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Cendol Product Innovation Using Potato Flour Substitution to Develop Traditional Dawet Drinks in the Modern Era

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ABSTRACT

This innovation was carried out to increase the nutritional value of traditional dawet drinks so that they are richer in carbohydrates, as well as an effort to preserve local culinary in the modern era. This study aims to: (1) find the right formulation of the cendol dawet recipe for potato flour substitution, (2) determine the presentation technique and packaging of Datang products, (3) find out the level of liking of the general public for Datang products. The method used is *Research and Development* (R&D) with a 4D development model. The results of the study showed: (1) the best formulation is 100% potato flour substitution, (2) the presentation of Datang products using a 300 ml transparent bottle with a product label containing nutritional information and product composition, (3) Datang products are acceptable to the general public, have an average level of likability in the overall aspect of 4.6.

Keywords:

Cendol dawet,
Potato Flour,
Tradisional drinks,
carbohydrate

Inovasi ini dilakukan untuk meningkatkan nilai gizi minuman tradisional dawet agar lebih kaya akan karbohidrat, sekaligus sebagai upaya pelestarian kuliner lokal di era modern. Penelitian ini bertujuan untuk: (1) menemukan formulasi resep cendol dawet substitusi tepung kentang yang tepat, (2) menentukan teknik penyajian, pengemasan produk Datang, (3) mengetahui tingkat kesukaan masyarakat umum terhadap produk Datang. Metode yang digunakan adalah *Research and Development* (R&D) dengan model pengembangan 4D. Penelitian dilaksanakan di Laboratorium Tata Boga Fakultas Vokasi Universitas Negeri Yogyakarta yang dimulai sejak bulan September 2025 hingga April 2026.

Hasil penelitian menunjukkan: (1) formulasi terbaik adalah substitusi tepung kentang sebesar 100%, (2) penyajian produk Datang menggunakan botol transparan ukuran 300 ml dengan label produk yang berisi informasi gizi dan komposisi produk, (3) produk Datang dapat diterima oleh Masyarakat umum, memiliki rata-rata tingkat kesukaan pada aspek keseluruhan sebesar 4.6.

1. Introduction

Indonesia has a variety of traditional drinks that are very diverse, one of which is dawet which has been known for a long time by the community. However, nowadays traditional drinks are starting to be eliminated by the many more interesting modern drinks. In addition, the main raw material for making traditional dawet, namely palm sago flour, is now difficult to find in markets. This condition is a big challenge so that traditional drinks such as dawet can still survive and be liked by people today [1].

So far, there have been efforts to develop cendol dawet products to make them more attractive, such as in previous research trying to mix ingredients such as moringa leaves into cendol dough to add its nutrients. Although there have been many studies on cendol dawet, not many have tried to use local food ingredients in the form of potato tubers to overcome existing problems [2].

Potatoes are a food ingredient that is rich in nutrients such as vitamins and minerals, but it often rots quickly if not processed immediately. One way is to process potatoes into flour to make them more durable. Through this study, potato flour was chosen as a substitute for palm sago flour in the manufacture of cendol dawet. The use of potato flour is expected to provide a soft and chewy texture, as well as make dawet more nutritious. In this way, it is hoped that dawet can still be produced with materials that are easy to find and still liked by the public in the modern era [3].

This research aims to create dawet product innovations by utilizing potato flour as a substitute for palm sago flour and has nutritional value. In addition, this study also aims to find out the level of people's preference for the texture and taste of dawet resulting from this innovation. To achieve this goal, this research uses the Research and Development (R&D) method with a 4D development model, which includes the definition stage, product design (Design), development and testing (Develop), to the stage of product dissemination to the public (Disseminate) [4].

2. Methods

The research method used in the development of the "Datang" product (Dawet Kentang) is Research and Development (R&D) with a 4D development model which includes the Define, Design, Develop, and Disseminate stages [4]. The stage begins with determining the standard reference recipe, which is followed by designing the formulation of potato flour substitution of 50%, 75%, and 100% [5], as well as determining the packaging design. This research was carried out at the Culinary Laboratory, Vocational Faculty of Yogyakarta State University, Wates Campus, in the period of September 2025 to April 2026. At the development and deployment stage, the quality of the product is validated by three experts and tested sensorially through 30 semi-trained panelists. Furthermore, a preference test was conducted on 80 panelists from the general public to determine the acceptability of the product and the effectiveness of its packaging. The data analysis in this study includes descriptive data analysis [6] and paired simple t-test data analysis [7].

3. Results and Discussion

3.1. Results

a. The define stage in cendol products uses potato flour in dawet.

In the early stages of developing the Datang product, three dawet recipes were collected and analyzed as a basis for determining the standard formulation. The selection of this reference recipe is very important because it will be a measure of comparison in assessing the success of the texture, shape, aroma, color and taste of the product after being substituted with potato flour. The following can be seen in table 1.

Table 1. Recipe for cendol dawet

Ingredients	References Recipe 1	References Recipe 2	References Recipe 3
Palm sago flour (g)	125 gr	150 gr	-
Rice flour (g)	25 gr	50 gr	100 gr
Tapioca flour (g)	-	-	25 gr
Agar	-	-	1 pack
Suji Leaf Water (ml)	500 ml	650 ml	600 ml
Pandan	3 sheets	11 sheets	2 sheets
Confectioners' Sugar (g)	250 gr	250 gr	250 gr
Coconut milk (ml)	750 ml	750 ml	760 ml
Salt (g)	1/2 tsp	1/2 tsp	1/2 tsp

Based on the data in Table 1, it can be seen that there are variations in the composition of the ingredients in the three cendol dawet reference recipes to be tested, especially in the type and amount of flour used. Recipes (1) and (2) tend to use a combination of palm sago flour and rice flour in different ratios, while Recipe (3) uses tapioca flour and powdered gelatinous ingredients.

In addition, a striking difference can also be seen in the amount of water used in suji leaves and pandan leaves as a source of natural aroma and color. Despite the differences in texture and aroma ingredients, these three recipes still use relatively consistent amounts of tamarind sugar and coconut milk as the standard for sweet and savory taste in dawet dishes.

Then organoleptic properties were identified to compare the physical qualities of each recipe tested. Characteristics regarding the differences in color, aroma, texture, taste, and shape of the three recipes. The following table 2 shows the results of the characteristics of the three reference recipes.

Table 2. Characteristics of the results of the three reference recipes

Characteristics	Recipe 1	Recipe 2	Recipe 3
Color	Dark green	Dark green	Dark green
Aroma	Fresh pandan	Fresh pandan	Fresh pandan
Text	Very thick	Chewy	Soft
Taste	Taste of suji leaves	Taste of suji leaves	Taste of suji leaves
Shape	Oval	Oval	Oval

Based on the results of the organoleptic test in Table 2, it can be seen that the three reference recipes produce visual and taste characteristics that tend to be uniform, but have significant differences in texture aspects. In terms of color, aroma, taste, and shape, all three provide consistent results, namely dark green color with a fresh pandan aroma, the distinctive taste of sugi leaves, and an oval shape that is ideal for dawet granules.

The main difference is found in the texture aspect, where Recipe 1 produces a very thick texture, while Recipe 2 has a chewy texture, and Recipe 3 provides a softer result. This variation in texture is closely related to the composition of the type of flour used in each reference recipe, which will later become an important consideration in determining the basic formula for the development of the next product.

The following is documentation of the three reference recipes at this defining stage.

Table 3. Documentation of the reference product at the define stage

Recipe 1	Recipe 2	Recipe 3
		

All three recipes tested consistently produce products with a dark green color, a fresh pandan aroma, and a uniform oval shape. Despite having strong visual similarities, the main significant difference lies in the final texture of each product. Recipe 1 has a very chewy texture, which has the strongest physical resistance compared to other recipes, recipe 2 produces a chewy texture in a medium degree, while recipe 3 has a soft texture compared to recipes 1 and 2. Overall, the use of suji leaves provides a stable flavor consistency in all samples, so the selection of the best recipe can be focused on the desired texture preference.

Table 4 shows, overall is the R2 recipe, the most preferred product in general with the highest overall score of 4.4 and an average score of 3.8. This recipe has very strong quality in terms of color (4.2) and size (4). So the reference recipe was selected using the R2 recipe. Here can be seen the average results in table 4.

Table 4. Average results of the define stage

Sensory properties	Recipe 1	Recipe 2	Recipe 3
Shape	3,2	3,2	4,4
Size	3,2	4	4
Color	4	4,2	3,8
Aroma	3,2	3,6	3,6
Taste	3,6	3,4	3
Texture	3,6	3,6	2,4
Overall	3,4	4,4	3,8
Average	3,5	3,8	3,6

b. The design stage of cendol products uses potato flour in dawet.

At this stage, a series of trials were carried out to find the most optimal dawet recipe formulation through the substitution of potato flour ingredients. The main focus of this experiment was to partially replace the use of palm sago flour with potato flour at three different concentration levels, namely 50%, 75%, and 100%. This step aims to observe the effect of differences in texture and characteristics of the final product compared to the initial reference recipe. The following table 5 shows the formula recipe at the design stage.

Table 5. Recipe for the formulation of cendol dawet

Ingredients	Reference Recipe	Formulation 50%	Formulation 75%	Formulation 100%
Palm sago flour (g)	150 gr	75 gr	37.5 gr	-
Potato flour	-	75 gr	112,5 gr	150 gr
Rice flour (g)	50 gr	50 gr	50 gr	50 gr
Suji Leaf Water (ml)	650 ml	650 ml	650 ml	650 ml
Pandan (Imbr)	11 sheets	11 sheets	11 sheets	11 sheets
Confectioners' Sugar (g)	250 gr	250 gr	250 gr	250 gr
Coconut milk (ml)	750 ml	750 ml	750 ml	750 ml
Salt (g)	1/2 tsp	1/2 tsp	1/2 tsp	1/2 tsp

The formulation of dawet in this study uses the main ingredients in the form of palm sago flour, potato flour, and rice flour as texture forms. In the reference recipe (R2), 150 gr of palm sago flour is used, but in the development formula (F1, F2, and F3), this amount is gradually reduced and replaced with potato flour until it reaches a full substitution of 150 gr in F3. The following are the results of the characteristics of the three formulas at the design stage.

Table 6. Characteristics of the results of the design stage

Characteristics	Reference recipe	Formulation 50%	Formulation 75%	Formulation 100%
Color	Dark green	Dark green	Dark green	Dark green
Aroma	Fresh pandan	Fresh pandan	Fresh pandan	Fresh pandan
Text	Chewy	Chewy	Chewy	Slightly chewy
Taste	Taste of suji leaves	Taste of suji leaves	Taste of suji leaves	Taste of suji leaves
Shape	Oval	Oval	Oval	Oval

The identification of organoleptic tests in table 5 was carried out to compare the physical quality of reference recipes and developer recipes that have different percentages of substitutions. Characteristics regarding the differences in color, aroma, texture, taste, and shape of the three formulas

Furthermore, documentation was taken including reference recipes and three variations of the development formula, namely F1 (50%), F2 (75%), and F3 (100%), in order to objectively compare the physical characteristics of each sample. Documentation is done from a top-down viewing point to ensure texture details, and the product display is clearly visible and can be seen in table 7.

Table 7. Documentation at the design stage

Reference recipe	Formulation 50%	Formulation 75%	Formulation 100%
			

Overall, F3 can be considered the most optimal formulation because it has the highest overall score (4.4) and the highest average score (4.1). Although F2 is superior in terms of taste, it provides a better sensory balance, especially due to its success in improving textures which is often a major challenge in the development of this candol dawet product. The following results of the sensory test at the design stage can be seen in table 8.

Table 8. Design Sensory Test Results

Sensory properties	Reference Recipe	Formulation 50%	Formulation 75%	Formulation 100%
Shape	3,2	3,2	3,6	3,6
Size	4	3,6	3,2	3,4
Color	4,2	4	4,4	4,4
Aroma	3,6	4	3,8	4,2
Taste	3,4	3,6	4,4	4
Texture	3,6	3,8	4	4,6
Overall	4,4	3,6	4	4,4
Average	3.8	3,7	3,9	4,1

c. The development stage in candol products uses potato flour in dawet.

This development stage is an important stage where validation is carried out to compare the reference product with the development product with the percentage of substitution that has been selected. In this process, the main focus is to ensure that the new formulation still meets the desired quality standards while highlighting the unique characteristics of the development. In addition to recipe refinement, this stage also includes aesthetic planning and product logistics, starting from determining the type of packaging that is able to maintain shelf life, attractive presentation techniques to strengthen the visual identity of the product before moving on to the next stage.

In this stage of research, two main prescriptions were determined as the basis for comparison, namely the Reference Recipe (R) and the selected Development Recipe (F3 100%). The reference recipe uses a standard formula with the use of 150 gr of palm sago flour as the main ingredient. Meanwhile, in the F3 development recipe, a substitution of 100% was made by replacing all the use of palm sago flour with 150 grams of potato flour. The following development stage recipe can be seen in table 9.

Table 9. Recipe stage of developing cendol dawet

Ingredients	Recipe Mold	Formulation 100%
Palm sago flour (g)	150 gr	-
Potato flour	-	150 gr
Rice flour (g)	50 gr	50 gr
Suji Leaf Water (ml)	650 ml	650 ml
Pandan (Imbr)	11 sheets	11 sheets
Confectioners' Sugar (g)	250 gr	250 gr
Coconut milk (ml)	750 ml	750 ml
Salt (g)	1/2 tsp	1/2 tsp

The results of the sensory test in the development stage, the following is an explanation of the comparison of sensory characteristics in terms of color, aroma, texture, taste, and size between the reference product and the selected development product, namely F3 (100%) can be seen in table 10.

Table 10. Characteristics of the results of the development stage

Characteristics	Reference recipe	Formulation 100%
Color	Dark green	Dark green
Aroma	Fresh pandan	Fresh pandan
Text	Chewy	Slightly chewy
Taste	Taste of suji leaves	Taste of suji leaves
Size	Friendly	Friendly

The following documentation is taken in table 11 including a reference recipe and a selected development formula, namely F3 (100%), in order to objectively compare the physical characteristics of each sample. Documentation is done from a top-down viewing point of view to ensure the details of the product's texture and appearance are clearly visible.

Table 11. Reference and development product documentation

Reference recipe	Formulation 100%
	

From the results that have been obtained at this development stage, in terms of overall this data shows that the development product is superior with a score of 4.7, compared to the reference product which has a score of 4.0. On an overall average, the selected development recipe recorded a score of 4.3, higher than the reference recipe which had an average of 4.0. The following sensory test results can be seen in table 12.

Table 12. Developmental Stage Sensory Test Results

Sensory properties	Reference recipe	Formulation 100%
Shape	3,2	3,6
Size	4	3,4
Color	4,2	4,4
Aroma	3,6	4,2
Taste	3,4	4
Texture	3,6	4,6
Overall	4,4	4,4
Average	3,8	4,1

Then then determine packaging that functions not only to maintain the quality and safety of the product, but also to increase its attractiveness in the eyes of consumers. In addition, packaging plays a very important role in simplifying the distribution process until the product arrives safely in the hands of consumers. On the other hand, packaging is also an important communication medium that contains complete information, ranging from the composition of the ingredients, to the expiration date limit.



Figure 1. Packaging comes



Figure 2. Packaging Labels Come

This Datang product is packaged using a transparent 300 ml clear bottle as seen in figure 1 with a dose of 100 gr of cendol in each package, then closed with a black bottle cap. The selection of transparent packaging aims to allow consumers to clearly see the quality, color, and texture of dawet in it.

Figure 2 shows the design of the Datang product packaging label that provides information to consumers that serves as a visual identity that highlights the brand, claims of 100% potato flour raw materials, product illustrations, and a net weight of 300 grams.

d. The disseminate stage in cendol products uses potato flour in dawet.

The disseminate stage is the final stage in this research, the main focus is to test whether the product that has been developed is really worthy of acceptance by the wider community. At this stage, a series of comparative trials were carried out between the reference product and the product of development. The process involves the participation of 80 untrained general panelists, with the aim of obtaining an honest and objective assessment from the consumer's point of view.

Each panelist will be given two samples, namely, one sample as a reference product and the other as a product of development that is being tested. After receiving the samples, the panelists were asked to taste and compare the sensory characteristics of the two in depth. This organoleptic test covers several important aspects, such as taste, aroma, texture, color, packaging to the overall of the product. The following t-test results can be seen in table 13.

Table 13. Product reference and development t-test results

Properties	Reference Products	Products	P-value	Remarks
Sensory		Development		
Taste	4,2 ± 0,6	4,6 ± 0,7	0,23	no significant
Aroma	4,2 ± 0,6	4,5 ± 0,7	0,20	no significant
Texture	4,1 ± 0,6	4,5 ± 0,8	0,18	no significant
Packaging	4,2 ± 0,7	4,6 ± 0,7	0,42	no significant
Color	4,2 ± 0,6	4,5 ± 0,8	0,16	no significant
Overall	4,2 ± 0,5	4,6 ± 0,7	0,22	no significant

Based on the results of the t-test in table 13, the development products consistently obtained a higher average value compared to the reference product in all aspects tested. This test is carried out by looking at the p-value, with the basis for decision-making being the *p-value* < 0.05, then the reference and development are clearly different, while *the p-value* > 0.05, then the reference and development are not significantly different. The results of the analysis showed that for all aspects tested, namely *p-value* at taste 0.23, aroma 0.20, texture 0.18, packaging 0.42, color 0.16, and overall acceptance of 0.22, all of which had a *p* > value of 0.05, it can be concluded that statistically there was no real (significant) difference between the development product and the reference product in all sensory aspects assessed.

Table 14. Average results of reference and development product preference tests

Remarks	Reference	Development
Very dislike	0,0	1,0
Dislike	0,5	1,0
Quite like it	5,7	1,7
Likes	51,7	25,8
Really like	22,2	50,5

Regarding the average results of the organoleptic test of the reference product, the majority of panelists gave a good assessment, where as many as 51.7% stated "Like" and 22.2% stated "Very Like", so that in total around 73.9% of respondents had a positive response to this product. As for

the development product, the most prominent point is the high level of satisfaction of the panelists, where as many as 50.5% of respondents stated "Very Like" and 25.8% stated "Like". So in total around 76.3% of respondents have a positive response to this product.

3.2. Discussion

a. Product Recipe

The selected reference recipes are based on the acceptance rate of trained panelists in terms of texture, aroma taste, shape, and color. After testing, the 2nd reference recipe was chosen, namely from the recipe book for mixed ice and fresh drinks by Dapur Kirana. In the next stage, the researcher substituted the reference material using potato flour with a percentage of 50%, 75%, and 100%. The results of observations show that the use of potato flour affects the shape, and taste. The formulation chosen is 100%, because it produces a texture that resembles cendol in general, but with the advantage of using potato flour as a substitute for palm sago flour.

b. Product Packaging

The packaging used in Datang products is made with the aim of making the product look attractive and safe for consumption. The packaging used is a clear bottle measuring 300 ml, because this bottle is transparent, consumers can immediately see the freshness and quality of the contents of cendol in it. This bottle is also made airtight by using a black bottle cap so that the cleanliness of the product is maintained and does not go stale easily. On the bottle, there is a label containing the name of the product, an animated image of the duphet product, the serving size, the ingredients used, the way it is served, and the expiration date. With neat packaging and honest information, consumers will feel more confident and comfortable when buying this local innovation product.

c. Discussion of the level of liking of the product Datang

This study conducted an organoleptic test to compare development products with reference products, this test involved 80 untrained panelists. The parameters assessed included taste, aroma, texture, color, packaging, and overall rating. The results of the research show that the Datang product received a very positive response from the panelists where as many as 50.5% of the panelists stated that they liked it very much and 25.8% said they liked it, although there were still 1.0% of the panelists who said they did not like it and did not like it very much.

The results of the *paired t-test* showed no significant difference, $p\text{-value} > 0.05$ for all aspects (taste, aroma, texture, packaging, color, and overall acceptance). The innovation of using potato flour in Datang products has been successfully accepted by the public with a high level of preference. Because there is no significant difference in quality with the reference product, Datang products are considered a viable alternative and have acceptability equivalent to standard dawet products that are already on the market, but with the advantage of better nutritional value.

4. Conclusions

Based on the results of research, data analysis, and discussions that have been carried out related to the development of Datang products, it can be concluded as follows:

- a. Based on the results of the research, the most appropriate formulation of the cendol dawet recipe is to use a reference recipe from the book Kirana, 2019 with a percentage of potato flour substitution of 100% as a substitute for palm sago flour.

- b. Datang products have a very high level of likability test in the community with an average likability score of 4.6 on the overall aspect of the scale of 5. The results of organoleptic tests on 80 panelists showed that 76.3% of respondents stated that they liked the quality of the taste, shape, color, aroma, and texture of the product, and were statistically proven to have quality equivalent to dawet products in general.
- c. Product packaging Datang uses 300 ml transparent plastic bottles as primary packaging and 150 ml bottles as secondary packaging equipped with black bottle caps and informative label stickers to ensure food safety while enhancing visual appeal in the modern era.

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