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The Development of Multivitamin Mineral Jelly Candy "Previmin" for Stunting Prevention

Pengembangan Permen Jelly *"Previmin" Multivitamin Mineral untuk Pencegahan* Stunting

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ABSTRACT

Background: *The prevalence of stunting in Yogyakarta province has decreased in 2022, although it hasn't reached the target of 14%. The Taburia supplementation program, implemented by the Indonesian government in 2010, aimed to address this issue, but its effectiveness remains a concern. Therefore, in 2017 jelly candy with fortification of Taburia and prebiotics fructooligosaccharides was developed as well as an organoleptic test in preschool and kindergarten children. Subsequently, in 2022, the production of the same jelly candy, named "Previmin" was upscaled and carried out in a factory. Production on a factory scale can change the nutritional contents and organoleptic properties of the product.*

Objectives: *To evaluate the organoleptic properties, acceptability, and nutritional content of factory-scale "Previmin" jelly candy.*

Methods: *This was true experimental study carried out in Kalurahan Sumberarum, Kapanewon Moyudan, Sleman District, Yogyakarta to evaluate the organoleptic properties and acceptability of jelly candy "Previmin'' on 59 toddlers. The production process was conducted by PT Natural Food Success, whereas nutritional content analysis was carried out in BBSPJIA Laboratory Bogor.*

Results: *Based on organoleptic tests, the color, flavor, taste, and texture score were above 5 points hence respondents liked "Previmin". As many as 75% of respondents could consume the product hence Previmin's acceptability was good. Nutritional content, heavy metals, and microbial count have good results and comply with SNI standards.*

Conclusions: *Most toddlers like and can consume "Previmin" jelly candy. "Previmin" jelly candy contains a good source of macronutrients and micronutrients as well as has complied with SNI standards.*

INTRODUCTION

Stunting is a significant nutrition problem worldwide, especially in developing countries. In this context, stunting can be defined as a state of chronic malnutrition that arises from inadequate nutrient intake over a long period of time. This condition is caused by feeding that is not in accordance with nutritional needs, which ultimately slows down the rate of growth and development of children[1–3]. Stunting in toddlers is expressed by an index of Length/Weight or Height/Weight that is below the threshold (Z-Score) of <-2 SD to -3 SD (short/stunted) and <-3 SD (severely stunted) in anthropometric standards of child nutritional status assessment. The importance of addressing

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stunting is reflected in the Sustainable Development Goals "Zero Hunger" of 2030, where one of the targets is to achieve food security and end hunger on a global scale. Attention to the agricultural sector is crucial, as improving the quality and quantity of food production is closely related to efforts to prevent and overcome stunting[4].

Based on data from the Indonesian Nutrition Status Study (SSGI) in 2022, there is a positive trend of decreasing stunting prevalence in Indonesia. The prevalence decreased to 21.6%, compared to 2021 which recorded a prevalence of 24.4%. Likewise, in the Special Region of Yogyakarta, there was a decrease from 17.3% in 2021 to 16.4% in 2022[5]. Although there is an increase in awareness and efforts carried out, this prevalence still does not reach the national stunting reduction target set at 14%. Stunting, as a nutritional phenomenon, is closely related to nutrient intake deficiencies. The main concern is not only to focus on macronutrients such as carbohydrates, protein, and fat, but it is also important to consider the intake of micronutrients such as vitamins and minerals. The presence of these substances is crucial in ensuring optimal growth and development of children. The important role of micronutrients is globally recognized, and a lack of intake can lead to long-term health problems in children[6]. Stunting itself can occur since the fetus is still in the womb and is only seen in children when they reach the age of two[7]. If not prevented or addressed quickly, stunting can have a lasting impact on individuals. These impacts include decreased cognitive and physical development, decreased productive capacity, and increased risk of degenerative diseases in adulthood. Therefore, the handling of stunting is not only limited to prevention efforts, but also requires special attention in increasing access and consumption of balanced nutrition to achieve more serious stunting reduction targets[8].

Meeting the vitamin and mineral needs of children often requires the help of supplements. One of the efforts that have been made to reduce the prevalence of stunting in Indonesia is through the provision of Taburia supplements, a government program that has been running since 2010. Taburia contains 12 types of vitamins and 4 types of minerals that are given in one month as many as 15 sachets or 1 sachet to be consumed every 2 days and must be finished at breakfast. However, this intervention has not been fully effective due to some obstacles, such as more than 80% of toddlers disliking the smell and taste of Taburia, less than 50% of mothers adhering to administration recommendations, discoloration of food, and inequitable distribution, especially in remote areas[9]. Therefore, in 2017, a comparative study of the acceptability test of Taburia and functional food in the form of jelly candy with fortification of Taburia and prebiotics in the form of FOS (fructooligosaccharide) as an innovative supplement in the form of jelly candy that is dense in prebiotics, vitamins, and minerals, and has conducted trials on preschool and kindergarten children in Yogyakarta and obtained the results that there is no significant difference between the form of supplementation on the level of compliance with micronutrient consumption of toddlers[10-12]. In 2022, the same jelly candy was developed on a larger scale and produced industrially. The product is named "Previmin" and will be commercially marketed. With this background, this study aims to conduct organoleptic tests, acceptability tests, and nutritional content analysis on "Previmin" jelly candy produced on an industrial scale. With the hope that this product can be an alternative that is more favorable and acceptable to children and make a significant contribution to efforts to prevent stunting in Indonesia.

METHODS

The jelly candy production process involves close cooperation with a jelly candy manufacturer, PT Natural Food Success, which operates in Bekasi, West Java. Meanwhile, the nutritional content analysis was conducted at the Testing Laboratory of the Center for Agro-based Industry (BBSPJIA), located in Bogor, West Java. This research was implemented using a true experimental method, which was carried out in November 2022 in Sumberarum Village, Kapanewon Moyudan, Sleman Regency, Yogyakarta. The implementation stage of this research has obtained ethical permission from the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, which is documented with letter number KE/FK/0069/EC/2023. In this study, we refer to the Indonesian National Standard (SNI) number 01-2346-2006[13], which stipulates that the minimum number of respondents for organoleptic or sensory tests is 30 people and the respondents in this study were toddlers totaling 59 children. The inclusion criteria used in the selection of respondents involved toddlers aged 12-59 months who were willing to be part of the study, and had obtained approval from parents or guardians, which was indicated by filling out and signing an informed consent form. The exclusion criteria in this study include toddlers who experience sensory disorders. The research data that we collected is presented in three main categories, involving organoleptic tests, acceptability tests, and nutritional content analysis of "Previmin" jelly candy. In terms of the organoleptic test, we used six different indicators that ranged from 6 (strongly like) to 1 (strongly dislike). Mothers of toddlers were asked to fill in the indicators according to their children's expressions when consuming the "Previmin" jelly candy. Each value was then matched by giving a check mark (V) on the corresponding face expressions indicator, as listed in the following Table 1. Meanwhile, in evaluating the acceptability test, we assessed whether or not the "Previmin" jelly candy product was consumed by the toddlers. Thus, this study summarizes various aspects to provide a more thorough understanding of the response and acceptability of the product.

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Table 1. Organoleptic Test Indicators

Indicators	Strongly dislike	Dislike	Somewhat dislike	Somewhat like	Like	Strongly like
After finishing the "Previmin" jelly candy						

The analysis of macronutrient content and the analysis methods used are based on SNI 01-2891-1992[14], including energy and carbohydrate content using the calculation method (IK.7.2.3), protein content using the Kjeldahl method, total fat content using the hydrolysis method (Weibull), saturated fat content using the Gas Chromatography (GC) method, and sugar analysis using the Luff Schoorl method. Furthermore, for the analysis of micronutrient content and analysis methods used are sodium content using the Association of Official Analytical Chemist (AOAC) method 985.35 (50.1.14.2011)[15], ash content using the method of burning in a furnace until it becomes ash which is then calculated gravimetrically in accordance with SNI 3547-2-2008[16] appendix B.4, moisture content using the oven method which is then calculated gravimetrically in accordance with SNI 3547-2-2008[16] appendix B.3.1, vitamin content using the High Performance Liquid Chromatography (HPLC) method, and iron and zinc content using the AOAC 999.11 method (9.1.09.2011)[15]. Then the analysis of heavy metals and microbial contaminants, the analytical method used for lead, cadmium, mercury, and arsenic levels was the same method, namely Atomic Absorption Spectrophotometry (AAS), selenium levels using the AOAC method, Official Method, 986. 15 (2011)[15], tin levels using the British Standard (BS) EN 15764: 2009[17] method, total plate count levels using SNI ISO 4833-1: 2015[18] and SNI ISO 7218: 2012[19], coliform levels using a test method based on the *Bacteriological Analytical Manual* (BAM)[20] Chapter 4, while for mold and yeast levels tested using the *Bacteriological Analytical Manual* (BAM)[20] Chapter 18.

The development of the formula for "Previmin" jelly candy involved a careful and measured composition of ingredients. The formula was carefully designed, using a combination of glucose, sucrose, water, gelatin, citric acid, and essences, as the basis of the formulation. The formula development process not only included these basic ingredients, but also involved the addition of premixes consisting of 12 types of vitamins, 4 minerals, and prebiotic FOS (Fructooligosaccharide). Prebiotic FOS is presented as a source of soluble fiber that has significant benefits in maintaining a healthy digestive system. In the context of mass production of "Previmin" jelly candy for this study, the main reference is to use a formula that has been tested in previous studies. This formula contained 10% gelatin and 2.5% konjac glucomannan[11,12], which has been shown to provide optimal results. This large-scale production process refers to previous research to ensure consistency and excellence of the formulation. "Previmin" jelly candy itself comes in two flavors, namely Strawberry and Grape. The selection of these two flavors aims to increase product acceptance by toddlers. This approach was taken with the belief that a variety of flavors can make jelly candy more easily accepted and enjoyed by toddlers, thus providing a more enjoyable consumption experience and meeting nutritional needs well.

RESULTS AND DISCUSSION

The manufacture of "Previmin" jelly candy on a larger production scale is carried out in a factory in compliance with strict standards, especially SNI 3547-2-2008[16] concerning Jelly Candy. "Previmin" jelly candy is produced with good quality and has passed the test in accordance with these standards. One of the advantages of this jelly candy is its soft texture, which is obtained through the addition of ingredients such as gelatin. The addition of gelatin gives the product a distinctive chewiness, making it more attractive and palatable. The organoleptic test and acceptability evaluation process was carried out successfully in Sumberarum Village, Kapanewon Moyudan, Sleman Regency, Yogyakarta. A total of 59 toddlers participated in this activity, accompanied by their mothers to interpret the test. The participation of toddlers in organoleptic tests is important to understand the reactions and preferences of young consumers to "Previmin" jelly candy. The organoleptic and acceptability test was conducted in conjunction with the soft launching event of "Previmin" jelly candy. This event aims as a platform to officially introduce this innovative product to the public. "Previmin" jelly candy with prebiotics, multivitamins, and minerals is expected to make a positive contribution in meeting the nutritional needs of children and is expected to play a role in efforts to reduce stunting rates in the Special Region of Yogyakarta.

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Figure 1. "Previmin" Jelly Candy Products

Respondent Characteristics

Table 2. Characteristics of Respondents of Organoleptic Test of Jelly Candy "Previmin"

Toddler Age	n (N=59)	%
12-24 months	5	8,4
25-36 months	19	32,2
37-48 months	24	40,7
49-59 months	10	17
Unknown	1	1,7

The organoleptic test of "Previmin" jelly candy involved the active participation of 59 toddlers from Sumberarum sub-district, Kapanewon Moyudan, Sleman Regency, Yogyakarta. The majority of the toddlers involved in this test were aged between 37 to 48 months, which consist of 24 respondents. However, there was one respondent whose age was not specifically known. The selection of this age range was not made arbitrarily but based on the consideration that in the age range of 1 to 5 years, because children show higher enthusiasm for their surroundings. At this age, children tend to be more expressive in giving reactions to various stimuli, including consumer products such as jelly candy[9]. In addition, the age range of 1 to 5 years is also considered a golden period or golden age in a child's life. During this period, a child's physical, mental and social development reaches its peak. Therefore, giving maximum attention to nutritional intake is very important to ensure daily nutritional needs are met and to prevent the risk of malnutrition, including serious problems such as stunting. By involving toddlers at this very significant age range, the "Previmin" jelly candy organoleptic test can provide a more holistic understanding of how this product is received and enjoyed by its target consumers[21].

Organoleptic Test Results of "Previmin" Jelly Candy

Table 3. Average Score of Organoleptic Test Results of "Previmin" Jelly Candy

Indicators	Average Score
Color	5,44
Aroma	5,20
Taste	5,44
Texture	5,24

Based on the analysis of the questionnaire results from the 59 respondents, it can be revealed that the average organoleptic test of "Previmin" jelly candy reached 5.44 for color indicator, 5.20 for aroma indicator, 5.44 for taste indicator, and 5.24 for texture indicator. Looking at the average value, it can be concluded that "Previmin" jelly candy is highly preferred by toddlers, because it gets an average value of around 5, which indicates an indicator of liking. The interpretation of this value illustrates that the color, aroma, taste, and texture aspects of "Previmin" jelly candy are overall very positive and satisfying according to the perceptions of toddlers who become the respondents. This is also in accordance with previous research[11,12], where the formula used in making "Previmin" jelly candy was chosen based on the preferences most favored by toddlers. This success shows that the team has succeeded in identifying and applying the optimal formula and in accordance with the preferences of its target consumers. Thus, the results of this organoleptic test provide a solid foundation in ensuring that "Previmin" jelly candy not only meets high nutritional standards, but also appeals to the overall preferences of toddlers.

The color indicator plays a very significant role in product assessment because color could create a subjective first impression on respondents. Attractive colors can provide strong visual appeal, encouraging respondents' interest in exploring the product further, even trying the product[22]. The success in creating attractive colors on "Previmin" jelly candy is a key factor in increasing the attractiveness of this product by the toddlers. In addition to color indicator, organoleptic evaluation also involves other aspects such as aroma, taste, and texture. Aroma and taste indicators are often interrelated, where products with a strong aroma can have a direct influence on the taste experience.

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Interestingly, aroma is often considered to be one of the most difficult aspects to describe, as aroma descriptions can be highly subjective and vary. In the context of "Previmin" jelly candy, a strong aroma can be a key trigger in whetting a toddler's appetite for the product. Meanwhile, texture indicators involve evaluation through the sense of touch, considering aspects such as size, shape, and constituents of the ingredients. This assessment can only be done by directly touching the product, ensuring that the texture of the "Previmin" jelly candy meets quality standards and can provide an optimal consumption experience[23].

Acceptability Test Results of "Previmin" Jelly Candy and Consumption of Similar Products

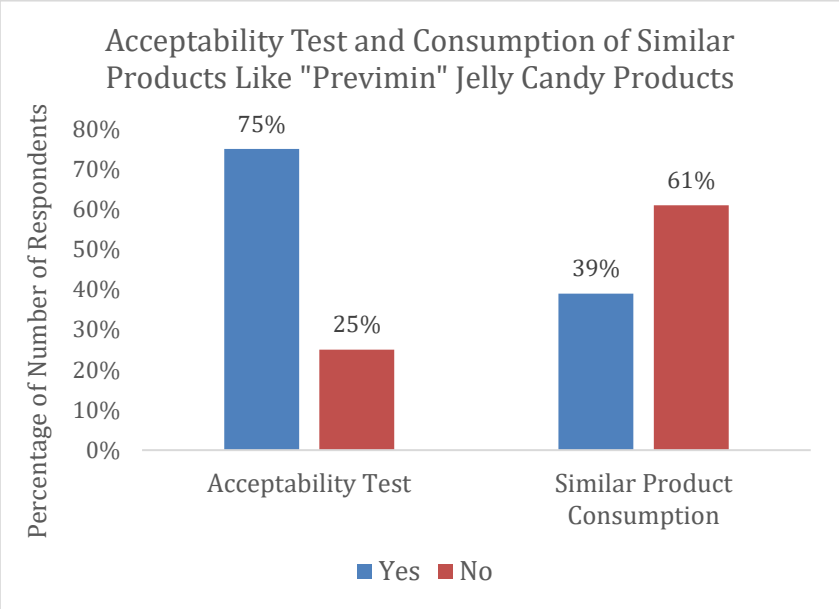

Figure 2. Graph of Acceptability and Consumption Test of Similar Products Like "Previmin" Jelly Candy Products

The results of the questionnaire analysis involving 59 respondents presented data that reflected the consumption patterns and preferences of respondents for "Previmin" jelly candy. Majority of the respondents, 44 respondents to be exact (about 75%), showed the ability to finish the sample product of "Previmin" jelly candy given to them. This result indicates that most respondents have an active consumption level of this product, reflecting a good acceptance of "Previmin" jelly candy. In contrast, there were 15 respondents (about 25%) who did not finish the sample product, possibly due to personal preferences or other considerations that influence consumption decisions.

From the results of the same questionnaire, it can be identified that most respondents, namely 36 respondents (about 61%), do not take multivitamins similar to "Previmin". This indicates that "Previmin" jelly candy not only fulfills nutritional needs but can also replace or become an alternative for respondents who did not previously take similar supplements. On the other hand, 23 respondents (around 39%) took similar multivitamins, including various brands such as Curcuma Plus, Egoji, Blackmores, Fitkom Gummy, Marine Gummy, Yummy Gummy, and Youvit Gummy. This fact shows the variation in preferences among respondents, with some opting for other brands while others chose "Previmin" jelly candy as their supplement of choice. This provides a more in-depth picture of the position of "Previmin" jelly candy in the supplement market, highlighting the extent to which this product can compete and fulfill consumer needs amidst the variety of similar products available.

Acceptability of a product can be affected by several factors, including lack of knowledge, low motivation, and lack of food security. These factors can influence a child's upbringing and, therefore, provide additional insight into how the consumption of "Previmin" jelly candies may be accepted in a toddler setting that may be influenced by family and neighborhood dynamics. By expanding knowledge on the extent to which these factors play a role in product acceptability, we can better understand the context of "Previmin" jelly candy consumption in children's daily lives[24].

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Nutritional Value Content of "Previmin" Jelly Candy
Macronutrients

Table 4. Macronutrient Content of "Previmin" Jelly Candy

Test Parameters	Nutrient Content
Energy (per 20 g serving), kcal	70
Protein, %	5,35 ± 0,17
Total carbohydrate, %	86,25 ± 0,78
Sugar, %	56,40 ± 1,41
Total fat, %	0,73 ± 0,06
Saturated fat*, %	0,34 ± 0,04
Ash content, %	0,15 ± 0,00
Water content, %	7,45 ± 1,12

*Outside the scope of the accreditation

Testing of the nutritional content of "Previmin" jelly candy was carried out at the BBSPJIA laboratory which has been accredited by the National Accreditation Committee (KAN), except for the analysis of saturated fat. The macronutrient content of Previmin jelly candy is presented in percent (%) and energy is calculated per serving size of 20 grams (Table 4). Since this was the first time the product was analyzed for nutrient content, the macronutrient content could not be compared with previous studies. However, the ash content and water content can be compared with SNI 3547-2-2008[16] and have met the standards because the requirements for jelly candy have a maximum ash content of 3% and a maximum water content of 20%.

The results of the macronutrient content analysis have positive implications for "Previmin" jelly candy. This product is considered suitable as an alternative to Supplementary Feeding for toddlers to prevent stunting. One serving of "Previmin" jelly candy weighing 20 grams shows high nutritional density and is safe for consumption. With the consumption of one serving of "Previmin" jelly candy every 2 days, a maximum of 3 candies per day, it can fulfill about 5% of the Nutrition Adequacy Rate (AKG) in toddlers. The presence of protein in "Previmin" jelly candy provides added value, supporting the growth and development process of toddlers to minimize the risk of malnutrition[22]. The presence of saturated fat, although potentially increasing the risk of cardiovascular disease, can still be considered safe in the serving of "Previmin" jelly candy. This refers to the Acceptable Macronutrient Distribution Ranges (AMDRs), which stipulate that saturated fat intake is still below 10% of total energy[25], ensuring that the consumption of "Previmin" jelly candy is still in accordance with applicable health standards. Therefore, the results of this macronutrient content analysis provide a strong basis for positioning "Previmin" jelly candy as a healthy and nutritious choice for consumers children under the age of five.

Micronutrients

Table 5. Micronutrient Content of "Previmin" Jelly Candy

Test Parameters	Nutrient Content
Natrium (mg/100 g)	9,79 ± 13,31
Vitamin	
Vitamin A (IU/100 g)	3706,00 ± 427,09
Vitamin B1 (mg/Kg)	288,50 ± 13,44
Vitamin B2 (mg/Kg)	14,80 ± 0,00
Vitamin B6 (mg/Kg)*	21,65 ± 0,64
Folic Acid (mg/g)*	5,40 ± 0,49
Vitamin C (mg/Kg)	836,00 ± 69,30
Vitamin E (mg/100 g)	7,57 ± 1,63
Mineral	
Iron (Fe, mg/kg)	15,35 ± 1,91
Zinc (Zn, mg/kg)	175,00 ± 5,66

*Outside the scope of the accreditation

The micronutrient content of “Previmin” jelly candy can be seen in Table 5. Almost all test parameters have been accredited by KAN, except for vitamin B6 and folic acid. Since this is the first time this product has been analyzed, the micronutrient content cannot be compared with previous studies. In addition to focusing on macronutrients, attention to micronutrients is also essential. Natrium plays an important role in regulating fluid balance, conducting nerve impulses, and supporting muscle function. Iron, which is also contained in "Previmin" jelly candy, plays a role in supplying oxygen to the whole body and supports the increase of hemoglobin levels in the blood. Hemoglobin deficiency can lead to anemia, with adverse effects such as susceptibility to infections[22] and other health problems. Zinc, which is also present in "Previmin" jelly candy, has vital functions for wound healing, cell growth and division, and increasing appetite[26].

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"Previmin" jelly candy not only boasts a delicious taste, but also presents rich nutrition in the form of vitamins, including vitamin A, vitamin B complex, vitamin C, and vitamin E. Each vitamin has its unique function and complements each other, with the main purpose of increasing the body's resistance. Vitamin A, as one of the key components, has an important role in maintaining eye health, supporting body growth, participating in bone formation, maintaining healthy skin, and assisting in the formation of thyroid hormones[27]. Furthermore, vitamin B complex consisting of B1, B2, B6, and B9 (folic acid) is also found in "Previmin" jelly candy. The content of these vitamins in "Previmin" jelly candy does not cause side effects because they are still in reasonable amounts and have a very vital role. In addition to functioning as antioxidants, B-complex vitamins play a role in cell development, the conversion of carbohydrates and glucose into energy[28], the formation of blood cells to prevent anemia, maintain the health of the nerves, brain, heart, and gastrointestinal tract, and contribute to DNA repair[29,30]. Complementing the two vitamins, "Previmin" jelly candy also boasts vitamin C and vitamin E. Vitamin C plays an important role in enhancing nutrient absorption, strengthening white blood cells to fight pathogens in the body, and promoting collagen production[31]. On the other hand, vitamin E functions as an antioxidant substance that fights free radicals, maintains hormonal balance, has anti-inflammatory properties, and is known to have potential as an anti-cancer substance[32].

Thus, the results of this micronutrient content analysis strengthen the claim that "Previmin" jelly candy not only provides taste satisfaction but also makes a significant contribution in meeting daily nutritional needs, especially for toddlers. Despite some notes related to vitamin B6 and folic acid, "Previmin" jelly candy remains a nutritious and safe choice for toddler consumers.

Heavy Metals

Table 6. Heavy Metal Content of "Previmin" Jelly Candy

Test Parameters	Heavy Metal Content	SNI 3547-2-2008 Standard
Lead (Pb, mg/kg)	<0,034 - 0,09	Max 2.00
Cadmium (Cd, mg/kg)	<0,007	NA
Selenium (Se, mg/kg)*	0,385	NA
Tin (Sn, mg/kg)	0,36	Max 40.00
Mercury (Hg, mg/kg)	<0,005	Max 0.03
Arsenic (As, mg/kg)	<0,013	Max 1.00

*Outside the scope of the accreditation

The heavy metal content of "Previmin" jelly candy can be seen in Table 6. Almost all heavy metal test parameters are accredited by KAN, except selenium. Since this is the first-time heavy metal analysis has been conducted, it cannot be compared with previous studies but has been compared with SNI 3547-2-2008[16]. Nevertheless, the content of heavy metals such as lead, cadmium, tin, mercury, and arsenic in "Previmin" jelly candy can be declared still safe for consumption without causing health problems. These results provide confidence that "Previmin" jelly candy meets the heavy metal safety standards set by health regulatory agencies, despite being the first test for heavy metals.

The presence of heavy metal levels in food can be influenced by several factors, such as wind direction, lead content in the air, the location of the food manufacturing plant, and the distance between the food and the road. This information helps to understand the context of heavy metal content in "Previmin" jelly candy and provides confidence that the results are within safe limits for consumption[33]. However, it should be noted that the selenium level in "Previmin" jelly candy exceeded the standard. However, this is not necessarily harmful to health, as selenium has important roles as an antioxidant, anti-inflammatory, anti-microbial, can inhibit cancer, and can interact synergistically with vitamin E to provide maximum benefits to the body[34].

Microbial Contamination

Table 7. Microbial Contamination Content of "Previmin" Jelly Candy

Test Parameters	Microbial Contaminant Content	SNI 3547-2-2008
Total Plate Count (colonies/g)	<10	Max 5 x 10^2
Coliform (APM/g)	<3	Max 20
Mold (colonies/g)	<10	Max 1 x 10^2
Yeast (colonies/g)	<10	Max 1 x 10^2

All microbial contamination analysis methods carried out in the BBSPJIA laboratory have been accredited by KAN. The content of microbial contamination in jelly candy "Previmin" is in accordance with SNI 3547-2-2008[16]. The absence of levels that exceed the standard on the parameters of Total Plate Count (TPC), coliform, mold, and yeast in jelly candy "Previmin" can be stated still safe for consumption without causing health problems. The presence or absence of Total Plate Count is not related to the danger of a food, but rather indicates the quality of the food which can be seen from the shelf life and hygiene of the product during manufacture. For mold or fungi, the appearance of hyphae-forming fungi can arise due to the storage time, temperature, moisture content, and humidity of the product where if the food already has mold that causes

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an unpleasant aroma. The food is not suitable for consumption because it is already at the stage of spoilage[35]. Just like mold, the presence of yeast can also be caused by a lack of heating stage so that mold and yeast still survive, generally the growth of yeast is accompanied by the presence of alcohol and CO_2 gas which causes the packaging to bulge. Yeast is often found in packaged fruit, jam, and jelly but yeast also cannot cause disease in humans just like mold[36]. Furthermore, coliform is a class of bacteria that can cause foodborne disease because these bacteria will live and develop in the digestive tract which can then turn into pathogenic bacteria that trigger diarrhea. Coliform bacteria that are often found in food are Escherichia coli. E. coli bacteria is one of the factors of poor sanitation during food processing[37]. Therefore, the microbial test results on "Previmin" jelly candy show that this product has met the hygiene and safety standards.

The research conducted on "Previmin" jelly candy certainly brings several advantages and certain disadvantages/limitations. One of the main advantages of this research is that the jelly candy product "Previmin" has been produced using a real factory setting. In terms of organoleptic tests, acceptability tests, and nutritional content analysis, the results obtained were very positive and satisfactory. The success of this research indicates that "Previmin" jelly candy is ready to be directed to the commercialization stage easily, strengthening the prospects for the sustainability of this product in the market.

However, along with these advantages, this research also has several shortcomings. One of the shortcomings that can be noted is that no research has been conducted related to the durability or shelf life of the product. This is relevant considering the content of micronutrients, such as iron, contained in “Previmin” jelly candy. Over time during storage, iron can affect the organoleptic characteristics of the product, including changes in color, taste, aroma, and texture. Therefore, this aspect deserves special attention in future studies. In addition, it should be noted that in the assessment and interpretation of results on a visual scale, there is no measurable standardization. Therefore, the interpretation made by mothers or test participants regarding the organoleptic jelly candy "Previmin" may not be completely consistent. Better standardization in visual assessment could improve the validity of the study results and provide a deeper understanding of consumer preferences and perceptions of the product.

Recognizing these strengths and weaknesses, this study provides a strong foundation for further development, which could include further research aspects related to product shelf life, increased standardization in organoleptic test assessment, and measures to ensure optimal product quality during mass production and distribution.

CONCLUSION

Through the organoleptic tests that have been conducted, it can be concluded that "Previmin" jelly candy received a positive response from toddlers, where most of them showed a preference for this product. In addition, the data also indicated that the majority of toddlers were able to finish the "Previmin" jelly candy. The results of the nutritional content analysis showed that "Previmin" jelly candy has a good density of macro and micronutrients. This "Previmin" product has met the standards for heavy metal levels and microbial contamination, making it safe for consumption from a nutritional and health perspective.

The suggestion for further research is to involve a power test or product shelf life. Considering that “Previmin” jelly candy contains iron, which during storage can affect the organoleptic characteristics of the product, a shelf-life test would provide a deeper understanding of how “Previmin” jelly candy can maintain its quality over a long storage period. In addition, it is necessary to align the mother's perception or standardization in giving values on a visual scale to improve accuracy and consistency in the interpretation of organoleptic results by respondents. This will strengthen the validity of the study and increase confidence in the data obtained.

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CONFLICTS OF INTEREST AND SOURCES OF FUNDING

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