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Effect of corn starch on sensory quality, physical quality, and consumer acceptance of gelatin-free pudding products

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Abstract

This research aimed to investigate sensory quality, physical quality (values of color and texture) and consumer acceptance of pudding products. The experimental factor was the use of corn starch in place of gelatin in different ratios of four formulations: gelatin pudding (control), 4% corn starch pudding, 6% corn starch pudding, and 8% corn starch pudding. According to a sensory evaluation, the 4% corn starch pudding received the highest accepted sensory test scores and was the best formulation for replacing gelatin with corn starch. Meanwhile, a physical quality analysis showed that the color and texture values of the pudding were the lowest, but it showed that the lightness value was high when compared with other formulations. A study on consumer acceptance of 4% corn starch pudding (final product acceptance) found that acceptance was at a high level. The average score of all attributes was 7.61. From analysis of consumer attitudes, it was found that 97% of consumers accepted the pudding products, 98% would decide to buy the pudding products when they were on the market, and 32% rated the products as a novelty. Additionally, when the price of gelatin pudding (control) was compared to the price of 4% corn starch pudding, it was found that corn starch pudding was cheaper.

Keywords: Pudding, Gelatin, Corn starch, Sensory evaluation, Physical quality, Consumer acceptance

1. Introduction

Sweets are ubiquitous throughout the world and in all cultures. They are typically ingested as a dessert or as a refreshment [1]. As well as dairy-based sweets, other sweets are available in a wide variety of flavors and may be found in many different parts of the globe [2]. In every country, gel-like treats are consumed, and there are numerous varieties which are made by processing ingredients until a type of gel is formed. One of these desserts is pudding. It is a globally desirable and widely recognized dairy product which is easy to consume and appropriate for all ages [3]. It appears in semi-liquid and semi-creamy forms. It is frequently presented as a delicacy, and as a dessert for celebratory or special occasions [4]. In Thailand, pudding is a favored dessert option. From confectionery shops, coffee shops, and supermarkets, puddings are frequently sold to consumers, which can generate income and a career for the business proprietor [5].

Puddings are often made using milk, sugar, and stabilizers such as gelatin, which act as emulsifiers and stabilizers, respectively. The result is a product that has a delicate texture, suppleness, and the ability to retain its form [6,7]. This is due to the fact that gelatin, the most important component of pudding, is derived from collagen. Collagen is a naturally occurring protein that may be found in the skin, bones, and connective tissue of animals [8,9]. Generally, 46% of gelatins come from porcine skin, 29.4% and 23.1% from bovine hide and bones, respectively, and about 1.5% from fish [10]. This means certain customers who practice Islam are prohibited from consuming gelatin due to the presence of some elements of pork in it [11,12]. Therefore, use of alternatives to gelatin in pudding ingredients will permit Muslim consumers to consume pudding. Corn starch is a significant alternative ingredient that can be used to replace gelatin.

Over 85% of the starch that is generated on a global scale comes from corn, which is the primary source of starch [13]. Among the various varieties of plant starches, corn starch has the largest market share (65%) and has garnered significant attention due to its low cost and superior physical and chemical properties [14,15]. The molecules of amylose and amylopectin found in corn starch are distinctive and abundant, and both of these components have the potential to serve as important industrial resources that are very adaptable [16]. Usually, there is around 72% amylopectin and 28% amylose in corn starch [17]. Corn starch is extensively used in the food industry as a thickening, gelling, and water-retaining agent [18]. According to previous research, corn starch has been used in pudding products [19]. There has also been consistent research on the use of corn starch in the manufacturing process, and experiments have been conducted with fresh milk yogurt products [20]. One pudding gelled with corn starch was found to exhibit a consistency which was occasionally challenging to pour; the pudding underwent a retrograde transformation while being stored, and the gel was entirely destabilized through chilling. The viscous, stringy consistency of the untreated waxy maize was destabilized when exposed to cooling [21].

The researcher is thus interested in creating a pudding product based on corn starch instead of gelatin for the aforementioned reasons. Due to its characteristics, corn starch allows for the creation of a gel for stability in desserts. Additionally, the texture of such desserts is dense and velvety. Furthermore, corn starch is readily accessible on the market and cheaper than gelatin. This will result in pudding production costs that are not very high. Meanwhile, the successful creation of this product will result in the emergence of corn starch pudding as a dessert option for consumers, and it will present an opportunity to create other novel products using corn starch. Therefore, the objectives of this study were to explore the sensory character of puddings made with varying quantities of corn starch in place of gelatin, the physical quality of corn starch pudding at different ratios, and the consumer acceptance of corn starch pudding products.

2. Materials and methods

2.1 Raw materials

The ingredients of the pudding product formulas, which were purchased from a supermarket, consisted of the following: fresh milk (Thai-Denmark, Dairy Farming Promotion Organization of Thailand), whipping cream (Anchor, Fonterra Brands (New Zealand) Limited, New Zealand), sugar (Mitr Phol, Mitr Phol Group, Thailand), water (Nestle, Perrier Vittel (Thailand) Co., Ltd.), gelatin (McGarrett, Continental Food Co., Ltd., Thailand), and corn starch (McGarrett, Continental Food Co., Ltd., Thailand).

2.2 Pudding preparation

Table 1 displays the formulations and production methods for the gelatin-based pudding (control) and the corn-starch-based puddings (4%, 6%, and 8% corn starch) produced by varying the amount of corn starch in different ratios based on the weight of all the ingredients in each formula.

For the preparation of each pudding, the fresh milk, heavy whipping cream, and sugar were placed in a cooking saucepan. All of the ingredients were mixed together well and brought to a simmer using a temperature of 80 °C. The mixture was continually stirred while it gradually came to a boil. The gelatin was combined with the water, and stirring continued until the gelatin had absorbed all of the liquid. After that, the gelatin was added to the saucepan, the mixture was stirred constantly until the gelatin had been cooked for around 5 minutes, and then the heat was turned off. If it was a formula that called for corn starch, the corn starch mixture was prepared, the water and corn starch were added to the saucepan, the mixture was stirred constantly until the corn starch had been cooked for approximately 5 minutes, and then the heat was turned off. An 85 g amount of pudding was transferred from the pan to pudding cups made from polypropylene (PP) plastic, which were 100 ml in size, 8 cm in diameter, and 6 cm in height. Then, they were placed in a refrigerator for about 8 hours at 4°C, or until the pudding had completely set.

Table 1 The amounts of pudding ingredients in different samples.

Ingredients (g)	Gelatin pudding (control)	Corn starch pudding (4%)	Corn starch pudding (6%)	Corn starch pudding (8%)
Fresh milk	350	350	350	350
Whipping cream	150	150	150	150
Sugar	35	35	35	35
Water	70	70	70	70
Gelatin	15	-	-	-
Corn starch	-	26	39	52

Control formula adapted from [22].

2.3 Sensory evaluation

Four pudding samples, consisting of gelatin pudding (control), and corn starch pudding with 4%, 6%, and 8% corn starch, were prepared according to the formula in Table 1 and the production procedure described above. Sensory quality evaluations were conducted in terms of appearance, color, smell, flavor, texture, and overall preference, and the 9-point hedonic scale was used: 1 = dislike extremely to 9 = like extremely [23]. A group of 30 untrained panelists, including an instructor of the Food and Nutrition Program and students who had passed the experimental design and sensory evaluation course of the Food and Nutrition Program, Faculty of Home Economics Technology, Rajamangala University of Technology Thanyaburi, was used to determine the optimal corn starch pudding ratio. The panelists accepted an invitation to take part in sensory testing from the researcher and acknowledged the purpose of this study before participating. The sensory testing process involved 30 panelists, who were given a sample of one cup with 85 g of pudding cooled to a temperature of 4°C. The panelists were given water and tasteless crackers for cleaning the palate during sample tasting.

2.4 Color analysis

The color measurement was carried out according to the CIE system (L* a* b*), where L* represents the value of brightness and darkness and ranges between 0 and 100 (L* 0 indicates black, while L* 100 indicates white); a* indicates red-green, while a* positive signifies red and a* negative represents green; and b* represents yellow-blue, b* positive represents yellow, and b* negative represents blue [24]. A Hunter Lab Color Flex EZ Colorimeter was utilized in the following geometry measurement: directional annular 45° illumination/0° viewing, spectral range: 400 nm –700 nm, spectral resolution: < 3 nm. Samples of gelatin pudding formula (control), and samples of 4%, 6%, and 8% corn starch pudding were measured, with five repetitions for each sample.

2.5 Texture profile analysis

A texture analyzer (Model TA-XT plus, Stable Micro Systems, Surrey, UK) equipped with a 36 mm diameter P36R cylindrical probe was used and a double cycle was programmed. The samples were prepared in plastic cups of 100 ml in size, 8 cm in diameter, and 6 cm in height, containing 85 g of pudding cooled to a temperature of 4°C before being measured. The compression rate for 50 percent of the sample height was 1 mm/sec. The second compression occurred 15 seconds after the first compression [25]. Values for hardness, cohesiveness, springiness, gumminess, and chewiness were determined and reported by quantifying the gelatin pudding formula (control) and corn starch pudding formulas with 4%, 6%, and 8% corn starch, each weighing 85 g, with five repetitions for each sample.

2.6 Consumer acceptance test

The consumer acceptance test of corn starch pudding products was carried out by using the corn starch pudding formula that performed best in sensory quality testing. In order to determine the level of consumer acceptability, students and staff members from Rajamangala University of Technology Thanyaburi along with members of the general public who had been randomly selected were used to make up the group of 100 persons serving as the sample. The researcher informed the panelists of the research objectives, and they accepted the terms of participation by signing a consent form. This sample completed a survey that was divided into the following three parts [26]:

Part 1: Personal information, such as gender, age, education, and occupation; Part 2: Sensory quality test (tasting of the final product) in terms of appearance, color, smell, taste, texture, and overall preference using the 9-point hedonic scale (1 = dislike extremely and 9 = like extremely); and Part 3: Consumer attitudes towards the acceptance of corn starch pudding products through use of a check-list questionnaire which consisted of three questions on the following: 1) acceptance of the corn starch pudding product, 2) whether they would purchase the corn starch pudding product when it was available in the market, and 3) the reason why they would choose to buy the corn starch pudding product.

2.7 Comparison of the cost of gelatin pudding and corn starch pudding

Using the cost calculation formula, a comparison was made between the costs of making gelatin pudding formula (control) and the corn starch pudding formula which received the most favorable evaluations from the panelists; the following formula was used for calculating costs: [27].

$$\text{Raw material cost} = \frac{\text{Actual weight (g) x Price (USD)}}{\text{Total weight (g)}}$$

2.8 Data analysis

Sensory value, value of color, and value of texture were used in variance analysis. In terms of statistical analysis, the ANOVA was contrasted using Duncan's new multiple range test (DNMRT). Differences between means were accepted at $p \leq 0.05$. and consumer acceptance data were analyzed to produce means, frequencies, and percentages using SPSS software, version 22.

3. Results

3.1 Sensory evaluation

Table 2 shows that the appearance characteristics and the overall acceptance of the four pudding formulas, namely, gelatin pudding (control) and corn starch pudding (4, 6, and 8%), were significantly different ($p \leq 0.05$). At the same time, the characteristics, which included the color, smell, taste, and texture of the four pudding formulas, were not different ($p > 0.05$). This may be because the panelists were unable to distinguish between the colors of the puddings with the naked eye because the colors of the puddings were similar. Additionally, the gelatin and corn starch ingredients in the pudding did not affect the smell and taste. The textures were so similar that the panelists could not differentiate between each pudding formulation because the corn starch content of 4–8% may have had little effect on the texture and viscosity of the corn starch in the pudding. However, in terms of mean scores, it can be seen that gelatin pudding (control) and 4% corn starch pudding were the closest. In addition, the 4% corn starch pudding had the highest average score of overall liking, at 7.20. Therefore, it can be concluded that the optimum amount of corn starch for making pudding is 4% corn starch. The researcher therefore used this formula for the next step of the study.

Table 2 Results of the sensory evaluation of corn starch pudding (n=30).

Characteristics	Gelatin pudding (control)	Corn starch pudding (4%)	Corn starch pudding (6%)	Corn starch pudding (8%)
Appearance	$7.17^{a} \pm 1.62$	$6.80^{ab} \pm 1.54$	$6.00^{bc} \pm 1.91$	$5.50^{c} \pm 2.03$
Color ^{ns}	7.43 ± 0.89	7.23 ± 1.00	6.93 ± 1.08	7.10 ± 1.09
Smell ^{ns}	6.87 ± 1.10	6.43 ± 1.47	6.33 ± 1.32	6.47 ± 1.50
Taste ^{ns}	6.50 ± 1.33	7.03 ± 1.67	6.63 ± 1.29	6.17 ± 1.94
Texture ^{ns}	6.77 ± 2.04	6.97 ± 2.20	6.40 ± 1.35	6.27 ± 1.92
Overall acceptance	$7.00^{ab} \pm 1.20$	$7.20^{a} \pm 1.54$	$6.50^{ab} \pm 1.33$	$6.20^{c} \pm 1.33$

Values are means ± standard deviations. Values with different superscripts within the same row are significantly different at the 95% confidence level ($p \leq 0.05$). ^{ns} refers to non-significant difference ($p > 0.05$).

3.2 Color analysis

Table 3 shows that the L*, a*, and b* color values of all four pudding samples produced from gelatin (control) and 4%, 6%, and 8% corn starch pudding were statistically significantly different ($p \leq 0.05$). The color value L* means lightness. It can be concluded that 4% corn starch pudding had the highest lightness mean value (90.31). It can be seen that the L* color value is inversely proportional; that is, when the amount of corn starch is increased, the brightness value decreases. The a* value is the redness value. The gelatin pudding (control) had the highest a* mean value (1.40), and it was found that when the corn starch content was increased, the a* value decreased. The b* value is the yellowness value. The gelatin pudding (control) had the highest b* mean value (23.93). It was found that when the corn starch content was increased, the b* value decreased, as shown in Figure 1. It was also shown that the a* and b* values of 4% corn starch pudding were closest to the control formula.

Table 3 Results of the color analysis of corn starch pudding (n=5).

Characteristic	Gelatin pudding (control)	Corn starch pudding (4%)	Corn starch pudding (6%)	Corn starch pudding (8%)
L*	$86.35^{c} \pm 0.53$	$90.31^{a} \pm 0.14$	$89.64^{b} \pm 0.07$	$85.99^{c} \pm 0.13$
a*	$1.40^{a} \pm 0.01$	$0.80^{b} \pm 0.01$	$0.61^{c} \pm 0.01$	$0.03^{d} \pm 0.01$
b*	$23.93^{a} \pm 0.02$	$21.61^{b} \pm 0.16$	$18.30^{c} \pm 1.11$	$17.35^{d} \pm 0.02$

Values are means ± standard deviations. Values with different superscripts within the same row are significantly different at the 95% confidence level ($p \leq 0.05$).

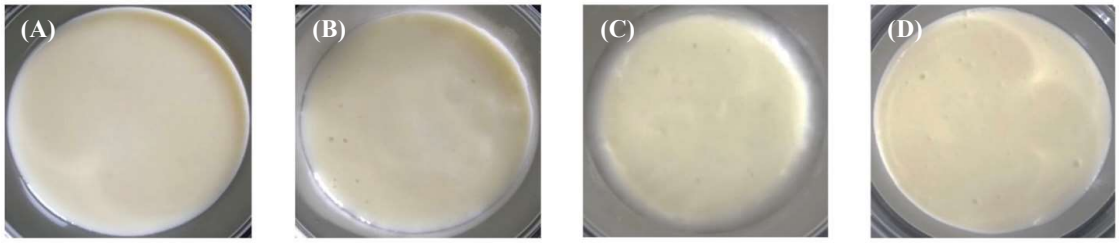

Figure 1 Pudding products (A) = gelatin pudding (control), (B) = 4% corn starch pudding, (C) = 6% corn starch pudding, and (D) = 8% corn starch pudding.

3.3 Texture profile analysis

Table 4 shows that the texture values, namely, the hardness, cohesiveness, springiness, gumminess, and chewiness of the four pudding samples produced from gelatin (control) and corn starch pudding (4%, 6%, and 8%), were statistically significantly different ($p \leq 0.05$). It was found that gelatin pudding (control) had higher hardness, cohesiveness, springiness, gumminess, and chewiness values than corn starch pudding. The mean values were 0.85, 0.51, 10.41, 0.44, and 4.63, respectively.

Table 4 Results of the texture profile analysis of corn starch pudding (n=5).

Characteristic	Gelatin pudding (control)	Corn starch pudding (4%)	Corn starch pudding (6%)	Corn starch pudding (8%)
Hardness (N)	$0.85^{a}\pm0.02$	$0.05^{d}\pm0.01$	$0.24^{c}\pm0.01$	$0.31^{b}\pm0.08$
Cohesiveness	$0.51^{a}\pm0.03$	$0.25^{c}\pm0.04$	$0.33^{b}\pm0.02$	$0.38^{b}\pm0.14$
Springiness	$10.41^{a}\pm0.33$	$7.92^{c}\pm0.56$	$9.38^{b}\pm0.35$	$9.95^{ab}\pm0.19$
Gumminess	$0.44^{a}\pm0.17$	$0.01^{d}\pm0.01$	$0.08^{c}\pm0.10$	$0.12^{b}\pm0.01$
Chewiness (N)	$4.63^{a}\pm0.32$	$0.10^{c}\pm0.02$	$0.80^{b}\pm0.10$	$1.10^{b}\pm0.04$

Values are means ± standard deviations. Values with different superscripts within the same row are significantly different at the 95% confidence level ($p \leq 0.05$).

3.4 Consumer acceptance test

Table 5 shows the personal information of the 100 consumers who participated in the study: more than half of them were female (72%), and the rest were male (28%); most of them (94%) were between 15 and 24 years old. Most of them had been educated to the bachelor's degree level (93%), and almost all of them were students (96%).

Table 5 Consumer personal information (n=100).

Basic Personal Information	Number (persons)	Percentage
Gender		
Male	28	28.00
Female	72	72.00
Total	100	100.00
Age		
15-24 years	94	94.00
25-34 years	4	4.00
35-44 years	1	1.00
45 years or older	1	1.00
Total	100	100.00
Education		
Bachelor's degree equivalent	5	5.00
Bachelor's degree	93	93.00
Postgraduate degree	2	2.00
Total	100	100.00
Occupation		
Trader	1	1.00
Student	96	96.00
Government service worker	1	1.00
Missing	2	2.00
Total	100	100.00

Figure 2 shows that in a sensory test of 4% corn starch pudding as a final product with 100 consumers, the consumers assessed sensory quality in terms of appearance (7.56), color (7.82), taste (7.54), texture (7.45), and overall acceptance (7.81) at the very favorable level. As for the smell, the average score was 7.11, which was at a moderate level of liking.

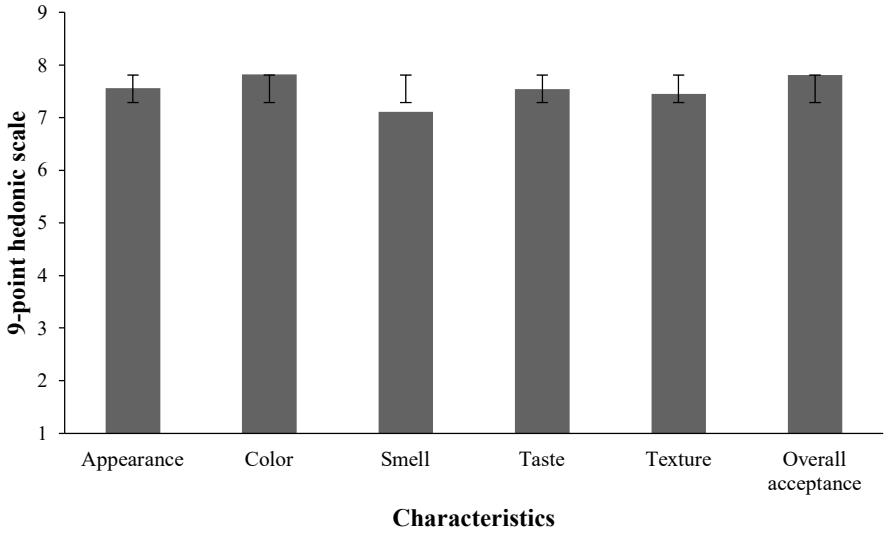

Figure 2 Results of the sensory test (Tasting of the final product).

In terms of the acceptance of corn starch pudding products, it was found that 97% of consumers accepted corn starch pudding products. The remaining 3% rejected corn starch pudding products. The majority of customers, 98%, said they would purchase corn starch pudding goods if they were offered on the market, while the remaining 2% indicated they would not. In addition, it was discovered that 32% of consumers would choose to purchase a corn starch pudding product because of the novel use of corn starch in this product instead of gelatin, while 26% of consumers would purchase it because Muslims can consume it, 24% of consumers would purchase it due to the fact that corn starch is gluten free, and 18% would purchase it because it is a novel product on the market.

Table 6 shows the production costs of two pudding formulas: gelatin pudding (control) and corn starch pudding (4%). The total production cost of the gelatin pudding (control) per formula was 2.34 USD, while the corn starch pudding (4%) had a total production cost of 2.00 USD per formula. This indicates that the corn starch pudding is 14.53% more cost-effective than the gelatin pudding. Each formula yields approximately 600 g of pudding, which can be divided into seven 85 g servings. Based on the total production costs and the number of servings, the average price per serving for the gelatin pudding (control) is 0.33 USD, whereas the corn starch pudding (4%) has an average price per serving of 0.29 USD.

Table 6 Results of the comparison of the cost of gelatin pudding and corn starch pudding.

Gelatin pudding (control)		Corn starch pudding (4%)	
Ingredients	Cost (USD)	Ingredients	Cost (USD)
Fresh milk	0.61	Fresh milk	0.61
Whipping cream	1.27	Whipping cream	1.27
Sugar	0.02	Sugar	0.02
Water	0.02	Water	0.02
Gelatin	0.41	Corn starch	0.07
Total	2.34	Total	2.00

Product price in April 2023.

4. Discussion

In sensory testing, four pudding samples, namely, those of gelatin pudding (control) and corn starch pudding (4%, 6%, and 8%), were assessed. In terms of appearance and overall acceptance, there was a statistically significant difference ($p \leq 0.05$) between the samples. However, it was observed that when the amount of corn starch was increased, the average score decreased accordingly. This may be because higher amounts of corn starch may affect the quality of the pudding and make it look worse than it should. This is in line with the study

of Phantusuk [20], which found that yogurt made from corn starch received lower favorability scores than yogurt (control) and yogurt made from different types of modified starch.

In terms of color, smell, and texture, there was no statistically significant difference ($p>0.05$) between the samples. However, it was found that in terms of taste and texture, 4% corn starch pudding tended to score higher than gelatin pudding (control) and 6% and 8% corn starch pudding. This shows that adding more corn starch to the pudding formula resulted in a decrease in the average sensory score. This may be because increasing the amount of corn starch affects the taste and texture, resulting in tasters giving it a low sensory rating. The product contains a lot of corn starch, and the starch coats the surface of the tongue, altering the perception of taste. In addition, gels derived from starch are more fragile than gels obtained from gelatin, thus resulting in a decrease in texture preferences.

There was a statistically significant difference ($p\leq0.05$) between the L*, a*, and b* color values of the four samples. However, it was observed that the L* (lightness) values of the 4%, 6%, and 8% corn starch pudding samples had inverse variations, i.e., with increasing amounts of corn starch, the brightness decreased. It is possible that this is because corn starch has a yellowish-white appearance. The starch has hydrocolloid properties, resulting in less light transmission into the product. In terms of yellowness, it was found that pudding made from gelatin had the highest yellowness. This may have been due to the yellowish color of the gelatin, which results in the most yellow color of pudding, and the fact that heating the pudding mixture results in the presence of more protein, which may result in even more Maillard reactions in the process [28,29]. Pudding made from gelatin also had the highest yellowness because the bleaching process used in corn starch manufacture makes corn starch brighter than gelatin.

The texture values of the four samples, namely, those of hardness, cohesiveness, springiness, gumminess, and chewiness, were significantly different ($p\leq0.05$). However, it was observed that the gelatin pudding (control) had the highest average texture value, greater than that of 4%, 6%, and 8% corn starch pudding. This may be because the gelatin affects the texture of the pudding; it makes the pudding set. Due to its distinctive qualities, which include its exceptional gelling, water-holding, and emulsifying abilities, gelatin enhances the viscosity, texture, and stability of liquid and semi-solid foods [30,31]. Gelatin begins gelling when the gelatin solution is heated, altering it to a sol or colloidal solution in which the molecules of gelatin are dispersed. However, in the form of an unpredictable helix, as the temperature decreases, already-strained molecules begin to curl. At the gelling point, where the temperature decreases, intermolecular interaction is intense. A robust reticulated structure is thus produced. An increasing number of intermolecular bonds are established via hydrogen, ionic, or hydrophobic means until a lattice in three dimensions is achieved. During this phase, the intermolecular bonds are exceptionally stable and robust [32]. The characteristics of individual starches are determined by the relative amounts of amylose and amylopectin they contain. Amylose solidifies into a gel through retrogradation, which is a smooth process. The gel of amylopectin is moderate in consistency. However, retrogradation and application as an adhesive are difficult. Corn starch is high in amylose, comprising about 28% of it. However, the gel obtained from corn starch is not as strong as the gel derived from gelatin [33]. On the other hand, the sensory tests of puddings (Table 2) showed that there was no difference in texture between puddings made from gelatin and those made from corn starch. In terms of texture, the analysis using the texture analyzer showed that the pudding containing gelatin had statistically significant maximum hardness values. This was due to the gel formed by the structure of gelatin, which is stronger than gels produced from starch. However, when the amount of corn starch was increased in puddings with corn starch added, it was found that the texture of the pudding tended to be even harder. This may be due to the fact that an increased quantity of corn starch gives the pudding a firmer texture. This is in line with the recommendations of the trained panelists, who stated that when the amount of corn starch is increased, the texture of the pudding will be firmer. This might be due to the fact that corn starch is a thickening, gelling, bulking, and water retention agent as a result of the gelatinization process which corn starch goes through when heated. When corn starch is heated, the dough will be thick and viscous, and the starch gel will harden [34,35].

In the consumer acceptance test of the final product, it was found that for the characteristics of appearance, color, taste, texture, and overall acceptance, the average score was at the level of liking. Therefore, in the tasting of the final product (4% corn starch pudding), the majority of consumers liked the pudding product and rated it highly. Additionally, 97% of the 100 consumers accepted the product. It can be concluded that the research and the experimental pudding products were successful because there was a high level of acceptance among consumers. Furthermore, 98% of customers claimed they would purchase pudding products when they were available.

As for the reason for purchasing pudding products, 32% of consumers cited novelty as the reason for purchasing corn starch pudding because corn starch is used instead of gelatin. This is consistent with the anticipated benefits of this research, namely, the emergence of new products derived from corn starch and the introduction of corn starch products to the market in order to develop new products. This could affect corn farmers or industries involved in the production of corn starch directly and indirectly, from upstream to downstream throughout the value chain. Studies have shown that using corn starch as a substitute for gelatin in

the pudding production process and increasing the amount of corn starch will result in the texture of the pudding being similar to that of pudding made from gelatin. Our experiment shows that adding corn starch at a level of 4% will give it the best organoleptic tolerance. However, if a pudding with a similar texture to a pudding made from gelatin is desired, it is best to choose a level of 8%.

The aspect of pudding product costs was also considered. When comparing gelatin pudding (control) and 4% corn starch pudding, it was discovered that corn starch pudding was less expensive because gelatin was more expensive than corn starch. In addition, corn starch is easily available on the market. It is advantageous that corn pudding is less expensive than gelatin pudding. In the future, corn starch may be used to create pudding, and it can also make businesses more profitable by reducing expenses.

5. Conclusion

In this research, it was demonstrated that corn starch could be used replace gelatin in the production of pudding. The use of corn starch, a hydrocolloidal starch, in this study had an impact on pudding products in terms of physical properties such as color, texture, and sensory evaluation. The panelists gave the highest preference score to pudding containing 4% corn starch because it had similar properties to gelatin pudding (control). In the consumer acceptance study of the final product, the 100 participants rated the product at the level of 'liking', with regard to the product's appearance, color, smell, and texture as well as its overall acceptance. As for the smell, it was at a moderate level of preference. In terms of product acceptance, it was concluded that 97% of consumers accepted the corn starch pudding product, and 98% would decide to purchase the product when it was available in the market. In addition, 32% of participants said they would purchase the corn starch pudding if it were available in the market as a novel product because it was gelatin-free. As for pudding production costs, it was determined that corn starch pudding was less expensive to make than gelatin pudding. In further studies, other starches with hydrocolloid properties, such as tapioca starch and potato starch, could be used to produce pudding.

6. Acknowledgment

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