Quality Analysis of "Sambal Tempoyak" with Variation Additions of Salt, Types of Chili and Stabilizer

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ABSTRACT

Tempoyak is fermented by using over-ripe Durian fruit with the addition of salt 1-1.5 % or more for 3-7 days. The research has been conducted with the aim to analyze the chemical properties, microorganisms and organoleptic of "sambal tempoyak". The research was conducted in two stages. Phase 1 was the tempoyak manufacture variation with the addition of salt treatment (0, 1, 1.5%). Phase 2 was the manufacture of "sambal tempoyak" with two treatments, namely the treatment of variety of chilli (red chili, red chili combination with green chili, green chili) and the treatment of the addition of stabilizer (CMC 1% and 1% gum arabic). The result showed that the panelists preferred of "sambal tempoyak" with salt concentration on "tempoyak" processing as much as 1.5%. The results of chemical analysis showed that all treatments have met the quality requirements of "sambal" that is a minimum of 40% total solids. The results of microbiological analysis indicated that all treatments can maintain its quality up to two weeks. Organoleptic analysis results shows treatment with either red chili variation using a stabilizer CMC or gum arabic is preferred by the panelists compared with green chili variations and combinations of red and green chili peppers.

Key words: Tempoyak, salt, chili, stabilizer

INTRODUCTION

Tempoyak is a food processing using durian fruit which is obtained simply by the fermentation of durian with the addition of salt as much as 1-1.5 % into the flesh of the fruit which is then cured for 3-4 days (Antarlina *et al*., 2010). According to Yuliana (2007), the addition of salt can also affect the characteristics of good pH of tempoyak, fermentation time, the acidity level and in terms of sensory. In addition to a mixture of food ingredients, tempoyak can also be processed into "sambal tempoyak" in packaging. Tempoyak generally uses red chili. However, it requires a new innovation to make "sambal tempoyak" using green chili. In addition to make a "sambal tempoyak" in accordance with the required quality characteristics of the appropriate sambal, it needs some additions of the stabilizer. According to Mustamanah (2012), emulsifier, stabilizer and thickener (emulsifier, stabilizer) can help the formation or establish a homogenous dispersion system on food. To the need for research, CMC and gum arabic were used as the stabilizers for "sambal tempoyak".

MATERIALS AND METHODS

Materials used in this study was the durian which has over riped, salt, chilli, onion, garlic, sucrose, water, cooking oil, gum arabic and CMC as well as chemicals for analysis .

Methods carriedout in this research were:

1) Research Phase 1 : Tempoyak manufacturing stage by varying the addition of salt (0, 1, and 1.5 %). Further processing of "sambal tempoyak" and organoleptic analysis . The best treatment is used for the next stage of research.

2) Research Phase 2 : "Sambal tempoyak" processing stage using two treatments, namely the treatment of variety of chili (red chili, a combination of red and green chili, green chili) and the addition of stabilizer (CMC 1 % and 1 % gum arabic).

RESULTS AND DISCUSSIONS

Organoleptic properties "Sambal Tempoyak"

Table 1. Appearance "Sambal Tempoyak"

Treatment	Appraisal		
	Color	Taste	Flavour
1.5%	2.05^{a}	1.9^{a}	2^{a}
1%	2.75^{b}	2.65^{b}	2.45^{b}
0%	2.65^{b}	2.5^{b}	2.85^{b}

Description : The figure shows that the number followed by the same letter are not significantly different at α level of 5 %. Quality attributes = 1 (really like), 2 (like), 3 (somewhat like), 4 (dislike), 5 (strongly dislike)

From Table 1 it can be seen that "Sambal tempoyak" most preferred that the tempoyak sauce with the addition of salt to the fermentation tempoyak of 1.5 %.

Microbiology properties "Sambal Tempoyak"

Table 2. Total Plate Count (CFU / g) "Sambal Tempoyak"

Week	Treatment					
	Red Chili; CMC	Red Chili; Gum Arab	Red and Green Chili; CMC	Red and Green Chili; Gum Arab	Green Chili; CMC	Green Chili; Gum Arab
1	$4{,}33.10^{3}$	$5{,}67.10^{3}$	4.10^{3}	$5{,}33.10^{3}$	4.10^{3}	4.10^{3}
2	5.10^{3}	$6{,}33.10^{3}$	5.10^{3}	$5{,}67.10^{3}$	$4{,}67.10^{3}$	5.10^{3}
3	$11{,}33.10^{3}$	$12{,}33.10^{3}$	$11{,}33.10^{3}$	$16{,}33.10^{3}$	$12{,}33.10^{3}$	$12{,}33.10^{3}$
4	19.10^{3}	$19{,}67.10^{3}$	$19{,}67.10^{3}$	19.10^{3}	$19{,}33.10^{3}$	20.10^{3}

Description : The figure shows followed by the same letter are not significantly different at α level of 5 % (on the same line)

From Table 2 it can be seen that the storage from week 1 to week 4 the results of the analysis of Total Plate Count (TPC) increased. Treatment addition of stabilizers or variations of chili has no significant effect on the results of the analysis of the TPC. Until the 2nd week TPC "sambal tempoyak" still meets quality requirements according to SNI requirements "sambal" 01-4865.1-1998 microbiological quality of the TPC per gram maximum of 1.104 CFU / g. However, in week 3 and 4, TPC "sambal tempoyak" did not meet the limit values according to the SNI-01-4865.1-1998. "Sambal tempoyak" shelf life of up to two weeks happened due to the use of natural spices which were garlic, onion and red chili or green chili which have antibacterial ability in inhibiting the growth of bacteria. Wiryawan research results, et al (2005) showed that garlic may inhibit the growth of pathogenic bacteria *Salmonella typhimurium*. Lingga and Rustama research results (2005) indicated that garlic extract is antibacterial against gram positive and gram negative. Additionally, Surono (2013), showed that the ethanol extract of onion has antibacterial power. In the meantime, Sylvia (1996) studied that ethanol extract of chili shows the growth inhibitory activity of bacteria and fungi.

Total Solids of Sambal Tempoyak

Table 3. Total Solids Sambal Tempoyak

Treatment	A Combination of Chili		
Stabilizer	Red Chili	Red and Green Chili	Green Chili
CMC	86.28 % ^{e}	88.66 % ^{c}	89.61 % ^{a}
Gum Arab	85.66 % ^{f}	87.20 % ^{d}	89.15 % ^{b}

Description : The figure shows followed by the same letter are not significantly different at α level of 5 %

From Table 3 it can be seen that total solids of "sambal tempoyak" already meet the quality requirements of ISO-01-4865.1-1998 minimum of 40% total solids. The highest total solids in the treatment of a combination of green chili and stabilizers CMC resulted (89.61%) and the lowest one in the treatment combination of red chili and stabilizers Gum Arabic was (85.66%). The use of CMC has the strong enough capability to bind the free water in the "sambal tempoyak" compared with Gum Arabic and form a strong gel skeleton. According to Tamaroh (2004), CMC has the ability of forming the gel that is greater than the gum arabic. In addition it is also influenced by the total solids content of pectin in the chili. Red peppers have higher pectin content than green peppers. The higher the pectin the higher the ability of water to bind so that the total solids will be even lower.

Colour organoleptic of "Sambal Tempoyak"

From Table 4 it can be seen that "sambal tempoyak" most preferred stabilizers are the treatment of CMC and the combination of red chili. Red chili produced interesting color because the pigment of red. The red colour according to Purseglove (2003) due to carotenoid pigments whose color varies from yellow orange to dark red. Supporters of the red colour, capsantin and capsorubin, which can increase during fruit ripening, reach its maximum when the fruit is ripe. While the colour is green because the chlorophyll of green of the chili, while capsantin and capsorubin were not yet emerged. Tempoyak with chilli colour combination of red and green peppers with the addition of CMC and Gum Arabic colored less attractive. This is due to the dye of chili, both red and green became degraded due to heating.

Table 4. Colour Oganoleptik "Sambal Tempoyak"

Treatment Stabilizer	A Combination of Chili		
	Red Chili	Red and Green Chili	Green Chili
CMC	4.25 [a]	2.95 [b]	2.50 [c]
Gum Arab	4.05 [a]	2.90 [b]	2.35 [d]

Description Scale : 1 = very unhappy ; 2 = dislike ; 3 = somewhat like ; 4 = love ; 5 = love
Description : The figure shows followed by the same letter are not significantly different at α level of 5 %

Taste organoleptic "Sambal Tempoyak"

Table 5. Appearance Taste "Sambal Tempoyak"

Treatment Stabilizer	A Combination of Chili		
	Red Chili	Red and Green Chili	Green Chili
CMC	3.60 [a]	2.95 [c]	2.50 [d]
Gum Arab	3.51 [b]	3.05 [c]	2.40 [d]

Description Scale : 1 = strongly dislike ; 2 = dislike ; 3 = somewhat like ; 4 = like ; 5 = strongly like
Description : The figure shows that the numbers followed by the same letters are not significantly different at α level of 5 %

From Table 5 it can be seen that the judgment of the best taste of"sambal tempoyak" with red peppers and the combination treatment with the addition of a stabilizer CMC. The result showed that "sambal" tastes spicy, sweet, sour, and savory according to taste panelists. The spicy taste was appropriate for the use of red peppers and spices. According to Furia (1968), red chili contains oleoresin which raises spicy flavor and a distinctive taste. Meanwhile, Rahayu (2000) said that the content of the essential oil of garlic can cause smells and give a savory taste. Additionally, Suprapti (2000) stated that the added salt affects the taste for salt is a giver and a sense amplifier preexisting seasoning. Appropriate use of sucrose also contributes to the sweet sauce tempoyak. Besides taste of "sambal tempoyak" it is also preferred because tempoyak contributes a distinctive sour taste from organic compounds (lactic acid, acetic acid, and ethanol). "Sambal tempoyak" with green chili combination treatment with stabilizers CMC and Gum Arabic panelists was disliked because less spicy taste and a bit unpleasant. According to DeMedia (2008), green chilies give a distinctive flavour and

taste in the "sambal" and often steamed in advance to reduce the smell and taste unpleasant. Green chili spicy tasted no more delicious than red chilli.

Flavour organoleptic Sambal Tempoyak

From Table 6 it can be seen that the judgement of the most preferred "sambal tempoyak" flavour is "sambal tempoyak" with the addition of red peppers and the use of stabilizers CMC and Gum Arabic. Flavour arising from volatile compounds of red peppers and spices used. While green chillies give unpleasant flavour. According DeMedia (2008), green chilies give a distinctive flavour and taste in the "sambal" and often steamed in advance to reduce the smell and unpleasant taste.

Table 6. Appearance Flavour "Sambal Tempoyak"

Treatment Stabilizer	A Combination of Chili		
	Red Chili	Red and Green Chili	Green Chili
CMC	3.65 [a]	2.60 [c]	2.40 [d]
Gum Arab	3.65 [a]	3.00 [b]	2.50 [c]

Description Scale : 1 = strongly dislike ; 2 = dislike ; 3 = somewhat like ; 4 = like ; 5 = strongly like
Description : The figure shows followed by the same letter are not significantly different at α level of 5 %

Texture organoleptic "Sambal Tempoyak"

Table 7. Appearance Texture "Sambal Tempoyak"

Treatment Stabilizer	A Combination of Chili		
	Red Chili	Red and Green Chili	Green Chili
CMC	3,55 a	2,75 d	3,05 c
Gum Arab	3,55 a	2,85 d	3,30 b

Description Scale : 1 = strongly dislike; 2 = dislike ; 3 = somewhat like ; 4 = like ; 5 = strongly like
Description : The figure shows followed by the same letter are not significantly different at α level of 5 %

From Table 7 it can be seen that the judgement of the texture of most preferred "sambal tempoyak" with a combination of red chili with stabilizers CMC and Gum Arabic resulted stable, not too thick and not too liquid. This is because the pectin content is higher than the green chili, thus providing the appropriate texture with fondness panelists.

CONCLUSION

Based on the results of this study, it can be concluded that in terms of organoleptic (colour, taste, flavour), the most favored "sambal tempoyak" are based on the addition of salt in the process of making tempoyak by 1% . Judging from the chemical properties, all treatments have met minimum quality requirements of chili which total solids is 40%. Judging from the nature of microbiology, all treatments can maintain its quality up to two weeks. In terms of organoleptic (colour, taste, flavour, texture), treatment with red chili variety is preferred by the panelists compared with variations of green peppers and a combination of red and green chili peppers .

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