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THE EFFECT OF UTILIZING IE KULOH SIRA, IE ASAM SUNTI, AND CORNELA ON THE CHARACTERISTICS OF SILK TOFU

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ABSTRACT

Silken tofu is a type of tofu that has a soft and compact texture. Ie kuloh sira and ie acid sunti can be used as coagulants. The lack of this coagulant results in a tofu texture that is not compact. Therefore, cornstarch is added to the making of silken tofu to improve the quality of the resulting silken tofu texture. This study aims to determine the effect of the type and concentration of coagulant and cornstarch concentration on the characteristics of silken tofu and the shelf life of silken tofu. This research method uses the Response Surface Method (RSM) and the organoleptic method. Coagulant concentration (0.5%, 1%, 1.5%, 2%, 2.5%) and cornstarch concentration (5%, 10%, 15%, 20%, 25%). The results obtained for silken tofu with coagulant ie kuloh sira and cornstarch obtained the optimal value, namely at concentrations of ie kuloh sira 2% and cornstarch 10% producing a protein content of 8.45%, texture 4.5 mm/sec. The concentration of ie kuloh sira and cornstarch did not affect the color and aroma of silken tofu, but it did affect the taste of silken tofu. Meanwhile, silk tofu with coagulant ie acid sunti and cornstarch obtained the optimal value, namely at a concentration of 1.5% ie acid sunti and 15% cornstarch producing a protein content of 7.57%, texture 4 mm/sec. The concentration of ie acid sunti and cornstarch has an effect on the color of silken tofu, but has no effect on the aroma and taste of silken tofu. The shelf life of silken tofu with coagulant ie kuloh sira and ie asam sunti only lasted 15 hours at room temperature. Meanwhile, those stored in the refrigerator can last for 3 days with a coagulant ie kuloh sira and 5 days with a coagulant ie acid sunti.

Keywords: silken tofu, namely kuloh sira, namely sunti acid, cornstarch, RSM

1. INTRODUCTION

Silken tofu is a type of tofu that originates from Japan and is usually called tofu. Some differences between silken tofu and regular tofu according to Masruroh et al., (2013), include: the manufacturing process, texture, water content, type of coagulant, and coagulant concentration.

Coagulant is a coagulant used to precipitate protein in soybean extract. Protein coagulation is usually carried out with the help of a coagulant as a protein coagulant (Dharmawan, 2018).

In the manufacture of silken tofu, Glucano δ-lactone (GDL) coagulant is usually used (Arii, et.al., 2021). However, the use of natural coagulants such as ie kuloh sira and ie asam sunti for the manufacture of silken tofu has never been done before. So far, ie kuloh sira (water left over from making salt) has been used very little by people as a tofu coagulant. In fact, ie kuloh sira itself contains high minerals, which can make the resulting tofu taste savory and delicious (Salmyah, 2018). Meanwhile, ie asam sunti is produced from the remaining water from the fermentation of asam sunti at night. In ie asam sunti contains citric acid which can

coagulate protein in soybeans (Salmyah, 2017).

The weakness of the coagulant ie kuloh sira and ie asam sunti is the low yield level produced. Therefore, to increase the yield of tofu produced and a smoother texture, cornstarch is added to the process of making silken tofu.

Palupi et al.'s (2020) research on the addition of carrageenan and calcium sulfate to silken tofu can significantly increase the hardness response, cohesiveness, elasticity, and chewing power of silken tofu. However, the drawback of this study is that the addition of carrageenan can significantly reduce the syneresis rate of silken tofu.

Silken Tofu

Silken tofu Silken tofu is a type of tofu that originates from Japan and is usually called tofu.

Indonesian Industrial Standard (SII) No. 0270-80, stipulates the quality standards for silken tofu in Table 1.

I'm the One Who Loves You

Ie kuloh sira or known as nigarin is a tofu coagulant that comes from concentrated seawater or can also be obtained from the remains of salt making (Salmyah, 2018). Nigarin itself still contains more than 80 types of minerals with the main content being magnesium, potassium, iron, calcium, boron, selenium, and zinc (Widaningrum, 2015).

Sunti Acid

Ie Asam Sunti is produced from the remaining water from the fermentation of asam sunti at night. People use Ie Asam Sunti as a fish preservative and not a few people just throw away the starfruit water. Ie Asam Sunti contains a very high acidity level, namely citric acid (Salmyah, 2017).

Cornstarch

Cornstarch is obtained through corn kernel extraction, sedimentation, drying, and sieving. Cornstarch itself has a fairly high starch content, which is 80% (adi, 2018).

Cornstarch is used as an additional gelling agent for making silken tofu. In addition, the addition of Cornstarch will make the texture of the tofu smoother. Because silken tofu has a texture that is very easy to break, Cornstarch is added as an additional agent to increase the strength of the tofu gel and the yield of silken tofu.

RESEARCH METHODOLOGY

Time and Place of Research

The research on making silken tofu was conducted at the Biotechnology and Food Laboratory, Chemical Engineering Department, Lhokseumawe State Polytechnic. Analysis of the silken tofu products produced was conducted at the Biotechnology and Food Laboratory, as well as the Industrial Standardization Research Center (BARISTAND Industri) Banda Aceh. The research period was February-April 2022.

Materials and tools

The materials used in this study include: Main Ingredients Soybeans, Ie Kuloh Sira, Ie Asam Sunti, chicken eggs, and cornstarch. Chemicals used in the analysis, aquades, Selen, NaOH, Na2S2O3, H2SO4, HCl 0.01 N, boric acid 4%, and BCG-MR indicator.

The tools used in this study include: blender, sieve, stirrer, pan, basin, stove, analytical scales, thermometer, molded plastic, Texture Analyzer tool, distilled water, beaker, petri dish, Erlenmeyer flask, volume pipette, ball pipette, dropper pipette, measuring cup, spray bottle, and a set of Kjeldahl tools.

The variables tested were: Protein content, Texture, Organoleptic Test and Shelf life of silken tofu.

Silken Tofu Making Process

Making soy milk based on the modified research method of Murad, et al. (2015) The process of making tofu begins with the preparation of soybeans. Soybeans are sorted first in order to obtain good quality tofu products. After sorting, washing is carried out, by washing, dirt that is attached or mixed between the seeds can be removed. After being washed clean, the soybeans are soaked for 6 hours in a water: soybean ratio (3:1). The soaking process makes the soybeans absorb more water, so that they become softer and the skin is easy to peel. Peeling the skin is done by squeezing it in water, then removing the skin until it becomes pieces. Peeling the soybeans aims to reduce the amount of fiber or materials that are not dissolved in water that can inhibit the extraction process and can improve the color of the resulting soybean extract.

After the pieces are formed, they are then ground using a blender with the addition of 80℃ hot water with a soybean: water ratio of 1:5. The soy porridge obtained is filtered and separated from the dregs. The filtrate obtained is then added with cornstarch according to the treatment and heated at a temperature of 70-85℃ for 10 minutes. Then filtered and soy milk is obtained. The soy milk obtained in the previous stage is used as a raw material for making silken tofu. In the process of making silken tofu, soy milk is coagulated using a coagulant (Ie Kuloh sira, Ie Asam Sunti) according to the treatment. Then poured into a plastic mold and steamed for 3 minutes.

Design and Optimization of Silken Tofu Formula

This study uses the Response Surface Methodology (RSM) method to obtain the concentration of the variables used so that an optimal response is produced [6]. The concentration of ie kuloh sira (0.5-2.5%), ie asam sunti (0.5-2.5%), and cornstarch (5-25%) were selected as variables.

Protein Level Analysis Kjeldhal Method

Crude protein content in food is determined using the Semimicro Kjeldahl method (SNI 01- 2891-1992). The Kjeldahl method is divided into 3 stages, namely destruction, distillation, and titration.

Organoleptic Test Data Analysis Method

Organoleptic test data analysis was conducted using the ANOVA method using Microsoft Excel. Where after the calculation was completed, the F Calculation obtained was compared with the F Table (Probability F Distribution Table 0.01 and 0.05).

Hypothesis conducted for hedonic organoleptic test:

H0= Panelists like the parameters (color, aroma and taste) of silken tofu

H1= Panelists do not like the parameters (color, aroma and taste) of silken tofu

Hypothesis carried out for organoleptic quality testing:

H0=There are changes in parameters regarding the shelf life of silken tofu

H1 = There is no change in parameters regarding the shelf life of silken tofu

H0 = F Count < F Table (Accepted) F Count > F Table (Rejected)

RESULTS AND DISCUSSION

The results of this study were obtained from the results of the analysis conducted in the biotechnology and food laboratory of the Lhokseumawe State Polytechnic and the Banda Aceh Industrial Baristand.

Discussion

In this study, silken tofu with a coagulant, namely kuloh sira, will be compared with silken tofu with a coagulant, namely asam sunti. In addition, cornstarch is also added to bind (gelatinize) the texture of silken tofu.

The analysis of the results of the characteristics of silken tofu including

protein content and texture against the comparative variables, namely kuloh sira and ie asam sunti, was carried out using Minitab 19 software with Response Surface Methodology (RSM).

Protein Content

The protein content of silken tofu from the coagulant ie kuloh sira and ie asam sunti was analyzed using the Kjeldhal method and plotted in Figures 1 and 2.

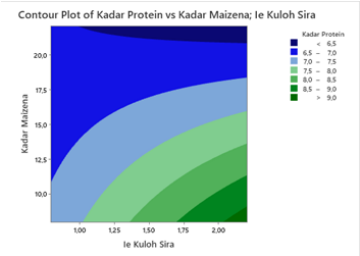

Figure 1 contour plot of protein content of silken tofu with coagulation i.e. kuloh sira

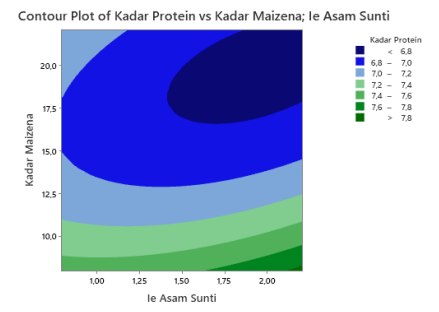

Figure 2. Contour plot of silk tofu protein content with coagulation, namely sunti acid

Based on Figure 1, it shows that the protein content of silken tofu with the best coagulant ie kuloh sira is at P2 at 8.45% with a concentration of ie kuloh sira of 2% and a cornstarch content of 10%. Where it can be seen that the higher the concentration of ie kuloh sira, the greater the protein content of tofu. Meanwhile, based on Figure 2, it shows that the protein content of silken tofu with the best coagulant ie asam sunti is at P13 at 7.57% with a concentration of ie asam sunti of 1.5% and a cornstarch content of 15%. And for commercial tofu, the protein content is 6.26%.

The protein content of silken tofu with a coagulant ie kuloh sira is greater than that of a coagulant ie asam sunti. This is because ie kuloh sira has a high mineral content. While in ie asam sunti only contains acid (in the form of citric acid). According to the results of the study (Salmyah, 2018) regarding the protein content of tofu with a coagulant ie kuloh sira is higher than ie asam sunti because the protein content in tofu with a coagulant ie kuloh sira have high magnesium (Mg) content. According to Siami (2015) nigarin (ie kuloh Sira) contains 80 types of minerals with the main content being Magnesium and Potassium. Meanwhile, the addition of cornstarch does not have much effect onprotein content of silken tofu.

In addition, the protein content produced does not meet SII No. 0270-80 which states that the protein content in SII is at least 9%. The protein content that still does not meet the SII standard is influenced by the steaming process which causes the protein components to denature. This is in accordance with Sundari's research (2015) that the higher the temperature used, the lower the protein content in food ingredients. In addition, according to Gloria (2019) the higher the water content of a food ingredient, the lower the protein content.

Texture

The texture of silken tofu was analyzed using a texture analyzer.

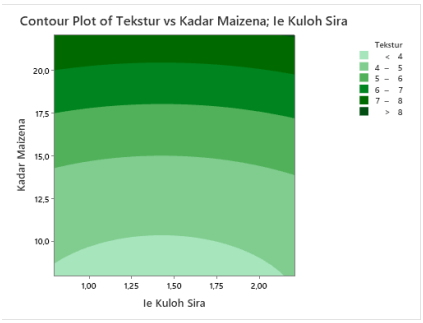

Figure 3 plots the texture contour of silken tofu with a coagulant, namely kuloh sira.

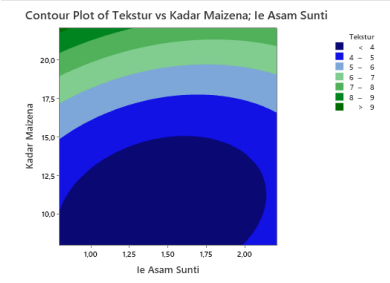

Figure 4 plots the texture contour of silken tofu with coagulation, namely sunti acid.

Based on Figures 3 and 4, it shows that the concentration of cornstarch in silken tofu with coagulants, namely kuloh sira and ie asam sunti, affects the texture of silken tofu. From the data obtained, it can be seen that there is an increase in the texture of silken tofu along with the increase in the concentration of cornstarch added.

Silken tofu with coagulant i.e. kuloh sira and cornstarch produced optimum texture value at P2 with 2% ie kuloh sira concentration and 10% cornstarch concentration produced tofu texture of 4.5 mm/sec. While silken tofu with coagulant i.e. sunti acid produced optimum texture value at P13 with 1.5% ie sunti acid concentration and 1.5% cornstarch concentration produced tofu texture of 4 mm/sec.

In addition, the addition of cornstarch causes starch to interact with soy protein and form a starch-protein matrix that can also affect the texture of the product. This is in accordance with Wahono's research (2019) where the more cornstarch added, the denser the texture will be. This is because of the presence of a starch-protein complex that interferes with protein gelation.

Starch is added to increase softness and improve the texture of the product, among other things. However, if starch is added in excessive concentrations, it will reduce the level of softness.

Organoleptic Test

1. Color

Color is the first sensory that can be seen directly by panelists. Color can improve and provide appeal to food, and influence the preference for the product (JK.Negara, et al. 2016).

The hedonic organoleptic test on the color of silken tofu with a coagulant, namely kuloh sira, shows that the researchers like the color of silken tofu. The average result obtained from 20 panelists is 6 (like). While for the color of silken tofu with a coagulant, namely asam sunti, the average panelists like it with a value of 6 (like) from 20 panelists. Silken tofu obtained from both coagulants is creamy (white slightly yellowish) this is due to the addition of chicken eggs which causes the color of the tofu like that

The difference in concentration i.e. kuloh sira and cornstarch did not affect the color of silken tofu. This is known from the calculated F value which is smaller than the F table value of 1% and F table of 5%. Meanwhile, the difference in concentration i.e. sunti acid and cornstarch was significantly different on the color of silken tofu. This is known from the calculated F value which is greater than the F table of 5%.

2. Aroma

Aroma is a smell that arises due to chemical stimulation by the olfactory nerves in the nasal cavity (JK.Negara, et al. 2016). Aroma is an added value to a product, by smelling the aroma, panelists can find out whether a product is delicious or not.

The hedonic organoleptic test on the aroma of silken tofu with coagulants ie kuloh sira and ie asam sunti showed that the researchers quite liked the aroma of silken tofu. The average result obtained from 20 panelists was 5 (quite like). While for the aroma of commercial silken tofu, the average panelists also quite liked the aroma and obtained a value of 5 (quite like) from 20 panelists. The aroma of silken tofu

produced from the study was not too eggy compared to commercial silken tofu.

The difference in cornstarch concentration in ie kuloh sira and ie asam sunti did not significantly differ on the aroma of silken tofu. This is known from the calculated F value which is smaller than the F table value of 1% and F table of 5%. Thus, it shows that the difference in cornstarch concentration in ie kuloh sira and ie asam sunti did not affect the aroma of silken tofu.

3. Flavor

The hedonic organoleptic test on the taste of silken tofu with coagulants ie kuloh sira and ie asam sunti showed that the researchers liked the taste of silken tofu. The average result obtained from 20 panelists was 6 (like). While for the taste of commercial silken tofu, the average panelist also liked the taste and obtained a value of 6 (like) from 20 panelists. Silken tofu with coagulant ie kuloh sira has a delicious, savory and slightly bitter taste in silken tofu with a high concentration of ie kuloh sira. This is in accordance with Salmyah (2017) that tofu with coagulant ie kuloh sira at excessive concentrations can cause a bitter taste in tofu. This bitter taste is due to the presence of magnesium minerals in it. While silken tofu with coagulant ie asam sunti has a savory and delicious taste.

The difference in concentration of ie kuloh sira and cornstarch is very different from the taste of silken tofu. This is known from the calculated F value which is greater than the F table value of 1%. So it shows that the difference in concentration of ie kuloh sira and cornstarch affects the taste of silken tofu. While the difference in concentration of ie asam sunti and cornstarch is not significantly different from the taste of silken tofu. This is known from the calculated F value which is smaller than the F table value of 1% and F table 5%.

Shelf Life

The shelf life testing of silken tofu was carried out using the organoleptic quality test method. The storage conditions of silken tofu itself were carried out in two different conditions, namely silken tofu stored at room temperature and silken tofu stored in the refrigerator.

The shelf life of silken tofu with coagulant ie kuloh sira and ie asam sunti at room temperature lasted up to 15 hours, where the silken tofu at time 0 the appearance of the silken tofu was normal and not slimy, had a soft texture, a slightly tofu aroma and tofu taste. At 10 hours the silken tofu did not change, either in terms of appearance, texture, aroma, and taste. While at 15 hours the appearance of the tofu had begun to change, where the appearance of the tofu had begun to become slightly slimy and the texture had begun to become slightly soft, so that silken tofu stored for more than 15 hours was no longer suitable for consumption. This is in accordance with research conducted by Harti et al. (2013), where tofu stored at room temperature (27 ℃) had a shelf life with good quality of only less than 1 day.

This is different from the shelf life of silken tofu at refrigerator temperature. Where at refrigerator temperature, silken tofu with a coagulant, namely kuloh sira, lasts for 3 days, while silken tofu with a coagulant, namely asam sunti, lasts up to 5 days. The difference in shelf life between the two coagulants is because ie asam sunti contains citric acid which can act as a preservative (Salmyah, 2017) and in acidic conditions inhibits bacterial growth. According to Asiah, 2018, bacteria grow faster in the pH range of 6-8, yeast between 4.5-6, and fungi 3.5-4.

In addition, another factor causing the low shelf life of silken tofu is because the packaging is not done in a vacuum condition, so this causes air to be trapped in the product. In aerobic conditions (the

presence of O2) like this, it is easier for bacteria to grow faster.

CONCLUSION

Based on the results and discussion it can be concluded that:

1. Silken tofu products were successfully made with the characteristics of silken tofu using coagulants, namely ie kuloh sira and cornstarch, the optimal value was obtained at a concentration of ie kuloh sira 2% and cornstarch 10%, producing a protein content of 8.45%, a texture of 4.5 mm/sec, and organoleptic tests (color, aroma, taste) were on average liked by panelists. While silken tofu using coagulants, namely ie asam sunti and cornstarch, the optimal value was obtained at a concentration of ie asam sunti 1.5% and cornstarch 15%, producing a protein content of 7.57%, a texture of 4 mm/sec and organoleptic tests (color, aroma, taste) were on average liked by panelists.
2. The shelf life of silken tofu with coagulation, i.e. kuloh sira and i.e. sunti acid, only lasts 15 hours at room temperature. Meanwhile, silken tofu stored in the refrigerator can last an average of 3 days for silken tofu with a lump, namely kuloh sira and an average of 5 days for silken tofu with a lump, namely sunti acid.

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