Amerta Nutrition
e-ISSN: 2580-1163 (Online)
p-ISSN: 2580-9776 (Print)
Devi et al. | Amerta Nutrition Vol. 9 Issue 1 (March 2025). 76-86

RESEARCH STUDY
English Version
OPEN ACCESS

The Potential of *Blondo*-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance

Potensi Snack Bar *Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet*

Shalma Devi[1], Malin Nur Aeni[1], Thifal Hazimah Al Insyirah[1], Haikal Rizky Azmi[1], Antonius Gunawan[1], Nanang Nasrullah[1]*

[1]Nutrition Study Program, Undergraduate Program, Faculty of Health Sciences, "Veteran" National Development University of Jakarta, Jakarta, Indonesia

ARTICLE INFO

Received: *12-09-2024*
Accepted: *03-01-2025*
Published online: *14-03-2025*

Correspondent:
Nanang Nasrullah
nasrullah@upnvj.ac.id

DOI:
10.20473/amnt.v9i1.2025.76-86

Available online at:
https://e-journal.unair.ac.id/AMNT

Keywords:
Blondo, Sea Grapes, Athletes, Sports Food

ABSTRACT

Background: Sports injuries represented an unavoidable morbidity condition among athletes. Data from the 2016 Summer Olympics in Rio de Janeiro demonstrated that 1,101 out of 11,274 athletes (9.8%) experienced injuries, with 19% sustaining two or more types of injuries. In world championships, 81 injury cases per 1,000 athletes were recorded. Muscle injuries dominated 30-40% of cases in soccer players and more than 59% in weightlifters. *Blondo*, a coconut oil industry by-product, contained 16.9 g protein, 23.9 g fat, 31.8 g carbohydrates, and 341 kcal energy per 100 g. Sea grapes (Caulerpa Lentillifera) contained chlorophyll a and b, which functioned as antioxidants to protect body cells from post-exercise free radicals.
Objectives: This study aimed to analyze the chemical and sensory characteristics of *blondo* and sea grape-based snack bars.
Methods: The research employed a Completely Randomized Design with three formulas (F1: 50%, F2: 75%, F3: 100% *blondo*). Analysis included proximate testing, fiber content, antioxidant activity, and organoleptic testing.
Results: ANOVA analysis revealed that *blondo* addition did not significantly affect the measured variables (p-value>0.05). However, moisture, ash, protein, fat, and fiber content increased, while carbohydrate content decreased, potentially benefiting athletes. Additionally, decreased IC50 values indicated increased antioxidant activity with *blondo* addition.
Conclusions: *Blondo* and sea grapes demonstrated potential as sports food ingredients, with F3 being the most preferred formula, containing 518.5 kcal, 14.11 g protein, 27.17 g fat, and 54.27 g carbohydrates.

INTRODUCTION

Sports injuries are a common and often inevitable condition experienced by athletes throughout their careers. This issue is not confined to professional or semi-professional athletes but is also common among amateurs, recreational participants, and beginners. At the 2016 Summer Olympics in Rio de Janeiro, 1,101 out of 11,274 athletes (9.8%) experienced injuries, with approximately 19% suffering from two or more types[1]. Similarly, data from world championships showed injuries rate of 81 cases per 1,000 athletes, equivalent to one in 12 participants. Muscle injuries are the most prevalent, constituting 30-40% of cases in soccer players and over 59% in weightlifters[2]. Muscle cramps, a frequent type of injury, result from factors such as dehydration, electrolyte imbalances (particularly sodium), insufficient carbohydrate intake, muscle stiffness, and inadequate physical preparation[3]. These issues often lead to reduced training duration and a decline in athletes performance, ultimately lowering performance index.

Although injuries are common, preventive measures are essential to minimize their occurrence and impact. A key aspect of prevention involves ensuring athletes meet their nutritional requirements. Athletes require significantly higher levels of nutrients due to their elevated physical activity levels[4]. Among the nutrients, protein plays a critical role in muscle regeneration, and during high-intensity training, muscle cells often sustain microdamage[5]. After rest and adequate nutrition, these cells are replaced by new ones, with protein serving as a key substrate in such a process.

To meet these heightened protein demands, providing snacks between training sessions is crucial. Functional foods offer a promising solution, as they are specifically designed to provide health benefits beyond basic nutrition[6]. The foods can support muscle recovery and sustain energy levels, addressing the specific needs of athletes. However, in Indonesia, high-protein functional snacks that meet sustainability standards

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

remain scarce, limiting athletes' options for suitable alternatives.

Proper nutrient selection improves athletes performance, reduces injury risks, facilitates recovery, and supports the adaptation process. Strategic choices regarding nutrient types and timing are essential for optimizing fuel resynthesis, minimizing muscle damage, and enhancing physical fitness. These factors enable athletes to achieve their performance goals and compete at championship levels[7]. *Blondo*, a by-product of the coconut oil industry, represents a potential protein source for athletes. In addition, antioxidants play a significant role in boosting performance by combating oxidative stress caused by intense physical activity. Sea grapes (*Caulerpa lentillifera*), known for their antioxidant properties, can fulfill this need effectively. Together, *blondo* and sea grapes present a sustainable and functional strategy to meet the nutritional requirements of athletes.

Blondo, a by-product of the coconut oil extraction process from coconut milk through heating, possesses excellent nutritional content, particularly its high protein levels[8]. The by-product not only provides nutrient-rich food but also contributes to waste reduction and promotes sustainability in the coconut industry. As a protein-rich ingredient, *blondo* effectively meets athletes' protein requirements. Each 100 g of *blondo* contains 16.9 g of protein, 23.9 g of fat, and 31.8 g of carbohydrates, delivering 341 kcal of energyi[9]. This nutrient profile makes it a promising raw material for developing sustainable sports food tailored to athletes' needs.

In addition to *blondo*, sea grapes represent another local resource with untapped potential. Known as green algae, sea grapes are widely recognized among coastal communities[10]. They contain chlorophylls a and b, with potent antioxidant properties that protect body cells from free radicals generated during physical activity. Free radicals negatively affect muscle performance by increasing fatigue susceptibility[11]. The chlorophyll in sea grapes helps alleviate inflammation and repair muscle cell damage, positioning these algae as a valuable ingredient for sports food production.

Recent research shows the potential of combining *blondo* and sea grapes as sustainable protein and antioxidant sources. The high protein content of *blondo* and the antioxidant properties of sea grapes not only enhance athletes health and performance but also contribute to environmentally sustainable food production. This synergy shows the importance of experimental research to evaluate the chemical and sensory characteristics of snack bars made from *blondo* with sea grapes flour substitutions. The analysis is crucial for assessing their potential as functional sports foods to support athletes performance and recovery.

METHODS

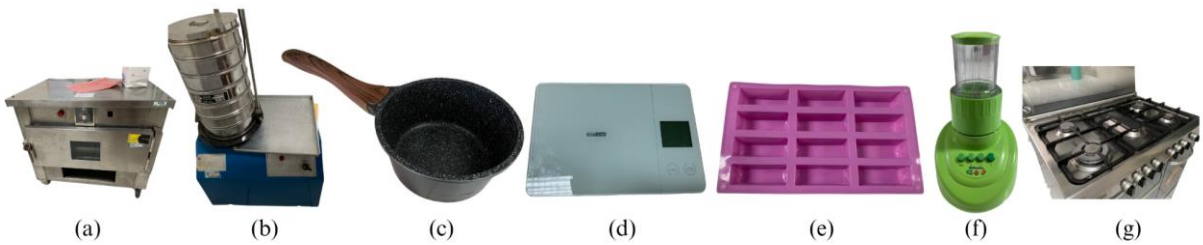
This research focused on developing snack bars using *blondo* and sea grapes flour, followed by an analysis of their chemical and sensory characteristics. The chemical properties were evaluated using Analysis of Variance (ANOVA), while sensory data were assessed through the Kruskal-Wallis test. Ethical approval was granted by the Ethics Committee of the Veteran National Development University, Jakarta, on December 6, 2024 (Approval Number: 521/XII/2024/KEP).

Research Design, Time, and Place

The research adopted an experimental design using a Completely Randomized Design (CRD) with a single-factor method, applying three treatment levels. Each treatment was repeated twice to enhance data consistency and reliability by minimizing external variability. Organoleptic testing was conducted at the Nutrition Laboratory of Campus B, Veteran National Development University, Jakarta. Proximate and antioxidant analysis were performed at the Testing, Calibration, and Certification Services Laboratory (LJPKS) at IPB University.

This analysis utilized three formulations of *blondo* in the snack bar preparation, including F1 (12.5 g), F2 (18.7 g), and F3 (25 g). Each formulation also included 0.2 g of sea grapes flour. The sensory evaluation involved 30 untrained panelists, who assessed color, texture, aroma, and taste using a five-point hedonic scale ranging from very dislike to very like. Proximate analysis and antioxidant activity testing were conducted for all three formulations with two repetitions.

Tools



(a) Oven Blower (b) Sieve (c) Pan (d) Scale (e) Silicone Mold (F) Blender (g) Stove

Figure 1. Snack Bar Production Tools

This research used various tools, including a frying pan and stove, for the *blondo*-making process. Other tools like scale, oven, blender, and sieve were also utilized to make sea grapes flour. However, snack bars were made using a pan, stove, blender, scale, silicone molds, and refrigerator.

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

Materials

(a) Crispy Rice and Corn Chips (b) Sea Grapes Flour (c) Granulated Sugar (d) *Blondo* (e) Wheat Flour (F) Dark Chocolate
Figure 2. Ingredients for Snack Bars

The primary materials included coconut milk from mature coconuts for *blondo* and sea grapes for sea grapes flour. Other ingredients for snack bar preparation comprised wheat flour, crispy rice, corn chips, sugar, and dark chocolate.

Research Stages

***Blondo* Production**

Mature coconuts with centos or trombones, which indicated the early stages of coconut shoot formation, were selected for this process. The coconuts were grated and squeezed to extract coconut milk, which was then heated in a pan over low heat for two hours to produce *blondo*.

Sea Grape Flour Production

Sea grapes were thoroughly cleaned under running water and arranged evenly on a baking sheet. They were dried in a blower oven at 80°C for five hours before being ground into a fine powder and sieved to obtain uniform flour consistency.

Snack Bar Production

The production process began with preparing ingredients for three formulas based on the formulations outlined in Table 1. Dark chocolate was melted using the double boiler method. Roasted wheat flour was then mixed into the melted chocolate, followed by the addition of *blondo* to create a uniform dough.

Separately, sugar was melted to the stage of caramelization, after which crispy rice and corn chips were added and mixed until evenly coated. This mixture was then combined with the prepared dough, which was poured into silicone molds and stored in the refrigerator.

(a) *Blondo* Production (b) Sea Grape Flour Production (c) Dark Chocolate Melting Process
(d) Crispy Rice and Corn Chips into Caramel Mixing Process (e) Whole Dough Mixing Process
Figure 3. Snack Bar Production Process

Table 1. Formulation of Raw Materials for *Blondo*-based Snack Bar Products and Sea Grapes Flour Substitution

Ingredient Name	Treatment		
	F1	F2	F3
Blondo (g)	12.5	18.75	25
Wheat Flour (g)	12.5	6.25	0
Sea Grape Flour (g)	0.2	0.2	0.2
Crispy Rice (g)	2	2	2
Corn Chips (g)	3	3	3
Dark Chocolate (g)	10	10	10
Sugar (g)	4	4	4

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

g=gram, F1=Snack Bar Formulation with 50% *Blondo* and 50% Wheat Flour, F2=Snack Bar Formulation with 75% *Blondo* and 25% Wheat Flour, F3=Snack Bar Formulation with 100% *Blondo* and 0% Wheat Flour

(a) F1=Snack Bar Formulation with 50% *Blondo* and 50% Wheat Flour (b) F2=Snack Bar Formulation with 75% *Blondo* and 25% Wheat Flour (c) F3=Snack Bar Formulation with 100% *Blondo* and 0% Wheat Flour

Figure 4. Final Result of Snack Bar

Chemical Characteristics Analysis

Chemical characteristics were analyzed through proximate testing and antioxidant activity evaluation. The proximate analysis measured the levels of water, ash, protein, fat, carbohydrates, and fiber content in the samples. Antioxidant activity was assessed using the IC50 method to determine the potential of the snack bars in combating oxidative stress.

Sensory Characteristics Analysis

Sensory analysis was conducted using the hedonic test method. A total of 30 untrained panelists, aged 17-25 years, from the Nutrition Study Program at the Faculty of Health Sciences, Veteran National Development University of Jakarta, participated in the evaluation. The organoleptic test followed the 2006 standards of the National Standardization Agency (BSN). Inclusion criteria required panelists to be available and capable of conducting and evaluating the sensory tests effectively[12]. Exclusion criteria included individuals who were sick, had sensory impairments affecting taste or smell, or suffered from health conditions impacting their ability to participate. The panelists evaluated sensory parameters such as color, texture, taste, and aroma using a five-point preference scale ranging from very dislike to very like.

Data Processing and Analysis

The data obtained was processed and analyzed using Microsoft Excel and SPSS version 16. The result of the chemical and sensory characteristics tests was carried out using descriptive and inferential methods. Descriptive analysis was applied to evaluate the data characteristics. Numerical data, mean values, and standard deviations were calculated when the data was normally distributed. Additionally, the median along with minimum and maximum values, were used when the distribution was not normal. For categorical data, the percentage was calculated for each existing category. Inferential analysis was applied to obtain conclusions regarding the characteristics of the population based on the data that had been collected. For the chemical characteristics test, ANOVA was used to compare the averages between more than two treatment groups. In its implementation, the data analyzed must meet the assumptions of normality and homogeneity of variance. When the ANOVA test results showed a p-value<0.05, this indicated a significant difference between the group averages. Further analysis was carried out to determine different groups using Duncan's Multiple Range Test (DMRT). Meanwhile, the Kruskal-Wallis test was used for the sensory characteristics test. The test was adopted when the data did not meet the normality assumption and was ordinal or non-parametric. This test was used to compare median values between more than two groups. When the p-value<0.05, there would be a significant difference between the groups. The Mann-Whitney test was performed as a further analysis to determine the specific differences between categories.

RESULTS AND DISCUSSIONS

Chemical Characteristics

The nutritional content of snack bars was measured by analyzing chemical characteristics, including proximate analysis, fiber content, and antioxidant activity. Proximate testing included water, ash, protein, fat, and carbohydrate content analysis. The research was conducted on F1, F2, and F3 snack bar formulas.

Table 2. Chemical Characteristics of *Blondo*-Based Snack Bar Products and Sea Grape Flour Substitution Based on Proximate Test Results and Antioxidant Activity Analysis

Parameter	Formula			p-value
	F1	F2	F3	
Water Content (%)	1.33±0.579a	1.06±0.353a	2.03±0.898a	0.414
Ash Content (%)	1.89±0.728a	1.94±0.6501a	2.40±0.516a	0.543
Protein Content (%)	10.32±0.212a	11.15±0.947a	14.11±1.979a	0.050
Fat Content (%)	20.08±8.442a	22.23±5.310a	27.17±5.225a	0.456

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

Parameter	Formula			p-value
	F1	F2	F3	
Carbohydrate Content (%)	66.37±9.963a	64.26±9.043a	54.27±8.619a	0.293
Dietary Fiber (%)	2.40±0.318a	2.38±0.106a	2.48±0.007a	0.577
Antioxidant Activity	135567.08±5839.344a	125259.49±16922.104a	107715.72±1705.647a	0.156

a, b, c=Similar Letter Notation Means No Significant Difference in Groups (p-value>0.05), F1=Snack Bar Formulation with 50% *Blondo* and 50% Wheat Flour, F2=Snack Bar Formulation with 75% *Blondo* and 25% Wheat Flour, F3=Snack Bar Formulation with 100% *Blondo* and 0% Wheat Flour

Water Content

The analysis of water content was crucial as it directly impacted the storage stability and quality of food products[13]. A lower water content generally extended shelf life, while higher water content accelerated spoilage[14]. In this research, the water content of the snack bars was measured as 1.33% for F1, 1.06% for F2, and 2.03% for F3. These results showed a decrease in water content from F1 to F2, followed by an increase in F3. However, the ANOVA results indicated that the addition of *blondo* had no statistically significant effect on the water content of the snack bars (p-value>0.05).

Interestingly, these results differed from previous research, which reported a consistent decrease in water content in *blondo*-based snack bars[15]. Factors such as processing temperatures and methods significantly influence water content reduction. Specifically, *blondo* contained a relatively high water content of 25.05%[16], signifying the importance of optimized processing methods and formulations to achieve the desired water content in the final product.

Ash Content

Ash content, which showed the mineral composition of food, was an important parameter for assessing nutritional value[17,18]. The analysis indicated an increase in ash content across the formulations, with F1 at 1.89%, F2 at 1.94%, and F3 at 2.40%. Despite this upward trend, ANOVA results showed no statistically significant effect of *blondo* addition on the ash content (p-value>0.05).

The increasing ash content correlated with the higher proportion of *blondo* in the formulations[19]. Minerals, such as potassium, sodium, and magnesium, present in the ingredients, played a key role in maintaining muscle health and preventing fatigue by aiding muscle contraction and relaxation[20].

The relatively high ash content in *blondo*-based snack bars was influenced by the inherent ash content of *blondo*, which was 0.65%[21]. In contrast, wheat flour used in the formulations had a lower ash content of approximately 0.44%[22]. The higher mineral content in *blondo* contributed to the elevated ash content in the final product, enhancing its nutritional value.

Protein Content

Protein was an important component present in all body cells, playing an essential role in various biological functions and the development of cellular structures[23]. Protein analysis methods typically measured nitrogen content, peptide bonds, aromatic amino acids, dye-binding capacity, ultraviolet absorption, and light scattering properties[24].

In this research, the protein content of the snack bar formulations showed an upward trend, with F1, F2, and F3 containing 10.32%, 11.15%, and 14.11% protein, respectively. The results indicate that the addition of *blondo* increased the protein content in snack bars. However, ANOVA analysis showed that this increase was not statistically significant (p-value>0.05). The correlation between the proportion of *blondo* and protein content indicated its contribution to enhancing nutritional value.

Blondo was rich in essential amino acids such as valine, isoleucine, and leucine, which were branched-chain amino acids (BCAAs)[25]. BCAAs were particularly significant for promoting muscle mass and strength, key factors in athletes performance[26]. Therefore, the high protein content in *blondo*-based snack bars could potentially support muscle development and improve physical performance.

Fat Content

Fat, a hydrophobic or amphipathic organic compound, belonged to the lipid group and served numerous biological functions. Measuring fat content helped determine the quality of fatty acids and their implications for health. The fat content in the snack bars increased with the addition of *blondo*, measuring 20.08%, 22.23%, and 27.17% for F1, F2, and F3, respectively. Despite this increase, ANOVA analysis showed no statistically significant effect of *blondo* addition on fat content (p-value>0.05). However, the higher fat content in the formulations could be attributed to the high-fat content of *blondo*, approximately 24.9%[27]. The results were in line with previous investigations, which also noted elevated fat levels in biscuits containing higher proportions of *blondo*[28].

Carbohydrate Content

Carbohydrates were essential nutrients that serve as a primary source of energy for the human body[29]. They played a significant role in influencing the sensory attributes of food, such as taste, color, texture, and others[30]. The inclusion of carbohydrates in snack bars aimed to optimize carbohydrate intake, which have been shown to help maintain athletes performance by preventing muscle fatigue[31]. In this research, the carbohydrate content in F1, F2, and F3 was found to be

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

66.37%, 64.26%, and 54.27%, respectively, indicating a decrease in carbohydrate content across the formulations. However, ANOVA analysis showed that *blondo* addition did not significantly affect carbohydrate levels (p-value>0.05). This suggested that the inclusion of *blondo* reduced the carbohydrate content in snack bars.

Carbohydrate content was closely related to other nutritional components, including water, ash, fat, and protein[32]. This research suggested that as the amount of *blondo* increased, the carbohydrate content decreased. While *blondo* impacted the total nutritional profile of the snack bars, it reduced carbohydrate content, potentially increasing other components like protein and fat.

Dietary Fiber

Dietary fiber remained in the large intestine or colon after digestion and existed in both soluble and insoluble forms in water. It offered several health benefits, including aiding in weight management, lowering cholesterol, and promoting gut health by fostering the growth of beneficial bacteria[34]. Furthermore, dietary fiber enhanced nutrient absorption and helped cleanse the intestines[35]. A deficiency in dietary fiber might lead to alterations in gut microbiota, contributing to increased inflammation and negatively affecting athletes performance[36]. In this research, the dietary fiber content of F1, F2, and F3 was 2.40%, 2.38%, and 2.48%, respectively. The data showed a decrease in fiber content from F1 to F2 but an increase in F3. Despite such variations, ANOVA analysis showed that the addition of *blondo* did not significantly affect fiber content (p-value>0.05). Previous investigations indicated the fiber content of 100 g of *blondo* was approximately 9.1 g, suggesting that *blondo* might have potential as a source of dietary fiber[37].

Antioxidant Activity

Antioxidants were compounds that prevent the oxidation of cell components, such as fatty acids and DNA, caused by free radicals. Therefore, they played a critical role in preventing various diseases[38]. Oxidation was a major cause of chemical damage in food, including rancidity, reduced nutritional value, sensory changes, and potential food safety risks[39]. Antioxidants also act as anti-inflammatory agents, reducing inflammation, promoting healing, and preventing long-term injury[40].

In this research, the antioxidant activity of snack bar products in F1, F2, and F3 was measured at 135,567.08 ppm, 125,259.49 ppm, and 107,715.72 ppm, respectively. The ANOVA analysis showed that the addition of *blondo* did not significantly affect antioxidant activity (p-value>0.05). As a result, the proportion of *blondo* did not result in significant differences in antioxidant activity. The data indicated a decrease in antioxidant activity from F1 to F3, suggesting that higher *blondo* proportions lead to a reduction in antioxidant strength.

Blondo was a byproduct of the coconut oil production process, where coconut milk was heated to produce the oil[41]. Coconut oil was rich in antioxidants, particularly α-tocopherol and polyphenols. However, the heating process could reduce the content of the antioxidants by approximately 25%[42]. This decrease in antioxidant activity as the *blondo* proportion increased might be due to the reduction in antioxidant levels during the production process.

Sensory Characteristics

The sensory characteristics of the snack bar products, including color, texture, taste, and aroma, were evaluated in this research. A significant difference was found in the color parameter between the three formulas, based on the Kruskal-Wallis test results (p-value<0.05). However, no significant differences were observed in the other sensory parameters (p-value>0.05).

Table 3. Hedonic Test Results of *Blondo*-Based Snack Bars and Sea Grape Flour Substitution

Parameter	Median Value of Hedonic Test on *Blondo* Snack Bars			p-value
	F1	F2	F3	
Color	4 (2-5)[a]	3.5 (2-5)[a]	4 (3-5)[a]	0.571
Texture	4 (3-5)[a]	4 (3-5)[a]	4 (3-5)[a]	0.963
Taste	4 (2-5)[a]	3 (1-5)[b]	2 (1-5)[b]	0.001
Aroma	4 (2-5)[a]	3 (2-5)[a]	3.5 (1-5)[a]	0.436

1=Very Dislike, 2=Dislike, 3=Neutral, 4=Like, 5=Very Like, Median (Minimum-Maximum), a, b, c=Similar Letter Notation Means No Significant Difference in Groups (p-value>0.05)

Color

Based on Table 3, the three formulations have nearly identical median values, including 4 ("like") for F1 and F3, and 3.5 ("like") for F2. The maximum value for all three formulations was 5 ("very like"). Specifically, F3 had a higher minimum value and a smaller data spread compared to F1 and F2, indicating more consistent acceptance among panelists. These results suggested that F3 generally achieved higher acceptance than the other formulations.

The Kruskal-Wallis test results indicated that the addition of *blondo* and sea grapes flour did not significantly influence the color of the snack bars (p-value>0.05). Consequently, a Mann-Whitney follow-up

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

test was considered unnecessary. This uniformity in color was attributed to the similar brown color across all three formulations, primarily derived from the dark chocolate used as a key ingredient. Additionally, the golden-brownish tone of *blondo* contributed to this consistent appearance.

The lack of significant differences in the Kruskal-Wallis test results suggested that variations in the composition of *blondo* and sea grapes flour did not significantly affect the visual appeal of the snack bars. This could be explained by the dominance of dark chocolate's brown color, which provided a visually appealing and consistent aesthetic. As a result, changes in other ingredients did not substantially alter consumer perception.

Texture

According to Table 3, all three formulations shared the same median value of 4 ("like"), indicating that panelists predominantly rated the texture as favorable. Furthermore, the minimum and maximum values for texture were identical across the formulations, suggesting that panelists perceived the texture of all three formulations as similar.

The Kruskal-Wallis test showed that the addition of *blondo* and sea grapes flour did not significantly impact the texture of the snack bars (p-value>0.05), making a Mann-Whitney follow-up test unnecessary. This consistency was likely due to minimal textural changes between the formulations, which were not detectable by the panelists.

Texture referred to the pressure sensation perceived through the sense of touch, whether orally or manually. Additionally, it covered attributes such as thickness, smoothness, and softness[43]. Cocoa butter, a primary component of dark chocolate, remained solid at room temperature but melted at body temperature[44]. These properties contributed to the soft and uniform texture of dark chocolate products.

Taste

Based on Table 3, the median taste value for F1 was the highest at 4 ("like"), compared to 3 ("neutral") for F2 and 2 ("dislike") for F3. Although all formulations shared the same maximum score of 5 ("very like"), F1 had a higher minimum value, indicating better total acceptance. This suggested that F1 achieved the most favorable taste perception due to its smaller value distribution and higher minimum rating.

The Kruskal-Wallis test showed that the addition of *blondo* and sea grapes flour significantly influenced the taste of the snack bars (p-value<0.05). Further analysis using the Mann-Whitney test indicated significant differences between F1 and both F2 and F3 (p-value<0.05). The differences in taste were attributed to the varying proportions of *blondo* in the formulations, which alter taste intensity. *Blondo* had a savory and slightly sweet flavor, but its high-fat content might contribute to a less desirable taste at higher proportions. These results were in line with previous investigations indicating that increasing *blondo* content enhanced a distinct taste profile, primarily due to its high amino acid content, such as glutamic acid, imparting a savory flavor[45].

Aroma

Table 3 showed that F1 had the highest median aroma value at 4 ("like"), followed by F3 at 3.5 ("like") and F2 at 3 ("neutral"). While all formulations shared the same maximum score of 5 ("very like"), F3 had the lowest minimum value, suggesting F1 was the most preferred in terms of aroma.

The Kruskal-Wallis test indicated that the addition of *blondo* and sea grapes flour did not significantly affect the aroma of the snack bars (p-value>0.05). Consequently, a Mann-Whitney follow-up test was unnecessary. The results contrasted with previous investigations on the hedonic aroma evaluation of red rice flour-based flakes, where *blondo* addition also did not show a significant effect (p-value>0.05)[21]. The aroma of *blondo* was derived from volatile non-methyl ketone compounds formed during the heating of coconut milk[46].

Selected Formulation of Snack Bar Products

Determination of Selected Formulation

This research identified the best formulation using the De Garmo method, prioritizing the highest productivity value. The results from all chemical and sensory analysis served as the basis for determining the optimal formulation. Each analysis parameter was weighted differently, reflecting the snack bars' intended purpose of enhancing athletes performance. Parameters such as protein content, carbohydrates, and antioxidant activity received the highest weights due to their critical roles in preventing athletes injuries and supporting recovery. Additionally, dietary fiber was given considerable weight for its importance in weight management and maintaining a healthy gut microbiota.

The De Garmo method analysis identified product F3 as the optimal formulation, achieving the highest total productivity value, followed by F1 and F2. Product F3 was composed entirely of *blondo* (100%) without wheat flour. This formulation showed superior performance across multiple parameters, including ash, fat, protein, dietary fiber, antioxidant content, and color, which indicated the highest productivity values compared to other formulations.

Determining Portion Size and Nutritional Value of Snack Bars

A serving size represented the recommended amount of a processed food product to be consumed in one meal. It was expressed in metric units or a combination of metric units and household measurements to provide clear and practical portion guidelines for consumers[47]. For snack bars to qualify as sports food, they must meet specific criteria. The criteria included snack bars must have a serving weight of 25-60 g (with one to two servings per package) and nutrient content of 40-50 g of carbohydrates, 2-6 g of fat, as well as 2-5 g of protein[31]. Based on these criteria, the serving size for the snack bars was set at 30 g, and the nutritional content was calculated accordingly, as presented in Table 4.

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

Table 4. Nutritional Value of *Blondo*-Based Snack Bars and Sea Grape Flour Substitution per Serving Size of 30 g

Nutrients	Nutritional Content/100 g	Nutritional Content/Serving Size	Nutritional Adequacy Rate	% Nutrients/Serving Size
Energy (kcal)	518.05	129.51	2150	6.02
Fat (g)	27.17	6.79	60	11.31
Protein (g)	14.11	3.52	67	5.25
Carbohydrate (g)	54.27	13.56	325	4.17

g=gram, kcal=kilocalorie

Table 4 showed the nutritional profile of the *blondo*-based snack bars formulated with sea grapes flour. Each serving (30 g) provided 129.51 kcal of energy, 6.79 g of fat, 3.52 g of protein, and 13.56 g of carbohydrates. However, the carbohydrate content did not meet the standard for sports food, which required 40-50 g of carbohydrates per serving.

This research introduced an innovative method by formulating snack bars using *blondo* and sea grapes as key ingredients, an area previously unexplored. This novel formulation leveraged local ingredients, contributing to food diversification in the functional food category to support athletes performance. By utilizing abundant yet underutilized resources, such as *blondo*, the research showed the potential for increasing the added value of such raw materials. Additionally, sea grapes, known for their rich bioactive compounds, enhanced the nutritional and health benefits of the product.

Despite its innovative nature, the research had several limitations. It remained exploratory, requiring further validation through larger-scale testing to assess the snack bars' effectiveness in improving athletes performance. Future investigations should also compare such a formulation to similar products on the market to determine their competitive advantages. Comprehensive validation was necessary to ensure the product's practical applicability and its ability to meet consumer expectations scientifically and commercially.

CONCLUSIONS

In conclusion, this research showed that *blondo*-based snack bars with sea grapes flour substitution have the potential as sports food to enhance athletes performance. The selected formulation, F3, demonstrated that while the protein and fat content met sports food standards, the carbohydrate content did not correlate with the required criteria. Organoleptic tests indicated significant differences in taste parameters (p-value < 0.05). Further investigations were recommended to refine the formulation to meet all sports food standards, particularly concerning carbohydrate content. Future research should also address the specific nutritional needs of different sports and involve athletes directly to validate the product's effectiveness.

ACKNOWLEDGEMENT

The authors would like to express their deepest gratitude to the Ministry of Education, Culture, Research, and Technology of Indonesia for funding this research. This financial support was important in conducting experiments, performing necessary analysis, and completing the research on the potential of *blondo*-based snack bars and sea grapes flour substitution to support athletes performance. The contribution of the Ministry of Education, Culture, Research, and Technology have been instrumental in advancing science in sports nutrition and developing sustainable food products using local ingredients.

CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The authors declared no conflict of interest related to this article. This research was funded by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, under the Work Implementation Agreement Letter (SPPK) Number 061/E2/PPK/SPPK/PKM/2024.

AUTHOR CONTRIBUTIONS

SD: the main contributor and coordinated the entire research process and manuscript preparation; MNA: contributed to data collection, analysis, and writing language arrangement; THAI: participated in data collection and analysis; HRA: only contributed to data analysis; AG: involved in writing language arrangement; NN: considered the supervisor and provided guidance and direction in the research and journal writing.

REFERENCES

1. Guermazi, A. *et al.* Sports Injuries at the Rio de Janeiro 2016 Summer Olympics:Use of Diagnostic Imaging Services. *Radiology* **287**, 922-932 (2018). Doi:https://doi.org/10.1148/radiol.2018171510
2. SantAnna, J. P. C., Pedrinelli, A., Hernandez, A. J. & Fernandes, T. L. Lesão Muscular:Fisiopatologia, Diagnóstico E Tratamento. *Rev. Bras. Ortop.* **57**, 001-013 (2022). Doi:10.1055/s-0041-1731417
3. Indri Harta, L. & Nur Fata, R. Terapi Pasca Cidera Olahraga. *COMSERVA J. Penelit. Dan Pengabdi. Masy.* **2**, 866-873 (2023). Doi:https://doi.org/10.59141/comserva.v2i6.527
4. Penggalih, M. H. S. T. *et al. Pedoman*

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

Penatalaksanaan Gizi Atlet. (Gadjah Mada University Press, 2021).

5. Pangemanan, M., Moleong, M. & Kakombohi, H. Profil Status Gizi Atlet Pplp Sulut. *Olymp. J. Pendidik. Kesehat. Dan Rekreasi* **4**, 245-250 (2023).
6. Rusydan, A. M. & Zulfaidah, N. T. Peptida Bioaktif:Menjelajahi Potensi dan Tantangan Menuju Pangan Masa Depan. *J. Farm. SYIFA* **2**, 56-67 (2024). Doi:https://doi.org/10.63004/jfs.v2i2.461
7. Putri, N. R. & Dhanny, D. R. Literature Review:Konsumsi Energi, Protein, dan Zat Gizi Mikro dan Hubungannya dengan Performa Atlet Basket. *Sport Nutr. J.* **3**, 14-24 (2022). Doi:https://doi.org/10.15294/spnj.v3i2.43290
8. Al Islamiyah, S., Tiffany, M. H. & Indrastuti, I. Pemanfaatan Produk Samping Pengolahan Minyak Kelapa Mandar (*Blondo*) di Desa Galung Lombok. *J. Ilm. Pangabdhi* **9**, 96-100 (2023). Doi:https://doi.org/10.21107/pangabdhi.v9i2.19857
9. Widodo, S., Riyadi, H., Tanziha, I. & Astawan, M. Acceptance test of *Blondo*, Snakehead Fish Flour and Brown Rice Flour Based Biscuit Formulation. *Int. J. Sci. Basic Appl. Res. IJSBAR* **4531**, 264-276 (2015).
10. Utami, T. P., Cakrawati, H. & Irramah, M. Potensi Farmakologi Makroalga Genus *Caulerpa* Bagi Pengembangan Obat Bahan Alam. *J. Ilm. Farm. Attamru JIFA* **2**, 37-47 (2021). Doi:https://doi.org/10.31102/attamru.2021.2.2.37-47
11. Penggalih, M. H. S. T. *et al.* Marine-Derived Protein:Peptide Bioresources for The Development of Nutraceuticals for Improved Athletic Performance. *Front. Sports Act. Living* **5**, 1281397 (2023). Doi:https://doi.org/10.3389/fspor.2023.1281397
12. Badan Standardisasi Nasional (BSN). Petunjuk Pengujian Organoleptik dan Sensori (SNI 01-2346).
13. Fikriyah, Y. U. & Nasution, R. S. Analisis Kadar Air dan Kadar Abu pada Teh Hitam yang Dijual di Pasaran dengan Menggunakan Metode Gravimetri. *Amina* **3**, 50-54 (2021).
14. Susanto, A., Kartika, K., Fertiasari, R. & Sari, D. *Food Bar* Berbasis Tepung Pisang dan Mocaf sebagai *Emergency Food*. *J. Food Secur. Agroindustry* **1**, 24-31 (2023). Doi:https://doi.org/10.58184/jfsa.v1i2.65
15. Sjarif, S. R. *et al.* Penggunaan Tepung *Blondo* dan Anuwun sebagai Substitusi Tepung Terigu terhadap Mutu Produk Suplementasi Gizi Berbentuk *Cookies*. *Maj. Tek. Ind.* **30**, 1-12 (2022). Doi:https://doi.org/10.61844/majalahteknikindustri.v30i1.362
16. Apriyanto, M. Recovery Protein by Product Virgin Coconut Oil. *J. Teknol. Pertan.* **9**, 14-18 (2020). Doi:https://doi.org/10.32520/jtp.v9i1.1009
17. Arifsyah, J., Dewi, D. P. & Wahyuningsih, S. Pengaruh Substitusi Tepung Talas (*Colocasia esculenta*) dan Tepung Beras Merah (*Oryza nivara*) terhadap Kadar Proksimat dan Kadar Zat Besi pada Mochi. *Ilmu Gizi Indones.* **5**, 141 (2022). Doi:https://doi.org/10.35842/ilgi.v5i2.296
18. Raya, I., Augustyn, G. & Lopulalan, C. Karakteristik Kimia dan Sensori Kukis Berbahan Baku Tepung Mocaf dengan Tambahan Puree Jagung Kuning. *Marsegu J. Sains Dan Teknol.* **1**, 38-48 (2024). Doi:https://doi.org/10.69840/marsegu/1.1.2024.38-48
19. Cicilia, S. *et al.* Karakteristik Cookies dari Tepung Terigu dan Tepung Biji Nangka Dimodifikasi Secara Enzimatis. *J. Agritechnology Food Process.* **1**, 1-15 (2021). Doi:https://doi.org/10.31764/jafp.v1i1.5960
20. Atmaja, H. P., Setiyaningrum, Z., Wardana, A. S. & Mardiyati, N. L. Kadar Air dan Kalium Produk Energy Chews Kulit Buah Semangka dengan Penambahan Air Jeruk Lemon untuk Atlet. *J. Sagu* **21**, 29 (2022). Doi:http://dx.doi.org/10.31258/sagu.21.1.p.29-37

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

21. Aulia Adha, R., Wisaniyasa, N. W. & Yusa, N. M. Pengaruh Penambahan *Blondo* Terhadap Karakteristik Flakes Tepung Beras Merah. *J. Ilmu dan Teknol. Pangan ITEPA* 10, **722** (2021). Doi:10.24843/itepa.2021.v10.i04.p17
22. Prasetyo, H. A. & Sinaga, R. E. Karakteristik Roti dari Tepung Terigu dan Tepung Komposit dari Tepung Terigu dengan Tepung Fermentasi Umbi Jalar Oranye. (2020).
23. Subroto, E. *et al.* The Analysis Techniques of Amino Acid and Protein in Food And Agricultural Products. **9**, (2020).
24. Nielsen, S. S. Introduction to Food Analysis. in *Nielsen's Food Analysis* (eds. Ismail, B. P. & Nielsen, S. S.) 3-14 (Springer International Publishing, Cham, 2024). Doi:10.1007/978-3-031-50643-7_1.
25. Rachmawati, D. O., Gunadi, I. G. A., Suswandi, I. & Risha, N. Pengolahan Buah Kelapa Menjadi VCO Berkualitas Bentuk Pemberdayaan Anggota Kwt Wirasa. *J. Widya Laksana* (2024). Doi:https://doi.org/10.23887/jwl.v13i1.51434
26. AbuMoh'd, M. F., Matalqah, L. & Al-Abdulla, Z. Effects of Oral Branched-Chain Amino Acids (BCAAs) Intake on Muscular and Central Fatigue During an Incremental Exercise. *J. Hum. Kinet.* **72**, 69-78 (2020). Doi:10.2478/hukin-2019-0099
27. Wijana, S., Perdani, C. G. & Angelina, T. Formulation of Vegetable Seasoning Made from Raw Material of Coconut *Blondo* Protein Hydrolysate. *IOP Conf. Ser. Earth Environ. Sci.* **475**, 012035 (2020). Doi:10.1088/1755-1315/475/1/012035
28. Koapaha, T., Langi, T. M., Montolalu, M. H., Tooy, D. & Pinatik, H. F. Increasing the Value of Coconut *Blondo* in Potato Flour as a Basic Ingredient for Nutrition-Rich Biscuits as an Alternative to Stunting Prevention. *Bp. Int. Res. Exact Sci. BirEx J.* **6**, 81-87 (2024). Doi:https://doi.org/10.33258/birex.v6i2.7861
29. Kole, H., Tuapattinaya, P. & Watuguly, T. Analisis Kadar Karbohidrat dan Lemak pada Tempe Berbahan Dasar Biji Lamun (*Enhalus acoroides*). *Biopendix J. Biol. Pendidik. Dan Terap.* **6**, 91-96 (2020). Doi:https://doi.org/10.30598/biopendixvol6issue2page91-96
30. Fitri, A. S. & Fitriana, Y. A. N. Analisis Senyawa Kimia pada Karbohidrat. *Sainteks* **17**, 45 (2020). Doi:10.30595/sainteks.v17i1.8536
31. Pontang, G. S. & Wening, D. K. Formulasi *Snack bar* Berbahan Dasar Tepung Mocaf dan Tepung Kacang Merah sebagai Makanan Selingan Bagi Atlet. *J. Nutr. Coll.* **10**, 218-226 (2021). Doi:https://doi.org/10.14710/jnc.v10i3.29278
32. Pehlepi, E. S., Puspita, T. & Suwita, I. K. Pengembangan Tepung Tempe dan Bayam Hijau (Amaranthus Tricolor L) sebagai Bahan Substitusi Pepaya Sandwich Biskuit untuk *Snack* Remaja Putri Anemia. *Nutr. J.* **1**, 36 (2022). Doi:https://doi.org/10.31290/nj.v1i2.3499
33. Ramadhani, I., Purwayantie, S. & Hartanti, L. Formulasi *Blondo* Minyak Kelapa dan Tepung Mocaf pada Pembuatan Cake. *FoodTech J. Teknol. Pangan* **4**, 64 (2021). Doi:https://doi.org/10.26418/jft.v4i2.56922
34. Damongilala, L. J. Kandungan Gizi Pangan Ikani. (2021).
35. Yunita, L., Rahmiati, B. F., Naktiany, W. C., Lastyana, W. & Jauhari, M. T. Analisis Kandungan Proksimat dan Serat Pangan Tepung Daun Kelor dari Kabupaten Kupang sebagai Pangan Fungsional. *Nutr. J. PanganGiziKesehatan* **3**, 44-49 (2022). Doi:https://doi.org/10.30812/nutriology.v3i2.2454
36. Lacey, J. *et al.* A Multidisciplinary Consensus on Dehydration:Definitions, Diagnostic Methods and Clinical Implications. *Ann. Med.* **51**, 232-251 (2019). Doi:https://doi.org/10.1080/07853890.2019.1628352
37. Sujaryanti, S. Pemanfataan *Blondo* Menjadi Resep Olahan Makanan sebagai Peluang Usaha

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*

Masyarakat. *J. Community Serv. Public Aff.* **2**, 85-91 (2022). Doi:https://doi.org/10.46730/jcspa.v2i3.45

38. Ramadhan, H., Baidah, D., Lestari, N. P. & Yuliana, K. A. Aktivitas Antioksidan Ekstrak Etanol 96% Daun, Buah dan Kulit Terap (*Artocarpus odorratissimus*) Menggunakan Metode Cuprac. *Farmasains J. Ilm. Ilmu Kefarmasian* **7**, 7-12 (2020).
39. Pawestri, S. & Syahbanu, F. Teknik Enkapsulasi Antioksidan Melalui Pengeringan Semprot. *J. Pertan. Agros* **26**, 5052-5066 (2024).
40. Kartika, D. Aspek Nutrisi Dalam Pemulihan Pasca-Latihan Fisik:Tinjauan Pustaka. *J. Edukasimu* **4**, (2024).
41. Nareswari, T. L., Aziz, S., Septiani, W. & Muhyi, A. Pelatihan Pengolahan *Blondo* Menjadi *Cookies* untuk Penanganan Stunting di CV. Buah Asa Tani, Bangunrejo, Lampung. *J. Kreat. Pengabdi. Kpd. Masy. PKM* **7**, 1980-1989 (2024).
42. Rachmawati, D. O., Suswandi, I. & Yasmini, L. P. B. Pendampingan Uji Kadar Air Kualitas VCO Berdasarkan Standar Nasional Indonesia Produksi Kwt Tunas Amerta. *J. Widya Laksana* **11**, 158 (2022).
43. Dewi, D. P. Substitusi Tepung Daun Kelor (*Moringa oleifera L.*) pada *Cookies* Terhadap Sifat Fsik, Sifat Organoleptik, Kadar Proksimat, dan Kadar Fe. *Ilmu Gizi Indones.* **1**, 104 (2018). Doi:https://doi.org/10.35842/ilgi.v1i2.22
44. Khairunnisa, K., Juanda, J. & Erika, C. Pengaruh Penambahan Ekstrak Kulit Manggis (Garcinia mangostana L.) dan Gula Aren terhadap Profil Sensori Deskriptif Cokelat Batang. *J. Ilm. Mhs. Pertan.* **7**, 285-293 (2022). Doi:https://doi.org/10.17969/jimfp.v7i3.20846
45. Kiyat, W. E., Reynaldo, K., Irwan, J. & Saputra, E. Review:Pemanfaatan Bromelain pada Beberapa Pangan Lokal Indonesia. *J. Agroteknologi* **10**, 33 (2019). Doi:http://dx.doi.org/10.24014/ja.v10i1.6515
46. Dimzon, I. K. D., Tantengco, G. B., Oquendo, N. A. & Dayrit, F. M. Profile of Volatile Organic Compounds (VOCs) from Cold-Processed and Heat-Treated Virgin Coconut Oil (VCO) Samples. in *The 1st International Electronic Conference on Food Science and Functional Foods* 85 (MDPI, 2020). Doi:https://doi.org/10.3390/foods_2020-07723
47. MAKANAN, K. B. P. O. D. *Peraturan Badan Pengawas Obat dan Makanan Nomor 16 Tahun 2020 Tentang Pencantuman Informasi Nilai Gizi untuk Pangan Olahan Yang Diproduksi Oleh Usaha Mikro dan Usaha Kecil*. (2020).

How to cite: *Devi, S., Aeni, M. N., Insyirah, T. H. A., Azmi, H. R., Gunawan, A., & Nasrullah, N. (2025) The Potential of Blondo-Based Snack Bars and Sea Grape Flour Substitution to Support Athlete Performance: Potensi Snack Bar Berbasis Blondo dan Substitusi Tepung Anggur Laut untuk Mendukung Performa Atlet. Amerta Nutrition, 9(1), 76–86.*