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The Effect of Blanching Methods and Extractions on Quality of Edamame Milk Product

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Abstract

This research was conducted with the aim to know the study the effect of blanching method and extraction on edamame milk characteristics. The design used in this study was a Randomized Block Design (RBD) with a factorial pattern consisting of two factors (blanching methods and extraction) and two replications. The analysis is done by objective and subjective. The actual analysis including of water content, pH, total soluble solids (TSS), protein content, ash content, and shelf-life. Individual observations include assessment of color, viscosity, flavor, and overall reception using the scoring method by SNI 3141.1: 2011. The result showed that the blanching method and extraction could maintain the characteristics up to 18 days of storage with features: water content 90.10%, pH 7.09, TSS, 15,90, protein content 1.25 (below standard quality), ash content 0.48, 5.93 colors, 5.60 flavor, 5.73 viscosity, 5.87 taste, and reception overall (rather like-like).

Keywords: Blanching methods; Extraction; Edamame milk; Quality

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1. Introduction

Vegetable soybean or more popularly called "edamame" includes species of Glycine max L. As the name implies, soybean vegetable is a type of soybean harvested when the pods are young and green when the filling of the seeds is almost full (80-90% filling). Edamame is consumed directly by boiling it; first, it is delicious so consumers favor it. Edamame has a soft grain texture ripened faster when boiled, so the green pod color can still be preserved [1, 2]. Along with the increasing knowledge of community nutrition, now processed soy get or get special attention especially since the popularity of edamame (Japanese soybeans) as a snack. Edamame is harvested when new soybeans are 80% cooked. The edamame with other soybeans is the larger seeds, the texture is smoother, the taste is sweeter, and more easily digested. Edamame contains antioxidants and isoflavones. Eating foods rich in antioxidants can strengthen the body's immune system and reduce the risk of cancer. Isoflavones are also shown to reduce the risk of prostate cancer and breast cancer, prevent heart disease, lower blood pressure, and reduce disruption at menopause. Besides edamame also contains beta-carotene, fiber and contains nine essential amino acids that the body needs in its perfect composition.

Edamame is not included in the group of nuts but into the vegetable category (green soybean vegetable). In Japan, the country of origin of this soybean, including tropical plants and used as vegetables and healthy snacks. This soybean is categorized as healthy food. In addition to high productivity, the age of edamame relief is shorter (maturity), the size of the pod is larger, and it tastes sweeter [3]. For some Indonesians, edamame soybean may become unfamiliar.

Food products that can be made from edamame raw materials, such as edamame milk made from

edamame soybean extract. Besides edamame chips, edamame cakes, edamame frozen, and dry edamame. In the manufacture of edamame cakes or often called edamame cake, this cake collaborates with fruit-based fruit strawberries, oranges, grapes, and milk and a little flour is processed with a temperature of 60 oC so it can maintain the vitamin content in fruits.

Problems often found in soy foods, including soy milk, are the unique smell of soybeans that are less favored by consumers [4]. In edamame, milk processing process required several stages of the process such as blanching and extraction. One function of blanching is to activate the lipoxygenase enzyme. Blanching can be done by a direct soak in hot water, steamed using warm water and boiled directly in hot water [5] while the extraction can be done with one to several times the extraction to obtain extract or extract of edamame soybean maximum, for that the authors do this research in order to obtain information on how to blanching method and extraction appropriate to obtain edamame soy milk with good characteristics and can be accepted by consumers.

2. Material and Methods

Place and Time of Research

This research was conducted in Agricultural Processing Laboratory of Faculty of Agriculture, University of Warmadewa, while the analysis was done in Udayana University Faculty of Agriculture Technology Laboratory. The study was conducted from December 2015 to February 2016.

Material and Equipment

The raw materials needed to make edamame soy milk can be found in markets or supermarkets at reasonable prices. The raw materials will affect the edamame soup product so it can not be drunk. As the main ingredient choose green edamame soybeans and still fresh, for each treatment required 200-gram edamame soybean seeds and as an ingredient to give a fresh flavor and aroma are two pieces of fragrant pandanus, two pieces of ginger, salt of approximately 2 g, and 130 g sugar. Besides, water used in the manufacture of edamame soy milk should be water that meets the requirements for industrial water and which has been boiled first. After all, ingredients have been prepared, further preparation of the necessary equipment for edamame soybean milk should be developed. We recommend that all equipment and raw materials have been prepared in a clean processing room. All equipment must be cleaned of dirt, dust, rust and residual water. The equipment used in this research is a pan, gas stove, blender (Philips), plastic bag, filter cloth, scales, measuring cups, wood stirrers, watches, thermometers, and bottles as a ready-made soybean milk packer.

Research Design

The design used in this study was a Randomized Block Design (RBD) with a factorial pattern consisting of two factors. The first factor is the Blanching methods (B) that consist of 4 levels, namely: without blanching, soaked in boiling water with temperature 100 oC for 20 minutes, boiled with temperature 85 oC for 20 minutes, steamed with temperature 85 oC for 20 minutes. The second factor is extraction (E) consisting of 4 levels: extraction 1 times for 5 minutes, two times for 5 minutes, three times for 5 minutes, four times for 5 minutes. So obtained 16 treatment combinations and repeated two times.

Research Applied

In the implementation of this research edamame soybeans are then washed and then drained then

blanching (soaked, boiled, steamed and without blanching) after it peeled off the skin and weighed as much as 200 g and then milled or blended for approximately 5 minutes with the addition of warm water as much as 1600 ml, Then extracted up to 4 times. After extracting is obtained edamame filtrate and not yet feasible to be consumed. To be consumed, edamame extract derived from the extraction is cooked or reheated to the temperature of 85 0C with the addition of flavor leaves (pandan Harum), ginger, salt, and sugar is then cooled to 60 oC and then filtered and then obtained milk edamame itself. Furthermore, the filtered edamame milk is bottled to be ready for analysis.

Observation and Analysis

To observe the effect of each treatment, objective analysis (water content, pH, TSS, protein content, ash content, and shelf life) were observed subjectively: color, flavor, viscosity, taste, and overall acceptance.

3. Results and Discussion

Objective Parameters

Moisture Content

The average edamame milk content ranged from 88.12 to 90.24% (Table 1) which showed an unreal effect; This is probably due to the amount of water added equally, ie 1600 ml and edamame used as the raw material is almost the same (homogeneous). Besides, when the blanching of water absorbed by edamame is not so different and the volume of water used at the time of extraction is also the same. From the result of this research, blanching treatment with boiling and extracting four times resulted in the high water content of 90.10%, and blanching treatment by steaming and two times extraction resulted in the highest water content of 90.22% exceeding that required by SNI. Quality requirement of soybean milk content is maximum 90.08 [6]. In the blanching process and the material absorbs the frequency of direct water extraction mixed with edamame feedstock and a lot of water. Following opinion [4] states in the wet state of food can absorb water until it reaches a certain balance.

Table 1.
The moisture contents (%) of Edamame milk as the effects of blanching methods and extraction times

Treatments	Extraction				Average*
	1	2	3	4	
Un- Blanching	88.86	88.54	90.24	89.60	89.31 a
Soaking	89.32	89.08	89.17	88.78	89.09 a
Boiling	89.46	89.41	89.57	90.10	89.64 a
Steaming	88.81	90.22	89.97	88.12	89.28 a
Average*	89.11 a	89.31 a	89.74 a	89.15 a	

*The average value followed by the same letter on the same row or column shows are not the significant difference (P> 0.05).

pH

The increased pH value of milk will cause the milk viscosity to increase as a result of the breakage of casein granules. The decrease in the pH of milk generally leads to a slight reduction in thickness, at a more drastic reduction in pH will result in increased viscosity due to aggregation, milk viscosity of casein slightly influenced by homogenization process [8]. According to SNI 3141.1: 2011 the pH quality

requirement in soy milk is 6.3-6.8, and for edamame, milk pH can still be called safe for consumption even though it is quite high because the average pH is between 7.09 - 7.39 (Table 2).

Table 2.
The pH of edamame milk as the effects of blanching methods and extraction times

Treatments	Extraction				Average
	1	2	3	4	
Un-blanching	7.33	7.18	7.24	7.25	7.25 ab
Soaking	7.25	7.37	7.48	7.47	77.39 a
Boiling	7.33	7.29	7.32	7.39	77.33 a
Steam	7.12	7.09	7.10	7.05	77.09 b
Average	7.26 a	7.23 a	7.29 a	7.29 a	

Description:

a. The average value followed by the same letter on the same row or column shows are not the significant difference (P> 0.05).

b. Different letters in addition to the mean values on the same line show a significant effect (P <0.05).

Total Soluble Solid (TSS)

Table 3 shows that the mean value of TSS of edamame milk ranged from 15.90 - 17.30 Brix which showed no significant effect. This is probably caused by the addition of sugar (130 grams) and salt (2 grams) in the same amount and the raw materials used in the process are almost identical, whereas TSS in the edamame milk shows the total amount of dissolved solids in a material in which the components Consisting of sugar and salt [8]. According to SNI 3141.1: 2011 the requirement of Total Soluble Solid of soy milk is 14.02-14.09 Brix. From the research, the resulting TSS is higher than the SNI quality standard, this means the dissolved solids in edamame soy milk is higher than regular soy milk.

Table 3.
The total soluble solids (%) of Edamame milk as the effects of blanching methods and extraction times

Treatments	Extraction				Average*
	1	2	3	4	
Un-blanching	16.80	17.30	16.50	17.10	16.93 a
Soaking	16.10	16.50	16.60	16.90	16.53 a
Boiling	15.90	16.20	16.10	16.00	16.05 a
Steaming	16.10	16.50	16.70	16.40	16.43 a
Average*	16.23 a	16.63 a	16.48 a	16.60 a	

*The average value followed by the same letter on the same row or column shows are not the significant difference (P> 0.05).

Protein Content

The lowest protein content of edamame milk was obtained from blanching combination by the boiling method and 1-time extraction of 0.66% and the highest was obtained from whitening treatment and four times extraction of 1.25% (Table 4). This is suspected because the treatment without protein blanching on edamame milk did not experience denaturation, at the time of process without blanching because of edamame not direct contact with heat. Similarly, in the blanching treatment by boiling the

protein decreased, because at the time of boiling protein denaturation, which shows changes in physical properties and loss of functional capacity. Visible physical changes ranging from flocculations showing cloudiness (such as clouds in solution) were followed by coagulation and precipitation [9]. According to SNI (Indonesian National Standard), protein quality requirement is at least 3.5%. From the result of this study, the treatment without blanching and extraction four times resulted in the highest water content of 1.25% and still lower or under the quality requirements of soy milk according to SNI. This is probably caused by the addition of salt, although besides of salt into a solution the amount is the same if in a solution containing protein added salt then the solubility of the protein will be reduced, consequently the protein will be separated as a precipitate.

Table 4.

The protein content (%) of Edamame milk as the effects of blanching methods and extraction times

Treatments	Extraction				Average*
	1	2	3	4	
Unblanching	0.90	1.04	1.02	1.25	1.05 a
Soaking	0.85	0.84	0.92	0.82	0.86 a
Boiling	0.66	0.80	0.72	1.10	0.82 a
Steaming	1.06	0.98	0.95	0.96	0.99 a
Average*	0.87 a	0.92 a	0.90 a	1.03 a	

*The average value followed by the same letter on the same row or column shows is no significant difference (P> 0.05)

Ash Content

Edamame ash milk content ranged from 0.46 to 0.75% (Table 5) which showed no significant effect. This is probably caused by the addition of salt in the same amount of 2 grams, in addition to the raw materials used are also the same.

Table 5.

The ash contents (%) of Edamame milk as the effects of blanching methods and extraction times

Treatments	Extraction				Average*
	1	2	3	4	
UnBlanching	0.60	0.67	0.67	0.75	0.67 a
Soaking	0.55	0.55	0.60	0.54	0.56 a
Boiling	0.46	0.53	0.48	0.68	0.54 a
Steaming	0.68	0.65	0.61	0.63	0.64 a
Average*	0.57 a	0.60 a	0.59 a	0.65 a	

*The average value followed by the same letter on the same row or column shows is no significant difference (P> 0.05).

Ash is generally defined as the inorganic substance of residue from the burning of organic materials. Ash content has something to do with the minerals of a material. Minerals contained in a material can be two kinds of salts, namely organic salts and inorganic salts which include organic salts such as salts of malic acid, oxalate, acetate, and pectate. The ash quality standard of soy milk according to the Directorate of Nutrition MOH RI, 2000 is a maximum of 0.5%. From the result of the research, blanching treatment with boiling and 1x extraction, and blanching treatment with boiling and 3x

extraction resulted in ash content below the required 0.46 and 0.48%. This is due to the possibility of dissolved minerals in fresh boiling water in the manufacture of edamame milk.

Shelf-Life

The Table 6 shown that the lowest storage period of edamame milk was obtained from the blanching combination treatment by immersion and 1-time extraction of 17.50 days and the highest was obtained from blanching treatment and 1 to 4 times extraction 20.00 days. This is suspected in the blanching process by immersion of food directly in contact with hot water where the reaction of enzymes present in the material can be activated [10]. Besides, edamame milk storage is not significant. This is probably caused by way of extraction, where the extraction frequency is almost the same one time, two times, three times, and four times extraction. According to SNI 3141.1: 2011 the requirement of shelf life of soybean milk is 18 days, whereas for fresh milk is 19 days, it means only edamame milk with blanching treatment by immersion and 1 time extraction which less meet SNI quality standard, while the same shelf life is the same or exceed the shelf life of the required soy milk of 18 days.

Table 6.

The shelf life (days) of edamame milk as the effects of blanching methods and extraction times

Treatments	Extraction				Average*
	1	2	3	4	
Un-Blanching	20.00	20.00	20.00	20.00	20.00 a
Soaking	17.50	18.00	18.00	18.00	17.88 a
Boiling	18.00	18.00	18.00	18.00	18.00 a
Steaming	18.00	18.00	18.00	18.50	18.13 a
Average*	18.38 a	18.50 a	18.50 a	18.63 a	

*The average value followed by the same letter on the same row or column shows no significant difference (P> 0.05).

Subyektif Variables

Color

The highest panelist favored level was obtained from treatment without blanching and 2 times extraction with a rating score of 5.93 (rather like- likes) whereas the lowest score was obtained from blanching treatment by boiling and 1-time extraction with a rating score of 5.07 (rather like-likes).

Flavour

The highest panelist favored level was obtained from blanching treatment by soaking and 1-time extraction with a rating score of 5.60 (rather like-likes) while the lowest score was obtained from blanching treatment by boiling and extracting 3 times with a score of 5.00 (rather like -likes).

Viscosity

The highest panelist favored level was obtained from the treatment without blanching and extraction 1 and 2 times with a rating score of 5.73 (rather like-likes) while the lowest score was obtained from blanching treatment by boiling and 1-time extraction with a score of 4.73 (neutral- rather like).

Taste

The highest panelist preferential level was obtained from blanching by soaking and extraction 2 and 3 times with a rating score of 5.87 (rather like- likes) whereas the lowest score was obtained from

blanching by boiling and 1-time extraction with a rating score of 5.07 (rather like-likes).

Overall Acceptance

The highest panelist preferential level was obtained from the treatment without blanching and 1 x extraction with the score of 5.80 (rather like-likes) scores while the lowest score was obtained from blanching by steaming and 1-time extraction with the score of 5.20 (rather like-likes). According to [6] quality standards in subjective variables regarding color, flavor, viscosity, taste and overall acceptance have not changed and especially in the scent of the lack of odor in milk produced.

4. Conclusion

The blanching methods and extraction times are not given significant effects for all parameters, moisture content, protein content, total soluble solid, ash content, and sensories evaluation, but provide substantial effect just on pH of edamame milk. The quality of edamame milk that produced by the blanching methods and extraction times can be stored until twenty days at low temperature.

Blanching treatment by boiling and extraction two times can maintain edamame milk characteristics for 18 days of storage with features: water content 90.10%, pH 7.09, TSS 15.90%, protein content 1.25, ash content 0.48, color 5.93 (rather like-likes), flavor 5.60 (rather like-likes), viscosity 5.73 (rather like-likes), taste 5.87 (rather like -likes), and overall acceptance (rather like-likes).

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