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Rabbit Skin Gelatine Effect Towards Yoghurt Quality

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ABSTRACT

This research aims to discover the quality of yoghurt added by rabbit skin gelatine of various concentrations. Qualities measured are protein content, fat content, acidity, pH, water holding capacity (WHC), syneresis, viscosity, and yoghurt texture. Materials used in this research are skim milk, rabbit skin gelatine, and yoghurt culture, which consisted of bacteria such as L. bulgaricus, S. thermophilus, and L. Acidophilus. The experiment is conducted using Completely Randomised Design, consisted of four treatments and five-time repetition. If there is an effect, the treatment later continued to Duncan's Multiple Range Test. Experimentation on texture is conducted through an organoleptic test with 25 panellists and later analysed with the Kruskal-Wallis Test. The treatments determined in this experiment are the effect on the addition of rabbit skin gelatin proportion of 0% (P0), 0.4% (P1), 0.6% (P2), and 0.8% (P3). The result of the Analysis of Variance (ANOVA) shows that the addition of gelatine has a significant difference (P<0.05) towards protein content, water holding capacity (WHC), and syneresis and no significant difference (P>0.05) towards the fat content, viscosity, pH, and yoghurt's acidity degree. The Kruskal-Wallis test result shows the significant difference (P>0.05) towards yoghurt's texture. This research concludes that the best yoghurt quality is obtained by the addition of 0.8% of rabbit skin gelatine.

Keywords*: yoghurt; gelatine; skin; rabbit; quality*

INTRODUCTION

Yoghurt is one of the functional food products because it contains a bio peptide compound of β-lactoglobulin, which is a precursor of β-lactorpin, which besides as an antioxidant, it is also claimed to has an antitumour activity by utilisation of lactate acid bacterial activity (Mohamed & Zayan, 2014).

The weak side of yoghurt is that during its making process, its water holding capacity tends to whey off due to the pH yoghurt is on the casein isoelectric point. Casein gel that exists in the isoelectric pH has a weak water molecule holding capacity, ignites water molecule release on the gel surface (syneresis) and viscosity reduction (Alakali, Okonkwo, & Iordye, 2008). This reduction of water holding capacity may affect yoghurt's end product's quality (Hartati, 2018). An alternative to avoid the problem is through the addition of gelatine as a stabiliser (Amatayakul, Sherkat, & Shah, 2006). Besides able to hold the water a bacterial growth media, gelatin also can increase yoghurt's shelf life by suppressing the growth of spoilage bacteria (Utomo, M. S., Purwadi., Thohari, 2018).

The problem on gelatine is that this is an expensive ingredient, which made from collagen-rich ingredients such as from cow skin, pork skin, or other animals. However, if gelatine made from the cow skin or other large animals, the production process tends to be longer and requires more washing water or neutraliser ingredients. It rarely develops well due to the significant investment, which leads to the high price of the gelatine (Triatmojo. S., A. Pertiwiningrum., Y, 2008). Therefore, an alternative offered by this research is by using rabbit skin.

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METHODS

The main ingredient of this research is skim milk. The rabbit skin gelatine is self-made from the rabbit skin bought in a rabbit farm in Batu, Greater Malang region. The yoghurt culture itself is a combination between L. *bulgaricus*, S. *thermophilus*, and L. *Acidophilus*. Tools used in the yoghurt making are autoclave, incubator, refrigerator, thermometer, oven, volume pipette, aluminium foil, bunsen burner, measuring glass, test tube, pipette, beaker glass, pycnometer, filter cloth, pH meter, Oswald pipe, mortar, filter syringe, and organoleptic test questionnaire.

Making rabbit skin gelatine

The gelatine making process was conducted through extraction by an acid process, according to a method explained by (Irfan, Triatmojo, Erwanto, & Fudholi, 2012) as follows: rabbit skin that has been cleaned from fat and meat then cut into pieces of roughly 1 x 1 cm in size. The cut skin then measured and soaked in 5% CH_3COOH solution. Afterwards, the skin then washed with flowing water several times until the wash water reached the pH of 6. After the washing, the skin then extracted in the temperature of 65 degrees centigrade for three hours before filtered with filter cloth. The gelatin water, as a result, then dried. Before the drying process, the gelatin must through a concentrating process on the temperature of 60 degrees centigrade for five hours and send to refrigeration for about 5-10 degrees centigrade for 30 minutes. The drying process uses the oven with the temperature set at 60 degrees centigrade until thoroughly dried. The gelatine product then blended and packed in a vacuumed plastic pack/container and later used for the yoghurt making process.

Making yoghurt

The process of making yoghurt started by dissolving 14% skim milk (b/v) and stabiliser ingredient of rabbit skin gelatin as much as 0% (P0), 0.4% (P1), 0.6% (P2), and 0.8% (P3). The solution then pasteurised in temperature of 72 degrees centigrade for 15 minutes and then lower the temperature until 43 degrees centigrade. Afterwards, the milk then inoculated by a previously prepared starter, as much as 3% (v/v) of the mix of L. *bulgaricus*, S. *thermophilus*, and L. *Acidophilus.* The solution then incubated in the temperature of 41 degrees centigrade for four hours. The yoghurt as the end product will be tested for its quality.

The chemical measurement is conducted by proximate analysis, which is protein and fat content (AOAC, 1995). The physical measurement of yoghurt comprises of viscosity (Arnesen, 2002), acidity (using titration method of (Newlander, 1981), pH (Van den Berg, 1987), water holding capacity/WHC (Hassan, Frank, Schmidt, & Shalabi, 1996) and syneresis (Songchotikunpan P, Tattiyakul J, 2008). The texture's organoleptic test is conducted in accordance with Kartika, B., (1998) by testing the provided samples and provide score towards yoghurt's texture. Twenty-five panellists will attend texture experimentation. The scores given are ranging from 1 to 9, which are highly thick (1 point), very thick (2 points), thick (3 points), somewhat thick (4 points), a bit thick (5 points), neutral (6 points), highly not thick (7 points), very not thick (8 points), and not thick (9 points).

Data analysis

This research utilises Completely Randomised Design, consisted of four treatments and five-time repetition. Treatments implemented are the effect of the addition of rabbit skin gelatine as much as 0% (P0), 0.4% (P1), 0.6% (P2), and 0.8% (P3) for five-hour incubation

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in which will be observed during the first, third, and fifth hour. Data obtained then analysed with the method of Analysis of Variance (ANOVA). If there is a significant difference, the test will be continued to Duncan's Multiple Range Test. Meanwhile, the texture experimentation uses the assessment of the 25 well-trained panellists.

RESULT AND DISCUSSIONS

Data analysis result of physical and chemical quality of yoghurt added with rabbit skin gelatin can be seen in Table 1.

Table 1. Yoghurt quality with the different proportions of rabbit skin gelatin

Treatment	Protein content (%)	Fat content (%)	Viscosity (cP)	Acidity (%)	pH	WHC (%)	Syneresis (%)	Texture
0 %	4,5^{9a}	0.35^{a}	56.04^{a}	0.84^{a}	3.75^{a}	45.14^{a}	0.0520^{c}	2.200^{a}
0,4%	5,00^{b}	0.44^{a}	58.28^{a}	0.85^{a}	3.77^{a}	50.35^{b}	0.0244^{b}	3.000^{b}
0,6 %	5,21^{b}	0.41^{a}	58.48^{a}	0.85^{a}	3.81^{a}	55.28^{b}	0.0104^{ab}	3.933^{c}
0,8 %	5,37^{bc}	0.38^{a}	57.18^{a}	0.83^{a}	3.89^{a}	68.55^{c}	0.0094^{a}	4.400^{c}

Table 1 explains that the protein content value of the gelatin-added yoghurt is higher than normal yoghurt. Therefore, this concludes that the higher rabbit skin gelatin concentration in the yoghurt, the protein content is also higher. Askar & Sugiarto (2005) stated that the protein content in yoghurt is determined by added ingredient quantity. The higher protein content in a certain ingredient, the protein content in the yoghurt will also be higher. It is also added that gelatin is a protein derivative of collagen fibre in the skins, bones, and cartilages. Gelatin compound is a linear polymer of amino acids. Generally, those polymer chains is a repetition of the amino acid of tryptophan, so the gelatin cannot be included as a completed protein (Junianto, Kiki Haetami, & Maulina, 2006).

According to the Indonesian Standarisation (2009), the protein content of yoghurt (SNI 01-2981-1992) should not less than 3.5%. In this research, the protein content obtained is 5.13% on average, so the result is still above the minimum requirement of the Indonesian National Standard.

The addition of rabbit skin gelatine did not affect the yoghurt content, which only ranged between 0.35% and 0.44%. This range is still under the Indonesian National Standard number SNI 01-2981-1992 that stated fat content in the yoghurt should not exceed 3.3%. The low fat content of the yoghurt is due to the lactate acid bacterial activity that absorbs fat in a particular ingredient as their energy source for growth. Besides, fat content in the gelatin is generally low, so it is not a fat source because even the high-quality gelatin is expected to have a low fat content.

Viscosity is a molecular flow power in a solution, either in water, simple organic liquid, suspension, or liquid emulsion (DeMan, 1999) Table 1 shows that the viscosity result has no significant difference. This occurs hypothetically due to the coagulated milk protein is relatively the same, so it resulted in the indifferent viscosity. This kind of thickness also caused by the existence of the protein. The higher protein content then viscosity will also be higher, moreover with the addition of rabbit skin gelatin. The water holding by protein results

in a smoother texture that makes the yoghurt looks uniformed. The acid-coagulated protein will form a gel so that the texture will be thicker. It is proved by the organoleptic test on the texture, which results in a significant difference. The addition of high rabbit skin gelatine concentration will produce a texture that more preferred by the panellists.

The addition of gelatin did not have a significant difference in yoghurt acidity (P>0.05). The acidity results are ranging from 0.83 to 0.85. This is due to the addition of gelation does not mean adding the lactose content in the milk because gelatin does not contain lactose (see Table 1). The lactose breaking, which caused by the lactate acid bacteria, causes the yoghurt acidity, likewise with the pH of the yoghurt, which is almost the same between the gelatin-added (up to 0.8) and non-gelatin ones, which ranges around 3.75-3.89. Research by (Tjahjadi, C, Debby M. S, 2002) confirms this result by stating that the adding of stabiliser ingredient such as gelatin does not significantly affect the yoghurt's pH.

There is a significant difference in the aspect of yoghurt's water holding capacity compared to ones that are gelatin-free (P<0.01). Table 1 shows that the higher gelatin concentrate, the higher water holding capacity of the yoghurt. Rabbit skin gelatin can increase the water holding capacity by breaking the hydrogen bonding between the casein molecule and lactate acid, which increase protein's hydrophilic characteristics. (Sawitri, Manab, & Palupi, 2008), confirmed by Fennema (1996) stated that the addition of stabiliser ingredients such as gelatin could inhibit the hydrogen binding between casein and lactate acid molecule, so it preserves the bond between water and protein molecule.

Table 1 also stated that the addition of rabbit skin gelatin has a significant effect (P<0.01) towards the yoghurt's syneresis. This means that the higher gelatin concentration added, the lower syneresis occurs in the yoghurt. The lower syneresis is due to the ability of rabbit skin gelatin to catch water in the matrix structure. The higher gelatin concentration in the yoghurt creates more matrix to catch water, so the amount of released water will be decreased, and the yoghurt syneresis degree will decrease as well.

CONCLUSION

Yoghurt with the addition of rabbit skin gelatin proportion of 0.8% has the best quality in the experiment due to its higher protein content and water holding capacity, low syneresis, and the most preferred texture compared to the other proportions of 0%, 0.4%, and 0.6%.

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