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Study on the Production of Tenjo Dodol and Glutinous Rice Sweet With The Addition of Emprit Ginger

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Abstract

This study aims to determine (1) the optimal concentration of ginger extract for enhancing the quality of white glutinous rice dodol, and (2) the moisture content, total solids, and organoleptic evaluation of white glutinous rice dodol in accordance with the Indonesian National Standards. The research method involved mixing the water content, total solids, and organoleptic properties (color, aroma, texture, and taste) of the dodol through four treatments and three repetitions. Data were analyzed using SPSS. The treatments were as follows: 100% glutinous rice with 0% ginger extract, 95% glutinous rice with 5% ginger extract, 90% glutinous rice with 10% ginger extract, and 85% glutinous rice with 15% ginger extract. The research design used a repeated measures model with three repetitions. The highest organoleptic score for color was obtained with the addition of 10% ginger extract, receiving a score of 3.80 (liked), while the lowest score was found in the 15% ginger extract group, with a score of 3.37 (liked). For aroma, the highest score was observed in the 10% ginger extract group, while the lowest score was recorded in the 0% ginger extract group. Texture received the highest score in the 0% ginger extract group. The taste evaluation revealed that the highest score, 4.47 (liked), was in the 10% ginger extract group, and the lowest score was found in the 0% ginger extract group. The analysis of variance results indicated that there was no significant difference among the treatments ($p > 0.05$), and no further testing was necessary.

Keywords: Tenjo Dodol, Glutinous Rice Flour, Emprit Ginger

I. Introduction

Dodol is a popular traditional food, known since ancient times and produced using traditional methods. It is now more commonly recognized by the region from which it originates, such as Dodol Garut, Dodol Kudus, or Jenang Kudus, and Gelamai from West Sumatra. Dodol is a semi-moist product that is solid and chewy, while similar products made traditionally are called jenang, which has a softer and oilier texture Alyanti, Patang, Nurmila. (2017).

Dodol is a semi-moist solid food with several advantages, including being a nutritious emergency food and highly sought after Wang, S.& Copeland L. (2015). Dodol can be categorized into two types: flour-based and fruit-based dodol. However, many fruits, including Emprit ginger, have not been widely used as an additive in dodol production. Glutinous rice flour is the main ingredient in making dodol. It is a type of flour derived from glutinous rice, a variety of Oryza sativa from the grass family "Gramineae", which is milled into flour Arnisa, A. (2017).

Glutinous rice contains about 87% starch, with the remainder consisting of fats, proteins, and fiber. Glutinous rice flour provides a thick consistency, making the dodol texture elastic. Its high amylopectin content allows for easy gelatinization when combined with water and heat (Savira, Husniati. 2018).

According to Sandiana, M. L. (2017), glutinous rice flour is a key component in dodol production. When heated with sufficient water, the starch in the flour absorbs water, forming a thick paste, which, upon cooling, becomes chewy, stretchy, and firm. The flour also significantly influences the taste, color, texture, and chemical properties of dodol Rudianto, Harun N, Efendi R. (2015).

Emprit ginger, also known as small white ginger, is a type of ginger used as a spice and flavor enhancer. It has larger rhizomes than red ginger, a flatter shape, and a white color, with a mild aroma and soft fibers. Its essential oil content ranges from 1.5-3.3% of its dry weight. The essential oil gives ginger its distinctive aroma, while oleoresin contributes to its spicy and bitter taste.

According to Asfi, M. W,. N. Harun, and Y. Zalfiatri. (2017), the compounds in ginger extract, such as flavonoids, phenolics, terpenoids, and essential oils, are bioactive substances that can inhibit bacterial growth. Ginger is widely known as a medicinal herb used for seasoning and as a natural remedy. Its rhizomes are commonly used for ailments like colds, digestive issues, dry cough, cholera, diphtheria, snake bites, itching, and appetite enhancement, as well as for warming the body Kallo. (2018).

Emprit ginger contains active phenolic compounds like shogaol, gingerol, and gingerone, which possess antioxidant properties superior to Vitamin E and have anti-cancer effects (Hidayat & Rodame, 2015). Like other spices, ginger can preserve food quality as an antimicrobial agent. According to Central Bureau of Statistics. (2018), ginger contains essential oils (0.5 - 5.6%), zingiberone, zingiberene, zingiberol, borneol, camphor, felandrene, cineole, gingerin, vitamins (A, B1, and C), carbohydrates (20 - 60%), resin, and organic acids (malic and oxalic acids). In addition to its antimicrobial properties, ginger also functions as an antioxidant.

2. Literature Review

2.1. Definition of Dodol

According to the Indonesian National Standard (SNI) No. 01-2986-1992, dodol is a food product made from glutinous rice flour, coconut milk, and sugar, with or without the addition of other permitted food ingredients and additives. Dodol has a soft texture, is elastic, ready-to-

eat, does not require refrigeration, and is dry enough to remain stable during storage Juiwati, Anggraeni T., Prayuginingsih, Henik., Saptya P. (2018).

According to Kamal, M. 2015), describes dodol as an intermediate moisture food product, resembling a dense, sweet porridge that is chewy and dry. Dodol can be classified as a snack made from a mixture of white glutinous rice flour, brown sugar, and coconut milk (Nasaruddin et al., 2012).

According to Lukito et al. (2017) assert that texture is a desirable functional characteristic of dodol, linked to the structural properties of processed food products. Nasaruddin et al. (2012) emphasize that consumer attraction and satisfaction with dodol depend heavily on its texture, such as stickiness and delicious flavor. The dodol production process involves continuous stirring.

According to Yenrina, R. Yuliana, D. Rasymida. (2015), stirring during the dodol preparation process prevents flour sedimentation, and as the mixture thickens, stirring helps evenly distribute heat to avoid burning. In addition to stirring, cooking temperature also affects the quality of dodol.

3. Research Methodology

3.1. Equipment and Materials

The equipment used in this research includes a gas stove, knife, wok, basin, spoon, steamer, strainer, measuring cup, wooden stirrer, grater, digital scale, and “dodol” molds. The materials used include ginger extract, white glutinous rice flour, coconut milk, brown sugar, and clean water.

3.2. Preparation of White Glutinous Rice Dodol

a. Preparation of ingredients: ginger extract, white glutinous rice flour, grated coconut (from which the coconut milk has been extracted), and brown sugar are cooked together until evenly mixed.
b. Sorting: the process of removing low-quality ginger.
c. Cleaning: the ginger is peeled, separated from its skin, and placed in a container.
d. Grating: the cleaned ginger is grated to ease extraction.
e. Extraction: the grated ginger is squeezed to produce ginger extract.
f. Filtering: the ginger extract is filtered to separate it from the pulp.
g. Cooking: all the main ingredients white glutinous rice flour, ginger extract, coconut milk, and brown sugar are mixed and cooked over low heat at 70°C, stirred continuously for 35 minutes until the dodol thickens and reaches the desired consistency.
h. Cooling: the dodol is cooled, shaped in molds, and analyzed for various parameters.

3.3. Research Treatment

The treatments applied in this research are as follows:
a. P0 = 0% Ginger Extract
b. P1 = 5% Ginger Extract
c. P2 = 10% Ginger Extract
d. P3 = 15% Ginger Extract

3.4. Research Design

This study uses a Completely Randomized Design (CRD) with one treatment and three repetitions. The data obtained are analyzed using SPSS. The design model is expressed as follows:

a. Yij = μ + Ai + Eijk
   Where:
b. Yij = observed value for treatment A and B
c. μ = overall mean
d. Ai = effect of ginger concentration for factor A (0, 5, 10, 15%)
e. Eijk = random error effect for treatment ijk.

4. Results and Discussion

The white glutinous rice dodol with the addition of ginger extract was analyzed for its chemical properties, including moisture content and total solids, as well as organoleptic properties such as color, aroma, texture, and taste. The chemical tests aimed to determine moisture content and total solids and assess the impact of ginger on these parameters, while the organoleptic tests evaluated consumer or panelist preferences regarding color, aroma, texture, and taste. The results for the white glutinous rice dodol are illustrated in Figure 1.

4.1. Moisture Content of Dodol

Moisture content represents the amount of water contained in “dodol” and is expressed as a percentage. It is an essential parameter for food quality, affecting both freshness and shelf life. High moisture content allows bacteria, mold, and yeast to proliferate, leading to food spoilage (Winarmo, 2002). The average moisture content of dodol with varying ginger extract concentrations ranged from 10.85% to 13.75%. The highest moisture content (13.75%) was found in “dodol” with 15% ginger extract, while the lowest (10.85%) was observed in “dodol” with 0% ginger extract.

Figure 1 Original Tenjo Dodol
(Source: Poskota)

As shown in Figure 2, increasing ginger extract concentration results in higher moisture content. However, at 10% ginger extract, the moisture content decreased, possibly due to a delay in cooking caused by running out of gas. Based on the variance analysis, ginger extract concentration did not significantly affect moisture content (P > 0.05; 0.309).

4.2. Total Dissolved Solids (Brix)

Total dissolved solids (TDS) refer to the concentration of solid particles, including ions, compounds, and colloids, dissolved in water (Nicola, 2003). The average TDS in dodol with ginger extract ranged from 33.48 to 47.07 °Brix, with the highest TDS (47.07 °Brix) observed in dodol with 15% ginger extract, and the lowest (33.48 °Brix) in dodol with 0% ginger extract. Detailed results are shown in Figure 3.

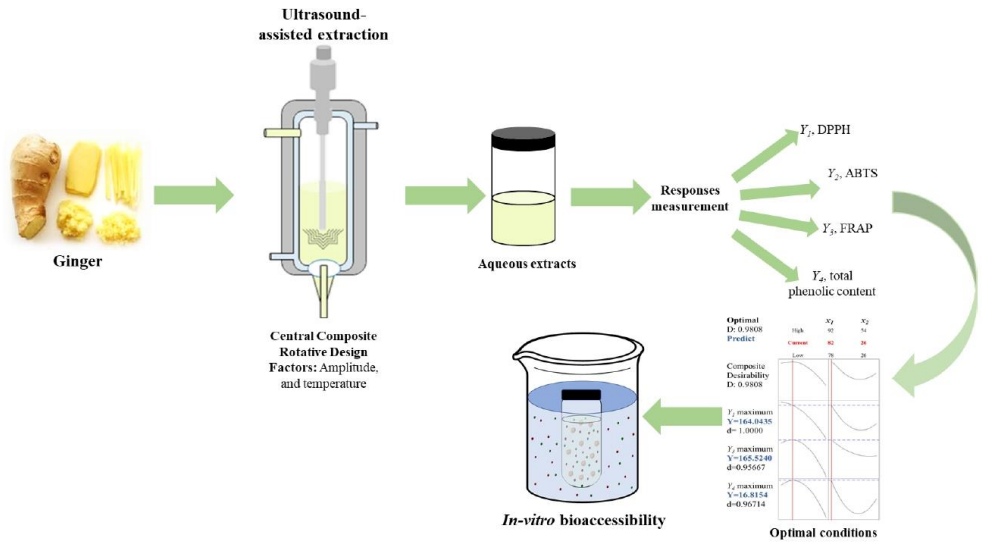

Figure 2. Effect of Ginger Extract Addition on Total Dissolved Solids in White Glutinous Rice Dodol (Source: MDPI)

Based on Figure 2, the effect of adding ginger extract to the water content of white glutinous rice dodol shows that the higher the amount of ginger extract added, the more the water content increases. However, at 10% ginger extract addition, the water content decreased. This was likely due to a cooking interruption when the LPG gas ran out. The variance analysis results indicate that the addition of ginger extract in the preparation of white glutinous rice dodol, with various levels of ginger extract, did not have a significant effect on water content, with a significance value of (P > 0.05; 0.309).

4.3. Total Dissolved Solids (TDS)

Total dissolved solids (TDS) refer to the dissolution of solid substances, including ions, compounds, and colloids, in water (Nicola, 2003). The total dissolved solids in the addition of ginger extract ranged from 33.48 to 47.07 oBrix. The highest TDS value was found in the 15% ginger extract addition with a value of 47.07, while the lowest TDS value was found in the 0% ginger extract addition with a value of 33.48. This is further illustrated in Figure 3.

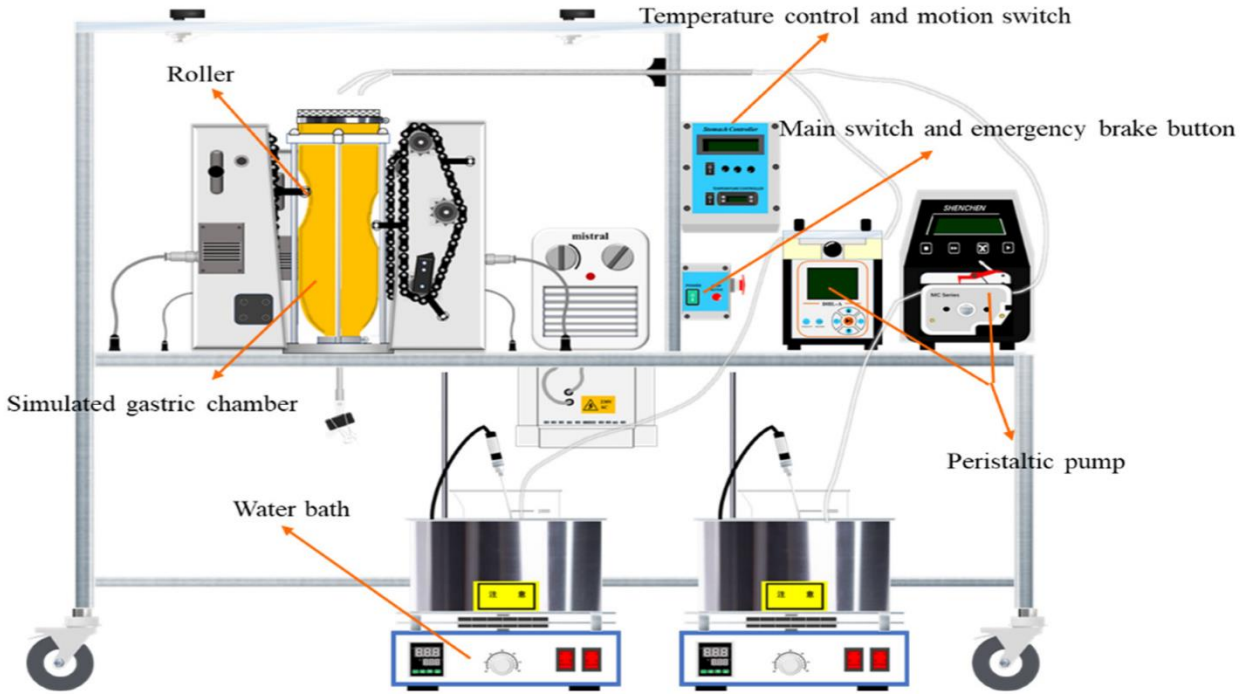

Figure 3. Effect of Adding Ginger Extract on Total Dissolved Solids of White Glutinous Rice Dodol (Source: MDPI)

4.4. Total Dissolved Solids of White Glutinous Rice Dodol

As shown in Figure 3, the addition of ginger extract to the total dissolved solids of white glutinous rice dodol indicates that the higher the amount of ginger extract, the greater the increase in total dissolved solids. This increase is likely due to the addition of palm sugar, which binds water in the dodol. According to the variance analysis, the total dissolved solids in white glutinous rice dodol with ginger extract variations did not show a significant effect, with a significance value of ($P > 0.05$; 0.72).

The analysis results further show that the higher the amount of ginger added, the higher the total dissolved solids. This aligns with (Farikha, 2013), who noted that total dissolved solids increase as free water is bound by stabilizing agents, causing the concentration of dissolved substances to rise. The more particles bound by stabilizing agents, the higher the total dissolved solids (Farikha, 2013).

4.5. Organoleptic Test Results

The organoleptic test evaluates food based on preference, using human senses as the main tool to measure product acceptability and quality. The food is tested by several trained panelists, each giving a score based on their perception of the food's taste. The panelists' scores determine the quality or acceptance of the tested food (Winarno, 2004). Organoleptic tests assess food quality using human sensory organs and are used to evaluate taste, aroma, texture, and color. This subjective yet important test can reveal a product’s sensory qualities. The preference scale for glutinous rice dodol was rated from 1 to 5, where 5 means "strongly like," 4 means "like," 3 means "neutral," 2 means "dislike," and 1 means "strongly dislike."

4.6. Organoleptic Test Results for Color

Color is a crucial component in determining the quality or acceptance of food. Foods with unappealing or unusual colors are less likely to be consumed. Thus, the quality of food is often judged based on its initial appearance (Winarno, 2004). The influence of ginger extract addition on the color of glutinous rice dodol showed the highest panelist preference with a 10% ginger extract addition, receiving a score of 3.8 ("strongly like"). The lowest panelist score was for the 15% ginger extract addition, with a score of 3.37 ("strongly dislike"). The results of the color organoleptic test for white glutinous rice dodol with ginger variations are shown in Figure 4.

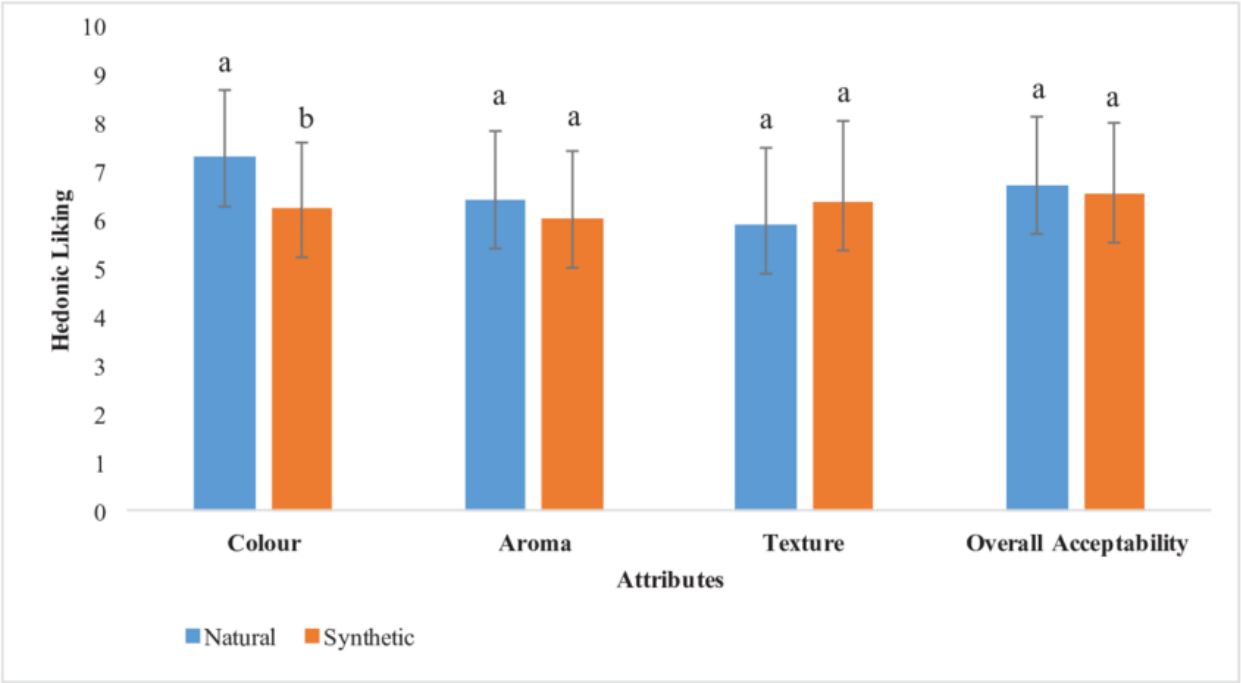

Figure 4. The Effect of Ginger Extract Addition on the Panelist Score for the Color of White Sticky Rice Dodol (Source: ResearchGate)

Based on Figure 4, the effect of adding ginger extract on the color of white sticky rice dodol is evident. As the amount of ginger extract increases, the color score also rises, reaching its highest at 47.07 (liked) with the maximum ginger extract addition. This increase is attributed to the ginger extract and brown sugar, which impart a color favored by the panelists. The results of the organoleptic variance analysis on the color show that the addition of ginger extract does not have a significant effect on the color of white sticky rice dodol, with a significance value of ($P > 0.05$; 0.164).

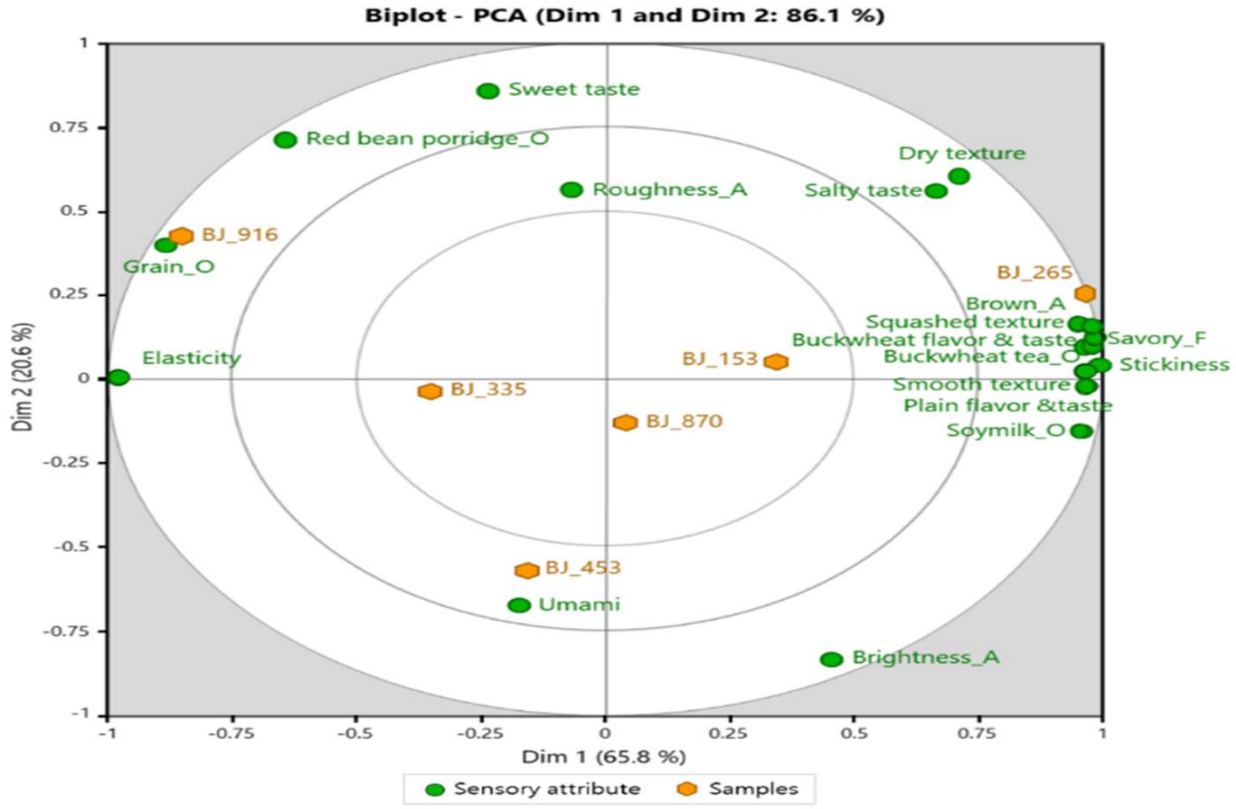

Figure 5. The Effect of Ginger Extract Addition on the Panelist Score for the Aroma of White Sticky Rice Dodol (Source: MDPI)

As shown in Figure 5, the addition of ginger extract impacts the aroma of white sticky rice dodol. The highest aroma score was obtained with 10% ginger extract, scoring 3.71 (highly liked). This is because panelists generally preferred the slightly sharp aroma of ginger. However, some panelists were not fond of the sharp aroma. The organoleptic variance analysis for aroma indicated that ginger extract significantly influenced the aroma of white sticky rice dodol ($P < 0.05$; 0.46).

4.7. The Results of Organoleptic Test on Texture

Texture, defined as the physical condition of a food product that can be identified through touch, is crucial for food evaluation (Soekarto, 1985). It can be sensed by biting, chewing, or pressing with fingers (Apriliyanti, 2010). The highest texture score for sticky rice dodol with ginger extract was achieved with 0% ginger extract, scoring 3.85 (highly liked), while the lowest score, 3.59, was obtained with 5% ginger extract. The addition of 15% ginger extract yielded a score of 3.65 (disliked). The organoleptic test results on texture, as seen in Figure 6, show that the addition of ginger extract did not significantly affect the texture of white sticky rice dodol ($P > 0.05$; 0.659).

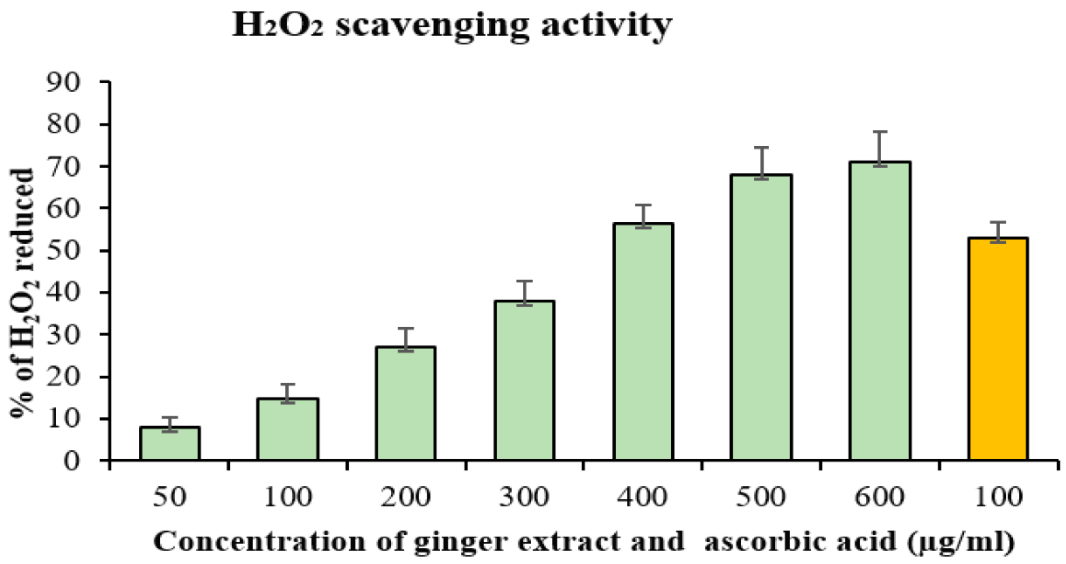

Figure 6. The Effect of Ginger Extract Addition on the Panelist Score for the Flavor of White Sticky Rice Dodol (Source: MDPI)

Based on Figure 8, the panelists' evaluation of the flavor of white sticky rice dodol varied according to the amount of ginger extract added. The highest score for flavor was achieved with 10% ginger extract, scoring 4.47 (highly liked), due to the preferred flavor imparted by the ginger extract. On the other hand, the lowest flavor score was recorded with 0% ginger extract, scoring 3.74 (disliked). The organoleptic variance analysis on flavor showed that ginger extract addition significantly influenced the flavor of white sticky rice dodol ($P < 0.05$; 0.44).

5. Conclusion and Suggestions

5.1. Conclusion

Based on the results of the research on sticky rice dodol with added ginger extract, as well as the results of the variance test, it was found that there was no significant effect on moisture content, total solids, or the organoleptic tests covering color, aroma, texture, and taste.

The highest moisture content was observed with the addition of 15% ginger extract, reaching 13.75, while the lowest was at 10% ginger extract, with a value of 11.19. The highest total solids were recorded with the addition of 15% ginger extract, scoring 47.07 (highly preferred), while the lowest was found in the 100% sticky rice treatment with 0% ginger, scoring 33.48.

The organoleptic test results showed that the highest color score was achieved with the addition of 10% ginger extract, reaching 3.80, while the lowest was at 15% ginger extract, with a score of 3.37. For aroma, the highest score was also observed at 10% ginger extract, with the lowest at 0% ginger. In terms of texture, the highest score was found at 0% ginger extract, scoring 3.85, and the lowest was at 5% ginger extract, with a score of 3.59. For taste, the highest score was achieved with the addition of 10% ginger extract at 4.47, while the lowest was at 0% ginger extract, scoring 3.74.

The variance analysis for each treatment showed a significance value of ($P > 0.05$), indicating that no further testing is required.

5.2. Suggestions

Based on the research findings, the following suggestions are made for future studies involving the addition of ginger extract:

a. In future dodol production, it is recommended to use a 10% ginger extract, as this concentration demonstrated the highest percentage of preference compared to other treatments.
b. Pay attention to the stirring process during cooking, as increased stirring results in a more elastic dodol.

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