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SENSORY ANALYSIS OF MOCHI PRODUCT WITH SUBSTITUTION OF LESSER YAM FLOUR (*Dioscorea esculenta*)

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The growing demand for healthy and innovative foods has encouraged the development of traditional products using functional ingredients. This study aimed to develop mochi with lesser yam (*Dioscorea esculenta*) flour substitution and natural beetroot coloring as a novel healthy snack alternative. Mochi was produced by substituting white glutinous rice flour with varying levels of lesser yam flour (F1: 20 g, F2: 40 g, F3: 60 g) and incorporating beetroot extract as a natural dye. Sensory evaluation was conducted on color, taste, aroma, texture, and overall acceptability using a hedonic scale. The results showed that formulation F1 (20 g lesser yam flour) achieved the highest overall acceptability score (4.11), indicating a "like" level among panelists. F1 also received superior ratings for taste (4.06) and texture (3.97) compared to F2 and F3, which showed decreased preference as the substitution level increased. Higher concentrations of lesser yam flour contributed to a slightly bitter taste due to diosgenin content and a firmer texture from reduced amylopectin levels. This study suggests that mochi with lesser yam flour substitution and natural beetroot coloring can be a potential functional food innovation with good market prospects.

1. Introduction

Mochi is a traditional Japanese wet cake commonly consumed during New Year celebrations. According to Mustofa et al. (2023), mochi was introduced to Indonesia during the Japanese colonial period and has since been adapted as a popular snack in various regions. This cake is made from glutinous rice flour combined with other ingredients and then steamed until cooked. The key characteristics of mochi include its chewy, sticky texture and round shape, usually dusted with sago flour or roasted cornstarch. The sticky nature of mochi is attributed to the high amylopectin content in glutinous rice flour, which contributes to the elastic texture upon cooking.

In recent years, alternative flour sources from local tubers have been explored in mochi production to enhance its nutritional value and support food diversification. One such tuber is the lesser yam (*Dioscorea esculenta*), a member of the Dioscorea family, which grows underground and is traditionally consumed as a rice substitute. Lesser yam is characterized by its light brown skin, white flesh, and a texture similar to sweet potatoes, with a distinctive mild flavor (Sulistyono & Marpaung, 2004). Nutritional analysis shows that 100 grams of lesser yam contains 31.3 g carbohydrates, 1.1 g protein, 0.2 g fat, 56 mg calcium, 0.6 mg phosphorus, 4 mg vitamin B1, and 66.4 mg vitamin C. Moreover, lesser yam is rich in inulin and bioactive compounds such as phenolics and diosgenin, which are known for their antioxidant activities. Phenolic compounds scavenge free radicals like DPPH, hydroxyl, and superoxide radicals, while diosgenin has been reported to possess antitumor and hypoglycemic properties (Pratiwi et al., 2016; Prabowo et al., 2014).

To leverage the nutritional potential of lesser yam, innovations in mochi processing were carried out by partially substituting glutinous rice flour with lesser yam flour and incorporating natural beetroot extract as a coloring agent. The formulated product aimed to improve the functional properties of mochi while maintaining sensory acceptability. This study was conducted to determine the optimal formulation of mochi substituted with lesser yam flour.

2. Materials and methods

The prototype of mochi substituted with lesser yam flour was developed between May and June 2024 at the Food and Agricultural Product Processing Engineering Laboratory, Sebelas Maret University.

Sensory evaluation was conducted at the university's Sensory Laboratory to determine consumer preferences.

2.1. Equipment and materials

The equipment used included mixing bowls, stove, steamer, spatula, spoons, blender, tray, knives, weighing scales, baking pans, measuring cup, and sieves. For sensory analysis, additional tools included assessment forms, serving plates, and SPSS software for data analysis.

Raw materials for product development consisted of white glutinous rice flour, lesser yam flour, cornstarch, peanuts, granulated sugar, beetroot extract, water, and salt.

2.2. Product development procedure

The development process involved two stages: preparing peanut fillings and producing mochi with lesser yam flour substitution. Beetroot extract was prepared separately as a natural coloring agent. The detailed processing steps included:

a. Preparing peanut fillings.
b. Extracting beetroot juice for natural coloring.
c. Mixing dry and wet ingredients.
d. Steaming and molding the mochi into round shapes.
e. Dusting finished mochi with roasted cornstarch.

Raw materials for product development consisted of white glutinous rice flour, lesser yam flour, cornstarch, peanuts, granulated sugar, beetroot extract, water, and salt.

Formulations:

F1: 180 grams of white glutinous rice flour and 20 grams of lesser yam flour

F2: 170 grams of white glutinous rice flour and 30 grams of lesser yam flour

F3: 160 grams of white glutinous rice flour and 40 grams of lesser yam flour

2.3. Sensory evaluation

A preference test was conducted with 30 untrained panelists who evaluated samples for color, aroma, taste, texture, and overall acceptability using a 5-point hedonic scale (1 = dislike very much, 5 = like very much). Three formulations (F1, F2, F3) with varying proportions of lesser yam flour (20g, 30g, and 40g) were tested. Data were analyzed using ANOVA with a significance level of $p<0.05$.

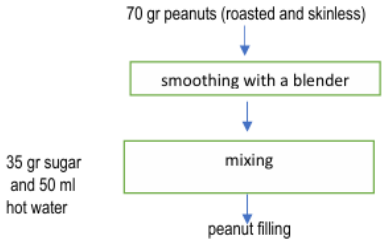

Figure 1. Peanut filling making

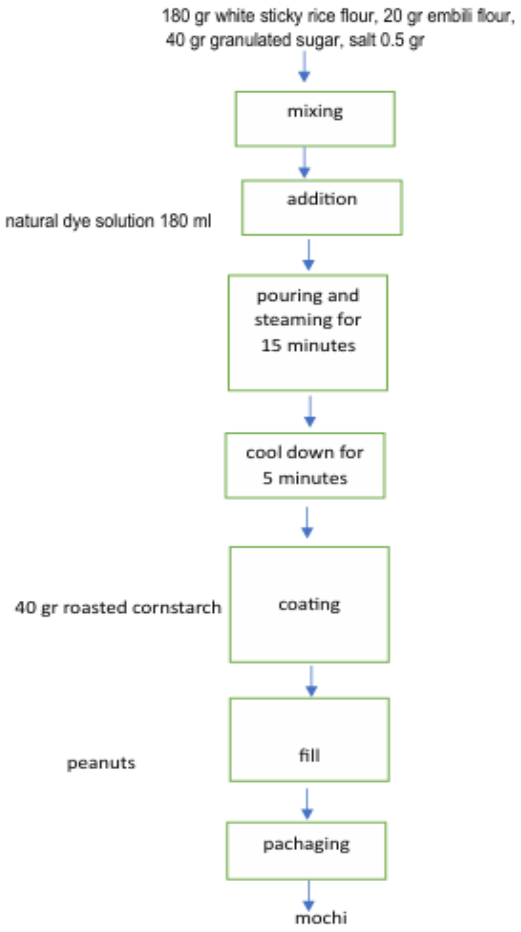

Figure 2. Mochi making process

3. Results and Discussions

Mochi is a type of wet cake, made from white glutinous rice flour mixed with other ingredients and then steamed. The cooked mochi is filled with peanuts and formed into a ball then sprinkled with roasted cornstarch. In general, white glutinous rice flour is used in making mochi cakes so that this product has a characteristic white color and chewy texture. Therefore, mochi is a food that is liked by all groups.

Several innovations in mochi product development have been carried out by replacing white

glutinous rice flour with other flours. The purpose of replacing raw materials is to maximize the use of other sources so that it becomes a functional food. One form of innovation in mochi products is by substituting lesser yam flour and using natural dyes such as beetroot in the processing process. With the innovation of mochi products with lesser yam flour substitution, it can be an alternative in product innovation and additional nutrition from the use of these additional ingredients.

Table 1. Sensory evaluation results of mochi product

Formulation	Color	Taste	Aroma	Texture	Overall
F1	3,91[a]	4,06[b]	3,54[a]	3,97[b]	4,11[b]
F2	3,71[a]	3,57[a]	3,23[a]	2,86[a]	3,63[a]
F3	3,54[a]	3,31[a]	2,94[a]	2,40[a]	3,40[a]

Information: Numbers followed by different letters in the same column indicate a significant difference ($p<0.05$)
Assessment scale: 1: Dislike extremely, 2: Dislike, 3: Neutral, 4: Like, 5: Like extremely

3.1. Color

Color is one of the parameters determining pane'ist' acceptance (Negara et al., 2016). **Table 1** shows that the results of the sensory assessment are not significantly different. In F1, a value of 3.91 was obtained, in F2 it was 3.74, and in F3 it was 3.65, all three of which shown samples "liked" by panelists. The lack of significant difference in the color parameters of mochi from lesser yam flour is in accordance with the results of a study by Fauzi et al. (2015), regarding the making of rainbow mochi with taro flour substitution that the comparison of taro flour use did not differ significantly in color and aroma parameters.

The color produced from mochi cakes with lesser yam flour substitution and the addition of natural beetroot coloring after the steaming process is darker (brownish red) compared to when the dough that has not been steamed, where the color of the dough was brighter in pink. According to Estiasih & Mar'atirrosyida (2014), the use of lesser yam flour can cause food products to turn brown because there are phenol compounds contained in lesser yam which trigger a brownish color in gembili. The red color is produced due to the betacyanin content in beetroot as a natural coloring agent (Wibawanto et al., 2014).

3.2. Taste

Taste is a primary factor for consumer preference. The results of the mochi sensory test with lesser yam flour substitution and natural beetroot coloring were known that there was no significant difference between F2 and F3. While in F1 compared to F2 and F3 shows a significant difference. The most preferred product is F1. In mochi products, the taste produced is influenced by the ratio of lesser yam flour addition to each formula. The more lesser yam flour added, the more bitter the product will be. The bitter taste is caused by the presence of bioactive compounds such as diosgenin which is included in the saponin group where saponin has a bitter taste (Manobharati & Mirunalini, 2020).

3.3. Aroma

Aroma is one of the parameters that can be assessed using the sense of smell. Table 1 shows the results of the sensory test that the three formulas did not have significant differences. In F1, a value of 3.54 was obtained; in F2 it was 3.23; and in F3 it was 2.94. In accordance with Imzalfida's research (2016) which states that substitution does not have a significant effect on aroma, because there is no aroma in lesser yam, causing the aroma of the product with the addition of lesser yam flour to be not different from the product in general.

3.4. Texture

Based on the data in **Table 1**, the formulation F1, which used 20 g of lesser yam flour, achieved the highest texture score (3.97), indicating strong panelist preference. In contrast, F2 (2.86) and F3 (2.40) received significantly lower scores, suggesting reduced acceptability as the level of yam flour substitution increased.

The superior texture of F1 is attributed to the predominance of white glutinous rice flour, known for its high amylopectin content, approximately 98–99%, which imparts a soft, sticky, and elastic texture to (Ikbal et al., 2019). In comparison, lesser yam flour contains around 75.7% amylopectin (Imzalfida, 2016), resulting in a less cohesive structure and diminished chewiness when used in higher proportions.

Furthermore, Prabowo et al. (2014) emphasized that starches with high amylose and amylopectin contents possess extensive hydrogen bonding potential due to the abundance of straight-chain molecules. These properties increase the energy required during gelatinization and influence the resulting texture. Therefore, the decline in panelist preference in F2 and F3 may be associated with the altered gelatinization behavior and less optimal textural qualities from higher lesser yam flour incorporation.

3.5. Overall

In the sensory evaluation, the overall parameter scores were derived from the combination of color,

aroma, taste, and texture attributes. As presented in Table 1, sample F1 achieved the highest overall score of 4.11, indicating it was the most preferred by the panelists. Sample F2 scored 3.63, reflecting a neutral preference, while sample F3 obtained a score of 3.40, also categorized as neutral.

4. Conclusions

The production process of mochi with lesser yam flour substitution and natural beetroot coloring involves several stages: preparation of tools and materials, extraction of beetroot, preparation of the mochi filling, mochi dough processing, and packaging. Among the formulations tested, mochi with the addition of 20 grams of lesser yam flour was the most preferred by the panelists based on sensory evaluation.

5. References

Estiasih, T., Mar'atirrosyida. 2014. Aktivitas Antioksidan Senyawa Bioaktif Umbi-Umbian Lokal Inferior. Jurnal Pangan dan Agroindustri, 3(2), 594-601.

Fauzi, I., Nauli, R., Hidayatuloh, S., Hutami, R. 2015. Pembuatan Mochi Pelangi dengan Subsitutsi Tepung Talas dan Pewarna Alami. Jurnal Agroindustri Halal 1(*2*), 107-111.

Ikbal, M., Mude, A.H., Gadisha, S.B., Pradana, A.P. 2019. Effect of Addition of White Glutinous Rice Starch (*Oryza Sativa L* Var. Glutinosa) In Alginate Impression Materials To Dimensional Stability. *Makassar Dent Journal, 8(2*), 112-117

Imzalfida, M., Indrawati, V. 2016. Pengaruh Substitusi Tepung Gembili (*Dioscorea ssculenta* Linn) Terhadap Sifat Organoleptik Chiffon Cake. E-Jounal Boga, 5 (1), 54-62.

Manobharati, V., Minuralini, S. 2020. Pharmacological characteristics of a phyto steroidal food saponin: Diosgenin. African Journal of Biological Sciences, 2(2), 77-87.

Mustofa, A., Pratiwi, L.D., Widanti, Y.A. 2023. Aktifitas Antioksidan Kue Mochi dengan Penambahan Ekstrak Beras Ketan Hitam, Ubi Jalar Ungu dan Buah Bit. Jurnal Teknologi Hasil Pertanian. 16(1), 75-83. https://doi.org/10.20961/jthp.v16i1.60407

Negara, J.K., Sio, A.K., Rifkhan, R., Arifin, M., Oktaviana, A.Y., Wihansah, R.R.S., Yusuf, M. 2017. Aspek mikrobiologis, serta Sensori (Rasa, Warna,Tekstur, Aroma) pada Dua Bentuk Penyajian Keju yang Berbeda. Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan, 4(2), 286-290.

Prabowo, A.Y., Estiasih, T., Purwantiningrum, I. 2014. Gembili (*Dioscorea esculenta* L.) as Food Contain Bioactive Compounds: A Review. Jurnal Pangan dan Agroindustri 2(3), 129-135.

Pratiwi, T., Affandi, D.A., Manuhara, G.J. 2016. The Application of Lesser Yam Flour (*Dioscorea esculenta*) as Wheat Flour Substitution in Tuna Fish (*Euthynnus affinis*) Nugget Filler. Jurnal Teknologi Hasil Pertanian, IX(1), 34-50.

Sulistyono, E., Marpaung, J. 2004. Catatan Penelitian Studi Karakter Umbi dan Kandungan Nutrisi Dioscorea spp. Buletin Agronomi 32. No. 2, Bogor Agricultural University.

Wibawanto, N.R., Ananingsih, V.K., Pratiwi, R. 2014. Produksi Serbuk Pewarna Alami Bit Merah (*Beta vulgaris* L.) dengan Metode Oven Drying. Prosiding SNST ke-5, Fakultas Teknik Universitas Wahid Hasyim Semarang.