Analysis of Instant Fruitghurt Quality Based on Mangosteen (Garcinia Mangostana L) Skin with Various Concentrations of Maltodextrin and Dry Temperature Level

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Abstract. Instant fruitghurt made from mangosteen peel is a mangosteen peel extract that is fermented by lactic acid bacteria then coated, dried and mashed. This study aims to determine the effect of maltodextrin concentration, drying temperature and the interaction of both of them on the quality of instant fruitghurt. The results showed that the concentration of maltodextrin gave a significant effect on total solids, total lactic acid, pH, solubility and water content, even lactic acid, and organoleptic test (color and aroma) but has no effect on protein content and organoleptic test (taste and appearance) instant fruitghurt. Drying temperature gives a significant effect on protein content, total lactic acid, pH, solubility and water content, total lactic acid bacteria, and organoleptic (color, aroma) but has no effect on total solid and organoleptic test (taste and appearance) fruitghurt instant. The interaction of the two had a significant effect on total solids, total protein content of lactic acid, pH, water content, and solubility, even lactic acid, and organoleptic tests (color and aroma). The best mactodectrin concentration and drying temperature in the production of instant fruitghut from mangosteen peel extract powder is maltodextrin at a concentration of 15% with a drying temperature of 60 °C resulting in a total solid of 30.89%, protein content 6.22%, total lactic acid 1.28%, pH 4.22, water content 4.18%, solubility 96.4%, lactic acid bacteria 2.3 x 10^7 with antioxidant activity (% inhibition 1000 ppm to 50 μM DPPH) 64.34% and organoleptically with numerical assessment for color 4.55 (preferred) and aroma 4.62 (preferred) for taste 3.42 (neutral) and appearance 3.23 (neutral).

Keywords: Instant fruitghurt, maltodextrin, drying, antioxidants

I. Introduction

Yogurt is a probiotic drink made from processed milk which is processed through a fermentation process with the addition of good culture of organisms, one of which is lactic acid bacteria such as Lactobacillus. One type of yogurt that is relatively new and still rare is fruitghurt. Fruitghurt is a fermented product from juice, or from fruit waste such as fruit skins and seeds. The principle is to ferment the fruit using the bacteria Lactobacillus bulgaricus and Streptococcus thermophilus. Both of these bacteria will break down lactose into lactic acid and produce components of aroma and flavor. L. Bulgaricus has a role for the formation of aromas, while S. Thermophilus plays a role in the formation of fruitghurt flavors [38]; [35]; [37]

Mangosteen peel is one of the raw materials that can be used for making fruitghurt, some people
consider mangosteen peel only as trash, it turns out that the benefits of mangosteen skin in addition to containing xanthone which is a substance that has antioxidant and anti-inflammatory activity, mangosteen peel can also treat various diseases and even even deadly diseases such as heart disease, cancer, stroke, diabetes, kidney, hepatitis, AIDS, etc. The antioxidant nature of mangosteen exceeds vitamin E and vitamin C. Xanthones found in mangosteen are natural chemical substances that are classified as polyhenolic compounds in the form of 3 - isomangoeinstein, alpha mangostin, Gamma-mangostin, Garcinone A, Garcinone B, C, D and garcinone E, maclurin, mangostenol [23]; [25];[45];[15]; [29]. Mangosteen peel powder has soluble properties in water, has fine texture, and contains antioxidants in the form of anthocyanin of at least 1.13 mg / g, a total phenol of 8.49 mg / g, capacity antioxidant 428.72 mg / g AEAC (Aerobic acid Equivalent Antioxidant Capacity, and xanthones (alpha mangostin) 0.59 mg / g [4]. The total phenol content of mangosteen peel powder averaged 195, 51 mgGAE / g with antioxidant capacity expressed as IC50 6.80 ppm [32].

From the research results of making probiotic drinks from mangosteen peel powder by extracting mangosteen peel powder using a water solvent at a dilution rate of 1:30. The total lactic acid bacteria (LAB) 2.0 x 10^{10} CFU / ml and pH 3.86 with organoleptic assessment for taste, aroma, and thickness preferred by panelists [33].

Research into the development of instant probiotic drinks made from mangosteen peel is one alternative to the processing of dry products besides that instant fruitgurt has other advantages besides its long shelf life and can be stored at room temperature also makes it easier in terms of transportation and distribution. According [1], viability of bacterial cells in probiotic products must range between 10^7-10^9 cfu / g.

One way to improve the resistance and viability of probiotic bacteria is by encapsulation. Encapsulation is a process of wrapping (coating) a core material, in this case of a probiotic bacteria, using certain encapsulation materials that are useful to maintain viability and protect probiotic bacteria from damage due to unfavorable environmental conditions, such as heat, chemicals, stomach acids, and bile salt. Before encapsulation, it is necessary to make a suspension of probiotic bacteria in a growth medium. Growth media is expected to be a source of nutrition for probiotic bacteria so that the number of live bacteria meets the requirements to be applied in the product. Common methods used in the encapsulation process are spray drying, freeze drying, and emulsion techniques [40]. In this study the technique used is the emulsion technique. Addition of filler needs to be done to reduce damage to the drying process. One of the coatings used for drying is maltodextrin.

Maltodextrin is a derivative of oligosaccharides which are energy ingredients for the growth of good bacteria (prebiotics) because the components of maltodextrin are classified as complex carbohydrates. According to Dickinson (2003) cit [39], maltodextrin is widely used because it is easy to find and easy in handling the process, can undergo rapid dispersion, has high solubility, is able to form a matrix, the possibility of low browning, can inhibit crystallization, has strong bonding, low viscosity, and stable on oil and water emulsions. Added by [10], maltodextrin has a good ability to inhibit oxidation reactions so that the age of the microcapsules produced has a better shelf life than using Arabic gum.

Common problems that occur in making instant powder are damage due to the drying process which generally requires high temperatures (over 60°C) such as the loss or damage to flavor components and the deposition when the powder is dissolved in water, so to anticipate this it needs to use a good drying method and the use of stabilizers that function to coat flavor components and prevent damage to material components due to the drying process [16]. Encapsulation provides the means to convert components in liquid form into solid particles and protect the material from environmental influences [34]. In the encapsulation process, lactic acid bacteria such as Lactobacillus cannot withstand high temperatures, so a coating is added so that the cells can be protected from heat. The optimal temperature of Lactobacillus is lower than 37°C.

The purpose of this study was to determine the concentration of maltodextrin and drying temperature and the interaction of both of them on the quality of instant fruit based on organic skin.
2. Methods

2.1. Materials

The ingredients used are fresh mangosteen (Garcinia mangostana L.), taken from Payakumbuh area, Lima Puluuh City, West Sumatra Province, sugar, milk, agar, curd, maltodextrin, and chemicals are selenium reagent, concentrated sulfuric acid (H2SO4), distilled water, sodium hydroxide (NaOH) 40%, boric acid (H3BO3) 4%, indicator conwey, hydrochloric acid (HCl) 0.02 N, methanol pa (Merck), gallic acid (pa) Merck, Folin Ciocalteu, Folin reagents - Ciocalteu pa (Merck), sodium carbonate pa (Merck), 96% methanol, and 2,2-diphenyl-pikrihidrazil (DPPH) pa (Merck). Alcohol, and MRSA media. Drying ovens, flouring machines, for analysis used are test tubes, glassware, analytical scales, Genesys 10 S UV-VIS spectrophotometers. refrigerator, erlenmeyer, plastic cup, plastic, aluminum foil packaging, and sealer.

2.2. Methods

The experimental design used in this study was to use a factorial design on the basis of RAL with 2 factors and three replications. Two factors in this study were the concentration of the maltodextrin coating material with three treatment levels and the drying temperature with the four treatment levels: The treatment factor levels were: maltodextrin 10% (A1), maltodextrin 15% (A2), maltodextrin 20% (A3) and Drying temperature, 50°C (B1), 55°C (B2), 60°C (B3), and 65°C (B4) with a combination of treatments A1B1, A1B2, A1B3, A1B4, A2B1, A2B2, A2B4, A3B1, A3B2, A3B3, and A3B4. The results of the study were analyzed with ANOVA and continued with the DNMRT (Duncan New Multiple Range Test) value with a 5% significance level with the SPSS System method.

2.3. Implementation

2.3.1. Making fruitghurt drink

The stages in making probiotic mangosteen peel begin with the preparation of making mangosteen peel powder from fresh mangosteen skin taken and then dried and mashed. Furthermore, the mangosteen peel powder was made by dissolving cinnamon powder with water with a ratio of one mangosteen peel powder and water, then the solution was heated at 50-60°C for 30 minutes. Next is the screening process. The filtrate obtained was precipitated overnight to separate the starch that was included in the filtrate. To the prebiotic filtrate 5% skim milk, 10% glucose and 5% agar were added and pasteurized for 10 minutes, then put in a sterile bottle and cooled to 37°C. Then 6% curd starter was added and incubated for 48 hours at 37°C [33].

2.3.2. Making instant fruitghurt drink

Fruitghurt which has been incubated for 48 hours is then dried using the oven method, before the encapsulation process is dried by coating the core material with maltodextrin according to the treatment and TBM is added as an emulsifier. Then the drying process is carried out using a drying oven according to the treatment. After extracting the powder, the milling process is carried out, and sifting with 80 mesh sieves and observed.

2.4. Observation

In conducting research, there are 5 stages of research included in the research procedure before reaching a conclusion, namely: the stage of drying fresh mangosteen rind, the stage of making mangosteen peel powder, the stage of making fruitghurt, the making of instant fruitghurt, and the observation stage, which
is:

- Total lactic acid (Hadiwiyoto, 1994)
- pH (Yenrina, 2015)
- Total lactic acid bacteria (BAL), (Hadiwiyoto, 1994)
- Moisture content (AOAC, 1990)
- Protein content (AOAC, 1990)
- Total solids (SNI 06-6989.26-2005)
- Solubility (SNI 7612-2011)
- Organoleptics (Fardiaz, 1994)
- Antioxidant activity (Hanani, E, 2005; Okawa.M, 2001)

3. Results and Discussion

3.1. Total lactic acid, pH and total lactic acid bacteria (LAB)

The concentration of maltodextrin exerted a significantly different effect (P < 0.05) on total lactic acid, pH and total bacterial lactic acid instant fruitghurt drink instant mangosteen peel produced is presented in Table 1.

Table 1. Effect of coating concentration on total lactic acid, pH, and total lactic acid bacteria (LAB) fruit drink instant drink made from mangosteen peel

| Maltodextrin Concentration(%) | Total Lactic Acid (%) | pH      | Total LAB (cfu/g) |
|------------------------------|-----------------------|---------|------------------|
| 10                           | 0.7608 a              | 4.5667 a| 4.7 x 10^6 a     |
| 15                           | 1.1408 b              | 4.3775 b| 1.9 x 10^7 b     |
| 20                           | 1.0775 b              | 4.1325 c| 1.8 x 10^7 b     |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.

From Table 1, it can be seen that the highest total lactic acid is in the treatment of maltodextrin use 15%, which is equal to 1.1408%, has not significantly different from the treatment of using maltodextrin 20%, and the lowest total acid is found in the treatment of using maltodextrin 10% which is 0.7698%. The higher the concentration of maltodextrin added, the total lactic acid increased, inversely proportional to the pH of the mangosteen fruit instant Fruitghurt drink, the higher the use of the maltodextrin coating agent the pH was lower. The highest pH was obtained with the use of 20% maltodextrin coating material, which was 4.1325 and the lowest was the use of maltodextrin 10 % is 4.5667. According to [31] increases and decreases in total acid levels are inversely proportional to pH. Added [47] acid formation from the addition of various types of sugars has been shown to have an effect on reducing pH. The disaccharide / sucrose group added adds to the substrate giving a strong contribution to the decrease in pH of the yogurt.

According to [3], that maltodextrin and similar products are made by hydrolyzing starch by heating or enzymes, the residual acid left after the hydrolysis process causes total acid to increase. These results are also comparable to the results of research [14], maltodextrin is a concentrated solution of saccharides obtained from the hydrolysis of starch with the addition of acids or enzymes.

Based on the above laboratory values, the highest number of lactic acid bacterial colonies was found in product samples with 15% maltodextrin amount, namely 1.9 x 10^7 colonies / gram, has not significantly different from the treatment of using maltodextrin 20%, and total lactic acid bacteria (LAB). The lowest is in the treatment of 10% maltodextrin use, which is 4.7 x 10^6 CFU / g. The low concentration
of maltodextrin (10%) is not perfect enough to cover the probiotic bacteria during the drying process, from the results that a number of lactic acid bacterial colonies die during the process of drying instant fruitghurt drink.

Drying temperature had a significantly different effect (P <0.05) on total lactic acid, pH and total bacterial lactic acid fruitghurt instant drink instant mangosteen skin produced is presented in Table 2.

| Drying Temperature (°C) | Total Lactic Acid (%) | pH     | Total LAB (mg/g) |
|-------------------------|-----------------------|--------|------------------|
| 50                      | 1.1478 b              | 4.3978 ab | 1.5 x 10^7 a     |
| 55                      | 1.0311 b              | 4.3444 ab | 1.6 x 10^7 a     |
| 60                      | 1.0811 b              | 4.1744 b | 1.6 x 10^7 a     |
| 65                      | 0.8633 a              | 4.5189 a | 1.0 x 10^7 b     |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.

From Table 2 it can be seen that the highest total lactic acid in the 50°C drying temperature treatment has not significantly different from the treatment temperature of 55°C and 60°C drying which is 1.1478%. The lower total acid is in the 65°C drying temperature treatment that is 0.08633%. The higher the drying temperature of the instant fruithurt the lower the total amount of lactic acid, inversely proportional to the pH of the instant fruitghurt. The higher the drying temperature the higher the pH.

The highest pH is obtained with a drying temperature of 65°C which is 4.5189 and the lowest with a drying temperature of 50°C which is 4.3978 has significantly different from the treatment temperature of drying 60°C which is 4.1744.

The interaction of maltodextrin concentration and drying temperature has a significantly different effect (P <0.05) on total lactic acid, pH and total lactic acid bacteria instant fruit drink instant mangosteen peel produced was presented in Table 3.

From Table 3 it can be seen that the highest total lactic acid was found in the interaction treatment of using maltodextrin 15% with a drying temperature of 60°C that is equal to 1.2800%. The lowest total acid found in the treatment of using maltodextrin 10% with a drying temperature of 65°C that is 0.6667%. The higher the drying temperature the higher pH, which is 4.5189 along with the increase in the total pH of lactic acid bacteria (LAB) is also reduced which is 1.0 x 10^7 is significantly different (P <0.05) with the drying temperature the other.

From Table 3 below, the highest total lactic acid bacteria (LAB) was obtained in the treatment of the interaction of maltodextrin concentration of 15% and a drying temperature of 60°C with a total lactic acid bacteria of 2.2 x 10^7 CFU / g. According to (Krasaekoopt, Bhandari, & Deeth, 2003) the dose needed to get health effects after taking probiotics depends on the probiotic strain used. In general, these health effects will be obtained when consuming probiotics around 10^6-10^7 cfug^-1 per day. An adequate amount according to [8] is 10^6 -10^8 cfu/g and is expected to develop to 10^12 cfu / g in the colon. Meanwhile, according to the International Dairy Federation (IDF) the standard minimum amount of living probiotics as a reference is 10^6 colonies / ml in the final product.

Probiotic microorganisms are generally derived from Lactic Acid Bacteria (BAL). Lactic acid bacteria such as Lactobacillus sp., Streptococcus sp., Leuconostoc sp., And Pediococcus sp. Lactobacillus plantarum is BAL gram homo-fermentative positive. This bacterium can grow at pH 3.0-4.6 has the ability to inhibit pathogenic bacteria and is more resistant to acids than the type of Streptococcus sp. Streptococcus thermophilus is a thermoduric, homofermentative LAB that has an optimum pH of 6.5 and will stop its growth at pH 4.2-4.4 [9].
| Maltodextrin concentration (%) | Drying Temperature (°C) | Total Lactic Acid (%) | pH | Total LAB (cfu/g) |
|-----------------------------|------------------------|-----------------------|----|------------------|
| 10                          | 50                     | 0.9133 ab             | 4.5300 bc | 3.7 x 10^6 a |
|                             | 55                     | 0.7467 a              | 4.5267 bc | 4.5 x 10^6 a |
|                             | 60                     | 0.7167 a              | 4.4200 abc | 6.4 x 10^6 ab |
|                             | 65                     | 0.6667 a              | 4.4900 bc | 4.0 x 10^6 a |
| 15                          | 50                     | 1.0300 bc             | 4.0033 a  | 2.0 x 10^-7 de |
|                             | 55                     | 1.1533 bc             | 4.3733 abc | 2.2 x 10^-7 e |
|                             | 60                     | 1.2800 bc             | 4.2200 abc | 2.3 x 10^-7 e |
|                             | 65                     | 1.1000 bc             | 4.5267 bc | 1.2 x 10^-7 bc |
| 20                          | 50                     | 1.2200 bc             | 4.3700 abc | 2.0 x 10^-7 de |
|                             | 55                     | 1.0800 bc             | 4.0033 a  | 2.0 x 10^-7 de |
|                             | 60                     | 1.1167 bc             | 4.0467 ab | 1.8 x 10^-7 cde|
|                             | 65                     | 0.8933 ab             | 4.4420 abc | 1.4 x 10^-7 cd |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.

3.2 Water content, protein content, total solids and solubility

The results of the analysis of the treatment of maltodextrin concentrations has a significantly different effect (P <0.05) on water content, total solids and solubility and were not significantly different from the instant fruithurt drink protein content of mangosteen peel produced are presented in Table 4.

**Table 4. Effect of maltodextrin concentration on water content, protein content, total solids, and solubility of instant mangosteen fruit-based drink**

| Maltodextrin Concentration (%) | Water Content (%) | Protein content (%) | Total Solid (%) | Solubility (%) |
|-------------------------------|-------------------|---------------------|-----------------|----------------|
| 10                            | 4.2350 a          | 5.6775 a            | 28.6400 a       | 82.0275 a      |
| 15                            | 4.7375 b          | 6.0875 a            | 30.8483 b       | 91.8725 b      |
| 20                            | 4.7992 b          | 6.0433 a            | 32.6800 c       | 93.0075 b      |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.

From Table 4 it can be seen that the highest water content is in the treatment of maltodextrin use with a concentration of 20% which is 4.7992% and is not significantly different from the treatment of using maltodextrin 15%, while the treatment of using maltodextrin 10% is significantly different (lower). The higher the concentration of maltodextrin added, the water content of the microcapsules will increase. According to [13], maltodextrin consists of hydrophilic granules. The maltodextrin molecule has many hydroxyl groups so that it can bind large amounts of water. The bonding between the hydroxyl group...
and the water molecule will cause the water molecule that was originally outside the maltodextrin granule and free to become inside the granule and no longer free. The higher levels of maltodextrin added the thicker the resulting suspension so that the more difficult the evaporation of water occurs, because maltodextrin has a good binding ability.

Added Blancard and Katz (1995) cit [36], Maltodextrin has higher solubility, is capable of forming film, has low hygroscopic, is able to inhibit crystallization and has a strong binding capacity, besides maltodextrin is tasteless and is known as a food additive that is safe Added by [46] the treatment of maltodextrin concentration gave a real influence on the solubility of the noni leaf instant drink. This is caused because when the noni leaf powder is dissolved, the hydroxyl group contained in maltodextrin will interact with water so that the solubility of the powder increases.

Increasing the concentration of maltodextrin as a coating gives no significant effect (P <0.05) on the protein content of instant fruit drink drinks, with a range of protein levels of 5.6775 - 6.0875%. Maltodextrin is a polysaccharide compound that undergoes hydrolysis. According to [3]; [14] maltodextrin and similar products are made by hydrolyzing starch by heating or enzymes.

The results of the analysis of the treatment of maltodextrin concentrations had a significantly different effect (P <0.05) on the total solids and solubility of the mangosteen skin instant fruit drink produced is presented in Table 4. From Table 4 above the total values of the solids and solubility of instant fruitgurt drinks are proportional to straight with the concentration of maltodextrin use, the total range of solids and the solubility of instant fruitgurt drink are 28.6400% - 32.68%, respectively. and 82.0275 5 - 93.0075%.

According to [5] maltodextrin is a coating material that has a low viscosity at high solids and has high solubility. According to Kenyon (1995) cit [19]. The high solubility of microcapsules is due to the presence of maltodextrin. Maltodextrin can dissolve completely cold water so that it can release flavor properly in certain applications. Added [28] This is because the total dissolved solids are increasing so that the greater the solubility of the instant yam yogurt. Total solids such as lactose, protein, fat, oligosaccharides will be degraded into simpler compounds where the molecular weight is lower than before, and also the addition of dextrin which helps instant yogurt for rehydration. This is in accordance with the statement of [27]. The addition of maltodextrin aims to coat the flavor components, increase the volume, speed up the drying process, prevent damage to the material due to heat and increase the solubility and organoleptic characteristics of instant drink noni leaves.

The more maltodextrin used, the higher the solubility, the percentage of solubility of a product is largely influenced by the type of coating material used. Able to form a body, low browning properties, able to inhibit crystallization and has a strong tie.

Increasing drying temperature gives a significantly different effect (p <0.5) on water content, protein content and solubility. The results of the analysis of the treatment of the drying temperature of instant mangosteen fruit drink mangosteen peel are presented in Table 5.

| Table 5. Effect of drying temperature on water content, protein content, total solids, and solubility of instant mangosteen fruit-based drink |
|---|---|---|---|---|
| Drying temperature (°C) | Water content (%) | Protein content (%) | Total Solid | Solubility (%) |
| 50 | 4.7844 a | 5.7544 ab | 30.4211 a | 84.0189 a |
| 55 | 4.6889 a | 6.3322 b | 30.8922 a | 88.2300 b |
| 60 | 4.7656 a | 6.2422 b | 30.9322 a | 91.8022 c |
| 65 | 4.1456 b | 5.2844 a | 30.4111 a | 84.0189 a |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.

Increased drying temperature results in decreased water content and protein content. The range of water content and protein content are 4.7844% - 4.1456% and 5.7544% - 5.2844%, respectively. As for the total solids, the increase in drying temperature has no significant effect with the total range of solids.
30.4111 - 30.9322%. Solubility is higher with increasing drying temperature up to 60°C, while increasing drying temperature reaches 65°C, the solubility of microcapsules decreases again. The highest solubility achieved at a drying temperature of 60°C is 91.8022%.

This is due to the increasing temperature of protein drying which will experience denaturation. Which results in changes in protein structure. According to [50], protein denaturation is a condition in which a protein undergoes changes or damage to its secondary, tertiary and quaternary structures. While factors that can cause protein denaturation include heating, extreme acidic or alkaline conditions, heavy metal cations and the addition of saturated salt. Added by [26], the drying temperature (oven) shows a very significant effect on protein content and taste of salted eggs, which are dried with varying degrees of drying temperature (70°C, 80°C, 90°C and 100°C). In accordance with the opinion of Yuniarti et al. (2013) cit [22]; that heating with high temperatures will cause denatured proteins. Heating can damage amino acids where the resistance of proteins by heat is strongly related to the amino acids making up these proteins, so this causes protein levels to decrease with increasing heating temperatures.

The interaction effect of the coating material concentration and drying temperature which is increasing gives a significantly different effect (p <0.5) on water content, protein content, total solids, and solubility. The results of the analysis of the treatment of the drying temperature of instant mangrove fruit drink mangosteen peel are presented in Table 6.

Table 6. Effect of interaction of maltodextrin concentration and drying temperature on water content, protein content, total solids, and solubility of instant mangosteen fruit drink made from mangosteen peel

| Maltodextrin Concentration (%) | Drying Temperature (°C) | Water Content (%) | Protein Content (%) | Total Solid (%) | Solubility (%) |
|-------------------------------|-------------------------|-------------------|--------------------|---------------|--------------|
| 10                            | 50                      | 5.5400 ab         | 5.0000 a           | 28.2100 a     | 80.5440 a    |
|                               | 55                      | 4.1667 ab         | 6.1100 ab          | 28.8133 ab    | 81.1433 a    |
|                               | 60                      | 4.0667 a          | 6.3100 b           | 29.4533 ab    | 82.8433 ab   |
|                               | 65                      | 4.1667 ab         | 5.0467 ab          | 28.0833 a     | 83.5833 ab   |
| 15                            | 50                      | 4.7333 abcd       | 6.1333 ab          | 30.8587 bcde  | 85.3200 b    |
|                               | 55                      | 5.3133 cd         | 6.5567 b           | 31.4300 bcde  | 90.8200 c    |
|                               | 60                      | 4.8000 abcd       | 6.2200 b           | 30.8900 bcde  | 96.4000 d    |
|                               | 65                      | 4.1033 a          | 5.4067 ab          | 31.1233 bcde  | 94.9500 d    |
| 20                            | 50                      | 5.0133 bcd        | 6.1300 ab          | 32.1667 de    | 86.1967 b    |
|                               | 55                      | 5.5867 abc        | 6.3300 b           | 32.5333 de    | 92.7567 cd   |
|                               | 60                      | 5.4300 cd         | 6.1967 b           | 32.3333 de    | 96.2033 d    |
|                               | 65                      | 4.1667 ab         | 5.4000 a           | 32.6667 e     | 96.8733 d    |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.

The effect of the interaction of the concentration of the maltodextrin coating material and the drying temperature results in water content, and protein content being lower while total solids, and solubility increasing. Range of water content of 4.0067 - 5.5867%, protein content of 5.000 - 6.3300%, total solids of 28.0833 - 32.6667% and solubility of 80.5440 - 96.8733%.

From Table 6 it can be seen that the instant fruit yogurt drink which has the highest solubility is
found in the interaction treatment of using maltodextrin 15% with a drying temperature of 60°C which is 96.4000%, with a water content of 4.8000%, a protein content of 6.2200% and a total 30.800% solids. In this treatment the protein content was significantly different at the level (p <0.5) with the treatment of using 10% maltodextrin distributor with a drying temperature of 50 °C, the concentration of maltodextrin as much as 10% was not perfect enough to coat the lactic acid bacteria so that by drying only 50°C the protein is broken. Compared to the use of a 20% maltodextrin coating with a drying temperature of 65 °C, an increase in the use of the coating material to 20% is unable to maintain protein levels with a drying temperature up to 65°C.

3.3 Color, aroma, taste and appearance

Increased concentration of maltodextrin had a significantly different effect (p <0.5) on the results of the organoleptic value of the color and aroma of instant drink instant fruitghurt, and there was no significant difference in taste and appearance. The results of the analysis of the influence of the concentration of the maltodextrin coating material on the color, aroma, taste and appearance of the instant mangosteen fruit drink drink are presented in Table 7.

Table 7. Effect of coating concentration on hedonic organoleptic values of color, aroma, taste, and appearance of instant instant fruitghurt based on mangosteen peel

| Maltodextrin concentration (%) | Color    | Aroma    | Test     | Appearance |
|-------------------------------|----------|----------|----------|------------|
| 10                            | 2.9583 a | 3.1533 a | 3.2708 a | 3.2500 a   |
| 15                            | 4.2908 b | 4.2108 b | 3.2867 a | 3.2300 a   |
| 20                            | 4.3658 b | 4.1458 b | 3.3800 a | 3.2650 a   |

The numbers on the same path followed by the same lowercase letters show no significant difference at the 5% level

From Table 7 it can be seen that an increase in the concentration of maltodextrin causes the color and aroma values to increase. The range of color and aroma values are 2.9583 - 4.3658 and 3.1533-4.2108, respectively. The increasing concentration of maltodextrin given, the organoleptic value of the hedonic aroma of instant fruitghurt drink is increasing. This happens because the ability of maltodextrin to form the body and its properties as a coating material that can maintain the aroma of instant fruitghurt drinks.

The highest average color value of 4.3658 with the criteria for color produced by bone white obtained from the amount of maltodextrin 20% is not significantly different from the treatment of using maltodextrin 15% (4.2905). The lowest average value of 2.9583 with the resulting color criteria is somewhat brownish on the use of maltodextrin 10%. The increasing concentration of maltodextrin is given, the color hedonic organoleptic value of instant fruitghurt drink is increasing. This happens because of the ability of maltodextrin to form films and its properties as a coating material that can maintain the color of instant fruitghurt drinks.

The highest average aroma value 4.2108 with the criteria for the aroma produced typical of yogurt obtained from the amount of maltodextrin 15% was not significantly different from the treatment of using maltodextrin 20% (4.1458). The lowest average value of 3.1533 with the criteria of yogurt produced is less flavorful, typical of yogurt.

Aroma is a quality trait that is very fast to give an impression to consumers, because aroma is a very influential factor in consumers’ acceptability of a product. The aroma of the product will usually be reduced during handling, processing, storage, and is influenced by the ingredients used [43]; In the food industry, the value of aroma is very important because it can quickly provide the results of an assessment of consumer acceptance of the production produced [11]. Maltodextrin influences the real amount of the aroma of soybean milk powder yogurt because maltodextrin has a smell that is almost odorless [21].

For organoleptic values of hedonic taste and appearance the effect of increased maltodextrin concentration did not have a significantly different effect (p <0.5), the average range for taste was
3.2708 - 3.3800 and appearance was 3.2300 - 3.2650. According to Shenck and Hebbedah (2002) cit [41] maltodextrin can maintain food flavor during the heating process, has a fresh taste so it is suitable as a filler in various foods and drinks without disturbing the taste and aroma of the food.

Increasing drying temperature gives a significantly different effect (p < 0.5) on the results of the organoleptic value of the color and aroma of instant drink instant fruitghurt, and no significant difference in taste and appearance. The results of the analysis of the influence of the concentration of the maltodextrin coating material on the color, aroma, taste and appearance of the instant mangosteen fruit drink drink are presented in Table 8.

**Table 8. Effect of drying temperature on the organoleptic value of instant mangosteen fruit based on mangosteen peel**

| Drying temperature (°C) | Color     | Aroma    | Taste     | Appearance |
|-------------------------|-----------|----------|-----------|------------|
| 50                      | 3.8089 ab | 3.7578 ab| 3.1900 a  | 3.2456 a   |
| 55                      | 3.9711 ab | 3.8756 ab| 3.2800 a  | 3.3011 a   |
| 60                      | 4.0922 b  | 4.1456 b | 3.5089 a  | 3.2567 a   |
| 65                      | 3.6144 a  | 3.5678 a | 3.2722 a  | 3.1900 a   |

The numbers on the same line followed by the same lowercase a indicate not significant at the 5% level.

Increasing drying temperature gives a significantly different effect (p < 0.5) on the results of organoleptic values of hedonic colors, and the aroma of instant fruitghurt. The range of color and aroma values are 3.8089 - 4.3658 and 3.1533-4.2108, respectively.

Increasing the drying temperature to 60° C causes the color and aroma values to increase. On drying with a temperature of 65 °C, there was a decrease in organoleptic value for color with a value of 3.6144. The color changes from bone white to slightly brownish, because high temperatures can damage heat-sensitive compounds.

Drying temperature affects the aroma of soy milk yogurt because in the drying process there are maltodextrin used to protect heat-sensitive compounds. According to Gustavo cit Baharudin (2006), maltodextrin used in the encapsulation process, to protect compounds that are sensitive to oxidation or heat of maltodextrin can protect flavor stability during the spray filtering process.

The interaction of maltodextrin concentration and drying temperature had a significantly different effect (p < 0.5) on the results of the organoleptic value of hedonic color and the aroma of instant fruitghurt drink, and the taste and appearance were not significantly different. The results of the analysis of the influence of the concentration of the maltodextrin coating material on the color, aroma, taste and appearance of the instant mangosteen fruit drink mangosteen peel are presented in Table 9.

From Table 9 we can see the effect of interaction of maltodextrin concentration and drying temperature on the color hedonic organoleptic values, for 10% maltodextrin concentration giving significantly different values (p <0.5%) with the use of maltodextrin 15% and 20% with four drying temperature levels (50°C, 55°C, 60°C, and 65°C), the best color with an organoleptic value of 4.6167 is the interaction treatment of 20% maltodextrin concentration with a temperature of 60°C. The range of color hedonic organoleptic values is 2.8633-4.6100.

The effect of the interaction of maltodextrin concentration and drying temperature on the organoleptic value of aroma hedonic, for maltodextrin concentrations of 10%, 15%, and 20% gave significantly different values (p <0.5%) with four levels of drying temperature (50°C, 55°C, 60°C, and 65°C), the best aroma with organoleptic value of 4.6167, which is the interaction treatment of maltodextrin concentration of 20% with a temperature of 60 °C, not significantly different from the treatment of maltodextrin 15% with a drying temperature of 60 oC and maltodextrin treatment of 20% with a drying temperature of 55%.

**Table 9. Effect of interaction of maltodextrin concentration and drying temperature on organoleptic values of hedonic color, aroma, taste, and appearance of instant instant fruit based on**
The effect of the interaction of maltodextrin concentration and drying temperature on the organoleptic value of hedonic taste, and appearance for maltodextrin concentrations of 10%, 15%, and 20% gave significantly different values ($p < 0.05$) with four levels of drying temperature (50°C, 55°C, 60°C, and 65°C). The range of organoleptic hedonic taste and appearance of instant fruitghurt drinks is 3.1300 - 3.7067 and 2.9767 - 3.4867, respectively.

3.4 Antioxidant Activity

Based on testing of total lactic acid bacteria, pH, total acid, water content, protein content, solubility and organoleptic value of the best interaction treatment of maltodextrin concentration and drying temperature will be tested for antioxidant activity. The best treatment of various concentrations of maltodextrin and the drying temperature of instant fruitghurt drink is the interaction treatment of 15% maltodextrin concentration with a drying temperature level of 60°C from mangoosteen peel powder with a concentration of 15%. Antioxidant activity of instant fruitghurt drink made from mangoosteen peel powder.

**Table 10. Antioxidant activity of instant fruitghurt from mangoosteen peel powder with an interaction treatment of 15% maltodextrin concentration and a drying temperature of 60°C**

| Maltodextrin concentration (%) | 1000 ppm inhibition of 50 μM DPPH |
|-------------------------------|-----------------------------------|
| mangoosteen peel              |                                   |
| **Concentration maltodextrin (%)** | **Drying temperature (°C)** | **Color** | **Aroma** | **Taste** | **Appearance** |
| 10                            | 50                                | 2.8633 a  | 3.4633 abc| 3.2200 a  | 3.2200 a       |
|                               | 55                                | 2.9533 a  | 2.9767 a  | 3.2433 a  | 3.3533 a       |
|                               | 60                                | 3.1300 a  | 3.2200 sb | 3.4000 a  | 3.2967 a       |
|                               | 65                                | 2.8867 a  | 2.9533 a  | 3.2200 a  | 3.1300 a       |
| 15                            | 50                                | 4.5000 bc | 4.0567 bcd| 3.1300 a  | 3.0300 a       |
|                               | 55                                | 4.6100 bc | 4.3600 cd | 3.2200 a  | 3.1967 a       |
|                               | 60                                | 4.5300 bc | 4.6000 d  | 3.4200 a  | 3.2300 a       |
|                               | 65                                | 3.8233 b  | 3.8867 bcd| 3.3767 a  | 3.4633         |
| 20                            | 50                                | 4.0633 bc | 3.7533 abcd| 3.2200 a  | 3.4867 a       |
|                               | 55                                | 4.5300 bc | 4.3500 d  | 3.3767 a  | 3.3533 a       |
|                               | 60                                | 4.6167 bc | 4.6167 d  | 3.7067 a  | 3.2433 a       |
|                               | 65                                | 4.1333 bc | 3.8633 bcd| 3.2200 a  | 2.9767 a       |

The numbers on the same line followed by the same lowercase letters show no significant difference at the 5% level.
From Table 10 it can be seen that the value of antioxidant activity with an interaction treatment of 15% maltodextrin concentration and a drying temperature of 60°C (69.16%). This is because maltodextrin is a coating that can protect the antioxidants contained in instant fruit juice derived from mangosteen peel powder. Antioxidants on mangosteen peels are found in phenolic acid compounds, xanthones and pectin [42]; [48] [49]. These substances are able to carry out antioxidant activity, which is by increasing the capture of free radical compounds [12]. Pectin compounds in mango peels have higher levels of galacturonic acid compared to lime skin or mango skin. This has an impact on making it easier to extract pectin on mangosteen peels and see its antioxidant activity [24].

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