The Effect of the Addition of Green Bean Puree on the Sensory Quality and Nutritional Content of Kaswi Cake

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Abstract

This study aimed to analyze the effect of adding mung bean puree on the sensory quality and nutritional content of kue kaswi. The research was conducted at the Pastry and Bakery Laboratory, Culinary Education Study Program, Universitas Negeri Jakarta, from August 2024 to August 2025. The experimental method was applied to kue kaswi samples with three different percentages of mung bean puree additions, namely 30%, 40%, and 50%. Based on the sensory quality analysis using the Kruskal-Wallis test, the addition of mung bean puree at 30%, 40%, and 50% did not significantly affect all evaluated sensory attributes. Statistical hypothesis testing on the proximate analysis using ANOVA showed that the addition of different percentages of mung bean puree had no significant effect on moisture content, ash content, or crude fiber content. However, it significantly affected fat content, with the best percentage being 30%, and protein content, with the best percentage being 40%. The study concluded that the optimal kue kaswi formulation with mung bean puree was the 40% formulation. Based on a sensory perspective, this formulation did not differ significantly from the control product, while from a nutritional perspective, it resulted in an increase in both fat and protein content.

INTRODUCTION

Mung beans (Vigna radiata L.) are a widely cultivated and popular commodity in Indonesia. According to data from the Ministry of Agriculture (2024), mung bean production in 2023 reached 166,090 tons. Java is the main mung bean producer in Indonesia, contributing 43,400 tons. Mung beans are a highly nutritious food source, rich in protein and fiber, cholesterol-free, and low in sodium and saturated fat.

100 grams of mung bean seeds contain 345 kcal of energy, 62.9 g of carbohydrates, 22.2 g of protein, 4.1 g of fiber, 125 mg of calcium, 157 g of vitamin A, 0.64 g of vitamin B1, and 6 mg of vitamin C (Mustakim, 2020). According to Fitriani & Taryono (2022), mung beans rank third as the highest source of vegetable protein after soybeans and peanuts. Mung beans are easy to process, from simple to modern dishes, and can be used as additional ingredients, fillings, or processed into semi-finished products such as purees.

According to Ariani (2013), puree is a food made by pureeing food ingredients such as fruit, vegetables, or nuts until they become a soft paste and a porridge-like texture. Processing raw materials into puree can facilitate distribution, maintain quality consistency, extend shelf life, and ensure the availability of materials for the next production process (Fatoni K, 2013). Research on the addition of puree to increase the nutritional value of traditional cakes has been conducted by Sari et al. (2020) and Arofah (2017), found that the use of puree can increase the nutritional value of traditional cakes and affect the organoleptic properties of the product. This shows that fortification with green bean puree has the potential to improve the nutritional quality of food products. One traditional food that has the potential to be modified with green bean puree is wet cake.

Wet cakes are a type of cake with soft and chewy characteristics and are generally made from simple and easily available ingredients such as wheat flour, rice flour, sago, sugar, and coconut milk (Cita Rasa Team, 2017). The use of simple raw materials in wet cakes raises concerns about their limited nutritional value. The nutritional content of wet cakes tends to be limited because the raw materials are dominated by carbohydrates and fat. The nutrients obtained from wet cakes are used to supplement the nutrients obtained from the main meal, so efforts are needed to develop wet cake products with balanced nutrition.

Kaswi cake is a traditional cake from Palembang, South Sumatra. Chinese-

Palembangnese people often serve this cake as part of traditional ceremonies (Astuti, 2022). Kaswi cake is made from simple, readily available ingredients such as wheat flour, tapioca flour, sugar, coconut milk, and pandan suji sediment. This combination of ingredients produces a soft and chewy texture. However, due to the simple ingredients used, the nutritional value of kaswi cake is still limited. To meet the increasing nutritional needs of the community, innovation in wet cake products is needed by enriching the nutritional content of wet cake products, namely kaswi cake.

The use of green beans has great potential in improving the quality of local food products, by turning them into purees as an additional ingredient in kaswi cakes. The addition of mung bean puree aims to increase the nutritional value as well as the influence on the sensory quality that includes aspects of color, texture, aroma, and taste.

METHOD

Types of research

The research method used is the experimental method to assess the effect of adding *puree*. The effect of mung beans on the quality of kaswi cakes. The sampling technique in this study used a simple random sampling method, in which each sample was given a random code known only to the researcher. The population in this study was kaswi cakes with the addition of puree green beans with samples namely kaswi cake addition *puree* green beans with different percentages, namely 30%, 40%, and 50%.

Data Collection

In assessing product feasibility, product validation was conducted by five expert panelists, namely lecturers from the Culinary Arts Education Study Program, Jakarta State University. Next, samples will be tested on 45 semi-trained panelists, namely students from the Culinary Arts Education Study Program, Jakarta State University to assess the sensory quality of kaswi cakes including color, pandan suji aroma, mung bean aroma, sweetness, savory coconut milk taste, mung bean flavor, soft texture, and chewy texture. Then the samples will be tested for nutritional content using a proximate test with the aspects tested being water content, ash content, protein content, fat content, and crude fiber content.

Making Green Bean Puree

The process of making mung bean puree requires clean and dry equipment and ingredients. The ingredients needed are mung beans that are bright green, firm, and smell fresh. Next, the mung beans are soaked for 8 hours with a ratio of 1:2 (mung beans: water) then continued by boiling the mung beans for 20 minutes with a ratio of 1:5 (mung beans: water). The softened mung beans are then pureed using a blender; to produce a puree with a smooth consistency, it is continued by filtering using a sieve with a size of 40 mesh. The finished mung bean puree is transferred to an airtight container and stored in the freezer.

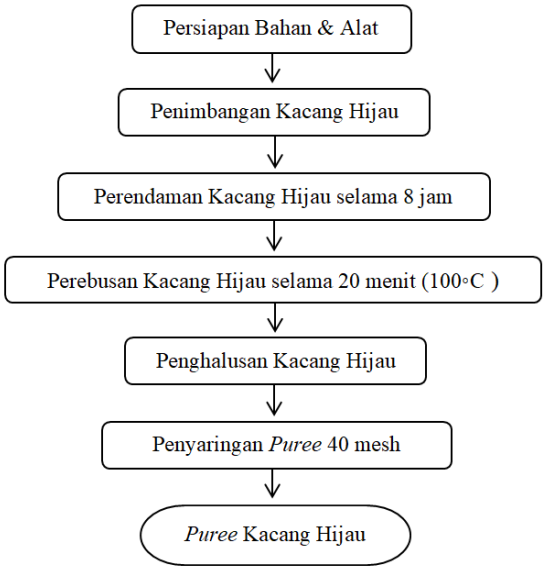


Figure 1 Process of Making Green Bean Puree

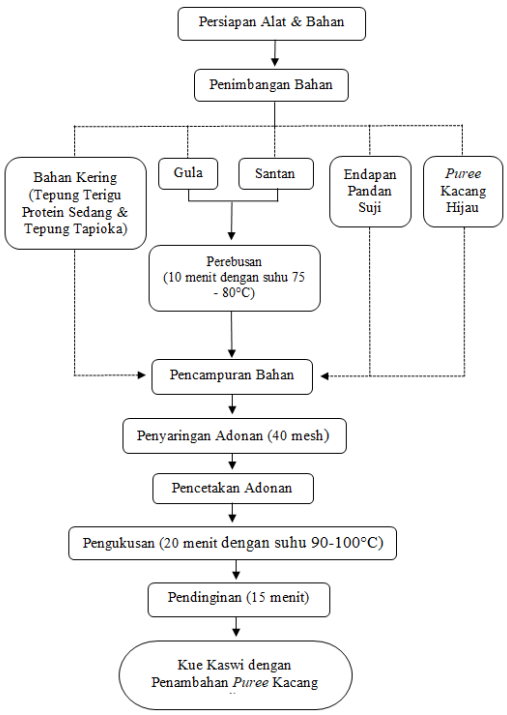
Figure 2 Green Bean Puree

Making Kaswi Cake

Table 1 Standard Formulation of Kaswi Cake

Material	Amount	
	Gram	%
Flour	250	79,3
Tapioca flour	65	20,7
Total Flour	**315**	**100**
Coconut milk liquid	900	285,7
Suji pandan deposits	100	40
Sugar	250	31,7

Making kaswi cake begins with preparing equipment and ingredients such as wheat flour, tapioca flour, sugar, pandan suji sediment, coconut milk liquid, and *puree* green beans. The ingredients are weighed precisely, then the coconut milk is boiled with sugar until homogeneous for 5 minutes, then mixed with the dry ingredients and *puree* mung beans are then strained. The finished dough is then strained. The dough is then pressed into a greased 5.5 cm diameter twister mold and steamed for 20 minutes. The cooked cake is cooled, removed from the mold, and served sprinkled with steamed grated coconut and a pinch of salt.



Picture 3 The process of making Kaswi cake with the addition of green bean puree

Figure 4 Kaswi Cake

RESULTS AND DISCUSSION

Research result

Sensory Quality

1) Color

Based on the results of the assessment of the color aspect of the kaswi cake addition *puree*Green beans, at a percentage of 30%, got an average value of 3.7 with a category close to light olive green, while at a percentage of 40%, got an average value of 3.9 with a category close to light olive green, and at a percentage of 50% got an average value of 4 with a category of light olive green.

Based on the results of the Kruskal-Wallis test, it was shown that the addition of mung bean puree had no effect on the color aspect. This is shown in X^2_{Count}= 1.05 and has a smaller result than X^2_{Table} which is 5.99.

Table 2 Results of the Color Aspect Hypothesis

Testing Criteria	X^2 Count	X^2 Table
Color	1,05	5,991

2) Green Bean Aroma

In the results of the assessment of the aroma aspect of green beans in kaswi cakes with the addition of green bean puree of 30, an average value of 3.7 was obtained with a category close to not having a green bean aroma. In kaswi cakes with green bean puree with a percentage of 40%, an average value of 3.2 was obtained with a slightly green bean aroma category, while in kaswi cakes with green bean puree with a percentage of 50%, the average value was 3.

By testing using Kruskal – Wallis, X2Calculate = 4.82 was obtained. It can be

concluded that there is no effect of the percentage of green bean puree on kaswi cake on the aroma aspect of green beans.

Table 3 Results of the Hypothesis of the Aroma Aspect of Green Beans

Testing Criteria	X^2 Count	X^2 Table
Green Bean Aroma	4,82	5,991

3) Pandan Suji Aroma

Based on the results of the assessment of the aroma aspect of pandan suji, it was found that kaswi cake with the addition of...*puree* green beans of 30% get the suji pandan flavored category with a flat value of 4.2. On kaswi cake *puree* green beans of 40% and 50% got an average value of 3.7 with a category close to the aroma of pandan suji.

Based on the results of the hypothesis test in the pandan suji aroma category, it was found that there was no effect of adding *puree* green beans on kaswi cake. This is shown in X^2_{Count}= 4.69 which has a smaller result than X^2_{Table}which is 5.99.

Table 4 Hypothesis Results of Pandan Suji Aroma Aspect

Testing Criteria	X^2 Count	X^2 Table
Pandan Suji Aroma	4,69	5,991

4) Green Bean Flavor

On the results of the evaluation of the taste aspect of mung bean in kaswi cake with addition *puree* 30% mung bean percentage yielded an average score of 3.5, categorizing it as slightly mung bean-like. Meanwhile, the 40% and 50% percentages fell into the same category, approaching slightly mung bean-like, with average scores of 2.9 and 2.8, respectively.

In the results of the hypothesis test using Kruskal – Wallis, X was obtained.$^2_{Count}$= 3.6. Then it is found that X^2_{Table}greater than X^2_{Count}, therefore the addition *puree* Mung beans do not affect the kaswi cake.

Table 5 Results of Hypothesis Testing of Green Bean Taste Aspects

Testing Criteria	X^2 Count	X^2 Table
Green Bean Flavor	3,6	5,991

5) Savory Coconut Milk Flavor

Based on the evaluation results of kaswi cake with additions of puree, *mung* beans in terms of coconut milk savory taste are obtained in the category close to coconut milk savory taste. On kaswi cake addition *puree* green beans at a percentage of 30% got an average value of 3.7, while at a percentage of 40% it was 3.8, and at a percentage of 50% it was 3.6.

Based on the results of the Kruskal – Wallis test, the value of X was obtained$^2_{Count}$namely 0.91 so that it is obtained that by adding pureed Mung beans in kaswi cake do not affect the savory aspect of coconut milk.

Table 6 Results of Hypothesis Testing of Coconut Milk Savory Taste Aspect

Testing Criteria	X^2 Count	X^2 Table
Savory Coconut Milk Flavor	0,91	5,991

6) Sweet Taste

The results of a sensory quality assessment on the aspect of sweetness in kaswi cake with additional *puree* green beans were categorized as sweet. This is indicated by the average value at 30% and 50%, which was 4, and at 40%, which was 3.9.

Based on the results of the Kruskal – Wallis test, it was found that the addition of pureed Mung beans in kaswi cake do not affect the sweetness aspect. This is indicated by the value of X^2_{Count} greater than X^2_{Table}namely 0.1.

Table 7 Results of Hypothesis Testing for Sweetness Aspect

Testing Criteria	X^2 Count	X^2 Table
Sweet Taste	0,1	5,991

7) Chewy Texture

Based on the evaluation results of the chewy texture aspect of kaswi cake with the addition *puree*Mung beans at 30% yielded an average value of 3.7, categorized as nearly chewy. Meanwhile,

at 40% and 50% yielded a slightly chewy value, with average values of 3.5 and 3.3, respectively. The Kruskal-Wallis test obtained an X value of$^2_{Count}$= 1.87 with X^2_{Table} 5,99.

Based on the value of X^2_{Count}which is smaller than X^2_{Table}, it was found that the addition of green bean puree did not affect the chewy texture aspect of kaswi cake.

Table 8 Results of Hypothesis Testing for the Chewy Texture Aspect

Testing Criteria	X^2 Count	X^2 Table
Chewy Texture	1,87	5,991

8) Soft Texture

The evaluation results on the soft texture aspect of kaswi cake with the addition of puree Mung beans get the soft category. On kaswi cake with a percentage *puree* green beans at 30% get an average value of 4, at 40% the average value is 4.4 and at 50% the average value is 4.5.

In the results of the hypothesis test using the Kruskal – Wallis test, the value of X was obtained$^2_{Count}$= 5.04 with X^2_{Table}= 5.99. It can be concluded that kaswi cake with the addition of *puree* Mung beans have no influence on the soft aspect.

Table 9 Results of Hypothesis Testing for Soft Texture Aspect

Testing Criteria	X^2 Count	X^2 Table
Soft Texture	5,04	5,991

Nutrient content

1) Water Rate

Based on the results of the proximate test analysis, on kaswi cakes with *puree* green beans with a percentage of 50% have the highest water content compared to all the addition treatments of *puree* green beans. Addition *puree* green beans in kaswi cake cause the water level to increase.

The results of the ANOVA test show that the addition of puree Mung beans do not influence the water content of kaswi cake. This is shown in the F value$_{Count}$ which is smaller than F_{Table}, namely 3.71.

Table 10 ANOVA Test of Water Content

SK	DB	JK	KT	F_{Count}	F_{Table}
Treatment	2	2,096	1,048	3,71	9,55
Error	3	0,848	0,283		
Total	5	2,944			

2) Ash Rate

The proximate test results obtained showed that the highest ash content was found in kaswi cake with a percentage of pure green beans at 40%.

Based on the results of the ANOVA test, the F value was obtained$_{Count}$ namely 1.64 so that it is obtained that the addition puree Mung beans in kaswi cake with a percentage of 30%, 40%, and 50% did not have a significant influence on the ash level.

Table 11 ANOVA Test of Ash Content

SK	BD	JK	KT	F_{Count}	F_{Table}
Treatment	2	0,009	0,004	1,639	9,55
Error	3	0,008	0,003		
Total	5	0,017			

3) Fat Rate

In the proximate test results in terms of fat content, it was found that kaswi cake with a percentage of pure green beans at 40% received the highest score. As the percentage increases puree, then the fat content tends to increase.

From the results of the Anova test, the F value was obtained.$_{Count}$ namely 23.25. So, it is concluded that the additional *puree* addition of green beans to kaswi cakes affected the fat content. To determine which treatment showed a significant difference, the analysis proceeded to the Duncan test.

Table 12 ANOVA Test of Fat Content

SK	BD	JK	KT	F_{Count}	F_{Table}
Treatment	2	0,012	0,0062	23,25	9,55
Error	3	0,001	0,0003		
Total	5	0,013			

Based on the results of the Duncan test, it was found that the 30% treatment was significantly different from the 50% and 40% treatments. Meanwhile, the 50% treatment was not significantly different from the 40% treatment.

Table 13 Duncan Test Results

Treatment	Mean	Mean+DMRT	Notation
30%	0,06	0,11	a
50%	0,13	0,18	b
40%	0,17		b

4) As much protein

Based on the results of the proximate test, it was found that the addition of *puree* green beans provides an increase in protein content as the percentage increases of *puree*. The highest protein level is found in kaswi cake with additional *pure green* beans by 40%.

From the results of the Anova test, the F value was obtained$_{Count}$ is 12.89 with a value of F_{Table}9.55. It can be concluded that the addition of *puree* Mung beans influences the protein content of kaswi cakes. This research was then followed up with a Duncan test to determine which treatments had differences in protein content.

Table 14 ANOVA Test of Protein Content

SK	BD	JK	KT	F_{Count}	F_{Table}
Treatment	2	0,105	0,053	12,89	9,55
Error	3	0,012	0,004		
Total	5	0,118			

Based on Duncan's test results, the protein content of kaswi cake with 30% mung bean puree added showed a significant difference compared to the 40% and 50% treatments. Meanwhile, the protein content in the 40% treatment was not significantly different from the 50% treatment.

Table 15 Duncan Test Results for Protein Content

Treatment	Mean	Mean+DMRT	Notation
30%	3,945	4,15	a
50%	4,17	4,37	b
40%	4,26		b

5) Crude Fiber Rate

Based on the proximate test analysis, it was found that the 40% percentage obtained the highest average value compared to the 30% and 50% treatments.

In the test of coarse fiber content of kaswi cake addition *puree* green beans obtained F results$_{Count}$ of 0.12. This value indicates that the addition of pureed Mung beans does not influence the amount of coarse fiber in kaswi cake.

Table 16 ANOVA Test of Fiber Content

SK	BD	JK	KT	F_{Count}	F_{Table}
Treatment	2	0,003	0,002	0,12	9,55
Error	3	0,039	0,013		
Total	5	0,042			

3.1. Discussion

1) Sensory Quality

In research conducted by Hapsari & Purwaidiani (2018), the color of food ingredients is caused by the natural pigments contained in the ingredients, namely chlorophyll. In kaswi cakes, the green color is produced from the use of pandan suji sediment which is dominant compared to other ingredients of *puree* mung beans. *Puree* Mung beans are pale green, unable to match the color intensity

of pandan suji sediment. In pandan suji sediment, suji leaves contain more chlorophyll than pandan (Riansyah et al., 2021).

The distinctive aroma of green beans comes from compounds volatile *2-pentyl-furan*. Aroma is formed from compounds volatile, fats, and proteins that evaporate during heating, where the compounds *volatile* in soluble in water, oxidized fat produces a rancid aroma, and high protein produces a distinctive aroma (Hapsari & Purwaidiani, 2018). Mung beans contain approximately 25.3% vegetable protein and 0.47% fat. The distinctive aroma of pureeung beans tends to be mild and not too sharp, which is due to the boiling process. In line with research by Apriyanti et al. (2022), using mung bean paste in a higher proportion than other pastes do not produce a dominant mung bean aroma. The mung bean aroma in kaswi cakes is reduced by the more dominant aroma of pandan suji sediment.

With the addition of *puree* mung beans in kaswi cake cannot mask the distinctive aroma of pandan suji sediment. Pandan extract is superior in aroma and flavor aspects, which suji leaf extract lacks (Riansyah et al., 2021). The aroma of pandan comes from compounds *volatile* with scientific name*2acetyl-1pyrroline* (Adhamatika, 2020).

The higher the percentage of puree on kaswi cake, then the taste of mung beans increases. The taste of a food can be enhanced by acid *glutamate to* balance the taste (Hapsari & Purwaidiani, 2018). Green beans are rich in non-essential amino acids, namely niacin *glutamate* which can affect the taste of kaswi cake. *Puree* Green beans can create a savory flavor due to their protein content. This aligns with research by Wiranata et al. (2017), which found that the protein in red beans can create a savory flavor in products. However, adding other ingredients such as coconut milk and pandan suji sediment can neutralize the resulting flavor.*puree* mung beans.

Coconut milk contains natural fats that contribute to its flavor. The fat in coconut milk contains compound nonylmethylketone, which when heated will produce compounds volatile which can give a special savory flavor to coconut milk (Hakiki et al., 2019). The savory taste of coconut milk in kaswi cake is still felt even though puree mung beans.

In kaswi cakes, the sweetness is achieved by using granulated sugar, which has sweetness and can impart flavor. Granulated sugar is a form of sucrose that is commonly used as an additive in products as a sweetener (Adna Ridhani, 2021).

The chewy texture of kaswi cake is created by the use of tapioca, which contains little amylose (17%) and high amylopectin (83%). Amylose and amylopectin undergo gelatinization when heated (Hakiki et al., 2019). The higher the percentage of mung bean puree, the less chewy the texture, due to the high amylose content in mung beans.

As the percentage increases puree, the softer the texture. According to research by Hapsari and Purwaidiani (2018) and Sinaga et al. (2021), the texture of a product is influenced by the protein content of the ingredients. The higher the protein content, the greater its role in providing texture. Mung beans contain around 22%. Research on making kaswi cakes shows that the use of coconut milk also affects the softness of the texture. The thicker the coconut milk added, the softer the kaswi cake becomes, while the chewiness tends to decrease.

2) Nutrient content

Based on the proximate test, it was found that *puree* Mung beans can increase the water content of kaswi cakes. Foods containing protein and carbohydrates will affect the water content of a product. According to the Indonesian Food Composition Table, mung beans contain 56.8 grams of carbohydrates and 22 grams of protein. Starch is a form of carbohydrate, and with high amylopectin and low amylose content, a product tends to absorb more water. According to Afriliyanti & Hodijat (2023), amylose and protein are hydrophilic, so the higher the content, the greater the ability to absorb water.

According to Sundari et al. (2015), the ash content value is related to the presence of inorganic mineral compounds in food ingredients. In this study, the addition of *puree* Mung beans did not affect the ash content of kaswi cakes. According to Nengsih (2012) and Sundari et al. (2015), boiling can damage mineral content, especially at high temperatures and for extended periods. This occurs because minerals can dissolve in water and evaporate of *Puree* Green beans are made using the boiling method (100°C), then the kaswi cake mixture is steamed for 20 minutes. This heating process can potentially cause mineral loss, so the addition of puree does not increase the amount of ash in kaswi cake.

Fat is a macronutrient that plays a vital role in increasing nutritional value, enriching flavor, and improving the texture of a food product (Wahyu, 2018). Research results show that there is an increase in fat content with varying percentages of *puree*. This is because the fat content in mung beans is 1.2%, which is unsaturated fat (Sari et al., 2020). According to Apriyanti et al. (2022), the greater the use of mung bean paste, the higher the fat content in the product. Although the fat content in mung beans is not particularly high, the accumulation of other ingredients, such as coconut milk, can increase the fat content.

Mung beans contain around 22% protein and rank third as the highest source of vegetable protein after soybeans and peanuts (Ratnasari et al., 2021). In research conducted by Apriyanti et al. (2022), the protein content in mung bean paste was 16.63%, so the higher the addition of mung bean paste, the higher the protein content.

According to Alhadi et al. (2021), crude fiber is defined as the residue from food ingredients after treatment with acids and bases under boiling conditions. In research conducted by Apriyanti et al. (2022), it was found that the crude fiber content in mung bean paste was around 1.94%. In this study, the manufacturing process of *puree* Mung bean processing involves several stages, namely soaking and boiling to soften the mung bean seeds and grinding them. This series of processes can affect the fiber content in the mung bean of *puree* Mung beans. According to Lusiyatiningsih (2014), in the journal Food and Nutrition, published by Sari et al. (2020), fiber content can decrease through soaking, boiling, and heating. Therefore, these processes can reduce the fiber content of food ingredients.

CONCLUSION

In the sensory quality test, it was found that the addition of green bean puree did not have a significant effect on all aspects tested, namely color, green bean aroma, pandan suji aroma, green bean taste, sweet taste, savory coconut milk taste, chewy texture, and soft texture.

Based on the results of the proximate analysis using ANOVA, the addition of mung bean puree had no effect on water content, ash content, or crude fiber content. However, there was an effect on fat and protein content.

The results of the study showed that kaswi cake with the addition of 40% green bean puree was the best formulation because it produced characteristics close to the control product and could increase the nutritional content in terms of fat and protein content.

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