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Acceptance of Consumer on Various Tempeh and Protein Content Comparison

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Abstract**—**This research aims to study consumer acceptance of Tempeh from various raw materials (type of bean) and determine protein contents for comparison. Tempeh made from soybean, peanut, white kidney bean and sesame in the ratio: - soybean:sesame =1:0.1, soybean:white kidney:sesame =1:1:0.1, soybean:peanut:sesame =1:1:0.1 and peanut:white kidney bean: sesame =1:1:0.1. The study found that consumer is most satisfied with appearances on soybean mixed with white kidney and black sesame tempeh (3.98). The most satisfied tempeh with textures is soybean mixed with peanut and black sesame tempeh (4.00). The most satisfied tempeh with odor is peanut mixed with white kidney bean and black sesame tempeh (4.04). And the most satisfied tempeh with flavor is peanut mixed with white kidney bean and black sesame tempeh (4.2).

The amount of protein in production, soybean tempeh has the highest protein. When we add sesame seeds, it made the protein content slightly decreased (1.86 and 0.6 %). When we use peanut as raw material, the protein content decreased 15.3%. And when we use white kidney bean as raw material, the protein content decreased (22.77- 26.11%).

Keywords**—**Acceptance, bean, protein content, tempeh.

I. Introduction

TEMPEH is a tradition soy product originally from Indonesia, where it is a staple source of protein. This food made by *Rhizopus oligosporus*, a fungus of the family Mucoraceae [6]. White mycelia of this mold bind the beans together to create cake form. It has a firm texture and an earthy flavor. Tempeh's fermentation process and its retention of the whole bean give it a higher content of protein, dietary fiber, and vitamins [5]. Because of its nutritional value, tempeh is used worldwide in vegetarian cuisine, where it is used as a meat analogue [7]. Although soy, the main raw material, is considered to be high quality of plant protein but it also tend to contain more fat, especially saturated fat [8], which can cause rancidness. Sesame seeds, domesticated well over 5000 years ago [1], is also rich in protein (at 25 percent by weight). It has good effective carbohydrates, and contains water-soluble antioxidants (sesaminol glucosides) that provide added shelf-life to many products. And the addition of sesame to high lysine meal of soybean produces a well - balanced food [2]. Moreover, one problem of vegetarian is eating too high carbohydrates which will result obesity. White kidney beans (*Bruguiera cylindrica*), a legume plant, is now one of the most popular ingredient in dietary supplements for weight control because whitebeans contain compound called "phaseolamin" which are inhibitors of enzyme amylase that acting as carbohydrate or starch digestion [3]. Phaseolamin has the ability to inhibit the digestion of starch to sugar more than 50%, and the remaining starch is excreted with feces [4]. Carbohydrates or starches we eat will not be absorbed into the body. When the body gets less energy, body will burn off accumulation fat in the body. Accumulation of fat resulting from the conversion of sugar is less. This research study on consumer acceptance of tempeh produced from a mixture of white beans, soybeans, peanuts and sesame seeds check the amount of protein. The data was used to improve the tempeh with high nutritional value and useful to consumers, especially those vegetarian who often lack protein and eating too much flour.

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II. Procedure

A. Tempeh Making

Wash soybean, peanut, white kidney bean. Soak overnight for about 16-18 hours. Then make the beans broke into two halves. Boil the soybeans for one hour to cook. Discard water and dry the beans to the touch. Place the beans in clean bowl and allow it to cool down to about 30-35 degrees Celsius. Mix bean together by ratio:-

1. Soybean:sesame =1:0.1
2. Soybean:white kidney:sesame = 1:1:0.1
3. Soybean:peanut:sesame =1:1:0.1
4. Peanut:white kidney bean:sesame = 1:1:0.1.

Add the tempeh starter and mix well to evenly distribute the starter *(Rhizopus oligosporus* spore) in the beans. Mixed well and packed the beans in plastic bags with needle-size holes poked through for ventilation). The beans should be 1-1.5 inches thick. Incubated at 30-32^{o}C for 24-48 hours. Pick up tempeh when the white mycelium cover the surface and grow through the beans. Keep in frozen condition

Black sesame White sesame Bean

Fig. 1 Raw material of studied tempeh

Fig. 2 Studied tempeh

B. Assessment Test for Tempeh Sensory

Cut tempeh into pieces of size 2x3cm. Fry at 160° C for 4 minutes, using palm oil. Leading fried tempeh to sensory evaluation of appearance, texture, odor and taste by 100 tester. Using a 5-point Hedonic scale test by 1 = dislike extremely, 2 = dislike, 3 = moderate, 4 = like, 5 = like very much.

All kind of tempeh was tested by 100 tester. Used Hedonic scale scoring test for checking acceptance of the tester.

C. Determination of Protein

All kind of tempeh was determined protein content by In-house method TM-CH-017 (based on AOAC 2005).

Fig. 3 Tempeh for sensory test

III. Result

TABLE I
SATISFACTION WITH APPEARANCE

Set	Sample	Average of satisfaction
1	tempeh with white sesame	
	Soybean with white sesame	3.82
	Soybean with white bean and white sesame	3.68
	Soybean with peanut and white sesame	3.94
	Peanut with white bean and white sesame	3.74
2	tempeh with black sesame	
	Soybean with white sesame	3.78
	Soybean with white bean and black sesame	3.98
	Soybean with peanut and black sesame	3.72
	Peanut with white bean and black sesame	3.96

Meaning of score: 1 = dislike extremely, 2 = dislike, 3 = moderate, 4 = like, 5 = like very much.

TABLE II
SATISFACTION WITH TEXTURE

Set	Sample	Average of satisfaction
1	tempeh with white sesame	
	Soybean with white sesame	3.42
	Soybean with white bean and white sesame	3.54
	Soybean with peanut and white sesame	3.66
	Peanut with white bean and white sesame	3.60
2	tempeh with black sesame	
	Soybean with white sesame	3.74
	Soybean with white bean and black sesame	3.78
	Soybean with peanut and black sesame	4.00
	Peanut with white bean and black sesame	3.88

Meaning of score: 1 = dislike extremely, 2 = dislike, 3 = moderate, 4 = like, 5 = like very much.

TABLE III
SATISFACTION WITH ODOR

Set	Sample	Average of satisfaction
1	tempeh with white sesame	
	Soybean with white sesame	3.62
	Soybean with white bean and white sesame	3.32
	Soybean with peanut and white sesame	3.72
	Peanut with white bean and white sesame	3.34
2	tempeh with black sesame	
	Soybean with white sesame	3.70
	Soybean with white bean and black sesame	3.76
	Soybean with peanut and black sesame	3.74
	Peanut with white bean and black sesame	4.04

Meaning of score: 1 = dislike extremely, 2 = dislike, 3 = moderate, 4 = like, 5 = like very much

TABLE IV
SATISFACTION WITH TASTE

Set	Sample	Average of satisfaction
1	tempeh with white sesame	
	Soybean with white sesame	3.60
	Soybean with white bean and white sesame	3.72
	Soybean with peanut and white sesame	3.68
	Peanut with white bean and white sesame	3.50
2	tempeh with black sesame	
	Soybean with white sesame	3.80
	Soybean with white bean and black sesame	3.88
	Soybean with peanut and black sesame	3.64
	Peanut with white bean and black sesame	4.22

Meaning of score: 1 = dislike extremely, 2 = dislike, 3 = moderate, 4 = like, 5 = like very much.

TABLE V
PROTEIN COMPONENT

SAMPLE	gram per 100 gram
Soybean	21.52
Soybean with white sesame	21.12
Soybean with white bean and white sesame	16.56
Soybean with peanut and white sesame	20.07
Peanut with white bean and white sesame	16.62
Soybean with black sesame	21.39
Soybean with white bean and black sesame	15.90
Soybean with peanut and black sesame	20.93
Peanut with white bean and black sesame	16.62

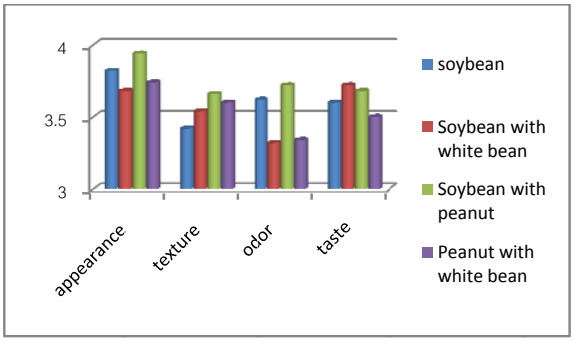

Fig. 3 (a) Graph show satisfaction of taster with tempeh added white sesame

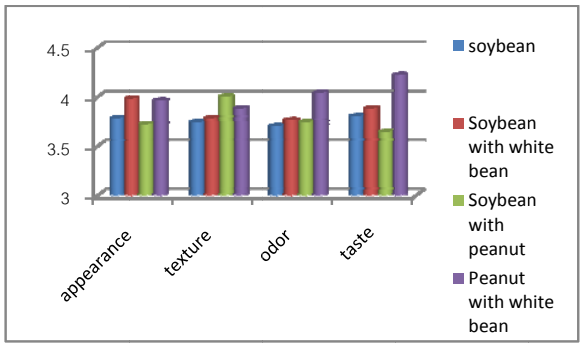

Fig. 3 (b) Graph show satisfaction of taster with tempeh added black sesame

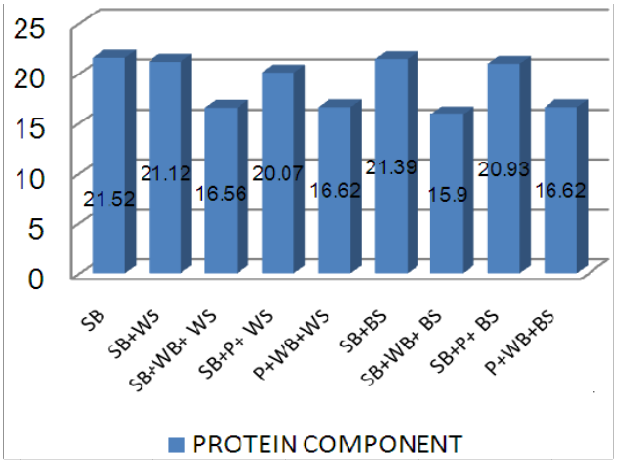

Fig. 4 Graph show Protein Component of variety tempeh
SB = Soybean SB+WS = Soybean with white sesame
SB+WB+WS = Soybean with white bean and white sesame
SB +P+WS = Soybean with peanut and white sesame
P+WB+WS = Peanut with white bean and white sesame
SB+BS = Soybean with black sesame SB+WB+BS =Soybean with white bean and black sesame
SB+WP+BS =Soybean with peanut and black sesame
P+WB+BS = Peanut with white bean and black sesame

IV. CONCLUSION

A. Assessment Test for Tempeh Sensory

1. Satisfaction with Appearance

The most satisfying tempeh on appearance is soybean with peanut and black sesame (3.98).

2. Satisfaction with Texture

The most satisfying tempeh on texture is soybean with peanut and black sesame (4.00).

3. Satisfaction with Odore of the Taster

The most satisfying tempeh on odor is Peanut with white bean and black sesame (4.04).

4. Satisfaction with Taste

The most satisfying tempeh on taste is Peanut with white bean and black sesame (4.22).

B. Protein Component

The Highest protein content tempeh is soybean. When we added sesame seeds, it makes the protein content decreased lightly (1.86 and 0.6 %). But when we change the Proportion of the raw material, the protein content decreased significantly. Raw material which made the most decreased is white bean (22.77- 26.11%).

V. DISCUSSION

A. Satisfaction of Tester

The experiment showed that

1. From the exterior appearance the tester prefered tempeh add black sesame than tempeh add white sesame but not

too much. Thus, the addition of white or black sesame tempeh is not different. And because white and black sesame are annual crops in the same species, they are't different in nutritional value. So it's not matter which one fills you choose to add in tempeh.

2. The most acceptable texture is soybean with peanut and black sesame. This acceptance may be cause of widely consumed of peanuts beans. While white bean has relatively hard texture, consumers are not familiar [4]. But we usually found Aflatoxin in peanut. Should have been improved the control of Aflatoxin contamination for peanut tempeh quality and safety of consumers.
3. For the odor and taste of tempeh, the most acceptable is peanut with white bean and black sesame. These showed that when consumers try tempeh which add white bean, they enjoy this kind of tempeh. It is beneficial to the development of tempeh that can control the amount of energy from starch.

B. Protein Component

Although tempeh which is made from soybeans contains highest protein, the addition of other components makes tempeh better in many features except white bean. But it has advantages in terms of reducing the digestion and absorption of carbohydrates, good for weight control. Vegetarian food isn't protein malnutrition food because they have protein from dried beans. So if we consumed less protein from tempeh which added white beans, we should consumed more or intake protein from other sources, such as eggs or milk.

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