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Functional jelly candy of moringa leaves, ginger, and dragon fruit for pregnant women

Permen jelly fungsional dari daun kelor, jahe dan buah naga bagi ibu hamil

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Abstract

Introduction: To ensure sufficient iron intake while addressing nausea in pregnant women, innovative food products that utilize local ingredients are required. The health benefits of moringa leaves, ginger, and dragon have been well documented; however, research on the combined effects of these ingredients in functional food formulations specifically designed for pregnant women is limited.
Objectives: This study aimed to develop a jelly candy formulation combining moringa leaves, ginger, and dragon fruit as an alternative source of iron and an anti-nausea remedy for pregnant women.
Methods: This study employed a completely randomized experimental design, using jelly candy formulations from combinations of moringa, ginger, and dragon fruit. The research was conducted at the Organoleptic Laboratory Health Polytechnic of the East Kalimantan and Politani Laboratory from July to August 2024. The study involved one factor: variations in moringa powder concentration, which were 0.5% (F1), 1% (F2), and 1.5% (F3), with three replicates. The jelly candy formulations were subjected to hedonic testing by 33 untrained panelists for color, taste, aroma, and texture, followed by chemical characteristic testing. Data analysis was performed using one-way ANOVA and post hoc Duncan's multiple range test.
Results: The study results indicate that the three formulations showed a significant difference only in texture attributes (p = 0,033), while color, taste, and aroma remained at comparable levels. The formulation with the most preferred taste, aroma, and texture was F3, with a taste score of 3,5, aroma scores of 3,3, and texture score of 3,8. The most preferred color attribute was F1, with a score of 3,9. Significant differences were found among the three formulations in terms of moisture content (p = 0,030), ash content (p = 0,010), sucrose content (p = 0,000), and iron (Fe) content (p = 0,002).
Conclusion: The F3 jelly candy can be used as an alternative snack, providing both iron supplementation and anti-nausea benefits for pregnant women. It can be consumed in addition to iron tablets and multivitamins.

Keywords:
Anemia, Anti-Nausea, Jelly Candy, Ginger, Moringa

Abstrak

Latar Belakang: Dalam mencukupi asupan zat besi dan menangani permasalahan mual pada ibu hamil diperlukan inovasi makanan dari pangan lokal. Manfaat daun kelor, jahe dan buah naga sudah terdokumentasi dengan baik namun terdapat sedikit penelitian mengenai efek kombinasi bahan-bahan ini dalam formulasi makanan fungsional untuk ibu hamil.
Tujuan: Penelitian ini bertujuan untuk menghasilkan formulasi permen jelly kombinasi daun kelor, jahe dan buah naga sebagai alternatif sumber zat besi dan anti mual bagi ibu hamil.
Metode: Penelitian ini menggunakan desain eksperimental Rancangan Acak Lengkap dengan formulasi permen jelly dari kombinasi kelor, jahe dan buah naga. Penelitian dilakukan di Laboratorium Organoleptik Poltekkes Kalimantan Timur dan Laboratorium Politani pada bulan Juli hingga Agustus 2024. Penelitian dilaksanakan menggunakan satu faktor yaitu variasi konsentrasi bubuk kelor terdiri dari 0,5% (F1); 1% (F2) dan 1,5% (F3) dengan 3 kali pengulangan. Formulasi permen jelly dilakukan uji organoleptik pada 33 panelis tidak terlatih untuk aspek warna, rasa, aroma dan tekstur

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kemudian dilanjutkan dengan pengujian karakteristik kimia. Analisis data menggunakan one way Anova dan posthoc Duncan Multiple Range Test (DMRT).
Hasil: Hasil penelitian menunjukkan bahwa ketiga formulasi hanya berbeda signifan pada atribut tekstur (p= 0.033), sedangkan untuk warna, rasa dan aroma berada pada tingkat yang sama. Formula dengan rasa, aroma dan tekstur yang paling disukai adalah F3 dengan skor rasa 3,5, aroma 3,3 dan tekstur 3,8, sedangkan untuk atribut warna yang paling disukai adalah F1 dengan skor 3,9. Terdapat perbedaan signifikan antara ketiga formulasi pada kadar air (p= 0,030), kadar abu (p= 0,010), sukrosa (p= 0,000) dan Fe (p= 0,002).
Kesimpulan: Permen jelly F3 dapat dijadikan sebagai alternatif kudapan sumber zat besi dan anti mual bagi ibu hamil yang dikonsumsi sebagai tambahan selain konsumsi tablet tambah darah.

Kata Kunci:
Anti-Mual, Anemia, Jahe, Kelor, Permen Jelly

Introduction

According to the WHO about 40% of maternal deaths in developing countries are related to anemia in pregnancy (Indrayani & Kurniati, 2024). According to data from the 2023 Indonesia Health Survey, approximately 27,7% of pregnant women in Indonesia are anemic lower than data from the 2018 figure of 48,9% (Badan Kebijakan Pembangunan Kesehatan, 2023). This decrease in prevalence related to higher compliance to iron supplementation in 2023 was 44,2% consumed more than 90 tablets, whereas in 2018 its was only 37,7%. This figure is quite high and shows that many pregnant women in Indonesia do not receive adequate nutrition during pregnancy. This figure is quite high and shows that many pregnant women in Indonesia do not receive adequate nutrition during pregnancy. Anemia in pregnant women in Indonesia is caused by several factors, including dietary iron deficiency, chronic energy deficiency (OR 1.975), infections, antenatal care compliance, zinc intake (Margawati et al., 2023; Tanziha et al., 2016), and other health problems. Anemia in pregnant women can cause various complications such as higher risk of preterm labor, low birth weight babies, and is associated with increased maternal morbidity (Amini et al., 2022; Breymann, 2015).

To prevent anemia in pregnant women, it is important to monitor iron and folic acid intake. The Indonesian government has made various efforts to provide iron tablet supplements containing iron (Fe) and folic acid to overcome anemia in pregnant women. As many as 55,9% of pregnant women in Indonesia have received iron tablet supplements, but only 43,1% consumed ≥90 tablets (Badan Kebijakan Pembangunan Kesehatan, 2023). This shows that adherence to iron tablets among pregnant women remains very low. One of the reasons for the low compliance with iron tablet consumption is the complaints of nausea and odor from iron tablets. Nausea and vomiting are common complications in pregnancy (Saberi et al., 2014).

The development of innovative snacks utilizing locally sourced ingredients is necessary to ensure adequate iron intake and to alleviate nausea in pregnant women. Moringa leaves and dragon fruit are local plants that can improve the nutrition of pregnant women and Hb levels. Based on the results of research, Moringa leaves contain vitamin A, vitamin B, vitamin C, calcium, iron, and protein in very high amounts that are easily digested by the human body.

Therefore, moringa leaves are very good for consumption by pregnant women both in the form of vegetables, flour, extracts, steeping, and others (Yuliastuti & Kurnia, 2021). According to Asriyapati (2020), moringa leaves have been proven to increase hemoglobin levels in anemic adolescent girls because the iron content is high at 28 mg in powder form. Some studies indicate that dragon fruit is effective in raising hemoglobin levels in pregnant women with mild anemia (Indrayani & Kurniati 2024;Futriani et al. 2024; Rahmiati et al. 2023).

Dragon fruit is a rich source of iron and plays a role in enhancing hemoglobin levels in pregnant women. Its iron content ranges from approximately 0.55 to 0.65 mg per 100 grams, contributing to erythropoiesis and overall maternal health (Indrayani & Kurniati 2024). In dealing with nausea, antiemetic and non-pharmacological interventions, such as ginger, are effective in reducing the frequency of nausea and vomiting.

Ginger is a plant that has been used to treat all types of nausea and vomiting, including pregnancy (Lete & Allué, 2016; Saberi et al., 2014; Stanisiere et al., 2018; Thomson et al., 2014). The

effect of ginger in treating nausea and vomiting is due to its anticholinergic and antihistamine (Firouzbakht et al., 2014). Ginger inhibits serotonin receptors. This inhibition contributes to its antiemetic properties, affecting both the gastrointestinal and central nervous systems (Anita et al. 2020). The typical daily dosage is approximately 1 g, administered in divided doses of two–four times per day (Lindblad & Koppula, 2016).

The combination of moringa leaves, ginger, and dragon fruit in jelly candy, a type of snack with a sweet taste and unique texture, is expected to be a solution for anemia and nausea in pregnancy. Jelly candy is expected to suppress nausea and vomiting in pregnancy, so macro and micronutrients, including iron intake, can be increased. Increased iron consumption is expected to reduce the incidence of anemia in pregnant women, especially during early pregnancy. This study aimed to produce jelly candy formulations and analyze their chemical characteristics, organoleptic properties, and Fe content using a combination of moringa, ginger, and dragon fruit as an alternative source of iron and anti-nausea for pregnant women.

Method

This study used an experimental design by preparing jelly candy formulations from a combination of moringa leaves, ginger, and dragon fruit. The research was conducted using a completely randomized design (CRD) with one factor, namely variations in moringa concentration, and three repetitions. The concentration of moringa powder consisted of 0,5%; 1% and 1,5% with other added ingredients, such as water, gelatin, and sugar, remaining the same for all formulations. The dependent variables measured in this study were chemical analysis such as water content, ash content, sucrose, and iron content. The other dependent variable was sensory analysis. This research was conducted at the Food Science Laboratory and Organoleptic Test of Health Polytechnic of East Kalimantan and the Analytical Chemistry Laboratory of Politani Samarinda from January to September 2024.

The tools used in the research were a refrigerator, stove, blender, digital balance, basin, pot, cutting board, candy mold, sieve, stirrer, knife, and thermometer. The materials used to make candy are moringa powder, dragon fruit, ginger, granulated sugar, and gelatin. This formula was divided into three formulations with the composition of moringa leaf extract in F1 as much as 1 g (0,5%), F2 as much as 2 g (1,0%), and F3 as much as 3 g (1,5%). Dragon fruit juice used was 200 g, gelatin (36 g), and ginger extract 0,5g in each formula. The process of making jelly candy involves the following steps:

1. Dragon fruit is crushed with a blender, then filtered to get the juice
2. Dragon fruit juice as much as 200 grams and ginger as much as 0.5g is added with moringa powder according to each formulation, and 36 grams of gelatin is added, then allowed to stand until the gelatin expands
3. 35 grams of granulated sugar is preheated in teflon using low heat until it melts and then poured with the previous ingredients
4. Stirred until smooth and the liquid temperature reaches 90^{o}C
5. Jelly liquid was poured into the mold and cooled at room temperature for 1 h, stored in a refrigerator at 14°C for 12 h, and then allowed to stand at room temperature for 1 h.

Organoleptic tests were repeated three times for each treatment by 33 untrained panelists using the organoleptic test form (hedonic) with items of color, aroma, texture, and taste. The scale used in this sensory test was 5 scale which 5 is very like until 1 was disliked to determine the selected formula.

The chemical characteristics were examined for water and ash content (gravimetric method), sucrose analysis by the Lane and Eynon Method (spectroscopy), and sucrose and iron content (Fe) were carried out quantitatively using the redox titration method in the laboratory of Politani Samarinda. All analyses were repeated three times.

The data generated were tested for normality using the Shapiro-Wilk test and categorized as normal if the p-value was more than 0,05. The test data were processed using the analysis of variance (ANOVA) method, and if there was a significant difference, it was continued by using Duncan's Multiple Range Test (DMRT) at the 5% level.

Result

Table 1 presents the mean scores of the panelists' preferences for jelly candy across four sensory attributes: color, aroma, taste, and texture. The evaluation indicated varying levels of acceptance, with each attribute contributing differently to overall liking. The panelists assessed the samples using a standardized hedonic scale, allowing the comparison of the most and least preferred characteristics. These findings provide insights into consumer perception of jelly candy quality and highlight the attributes that play the most significant role in overall acceptability.

Table 1. Organoleptic test results of jelly candy formulations

Component	Mean±SD			p-value
	F1	F2	F3	
Color	3.9 ± 0.75	3.9 ± 0.72	3.8 ± 0.81	0.643
Aroma	3.3 ± 0.82	3.3 ± 0.82	3.3 ± 0.70	0.916
Taste	3.4 ± 1.04	3.5 ± 0.95	3.5 ± 0.97	0.683
Texture	3.4 ± 1.14[a]	3.6 ± 0.92[a,]	3.8 ± 0.92	0.033

Table 2. Test results of chemical characteristics and nutrients of jelly candy

Parameters	Mean± SD			p-value
	F1	F2	F3	
Water (%)	14.5 ± 3.62	19.2 ± 0.57	26.5 ± 5.97	0.030
Ash (%)	2.5 ± 0.46	2.7 ± 0.12	3.5 ± 0.16	0.010
Sucrose (%)	12.1 ± 0.11	17.3 ± 0.07	20.0 ± 0.24	0.000
Fe (mg)	0.9 ± 0.01	1.0 ± 0.03	1.6 ± 0.25	0.002

For color attributes, the average F1 score was 3,9, F2 was 3,9 and F3 was 3,8. For aroma attributes, the average F1 and F2 adna F3 scores were 3,3. For the flavor attribute, the average score of F1 was 3,4, F2 and F3 is 3,,5. Regarding texture attributes, the average scores for F1 was 3,4, F2 was 3,6 and F3 were 3,8. The ANOVA test showed that the three formulations were significantly different only in texture attributes, and the other three attributes were at the same level. DMRT further tests showed that the level of liking on texture attributes was significantly different between F1 and F3. Although the post-hoc test showed no significant difference between formulations F2 and F3, the F3 formulation was the most preferred in terms of texture attributes based on the average organoleptic test results.

Table 2 shows the test results of chemical and nutritional characteristics of the jelly candy formulations. The average moisture contents in F1 was 14,5%, F2 19,2% and F3 26,5%. The ash contents of F1 was 2,5%, F2 2,7% and F3 3,5%. The sucrose contents of F1 was 12,1%, F2 17,3% and F3 was 20,0%. Fe content in formula F1 was 0,9 mg, F2 was 1,00 mg and F3 was 1,60 mg. The F3 formulation, with the highest Fe content contributing 8,9% of the daily iron intake requirement for pregnant women aged 19–49 years in the first trimester. Anova test showed that the three formulations were significantly different in moisture content, ash content, sucrose, and Fe. DMRT further tests showed that moisture content was different between F1 and F3, ash content and Fe in F1 and F2 were different from F3, and sucrose was different for all formulas. The standard water content in jelly candy according to SNI had a maximum of 20% and a minimum sucrose content of 27%. F1 and F2 met the standard water content of jelly candy; however, none of the formulations met the requirements for sucrose content.

Discussion

Organoleptic Test of Jelly Candy

Organoleptic parameters analyzed by the hedonic test almost all parameters showed values that were not significantly different (color, aroma, and taste), except texture, with p<0,05. One of the ingredients used is gelatin which plays a role in making candy have a chewy texture like jelly. Gelatin is usually chosen because it does not significantly affect the nutritional content of candy or food products (Krisnadi 2019). The combined jelly candy formulation of moringa leaves, dragon fruit, and ginger was the formulation with the most moringa leaf extract added, which also showed

the highest moisture content compared to other formulas. The moisture content was inversely proportional to the dry matter (percentage of the dry part of the sample). An increase in the percentage of dry matter is associated with an increase in texture preference (Krisnadi, 2019).

The color ranged from 3,8 to 3,9 which means that it was liked by the panelists. The jelly candy produced was dark purple, and there was no difference between the formulas. This dark purple color is thought to originate from the use of dragon fruit as a raw material. Dragon fruit contains a betacyanin pigment, which is also present in beetroot and is a strong antioxidant. The total phenolic and flavonoid contents were 55 mg GAE and 35 mg CE per 100 g, while Fe was 1.5 mg Fe, Vitamin C was found at 6 mg/100 (Arivalagan et al., 2021).

The taste of the analyzed jelly candies showed no significant difference, despite the addition of moringa leaf extract. All formulations were acceptable and preferred by panelists. The highest addition of moringa leaf extract, 1.5%, is still preferred even when the value is higher than that of other formulations, presumably because the added moringa leaves can be covered by the taste of ginger, dragon fruit, and the sweetness of granulated sugar. These results are in line with previous research showing that the acceptability of moringa jelly candy is still acceptable because of the addition of moringa leaf powder at approximately 2% (Rahmawati & Adi 2017). The level of liking for this formulation was neutral. The same thing was also found by Amini et al. (2022) which stated that organoleptic acceptability in terms of taste, color and texture at the "neutral" level of liking was found in the process of fortification of hard *candy* made from moringa leaf powder.

The aroma of jelly candy combined with moringa leaf extract, dragon fruit, and ginger is acceptable to panelists because the value ranges is 3.3 for all formula, which means it is preferred. The aroma of jelly candy originates from the addition of ginger powder. The amount of ginger added to all formulations was the same, although there were differences in the percentage of moringa extract added. The results of this study are in line with previous research that states that panelists prefer the soft aroma of ginger in jelly candy (Prasetio et al., 2022). The addition of moringa leaf extract did not significantly affect the acceptance of aroma by panelists (Rahmawati & Adi, 2017). The formula selected in this study was F3 because there was no significant difference in the organoleptic parameters, and F3 was the most preferred formula.

Chemical and Nutritional Characteristics

Jelly candy is loved by all age groups, from children to adults. The jelly candy appears clear and has a soft texture. Jelly candy is prepared from granulated sugar, sucrose, and glucose syrup. However, hydrocolloids, such as gelatin, agar, gum, pectin, starch, and carrageenan, are added to make the product chewy (Fitria et al., 2018). Analysis of the nutritional content of jelly candy with a combination of moringa leaves, dragon fruit, and ginger was carried out by analyzing the water, ash, and iron (Fe) contents. Table 2 shows that there was a significant effect of moringa leaf extract concentration on moisture, ash, and iron content ($p<0,05$).

The moisture content was in the range of 14,5% to the highest is 26,5%. The results of the analysis of moisture content in F1 and F2 were still in accordance with the SNI 3547.2:2008 Confectionery standard for jelly candy by Badan Standarisasi Nasional (2008), where the maximum moisture content value was 20, whereas in, F3 the moisture content exceeded the SNI standard. The results of this study are not in line with previous studies that show the water content of dumbo catfish head jelly candy and dragon fruit juice has a water content of more than 20%. The moisture content of the candy ranged from 46,6% to 54,8%. The higher water content in F3 compared to the SNI standard is thought to be due to the high water content of dragon fruit (86 %).

The water content of dragon fruit jelly candy is thought to be influenced by the addition of gelatin, which acts as a gelling agent that can bind water in large quantities (Jutrialni et al., 2024). The addition of moringa leaf extract increased the water content, which was thought to be related to the addition of moringa leaf extract in the form of moringa powder. The water content of 100 g of moringa leaf extract was 6,12 grams (Isitua et al. 2014). Another study reported that dried moringa powder has a moisture content ranging from 7,55% to 8,65%, depending on the variety (Sultana, 2020). The moisture content in jelly candy can be reduced by oven drying or drying at room temperature.

Drying jelly candy from papaya seeds at room temperature for approximately 48 h resulted in a moisture content of 23,74%. Although it is higher than the SNI standard for jelly candy, which has a maximum value of 20%, the texture is chewier because room temperature can hold more water (Roudbari et al., 2024). The jelly candy formulation with the highest percentage of pistachio extract, stevia, and starch had the highest moisture content. Conversely, the addition of the lowest amounts of pistachio extract, starch, and stevia resulted in the lowest moisture content (Roudbari et al., 2024).

Water is an important parameter in confectionery product manufacturing because it affects the texture of the resulting candy. The increase in water content, along with an increase in the percentage of moringa leaf extract added to jelly candy, is related to the *water absorption capacity of* moringa leaf powder. *The water absorption capacity is* related to the ability of proteins to absorb water, which is related to the texture of food products. Water plays an important role in determining texture and how food feels when chewed. The capacity of proteins to bind water depends on their composition and conformation between protein molecules. Interactions between water and hydrophilic groups on protein side chains can occur through hydrogen bonding. The amount of water a protein can hold depends on its amino acid composition, surface hydrophobicity and processing (Sultana, 2020).

The ash content analysis showed results ranging from 2,5% to a maximum of 3,5%. Similar to the water content results, the ash contents for F1 and F2 were in accordance with SNI 3547.2:2008 Confectionery, which states that the maximum ash content standard for jelly candy is 3.0% of the mass fraction (Badan Standarisasi Nasional, 2008). Meanwhile, the ash content of F3 exceeded the standard value of 3.5%. The results of this study are in line with those of Martiana et al. (2021), who showed that the ash content of dumbo catfish head jelly candy and dragon fruit juice ranged from 0.64% to a maximum of 9,36%. The ash content of food or food products is related to their mineral content (Davies & Boley, 2019).

The ash content of moringa leaf powder ranged from 8,05% to 10,38% (Sultana, 2020). Another study reported an ash content of 11,50% (Isitua et al., 2014). The ash content also represents inorganic materials after all water content is removed, and organic materials, such as fat, protein, carbohydrates, vitamins, organic acids, and other molecules, are ignored. Minerals in moringa leaf powder are quite high such as calcium, copper, iron, potassium, magnesium, manganese and zinc. Dried Moringa leaves contain 2003 mg of calcium per 100 g, which is 17 times the calcium content in milk and its bioavailability is 8.79 times higher than milk (Krisnadi, 2019). The sucrose content of jelly candy with a combination of moringa leaves, dragon fruit, and ginger had the lowest value of 12.1% for F1 and the highest 20.0% for F3. This sucrose value is not in accordance with the SNI 3547.2:2008 confectionery for jelly candy, where the standard saccharose (sucrose) content is at least 27%. This value is lower than that of the SNI standard. Sucrose or saccharose, most commonly referred to as table sugar, is a key ingredient in confectionery/candy products because of its sweetness and texture-enhancing properties. Sucrose is a disaccharide consisting of two different monosaccharides, glucose and fructose, with α 1–2 glycosidic bonds (Efe & Dawson, 2022).

Sucrose has many influences on the final candy product, such as sucrose, which is a substance with hygroscopic ability and is referred to as a humectant, a function to trap water from the environment in two ways: absorption or adsorption. Sucrose suppresses water activity (Aw) and reduces the activity of microorganisms by lowering the degree of Aw. Other examples of humectants include corn syrup, inverted sugar, and polyols (Efe & Dawson, 2022).

Iron levels in jelly candy with a combination of moringa leaf extract, dragon fruit, and ginger were the highest in the formulation with the highest addition of moringa leaf extract (1,5%. Moringa leaf powder contains 28,2 mg/100 g of iron (Krisnadi, 2019).Iron levels in jelly candy with a combination of moringa, dragon fruit, and ginger extracts were higher than Fe levels in moringa and guava candy as an alternative snack high in iron and vitamin c for children with Fe levels of 0,94 mg/100 g (Dewi et al., 2023) compared to Fe levels in F3 of this study of 1,6 mg/100 g. Iron is an essential mineral in the human body and a constituent of hemoglobin, which plays a role in the transportation of oxygen. Iron deficiency can cause anemia, especially in pregnant women. The best formula in this test is F3, based on the purpose of making jelly candy, to increase Fe intake for pregnant women to prevent and treat anemia. The Fe content in formula 3 was the highest.

The iron content in jelly candy cannot match that in iron tablets provided by the government (60 mg/tablet). Direct supplementation at controlled doses can provide a rapid increase in hemoglobin levels and is easily distributed through maternal health programs despite side effects such as nausea, constipation, and gastrointestinal discomfort that may reduce compliance (Stoffel et al., 2020). Nausea and vomiting, which are more common in pregnancies under 20 weeks, require a product approach that can relieve nausea while providing iron for pregnant women.

Jelly candy presents a promising alternative for addressing iron deficiency; however, product optimization is necessary to ensure that it meets the established quality standards for jelly based confectioneries. Once optimized, jelly candy can serve as a complementary source of iron alongside conventional iron tablets or other multivitamin-multimineral supplements. This approach may enhance adherence to supplementation programs, while providing additional means of meeting nutritional requirements. Furthermore, integrating fortified jelly candy into local nutritional programs could support broader public health efforts to combat micronutrient deficiency.

The limitations of this study are the possible loss of nutrients in the heating process, lack of analysis of key variables related to shelf life, hedonic quality, and the antiemetic efficacy of the jelly candy. The high moisture content in this product shortens the shelf life; therefore, product reformulation is required. Pre-treatment of dragon fruit with drying may reduce the moisture content of the product. The absence of clinical trials also makes the efficacy of this product unknown for the prevention and treatment of nausea, vomiting, and anemia in pregnant women. Future research should focus on optimizing the formulation to align with established standards and conduct comprehensive evaluations of the anti-nausea effects of candy through rigorous testing.

Conclusion

The 1,5% (F3) jelly candy formulation was the most preferred formulation by the organoleptic test panelists. F3 is preferred because it has a chewier texture than other formulas. Chemical characteristics in the form of water content and ash content in formulas 0.5% and 1% met the SNI of jelly candy, but no formulation met the SNI standards for sucrose content. The 1,5% moringa formulation had the highest Fe content, which can contribute to the intake of Fe by 8,9% in the first trimester. This product can be considered as one of the variations of locally produced food to accompany the provision of multivitamins or iron tablets that have become government programs. Product optimization needs to be done, especially for water and sucrose content, which can affect the shelf life of the jelly candy. Drying methods and the addition of sugar may be required.

Declaration of Conflict of Interest

The authors affirm that they have no financial or non-financial competing interests.

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