April – June, 2023
Original Article
DOI: http://dx.doi.org/10.30867/action.v8i2.932

AcTion: Aceh Nutrition Journal
Pages: 211 - 218
p-issn 2527-3310; e-issn 2548-5741

Low-fat, high-protein, and fiber drink as an alternative to daily snack

Minuman rendah lemak, tinggi protein dan serat sebagai alternatif pengganti selingan harian

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Article History:
Received: July 19, 2022; Revised: September 23 through December 6, 2022; Accepted: December 14, 2022; Published: June 4, 2023.

Publisher:
Politeknik Kesehatan Aceh
Kementerian Kesehatan RI

Abstract

Obesity is one of the causing factors of various degenerative diseases. Walnuts, almonds, pumpkin seeds, chia seeds, oats, and soy milk are nutritional ingredients that can help prevent disease and have the potential to be developed as health drink products. This study aims to make a supplement drink and find the results of the organoleptic test and its nutritional content. This study is an experimental, non-factorial, Completely Randomized Design with four treatments and three repetitions. The study was conducted in the Laboratory of Nutrition Department of Health Polytechnic of Palembang from March to April 2022. Organoleptic test data were analyzed using Kruskal-Wallis Test. The results showed that the best acceptance is the F1 formula. Based on Kruskal Wallis Test, it shows that the amount of composition of each ingredient makes a significant difference to organoleptic quality parameters of color (p=0,046) and taste (p=0,046) between formula In 100 grams of powder contains 381,65 kcal of energy, energy from fat 13,41 kcal, protein 26,31%, fat 1,49%, carbohydrates 65,75%, dietary fiber 22,54%, water content 3,53 %, ash content 2,92%, vitamin B3 0,87 mg, vitamin E 2,28 mg, omega 3 117,9 mg, omega 6 705,6 mg, linolenic acid 0,12%, unsaturated fatty acids monounsaturated 0,49%, polyunsaturated fatty acids 0,82%, calcium 166,31 mg, Fe 4,28 mg, magnesium 286,64 mg, selenium 21,61 mcg, and chromium 12,61 mcg. In conclusion, Fortipro Blended is low in fat, high in protein, and high in fiber based on the nutrient analysis test results.

Keywords: Obesity, supplement drinks, degenerative disease, Fortipro Blended

Abstrak

Obesitas merupakan salah satu faktor risiko munculnya penyakit degeneratif. Walnut, almond, biji labu kuning, biji chia, oats, dan susu kedelai merupakan bahan dengan zat gizi yang dapat membantu mencegah penyakit dan berpotensi dikembangkan sebagai produk minuman kesehatan. Penelitian bertujuan untuk mengetahui formula produk terbaik dan mengetahui nilai gizi formulasi terbaik Fortipro Blended. Desain penelitian yaitu kuantitatif eksprimental dengan rancangan acak lengkap non-faktorial 4 perlakuan dan 3 pengulangan. Penelitian dilakukan di Laboratorium Ilmu Gizi Jurusan Gizi Politeknik Kesehatan Palembang pada bulan Maret-September. Analisis data daya terima menggunakan uji Kruskal Wallis, kemudian formula terpilih dilakukan analisis zat gizi. Hasil penelitian diketahui bahwa formulasi yang mempunyai daya terima terbaik adalah formula F1. Berdasarkan uji Kruskal Wallis diketahui bahwa jumlah komposisi setiap bahan membuat perbedaan signifikan terhadap parameter mutu organoleptik warna (p=0,046) dan rasa (p=0,046) antar perlakuan Fortipro Blended. Dalam 100 gram bubuk mengandung energi total 381,65 kkal, energi dari lemak 13,41 kkal, protein 26,31%, lemak 1,49%, karbohidrat 65,75%, serat pangan 22,54%, vitamin B3 0,87 mg, vitamin E 2,28 mg, omega 3 117,9 mg, omega 6 705,6 mg, asam linolenat 0,12%, asam lemak tak jenuh tunggal 0,49%, asam lemak tak jenuh ganda 0,82%, kalsium 166,31 mg, Fe 4,28 mg, magnesium 286,64 mg, selenium 21,61 mcg, dan kromium 12,61 mcg. Kesimpulan, Fortipro Blended memiliki kandungan rendah lemak, tinggi protein, dan tinggi serat berdasarkan hasil uji analisis zat gizi.

Kata Kunci: Obesitas, suplemen minuman, penyakit degeneratif, Fortipro Blended

Introduction

Obesity is one of the risk factors for various degenerative diseases, such as cardiovascular disease, diabetes mellitus, osteoporosis, cancer, and others (De Lorenzo *et al*., 2019; Sofa, 2018). Obesity is a significant public health problem in developed and developing countries. In developing countries such as Indonesia, the prevalence rate of obesity is increasing significantly and alarmingly (Al Rahmad, 2021).

According to the World Health Organization (WHO, 2021), there are about 2 billion adults, or 30% of the world's total population, who are overweight, 650 million of whom are obese (BMI >30 kg/m^2). That is equivalent to 39% (39% men and 40% women) of adults aged 18 and over being overweight, with 13% being obese. The Global Burden of Disease Group 2017 "doubled in more than 70 countries since 1980 and continues to increase in most other countries" (GBD 2015 Obesity Collaborators, 2017).

Indonesia has an increasing prevalence of obesity. The Basic Health Research Report (Riskesdas) states that the prevalence of overweight in 2013 was 11,5%, and in 2018 increased to 13.6%. The prevalence of obesity also increased, which in 2013 was 14.8% to 21.8% in 2018(Kemenkes RI, 2018).

Obesity is a significant health problem in developed and developing countries (Rahmad, 2021). In this era of globalization, the growth of technological science is significantly correlated with the self and the environment. It can be positive or negative for the individual. One of the negative impacts is the numerous replacement of human work by machines or robots that reduce mobility and physical fitness, thereby increasing the risk of obesity. Complex and unlimited human interests and needs to encourage everyone to work unceasingly, so they ignore rest time, diet, physical activity, and recreation to choose less healthy and guaranteed nutrition.

Then the positive impact that can also be taken is that the public easier to obtain information related to health, one of which is the GERMAS activity (the movement of the community to live healthily), which nationally at the initial stage focuses on three activities: consuming fruits and vegetables, performing the physical activity for 30 minutes a day, and checking health (Dewantari & Sukraniti, 2020). People are becoming increasingly critical and selective about the food and beverages they consume, so they tend to consume foods and drinks that can help maintain health (Wahyuni & Yhoga, 2019).

Walnuts contain omega-3 fats (α-linoleate), phenolic acids, vitamins, phytosterols polyphenols, phytosterols, and high flavonoids that can lower cholesterol levels, reduce the effects of cardiovascular diseases, stabilize lipids and blood pressure, reduce diabetes levels, and are suitable for people with overweight problems (Abbas *et al*., 2021; Masyitah *et al*., 2018; Ros *et al*., 2018).

Almonds are rich in protein and fiber and are low in sugar. Meanwhile, vitamin E in almonds has anti-inflammatory and antioxidant properties that prevent the occurrence of oxidative stress (Barreca et al., 2020; Ningsih et al., 2019; O'Neil et al., 2016).

The nutritional content of 100 grams of yellow pumpkin seeds is 33.48% protein, 28.68% carbohydrates, 30.66% fat, and 3.07% fiber. Yellow turmeric seeds have high fiber and antioxidants that play a role in lowering blood sugar levels, hyperlipidemia, and hyper cholesterol (Devi *et al*., 2018; Dotto & Chacha, 2020; Shahangir, 2015). According to research by Ullah *et al*. (2016), Chia seeds contain high fiber, high omega-3s, which is 65% of the oil content, and are high in antioxidants. They can protect against diseases like heart, liver, anti-aging, anti-cancer, and digestive system, and control obesity and weight loss (Din *et al*., 2021).

Oats contain high carbohydrates, protein, minerals, fats, vitamin B complex, and natural fiber. Each 100 g of oats contains 5-7.2 g of soluble fiber and 9.9-14.9 g of total fiber. Oats also contain three natural antioxidants, including tocotrienol, ferulate acid, and caffeic acid, which protect body cells from free radical damage (Monikasari et al., 2023; Soycan, 2019; Widyastuti et al., 2015).

Grapes are high in protein, fat, and other essential nutrients, such as vitamins (phytate acids), isoflavones (flavonoids), and lecithin. Research on the benefits of soybeans and its processed products in controlling degenerative diseases such as diabetes, hypertension, hypercholesterolemia, cancer, and others, has been done a lot. It is due to soybean composition, rich in nutrients such as proteins

and essential amino acids, vegetable fats, vitamins, minerals, and non-nutritional such as food fiber and bioactive components (Triandita & Putri, 2019).

Based on the above description, walnuts, almonds, yellow strawberries, chia seeds, oats, and soy milk are nutrient-rich ingredients and have a variety of health benefits, so potentially to be developed as a health drink product. The research aims to know the best product formula and nutritional value of the best Fortipro Blended formula.

Methods

This study is expressive by applying a Complete Random Plan (RAL) non-factorial with four treatments and three repetitions.

The research was conducted in the Laboratory of Nutrition Sciences to manufacture formulations, products, and organoleptic tests, then PT Laboratory. Saraswanti Indo Genetech Bogor (SIGB) for nutritional content testing of the formulation selected in April 2022. This research has already obtained ethical validity from the Health Research Ethics Commission (KEPK) on Poltekkes Kemenkes Palembang with No.: 0253/Kepk/Adm2/III/2022. Thirty-five panelists are semi-trained explorers taken from students of level 3 of nutrition majors.

The main ingredients of the study were walnuts, almonds, yellow oatmeal seeds, chia seeds, oats, and soy milk powder. The equipment used to make the formula is a blender, mixer, digital scale, and spatula. Tools used in reception testing are plastic cups, tablespoons, label paper, writing tools, and reception test forms.

The study includes four stages: preparation of raw materials by smoothing them into powder form, formulation preparation, reception test, and nutritional content test of the selected formulation.

The process of making raw material powder starts from the preparation stage of all the materials, which are then roasted on a small fire, then smoothed using a blender. Then all the ingredients are mixed to get uniform powder details. Last, weigh the powder according to the prescribed formulation. Figure 1 to presented the Fortipro Blended manufacturing flow chart.

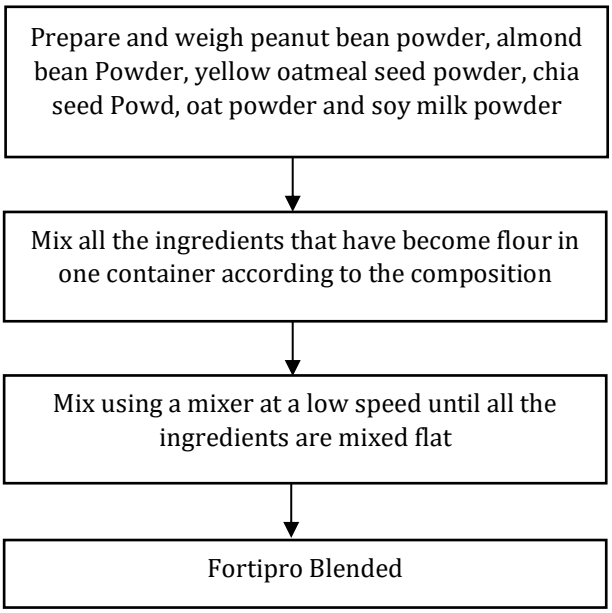


Figure 1. Fortipro Blended manufacturing flow chart

Figure 1. Fortipro Blended product formulation results

The study uses four formulas: F1, F2, F3, and F4 for Fortipro Blended product. The composition of the ingredients used for each formula is shown in Table 1

Table 1. Composition based on formulation

Materially	Formulations			
	F1	F2	F3	F4
Almond	8	7	6	6
Walnut	7	8	6	7
Tagged yellow	7	6	8	7
Oats	3	4	5	5
Chia seeds	2	2	2	2
Soya milk	5	5	5	5
Corn sugar	2,5	2,5	2,5	2,5

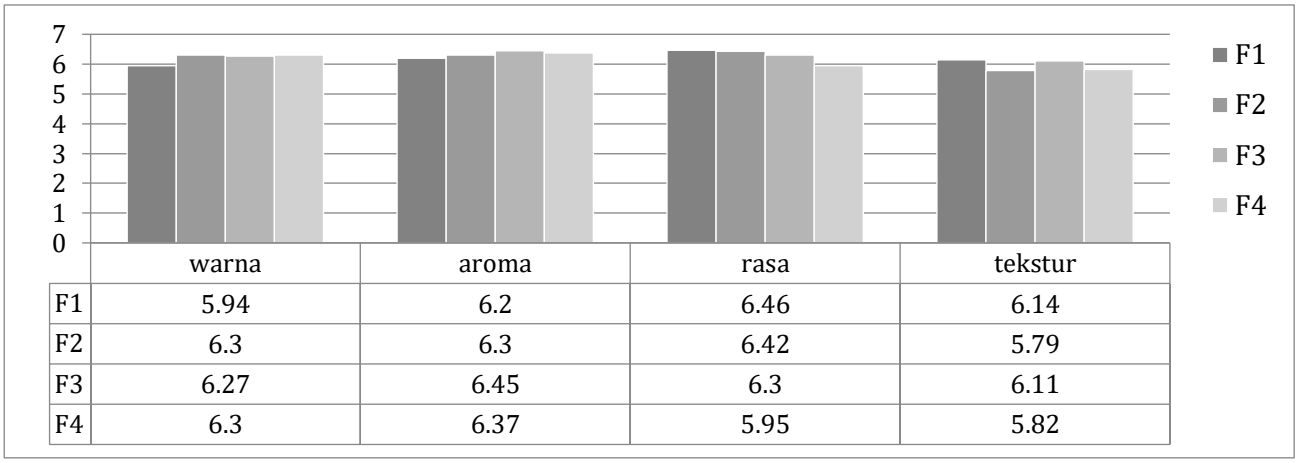
A semi-trained panel of 35 people carried out the receptive or organoleptic test of the product. The receptivity test covers the sensory

aspects of sight, smell, perception, and flavor, i.e., color, aroma, texture, as well as taste, by applying the hedonic test with the evaluation criteria: 1 = very much dislike, 2 = very disliked, 3 = not like, 4 = quite dislikes, 5 = neutral, 6 = quite like, 7 = like, 8 = very like, and 9 = very liked (Badan Standarisasi Nasional, 2006).

The receptive or organoleptic test results are then analyzed with the Kruskal Wallis test to determine whether there are differences between the product and the organoleptic quality. They were then continued with the Mann-Whitney test, if there were any differences, to analyze the differences of each product formulation. The conclusion of the hypothesis is made by looking at the p-value. If p-value < 0,05, then Ha is accepted, i.e., there is a difference in product acceptance between the four formulations. If p-value > 0,05, then H0 is accepted, meaning there is no difference in product acceptance between the four formulations. (Dhanang Puspita et al., 2021).

Result and Discussion

Here are the results of receptive or organoleptic tests of 4 formulations that have been performed based on aspects of color, aroma, taste, and texture.



	warna	aroma	rasa	tekstur
F1	5.94	6.2	6.46	6.14
F2	6.3	6.3	6.42	5.79
F3	6.27	6.45	6.3	6.11
F4	6.3	6.37	5.95	5.82

Figure 2. The average value of hedonic test scores

Figure 1 above shows that overall the most preferred formulation by the panelists is F1, seen from the highest value in terms of taste and texture.

Out of four formulations in the color receptivity test, it is known that the formulations with the highest values were F2 and F4, with an average hedonic test score of 6,30. Color is the first sensor that the panel sees directly. The different colors in each formulation are due to the difference in the materials' composition. All formulations generally have a white color with shades of brown and greenery. Food quality is often determined by its color, which is not different from the color it should be, thus giving its judgment to the panelists (Negara *et al*., 2016).

Regarding fragrance, the highest level of the favorite panelist was on formulation F3 with an average score of 6,45. In general, all formulations have a typical peanut aroma that dominates, but F3 has the least peanut composition, so the resulting aroma is not as strong as other formulations. Aroma is one of the determining factors that influence the level of preference of a panelist for a product. The aroma of food is a potent attraction that can increase appetite. The taste of food is often determined by its smell; each food has a different smell (Amir *et al*., 2020). When a person is confronted with new foods, in addition to shape and color, what becomes his primary concern is the smell. After receiving the fragrance, the taste, and texture are next (Sari, 2019).

Out of four formulations in the receptivity test to the taste aspect, it is known that the formulation with the highest average score was F1, with a score of 6,46. Taste is the stimulus produced by the combination and composition of foods perceived by the senses of the flavor. Taste is essential in deciding whether to accept or reject a product. Although the color, aroma, and texture are good, consumers will reject the product if it does not taste good. Taste responds to chemical stimuli that reach the tongue,

especially the sweet, acidic, salty, and bitter basic tastes (Amir *et al*., 2020).

Based on the receptivity test of the texture aspect, it is known that the formulation with the highest average score is F1, with a score of 6,14. The texture is a sensation of pressure that can be judged by seeing and feeling when bitten, chewed, swallowed, or worn with fingers (Dewantari & Sukraniti, 2020; Shafitri et al., 2021). A food's texture can judge whether the product is rough, smooth, complex, or shallow (Sari, 2019). Formulations F1 and F2 are the most preferred formulations of panels in terms of texture, and this is because F2 and F1 have more ingredient composition so that the resulting texture is relatively thick, slightly rough, and oily when consumed. The thick texture is due to the use of many materials that come from smoothed materials. The rough texture of the product is caused by oats and chewed chia seeds that give a gum-like texture.

Based on the results of the reception test, it can be concluded that F1 is the best formulation preferred by the panelists. F1 is superior to F2, F3, and F4 of the four aspects, taste, and texture.

Table 2. Result of analysis of Kruskal Wallis

The Formula	Mean Rank			
	Color	Scent	flavor	Texture
F1	55,23	66,73	79,83	79,33
F2	78,40	67,77	76,77	60,59
F3	73,94	75,34	68,39	75,27
F4	74,43	72,16	57,01	66,81
p-value	0,046	0,764	0,046	0,181

Based on Table 2, it is shown that the quantity of the composition of each ingredient makes a significant difference in the organoleptic quality parameters of color (p= 0,046, p<0,05) and taste (p= 0,046 and p<0,05) between the treatments of Fortipro Blended.

Further tests were carried out with the Mann-Whitney test to see the differences between the treatment of Fortipro Blended organoleptic in terms of color and taste.

The results of the Mann-Whitney Test showed that in the formulations F1 – F2 and F1 - F3, there were differences in the organoleptic qualities in the color aspects produced by the two formulations. In formulations F1 – F4, there are significant differences in organoleptic qualities in terms of color and taste. Then the formulation F2 – F4 showed a difference in the organoleptic qualities in the flavor aspects produced by the formula.

Table 3. Result of analysis of Mann-Whitney

Group	p-value	
	Color	flavor
F1 – F2	0,012	0,668
F1 – F3	0,033	0,255
F1 – F4	0,031	0,008
F2 – F3	0,607	0,385
F4 – F2	0,632	0,015
F4 – F3	0,949	0,285

Table 4. Makro formulation test results selected

Parameter	Value	SNI cereal milk	% AKG*
Energy (kcal to 100g)	381,65	-	14,9
Energy from Fats (kcal/100g)	13,41	-	-
Protein (%)	26,31	Min. 5	40,4
Fatty (%)	1,49	Min. 7	2,1
carbohydrates (%)	65,75	Min. 60	15,8

* %AKG based on energy needs 2550 kcal

The energy value of the product is based on the calculation of the conversion of the content of protein, fat, and carbohydrates into calorie units. The comprehensive energy analysis resulted in 381,65 kcal per 100 grams. When calculated from the daily energy needs of 2550 kcal, this product accounts for only 14,9% of the total daily needs. Thus, 100 grams of the product can be used as an alternative to daily snacks in the morning or afternoon.

The analysis showed that the product's protein content was 26,31% per 100 grams. The results showed that the protein levels in the product were much higher than in cereal milk, which could even account for 40,4% of the total daily requirement for the daily energy requirement of 2550 kcal. It is due to the selection of raw materials, such as walnuts, almonds, yellow oatmeal seeds, and soy milk, that are high in protein. Thus, this product is considered a product with a high protein content.

The fat analysis result on the product was 1.49% per 100 grams. These results show that the fat content of the products produced is lower when compared to the quality conditions of SNI cereal milk is min. This product even accounts for only 2,1% of the daily fat requirement for the

daily energy requirement of 2550 kcal. The low-fat content is because the composite ingredient has a relatively low but nutritious fat content.

The results of the nutritional analysis showed that the content of carbohydrates in the product was 65,75% per 100 grams. These results show that the carbohydrate levels in this product have been following SNI quality requirements, that is, minimum. Sixty percent This product accounts for only 15,8% of the daily carbohydrate requirement for the daily energy requirement of 2550 kcal. Carbohydrates are a source of energy for the body that also plays an essential role in determining the characteristics of foods, such as taste, color, and texture (Winarno, 2008).

Table 5. Results of test content of selected micro-formulas

Parameter	Value	SNI cereal milk	% AKG*
Water content (%)	3,53	Max. 3	-
Ash Content (%)	2,92	Max. 4	-
Dietary Fiber (%)	22,54	-	62,6
Vitamin B3 (mg)	0,87	-	5,4
Vitamin E (mg)	2,28	-	15,2
Omega 3 (mg)	117,9	-	-
Omega 6 (mg)	705,6	-	-
Linolenic Acid (%)	0,12	-	-
Monounsaturated Fatty Acids (%)	0,49	-	-
Polyunsaturated Fatty Acids (%)	0,82	-	-
Calcium (mg)	166,31	-	16,6
Fe(mg)	4,28	-	47,5
Magnesium (mg)	286,64	-	79,6
Selenium (mcg)	21,61	-	72,03
Chromium (mcg)	12,61	-	37,0

The water content analysis was 3,53% per 100 grams which showed that the result was higher than the SNI requirement for cereal milk, which is a maximum of 3%. It may be due to the theory that the higher the fiber, the higher its water level. Fiber can bind water, and water tied tightly to food fiber is difficult to evaporate even with drying (Winarno, 2008).

The ash level analysis was 2,92% per 100 grams, which indicates that the result has been following the SNI of cereal milk, maximum 4. Ashes are mineral elements or inorganic substances (such as potassium, calcium, iron, phosphorus, magnesium, and others) residues that remain after the material is burned until it is free of carbon elements, are components that are not easily evaporative, and remain in the combustion and processing of organic compounds (Winarno, 2008). The higher the ash level, the more the mineral content remains, and vice versa.

The analysis of food fiber on the product was 22,54 per 100 grams. The recommended dietary fiber intake is 30 – 35 g daily for men and 25 – 32 g for women (Barber et al., 2020). In this study, this product contributed ±75% to meeting daily needs. According to the BPOM regulation no. 13 (BPOM, 2016), A product may be claimed to be high in fiber if it has a fiber content of 6 g per 100 g or 6% where the results of the analysis indicate that aspects of food fiber have met the requirements of the regulations.

The analysis of vitamin B3 on the product is 0,87 mg per 100 grams. Vitamin B3 is water soluble because of its water-soluble properties (Lykstad & Sharma, 2019). The decrease in vitamin B3 content in blended Fortipro powder is due to processing processes such as refraction and smoothing. Vitamin B3 nutrients are easily damaged and easily lost in the processing process.

The analysis of vitamin E on the product is 2,28 mg per 100 grams. Increased vitamin E intake, such as green vegetables, vegetable oils, green beans, and other nuts, keeps the immune system awake (Harvard T.H. Chan School of Public Health, 2020b). The ingredient composition of Fortipro Blended is from nuts – wild and seeds – seeds such as oats, walnuts, almonds, chia seeds, pumpkin seeds, and soybeans.

The product's omega three and omega six analysis was 117,9 mg and 705,6 mg per 100 grams. Omega 3 and Omega 6 are long-chain unsaturated fatty acids (PUFA) that are essential or cannot be produced by the body. Omega 3 plays the most important role among other fatty acids because it has anti-inflammatory and anti-blood clotting effects, also for the central nervous system and the brain, and can prevent cardiovascular disease (Diana, 2012). Omega 6 has a beneficial role in supporting omega three functions. However, omega-six also has its benefits, such as helping to prevent muscle breakdown and increase muscle growth, as and

The analysis of linolenic acid on the product is 0,12% per 100 grams. Walnut has a

unique nutrient content, linolenic acid (ALA). ALA metabolism causes vasodilating and anti-inflammatory oxylipins, which may underlie the beneficial effects of walnut consumption on endothelial function. Recent experimental research also shows that ALA is neuroprotective, although polyphenols from walnuts may synergize for beneficial effects on brain function (Ros et al., 2018).

The analysis of single-unsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) on the product was 0,49% and 0,82% per 100 grams. The high intake of MUFA and PUFA can reduce the low-density lipoprotein (LDL) cholesterol level, thereby reducing the risk of increased blood pressure due to the accumulation of cholesterol (Ramadhini & Yuliantini, 2019). In this study, the materials used, such as walnuts, almonds, yellow peanut seeds, and chia seeds, are good sources of unsaturated fat.

The analysis of calcium in the product was 166,31 mg per 100 grams. Based on the recommended nutritional adequacy rate of children aged ten years, adults, and 80 to above, calcium needs 1200 mg daily (Kemenkes RI, 2019). If the Fortipro Blended beverage is taken in a slice within a day, 10% of the sufficient amount is 120 mg per 100 g.

The Fe analysis on the product is 4,28 mg per 100 grams. Good sources of iron are, among other things, liver, meat, nuts - nuts, beans, fortified cereals, soy flour, and dark green vegetables.

The analysis of magnesium in the product is 286,64 mg per 100 grams. According to the United States Food and Nutrition Board, the recommended magnesium intake is 420 mg daily for men and 320 mg per day for women. In this study, Fortipro Blended contributed ±68% to meeting daily needs. Magnesium is a very important element in producing energy from food and makes some parts of the body, such as the heart, bones, muscles, nerves, and others, run smoothly (Harvard T.H. Chan School of Public Health, 2021).

The analysis of selenium in the product was 21,61 mcg per 100 grams. According to the United States Food and Nutrition Board, the recommended magnesium intake is 40–70 mcg per day for men and 45–55 mcg for women (Kieliszek, 2019). In this study, Fortipro Blended contributed ±40% to meeting daily needs. Selenium is an essential nutrient and micronutrient that has good health benefits. The main benefit of selenium is the production of selenoprotein. Selenoprotein has a variety of cellular functions, including regulation of selenium transport, thyroid hormone, antioxidant, immune, and redox homeostasis. (Kang et al., 2020).

The product's chromium analysis is 12,61 mcg per 100 grams. Magnesium intake recommendations according to Harvard is 35 mcg daily for men and 25 mcg for women (Harvard T.H. Chan School of Public Health, 2020a). In this study, Fortipro Blended contributed ±36-50% to meeting daily needs. Chromium increases the action of the hormone insulin, also involved in the breakdown and absorption of carbohydrates, proteins, and fats. Vitamin B3 (Niacin) and vitamin C help increase chromium absorption.

Conclusion

Of the four existing product formulations, it is derived from the formulation with the best receptivity is F1. There is an average difference between product receptivity in color and flavor, while the aroma and texture do not indicate the average difference in this Fortipro Blended product. Fortipro Blended has a high protein content (26,31%), low fat (1,49%), high dietary fiber (22,54%), and also contains vitamins and minerals per 100 grams of product.

The product is highly likely to be a low-fat daily snack replacement, high in protein and fiber, and rich in other micronutrients such as linolenic acid, omega 3, and omega 6. People with obesity can consume Fortipro Blended as an alternative daily snack because it contains high protein and fiber and is low in fat.

Acknowledgments

The researchers thanked the panelists, supervisors, and all parties involved for supporting and assisting in completing this study.

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