2018. Protein Content and Amino Acid Composition of Commercially Available Plant-Based Protein Isolates. Springer Nature, 50:1685-1695.

XI. Ningsih, P. W. dan Noerhartati, E. 2019. Analisis Organoleptik Produk Pukis Sorgum: Kajian dari Konsentrasi Tepung Sorgum (Sorghum, SP) dan Ragi. Seminar Nasional Cendekiawan ke 5, Buku 1: "Teknologi dan Sains", Universitas Wijaya Kusuma Surabaya.

XII. Ismanto, H. 2022. Uji Organoleptik Keripik Udang (L. vannamei) Hasil Penggorengan Vakum. AgroSainTa: Widyaiswara Mandiri Membangun Bangsa, Vol. 6 (2): 53-58.

XIII. Muna, S., Noviasari, S., dan Muzaifa, M. 2023. Pangan Lokal Sebagai Bahan Baku Produk Bakteri Non-Gluten: Ulasan Jenis dan Karakteristik Produk yang Dihasilkan. Jurnal Ilmiah Mahasiswa Pertanian, Volume 8, Nomor 3, Universitas Syiah Kuala, Banda Aceh.

XIV. Hasmita, I. 2021. Peningkatan Kualitas Minyak Pasa Dengan Menggunakan Evaporator Vaccumm Rotary. Jurnal Pendidikan dan Pengabdian VokasiVol. 2, No. 2 (JP2V).

XV. Moulia, M. N., Syarief, R., Iriani, E. S., Kusumaningrum, H. D., and Suyatma, N. E. 2018. "Antimicrobial of Garlic Extract," J. Pangan, vol. 27, no. 1, pp. 55–66.

XVI. Putri, A.S. 2021. Formulasi Ubi Jalar, Tahu, dan Teri Kering Sebagai Pemberian Makanan Tambahan (PMT) Balita Usia 1 – 3 Tahun dengan Status Berat Badan Kurang, Pendek/Sangat Pendek. Poltekkes Kemenkes Malang.

XVII. Yusra, S., dan Putri, E. 2022. Karakteristik Fisikokimia Tepung Sorgum (Sorghum bicolor L.) Varietas Lokal Merah dengan Fermentasi Spontan. Jurnal Agroteknologi Vol. 16 No. 02.