

## Innovation, Consumer Acceptance, and GYR's Startups of *Poffertjes* with Different Percentages of Liquid Milk and Red Dragon Fruit Juice Composition

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### Abstract

*This study employed an experimental method involving product development through several stages of formulation testing. Dragon fruit juice \*poffertjes\* were prepared by substituting liquid milk with dragon fruit juice at levels of 20%, 30%, and 40% of the total liquid content. The products were evaluated subjectively through sensory testing—assessing color, aroma, taste, and texture—conducted by a panel of trained experts. The results indicated that higher percentages of dragon fruit juice yielded superior color and texture characteristics. The formulation using 40% dragon fruit juice produced the best product, characterized by an attractive reddish-purple color, a suitably soft texture, a sweet taste, and a distinct aroma. Consumer acceptance testing was also conducted to determine which formulation was most preferred; the results showed that the 40% dragon fruit juice substitution was the consumers' top choice. This product was developed as a startup under the brand name GYR Poffertjes and marketed via social media platforms Instagram and WhatsApp using a pre-order system. The results of the customer satisfaction analysis showed a Customer Satisfaction Index (CSI) of 85.8%, which falls into the “very satisfied” category, indicating that the product was well-received by consumers in terms of taste, aroma, price, packaging, and service. From a financial perspective, with a selling price of Rp12,000 per package and an initial investment of Rp815,000, the startup successfully sold 86 boxes out of a target of 84 boxes, generating revenue of Rp1,032,000 and a net profit of Rp141,076. Based on a Break-Even Point (BEP) analysis, the investment capital is estimated to be recouped in approximately 5 months and 4 days. These results indicate that GYR Poffertjes has the potential to be developed as an innovative culinary business based on the use of red dragon fruit and has good prospects for competing in the market. Sales reached Rp1,032,000 against a target of Rp1,008,000, with 86 boxes sold compared to the planned target of 84 boxes. The customer satisfaction survey results showed an average score of 85.89%, which falls into the “very strong” category.*

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## 1. INTRODUCTION

*Poffertjes* is a typical Dutch cake known for being soft, sweet, and golden in color. With the development of food product innovation, modifications to *poffertjes* not only emphasize delicious taste but also enhance the appearance and nutritional value by using

1008 | **Innovation, Consumer Acceptance, and GYR's Startups of *Poffertjes* with Different Percentages of Liquid Milk and Red Dragon Fruit Juice Composition** (Agwal Ghani Rulihafif Damarsyah)

natural ingredients. One option to consider is using red dragon fruit juice (*Hylocereus Polyrhizus*), which has anthocyanin pigments, so it can be used as a natural coloring agent while providing additional benefits for food products (Florida & Intan, 2020; Febriani et al., 2024).

The use of natural dyes is increasingly important as a healthier substitute for artificial colors. Red dragon fruit is known to contain vitamin C, minerals, antioxidants, and natural pigments that give it its attractive purplish-red color (Citramukti, 2008; Reni et al., 2024). Although dragon fruit juice has been used in various food products such as jelly candies, syrups, sponge cakes, and steamed cakes, the use of dragon fruit juice in other products is still unclear, especially with the variation in the percentage of liquid milk substitute from the total liquid, which has never existed and no one has studied.

This study observed the impact of changes in the percentage of liquid milk mixture with dragon fruit juice on the sensory characteristics of *poffertjes* with dragon fruit juice. This research aims to find the best formula based on taste and appearance to produce a product of *poffertjes* Dragon fruit juice of the highest quality. Research and development of *poffertjes* dragon fruit juice conducted its first experimental trial with three treatment products accompanied by a control product of the original recipe of *poffertjes*. In the first treatment trial, dragon fruit juice was used as a natural dye and a liquid substitute at percentages of 20%, 30%, and 40% of the total liquid used. Based on the tests conducted, dragon fruit juice was used to evaluate organoleptic qualities, including color, aroma, flavor, and texture. This research contributes to the development of naturally colored cake products and enriches research on functional food innovation. The results are expected to serve as a reference for creating more attractive cake products with good nutritional value, utilizing natural ingredients as a substitute for artificial colors, and expanding the use of red dragon fruit juice in food product innovation.

To ensure the innovative product's acceptance by the public, sensory quality analysis and consumer acceptance testing were conducted. Sensory quality analysis was conducted by assessing the product's color, aroma, taste, and texture. Initial trials with three filling ratio formulations (20%, 30%, and 40%) showed differences in sensory characteristics, necessitating further validation of consumer acceptance to determine which product was most preferred and had the potential for commercial development. Acceptance is the level of consumer preference for a product, as determined by its color, taste, aroma, and texture. Evaluation was conducted through a hedonic sensory test, in which consumers rated the product based on their preferences. Based on the results of the consumer acceptance test, one treatment was found to be preferred by consumers. This treatment will become the product to be sold in the startup business (Jayadi, 2022; Rahayu, 2019).

The development of the culinary industry is encouraging businesses to continuously create innovative, value-added food products to compete in the market. Current consumer trends are also influenced by social media, resulting in attractive product displays (*instagrammable*) being one of the consumer considerations when making purchases. Furthermore, increasing public awareness of health has driven the development of product innovations that utilize natural ingredients as alternatives to synthetic dyes (Setyarko, 2020; Hendrawan, 2021).

*Poffertjes* is a typical Dutch snack that can be developed through the innovation of using red dragon fruit juice as a natural coloring with the addition of sweet potato and cheese filling. This innovation is expected to provide distinct product characteristics and increase consumer appeal. In line with the opinion of (Mangginte et al. 2025), product innovation is a crucial factor in creating uniqueness and added value for consumers in a

competitive market. Therefore, this research develops a GYR business pilot *Poffertjes*, which is marketed through a *pre-order system* using social media such as Instagram and WhatsApp. This study aims to analyze the potential of the GYR startup business of *Poffertjes* based on marketing, production, organization and management, and financial aspects so that business development opportunities can be identified as innovative culinary products based on local food ingredients.

## 2. METHOD

This research was conducted in the Pastry and Bakery Laboratory, 2nd Floor, Building H, Campus A, Culinary Arts and Food Service Management Study Program, Faculty of Engineering, Jakarta State University. This research was conducted from February 2026 to June 2026. The subjects of this research were consumers of *poffertjes*. The sample used in the study was 10 expert panelists. The approach used in this study was quantitative. Furthermore, the method used was experimental, with various percentages of dragon fruit juice added to the total liquid milk: 20%, 30%, and 40%.

### Market Overview *Poffertjes*

GYR Market *Poffertjes* aimed at consumers who are looking for sweet snacks with an attractive appearance and a different taste from *Poffertjes*. This product offers innovation through the use of red dragon fruit juice as a natural dye, combined with a filling of sweet potato and cheese, providing added value in terms of color and appearance. The growing public interest in unique and practical snacks presents an opportunity for GYR *Poffertjes* to be developed as an innovative culinary product that can compete in the market.

### Target Market

GYR *Poffertjes*' target market is children and adults aged 5-50, particularly students, workers, and families who enjoy practical snacks with an attractive appearance. The product's soft texture, sweet flavor, affordable price, and convenient packaging make it suitable for various age groups.

## 3. RESULTS AND DISCUSSION

### Sensory Quality Test

#### 1. Exterior Color Aspect

The calculation shows that the 20% treatment obtained an average value of 2.2. Color of *poffertjes*, which in the 30% treatment got an average score of 2.1 with the assessment criteria of pale brownish red. The highest average score was obtained in the 40% treatment with a score of 3.5.

#### 2. Inner Color Aspect

The validation test results showed that the 20% treatment obtained an average value of 2.3. The 30% treatment obtained an average value of 3.4, and the 40% treatment obtained an average value of 4.5.

#### 3. Aroma Aspect of Dragon Fruit

The results of the dragon fruit aroma validation test showed that the 20% treatment yielded an average value of 1.8. The 30% treatment yielded an average value of 1.8, and the 40% treatment yielded an average value of 2.3.

#### 4. Taste Aspect of *Poffertjes*

Results of research on taste aspects of *poffertjes* show that the 20% treatment obtained an average value of 3.9. In the 30% treatment, an average value of 4 was obtained, and an average value of 4 was obtained by the 40% treatment, with the assessment criteria of a fairly sweet taste of *poffertjes* dragon fruit juice.

5. Inner Texture Aspect

Based on the texture aspect test, it shows that the 20% treatment obtained an average value of 4.5. The 30% treatment obtained an average value of 4.5, and the 40% treatment obtained an average value of 4.4 with the soft texture assessment criteria.

6. External Texture Aspect

Based on the texture aspect test, it shows that the 20% treatment obtained an average value of 4.1. The 30% treatment obtained an average value of 4.1, and the 40% treatment obtained an average value of 4.2 with the assessment criteria of soft and fairly soft texture.

**Consumer Acceptance**

1. Exterior Color Aspect

Testing of the external color aspect was carried out on the three treatments, with a result of 3.5 obtained for the 20% treatment, the 30% treatment obtained a value of 3.6 and a value of 3.7 obtained for the 40% treatment.

2. Inner Color Aspect

The results of the acceptance test on the inner color aspect obtained an average value of 3.5 for the 20% treatment and 3.9 for the 30% treatment. A value of 4.2 was obtained for the 40% treatment.

3. Aroma Aspect of Dragon Fruit

The aroma aspect obtained an average value of 3.3 in the 20% treatment. A value of 3.3 was obtained in the 30% treatment, and a value of 3.4 in the 40% treatment.

4. Taste Aspect of *Poffertjes*

Consumer acceptance test on taste aspect *poffertjes*, getting an average score of 3.5 with the 20% treatment, the 30% treatment got a score of 3.8, and the 40% treatment got a score of 3.9.

5. Inner Texture Aspect

Based on aroma and taste, each treatment yields a different texture. The 20% treatment yielded an average score of 3.5. The 30% treatment yielded an average score of 3.8. The 40% treatment yielded a score of 3.9.

6. External Texture Aspect

Based on aroma and taste, each treatment yields a different texture. The 20% treatment yielded an average score of 3.5. The 30% and 40% treatments yielded an average score of 3.7.

7. Overall Aspect of *Poffertjes*

Overall aspect *poffertjes* includes aroma, taste, and texture. In the 20% treatment, the average score was 3.5. In the 30% treatment, the score was 3.7. In the 40% treatment, the score was 3.9.

**Financial Analysis**

This study not only analyzes the GYR Poffertjes startup but also evaluates its financial aspects to assess its feasibility. The financial analysis includes initial investment, pricing, target sales, profit projections, and a business analysis of *Break-Even Point* (BEP).

a. Initial Investment

The initial investment required to start the GYR Poffertjes business consists of production equipment used throughout the operational process. Based on calculations, the total investment required is IDR 815,000. This equipment includes a blender, a gas stove, a digital scale, a takoyaki mold, and other supporting equipment.

b. Determination of selling price

The selling price is based on calculations of *food cost*, packaging costs, and profit margins. Total *food cost*: The cost of one recipe is Rp 29,183, while the production cost per pack (6 pieces) is Rp 4,170. After adding the cost of packaging and stickers of Rp 2,000, the selling price of the product is set at Rp 12,000 per pack.

c. Target Revenue

Sales planning was carried out for four weeks with a sales target of 84 boxes with a total turnover of IDR 1,008,000, so that the sales target that had been set could be achieved and even slightly exceeded the target of 86 boxes or IDR 1,032,000.

d. Profit/Loss Projection

The implementation of the GYR Poffertjes pilot business for one month showed results that exceeded the sales target. From a sales target of 84 boxes, the product was successfully sold as many as 86 boxes with a total turnover of 1,032,000. Based on the results of financial calculations, this business earned a gross profit of 364,374. After deducting operational costs, including equipment depreciation, transportation costs, and internet costs, a net profit of Rp 141,076 was obtained. The net profit was then allocated for personal needs, return on capital, business development, promotional costs, and operational costs.

and.

*Break-Even Point* (BEP)

The *Break-Even Point* (BEP) analysis indicates that the initial investment of Rp815,000 is estimated to be recovered in approximately 5 months and 4 days. These results indicate that the GYR business start-up *Poffertjes* has quite good prospects for development if marketing and production strategies are implemented consistently.

**Consumer Satisfaction Survey Results**

GYR *Poffertjes* achieved a Customer Satisfaction Index (CSI) of 85.8%, which is categorized as very satisfied. Based on the results of the consumer satisfaction survey, the taste aspect received a very good rating, with 60% of respondents stating very satisfied and 40% stating satisfied. In the aroma aspect, the majority of respondents (73.3%) stated they were satisfied, while 3.3% of respondents stated they were less satisfied. This assessment was caused by the distinctive aroma of dragon fruit which is not strong enough because dragon fruit does not have a distinctive aroma characteristic and also dragon fruit when processed into food products does not have an aroma, only as a natural coloring. Nevertheless, overall, the aroma of GYR *Poffertjes* is still acceptable to consumers. In terms of texture, the majority of respondents gave a satisfactory to very satisfied rating because the product has a soft and tender texture. Furthermore, the Cilembu sweet potato and cheese filling also received a positive rating because it provides a taste that matches the product's characteristics. In terms of price, most respondents expressed satisfaction because the price offered was considered commensurate with the quality and quantity of the product. Meanwhile, the service and packaging aspects also received good ratings, although there was still a small number of respondents who gave a less than satisfactory rating regarding the completeness of the information on the packaging label.

**Consumer Satisfaction Analysis**

Consumer satisfaction analysis was conducted on 30 respondents. The level of consumer satisfaction was measured using the method *Customer Satisfaction Index* (CSI). The results of the analysis show that GYR *Poffertjes* achieved a CSI score of 85.8%, which is considered highly satisfied. This assessment indicates that consumers

responded positively to various aspects of the product, including taste, aroma, packaging, service, and price, resulting in GYR *Poffertjes* having the potential to be developed as an innovative culinary product that can be accepted by the community.

## DISCUSSION

The results of the study showed that the higher the percentage of dragon fruit juice used, the more noticeable the effect on the color of *poffertjes*. The formulation with 40% dragon fruit juice added produced a purplish red color compared to the 20% and 30% treatment formulations. This color change indicates that the anthocyanin pigment in dragon fruit can be used well as a natural coloring agent in making cake products. The formulation that has been determined shows that the higher the concentration of dragon fruit juice used, the brighter the color will be while maintaining the quality of the product's appearance. These results are in accordance with research by Zulaikhah (2024), which states that anthocyanins produce red to purple colors and can be used as natural coloring agents for food products.

These findings also support research by Regilia et al. (2024), which states that red dragon fruit can make processed products more visually appealing. Therefore, the use of dragon fruit juice not only replaces artificial coloring but also provides the added benefit of a more attractive product appearance and is in line with natural food trends. The texture aspect with 40% treatment produces the most optimal inner and outer texture with an average value of 3.8. The use of dragon fruit which Overall results show that the 40% treatment produced the best balance of all organoleptic aspects.

Based on the results of the acceptance test *poffertjes* Dragon fruit juice obtained from the highest average score in the taste aspect of *poffertjes* obtained in the 40% treatment with an average score of 3.9 in the taste aspect of *poffertjes*. *Poffertjes* has a sweet taste, and the addition of red dragon fruit juice also makes it appetizing because of its attractive color.

Organoleptic test assessment on *poffertjes* Dragon fruit juice testing conducted on 100 panelists showed the highest average score in the aspect obtained in the 40% treatment with an average score of 3.8, which was the most preferred by panelists from all aspects of the organoleptic test of color, aroma, taste and texture.

Unlike the color, adding dragon fruit juice does not make a big change in the aroma, taste, and texture of the food *poffertjes*. Aroma values across all treatments generally ranged from mild to moderately strong, while the flavor remained moderately sweet and the texture remained soft across all formulations. The addition of up to 40% dragon fruit juice did not alter the basic properties of *poffertjes* as a cake food.

Scientifically, this condition can be explained because dragon fruit has a mild aroma, so it doesn't interfere with the aroma of the final product. Furthermore, the balanced composition of ingredients such as milk, eggs, flour, sugar, margarine, and yeast can maintain the taste and texture of the dough even though some of the milk is replaced with dragon fruit juice (Wahyuni, 2011). The balance of sugar composition can maintain the product's sweetness, and the product's texture is also influenced by the entire composition of the raw materials and not just the addition of one ingredient (Rizkarina Nurkitawangi, 2025).

Based on the overall sensory quality test results, the mixture consisting of 40% dragon fruit juice and 60% liquid milk achieved the highest overall average score compared to the other mixtures. These results indicate that increasing the amount of dragon fruit juice significantly improves the product's appearance without affecting aroma, taste, or texture.

This finding provides knowledge in the academic world that dragon fruit juice can be used as a good natural dye for cake products, especially *poffertjes*. This research can also be a reference for research studies on the use of dragon fruit in *pastry bakery products*, because previous research focused more on sponge cakes, traditional cakes, and various other cakes. Therefore, the results of this study can be used as a basis for creating innovative cake products that use natural ingredients while helping reduce the use of artificial coloring in the food industry.

*Poffertjes* itself has a sweet taste, so by adding dragon fruit juice as an additional liquid, it can add a distinctive color to the *poffertjes*. This is in accordance with the statement of Alsuhehri & Ridawati (2008), basic tastes are divided into 5, namely, sweet, salty, sour, savory, and bitter.

From the results of the panelist test on 100 people, the organoleptic test in the overall assessment showed the highest average score in the 40% treatment with an average value of 3.8 panelists choosing from the three samples from all aspects of the organoleptic test of color, aroma, taste and texture.

#### 4. CONCLUSION

The results of this study show that the difference in the amount of liquid milk and dragon fruit juice affects the taste and appearance properties of *poffertjes*, especially in terms of color. The formulation with 40% dragon fruit juice added produced a brighter color, a softer texture, a sweeter taste, and a stronger aroma compared to the 20% and 30% treatments. Therefore, the aim of this study was to determine the formulation of *poffertjes*. The best based on the aspects of color, aroma, taste, and texture has been successfully achieved, and knowledge has been obtained regarding the influence of variations in the composition of liquid milk and dragon fruit juice on the product quality of *poffertjes*.

This research shows that dragon fruit juice can be used as a natural coloring agent for products of *pastry bakery* and does not affect the quality of taste and appearance. This study only evaluated the characteristics of taste and texture through validation tests on three treatments of dragon fruit juice percentage in the product *poffertjes* dragon fruit juice.

Based on the results of descriptive analysis of consumer acceptance tests of the treatment *poffertjes* Dragon fruit juice showed that the 40% treatment had the highest average external color score of 3.7, categorized as "liked." The highest aspect was the internal color score of 4.2, categorized as "very liked." The aroma score of dragon fruit had an average of 3.4, categorized as "quite liked." The highest aspect was the taste score of *poffertjes* has an average of 3.9 and a category of "very liked."

The highest aspect of the inner texture aspect had an average of 3.9, with a category approaching very like. The highest aspect of the outer texture aspect had an average of 3.7, with a category of like.

Based on the research results, GYR *Poffertjes* has the potential to be developed as a culinary business based on local food innovation. The product successfully achieved its sales target with 86 boxes sold out of a target of 84 boxes and generated a turnover of Rp1,032,000. The financial analysis results show that this business earned a net profit of Rp141,076, with an initial investment of Rp815,000, which is estimated to be returned within 5 months and 4 days based on the analysis. *Break-even point* (BEP). In addition, the value *Customer Satisfaction Index* (CSI) of 85.8% indicates that consumers are in the very satisfied category, so that GYR *Poffertjes* considered worthy of being developed as an innovative culinary business.

Overall, *poffertjes* dragon fruit juice is an innovative cake product worthy of further development, both in terms of sensory quality and business potential. Promotional optimization, distribution channel diversification, and product quality improvement are needed to ensure competitiveness and public acceptance.

## 5. SUGGESTION

1. Improve marketing and promotional strategy plans through various channels, both directly and through digital media, in order to reach a wider range of consumers and help achieve predetermined sales targets.
2. Expand your distribution network by collaborating with various parties, such as cake shops, grocery stores, or other sales partners. This will broaden your marketing reach, thereby increasing your sales opportunities.

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