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Effect of citric acid and sucrose concentration on the quality of passion fruit jelly with dutch eggplant

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Abstract. The effect of citric acid and sucrose concentration on the quality of passion fruit jelly (Passiflora edulis) with dutch eggplant (Solanum betaceum) was aimed to determine the effect of citric acid and sucrose concentration on the quality of passion fruit jelly with dutch eggplant. This study used a completely randomized factorial design, with a comparison of citric acid concentration with dutch passion fruit and eggplant juice, which consisted of 2 factors: the ratio of citric acid concentration to passion fruit and dutch eggplant, and the second factor was the ratio of sucrose concentration. The results showed that the higher the concentration of citric acid, the water content, total acid, vitamin C levels and organoleptic values increased, while pH decreased. the higher concentration of sucrose, the water content, total acid, vitamin C levels and organoleptic values increase, while ph decreases. the combination treatment of citric acid and sucrose concentration had a very significant effect on pH and organoleptic value, but the effect was not significant on water content, vitamin C content and total passion fruit jelly with dutch eggplant.

Keywords: citric acid, sucrose, dutch eggplant, passion fruit jelly.

1. Introduction
Passion fruit is one of the plants belonging to the genus Passiflora and comes from tropical and subtropical regions in the Americas. Passion fruit contains a useful passiflorace which makes the nerves relax [1]. Passion fruit is rich in phosphorus, iron, calcium, potassium, vitamin A, sodium, vitamin C and magnesium. Some of the contents above are compounds that are very beneficial to maintain body health and help the body fight various types of diseases. Yellow passion fruit extract contains many phytochemicals which have the benefit to fight and kill cancer cells. Therefore, passion fruit is also useful as a natural anti-cancer drug [2]. Some of the content found in phytochemicals in yellow passion fruit are harm, passaflorine, harmony, harmol, vitexin, carotenoids, hermin, chrysin, isovitexin. Besides being useful as an anti-cancer. Passion fruit turns out to have a high nutritional content. Some nutrients contained in passion fruit are citric acid, ascorbic acid, niacin, riboflavin, tianin, iron, carotene, phosphorus, minerals, calcium, fiber, energy, fat and protein which are all needed by the body to help performance all organs and help the body's metabolism. Dutch eggplant is a type of eggplant family member plant that began to be developed in Bogor, West Java since 1941. In Indonesia, eggplant was probably first brought and developed in Indonesia by the dutch at that time so it was known as the dutch eggplant. Dutch eggplant (Solanum betaceum) came from Peru, South America. Dutch eggplant fruit was brought to Indonesia by Dutch colonizers. This fruit is often found
in the Province of Nanggroe Aceh Darussalam, which is one of the largest producers of Dutch eggplant in the archipelago. In addition to the Province of Nanggroe Aceh Darussalam, this fruit was also developed in Bali, West Java and Tanah Karo North Sumatra [3,4].

Another feature of Dutch eggplant plants can also be seen below. Dutch eggplant breeches are ovate or ovoid, measuring 3-10 cm x 3-5 cm, tapering to both ends, hanging, long stemmed, the leaves of the petals do not fall out. The skin of the fruit is thin, slippery, violet, reddish orange to yellowish, the flesh contains a lot of fruit juice, is rather acidic, has a blackish to yellowish color. Jelly is a semi-solid mixture consisting of gelatin, sugar and acid, which is made from not less than 40% by weight of fruit juice and 65% by weight of sugar which is thickened so that the dissolved solids content is not less than 65% [5-8].

The success of making jelly is very dependent on the combination of gelatin, sugar and acid. Pectin is needed to obtain the jelly structure, if pectin is too low it cannot form jelly. The gelling agent of pectin is affected by the added acid and sugar. The concentration of citric acid and sugar added in the process of making Dutch eggplant passion fruit jelly will affect the characteristics of the jelly produced. Based on the description above, it is necessary to do research using passion fruit juice with Dutch eggplant with a ratio of 50:50 in making jelly so that the products produced are functional foods that can improve health and also as food innovation. This is what underlies the author to conduct research on the effect of citric and sucrose acid concentration on the quality of passion fruit with dutch eggplant [9-12].

2. Methods
The materials used in this study were passion fruit, Dutch eggplant, citric acid and sucrose. The tools used in this study consisted of: pipette, measuring flask, measuring cup, erlenmeyer, cup glass, pH meter, filter paper, aluminum foil, magnetic stirrer, burette, oven, funnel, dexicator. Reagents used in this study are: citric acid, iodine, aquades, NaOH. The study was conducted at the Processing Laboratory of the Faculty of Agriculture, Universitas Katolik Santo Thomas Indonesia. This study consisted of 8 stages: 1. making passion fruit juice, 2. making Dutch eggplant juice, 3. mixing passion fruit juice and Dutch eggplant 4. analysis of water content, 5. total acid, 6. vitamin C levels, 7 pH analysis, 8. organoleptic test. Flowchart of the research method as in Figure 1 below.
3. Results

Based on the results of the study it was found that the concentration of citric acid had an effect on the quality of passion fruit jelly with dutch eggplant. The effect of citric acid concentration on the parameters observed can be seen in Table 1 below.

| Citric Acid Concentration (%) | Water content (%) | Total Acid (%) | Vitamin C content (mg/100 g) | pH | Organoleptic (score) |
|------------------------------|------------------|----------------|-------------------------------|----|----------------------|
| A₀ (0)                       | 36,25            | 6,92           | 3,96                          | 4,89 | 3,24                 |
| A₁ (3)                       | 37,50            | 7,91           | 4,18                          | 3,36 | 3,28                 |
| A₂ (5)                       | 38,75            | 8,85           | 4,28                          | 3,24 | 3,53                 |
| A₃ (7)                       | 40,63            | 10,34          | 4,62                          | 3,20 | 4,71                 |

In Table 1 it can be seen that the higher the concentration of citric acid, the water content, total acid, vitamin C levels and organoleptic values increase, while pH decreases. Sucrose concentration also influenced the quality of passion fruit jelly with dutch eggplant, the higher the concentration of sucrose, the water content, total acid, vitamin C levels and organoleptic values increased, while pH decreased.

3.1. The influence of citric and sucrose acid concentration on moisture mark passion with dutch eggplant

Based on the results of the study it is known that the higher the concentration of citric acid, the moisture content of passion fruit jelly with dutch eggplant is increasing. This is due to the presence of citric acid that binds water, so that increasing concentrations will increase more water. Addition of citric acid to ingredients containing pectin can increase gel formation [13-15]. The more acid added, the stronger the gel is formed and the higher the water binding ability. Gel formation can only occur in a narrow pH range of 3.1 to 3.5.

3.2 Effect of combination of citric acid and sucrose concentration on total acid passion fruit with dutch eggplant

Based on the results of the study, it is known that the higher the concentration of citric acid, the total acid content of jelly will increase. This is due to the addition of citric acid will increase the content of organic acids in passion fruit jelly with dutch eggplant. Organic acids can increase the solubility of simple sugars found in jelly. Addition of citric acid can increase the formation of glucose and fructose (reducing sugar) [14]

3.3. The effect of sucrose and citric acid concentration on vitamin C levels on passion fruit passion markers with dutch eggplant

Addition of sucrose concentration affects vitamin C levels of passion fruit jelly. Sucrose is hygroscopic, causing bacterial cells to dehydrate and eventually die. The higher concentration of sucrose can inhibit damage to vitamin C. Concentration of sucrose can reduce contact between oxygen and vitamin C [15]. Besides that during the jelly processing, in the presence of sugar it can prevent damage caused by heating during jelly processing. The pH value of passion fruit jelly with dutch eggplant produced decreases with the increasing concentration of citric acid added. Citric acid is used as a confirmation of taste, color or can cover unwanted after-taste and also as a pH regulator so as to prevent damage by microorganisms [16]. The pH value is affected by the condition of the material, the higher the acidity of the material, the lower the pH level caused by the work of acid-producing microorganisms. The higher the concentration of sucrose, the lower the pH of the jelly [17]. The decrease in pH with increasing levels of sucrose added to jelly is related to the process of gel formation. The lower the pH value, the tightness of the formed gel increases. The pH value that is too
low causes the gel to get harder, while the pH that is too high will cause the gel to break [18]. Sucrose functions as a dehydrating compound which plays a role in reducing the level of stability of pectin and water. During boiling, a solution of sucrose in the presence of acid will undergo a process of hydrolysis to produce reducing sugar. The gel formed depends on dehydration and neutralization of the charge of the dispersed colloid. Gel formation is faster with lower pH and temperature and increased sugar concentration. Therefore, the higher the addition of sucrose, the lower the pH value resulting in faster gel formation and increased gel tightness [19].

3.4. Effect of combination of citric and sucrose acid concentration on pH of passion fruit with dutch eggplant

Based on the results of the study, it was found that the higher the sucrose concentration, the pH of passion fruit jelly with dutch eggplant increased at all levels of sucrose concentration. Sugar has hygroscopic properties, so it will prevent organic acid from changing in jelly. The addition of citric acid will increase the total acid content of passion fruit jelly with Dutch eggplant. The more acid added there is a strong bond between the gel and water. The hydroxyl groups of sugar molecules can form intramolecular hydrogen bonds with water molecules forming stable hydrates and water trapped in jelly gel [20,21].

3.5. Effect of citric and sucrose acid concentration on organoleptic value of passion fruit with dutch eggplant

The relationship between citric acid concentration and organoleptic value of passion fruit jelly with dutch eggplant, namely: the higher the concentration of citric acid, the organoleptic value of passion fruit jelly with dutch eggplant increased. Citric acid gives an acidic taste to passion fruit jelly with dutch eggplant. Citric acid changes the properties of melting easily or increases gel formation. The effect of citric acid makes elasticity of passion fruit jelly with dutch eggplant quite popular. Besides that citric acid is an acidic that is an acidic chemical compound which is added to the food processing process with various purposes. Acididants can act as a reinforcement of taste and color or cover unwanted after-taste [22]. Increasing the concentration of citric acid can improve the taste and aroma of passion fruit jelly with the dutch eggplant produced. Citric acid is a tricarboxylic acid which is that each molecule contains three carboxyl groups. Carboxyl acids that react with alcohol will form ester compounds. These compounds play a major role in giving certain characteristics to flavor and odor of food. The higher the sucrose concentration, the organoleptic value of passion fruit jelly with dutch eggplant is increasing [23]. Increased sugar concentration will increase the organoleptic value of jelly. Basically sugar gives a sweet taste to jelly. Another factor that influences the acceptance of passion fruit jelly is the elasticity caused by sugar so passion fruit jelly with dutch eggplant is chewy and quite easily bitten. The combination of taste and elasticity produces flavors that fit the passion fruit jelly so that it is more preferred. The amount of sucrose which causes more sweetness that balances the strong sour taste in the jelly. Taste has an important role in determining the acceptance of a food. Sensing is divided into four flavors, sweet, salty, bitter and sour. The acceptance of panelists to taste is influenced by the concentration of ingredients and interaction with other flavor components [24,25].

4. Conclusion

From the results of the study the effect of citric acid and sucrose concentration on the quality of passion fruit jelly with dutch eggplant can be concluded that: the concentration of citric acid has a very real different effect (p<0.01) on water content, total acid, pH and organoleptic value of passion fruit jelly with dutch eggplant, and significantly different (p<0.05) on vitamin C levels of passion fruit jelly with dutch eggplant. The higher the concentration of citric acid, the water content, total acid, vitamin C levels and organoleptic values increase, while pH decreases. The combination of the treatment of citric acid and sucrose concentration has a very real effect (p<0.01) on pH and organoleptic value, but the effect is not real (p>0.05) on moisture content, vitamin C content and total passion fruit passion fruit with dutch eggplant. The best quality of passion fruit jelly with dutch eggplant is obtained at 7%
citric acid concentration with 80% sucrose concentration, because it has a higher organoleptic value compared to other treatment combinations.

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