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The Effect of Adding "Tape Singkong" (Fermented Cassava) Juice on the Characteristics of Fermented Milk

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Abstract: This study aimed to evaluate the effect of adding "Tape Singkong" juice on the characteristic of fermented milk. In the study 4000 ml of milk was used and divided into 20 cups (200 ml/cup). A completely randomized design that consist of five treatments with four replications was used to analyze the data. The treatment are the giving tape singkong juice as much as 0% (A), 22.5% (B), 5% (C), 7.5% (D) and 10% (E) into the milk that contained 2% of *Lactobacillus acidophilus*. The variable was observed the characteristic of fermented milk that consist of the moisture, fat, lactose and alcohol content, acidity and bacteria colony count. The result of this research indicated that the addition of tape singkong juice up to 7.5% was significantly decreased the content of moisture, fat and lactose and increased acidity, alcohol content and bacteria colony count.

Key words: Tape singkong, fermented milk, acidity, alcohol

INTRODUCTION

Milk is an ideal food for its high nutrition. Castle and Watkins (1979) stated that milk is food that consists of balance nutrients. This fact makes it the best media for the growth of microorganism that causes the quick spoiling of the milk. To lengthen the freshness of the milk, there should be further management and among it is milk fermentation.

The purpose of milk fermentation is to lengthens the preservation of fresh milk and lessens the lactose level on fresh milk. The dropping of the lactose level in milk is an advantage to those who suffer from Intolerance lactose. With milk fermentation, those who suffer from Intolerance diagnose can consume milk that has been processed and their nutrition needs fulfilled.

Milk fermentation products has been available, among them are Yakult, *dadih*, *kefir*, *koumiss* and others. Among these products *kefir* and *koumiss* is fermented milk that needs more than one microorganism in its process. It usually employs lactic acid bacteria and *khamir* and the fermented milk product will produce lactic acid and alcohol (FAO, 1978).

According to Buckle *et al.* (1978), the fermentation of milk involves the usage of Lactic Acid Bacteria (BAL), among them is *Lactobacillus acidhophilus*, where the culture growth of *Lactobacillus* is 2% starter bacteria. *Lactobacillus acidhophilus* bacteria possesses lactic acid that can endure through high acidity and bile saltiness that can survive in the intestines but has a very slow growth in milk. It only increases five times in 18-24 hrs with 0.8% acidity. One way of stabilizing the growth of *Lactobacillus acidhophilus* is by adding *khamir* extract (Surono, 2004).

Traditionally, *khamir* could be extracted by using *tape singkong* juice which is an excess from fermenting *tape* which used yeast as starter. Some microorganism which is in the yeast are *kapang* 8×10^7 to 3×10^8, *khamir* 3×10^6 to 3×10^7 and bacteria less than 10^5/gr (Hidayat *et al.*, 2006).

MATERIALS AND METHODS

Four thousand milliliter of milk are pasteurized at 85-90°C for 30 min and cooled to 40-42°C. Add 2% *Lactobacillus acidhopilus* into the milk and stirred and then divided into 20 cups (200 ml/cup) to receive five treatments with four replications. Juice Tape Singkong could be obtained from excess water from fermenting the cassava that added yeast for several days (3-5 days) until the cassava to be soft.

Research methods: This research is an experiment using Completely randomized design that consists of 5 treatments and 4 replications. Treatment will be giving *air tape singkong* amounting to A (0%), B (2.5%), C (5%), D (7.5%) and E (10%) into each cup of milk that contains *Lactobacillus acidhopilus* and then incubated at 37°C for 7 hrs. The variables observed were content of moisture (measured by thermogravitimetry method), fat (measured by Gerber method), lactose and alcohol, acidity (measured by titrated method) bacteria colony count (measured by standard plate count method). The data were subjected to the analysis of variance under

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Table 1: Effect of adding tape singkong juice on the characteristic of fermented milk

Variable	A	B	C	D	E
Moisture (%)	86.54[a]	84.56[b]	83.54[c]	82.58[d]	80.50[e]
Fat (%)	4.08[a]	3.99[ab]	3.65[bc]	3.44[c]	3.27[c]
Acidity (% TTA)	0.38[a]	0.44[b]	0.60[c]	0.77[d]	0.85[d]
Lactose (%)	3.44[a]	3.24[a]	2.59[bc]	2.19[cd]	1.79[d]
Alcohol (%)	0.14[a]	0.33[a]	0.61[b]	0.88[c]	1.49[d]
Bacteria colony count (x 10^6 CFU/ml)	69.00[a]	86.50[c]	100.00[d]	82.00[c]	76.25[b]

[ab]Means with common superscript do not difference significantly (p>0.05)

completely randomized design (Steel and Torrie, 1995). The differences of treatments were tested by Duncan's multiple range test.

RESULTS

Statistic analysis on Table 1 shows that the moisture content of fermented milk was significantly (p<0.01) influenced by the level of tape singkong juice, where if higher the adding of tape singkong juice the moisture content of fermented milk is lower. It could be seen on treatment E that adding of tape singkong is highest (10%) has decreased moisture content of fermented milk (p<0.01) significantly to be lowest (80.50%) among all treatment, followed by the moisture content at treatment D, C, B and the highest moisture content is at treatment A (86.54%).

The fat content of fermented milk were lowest significantly (p<0.01) at adding 10% of tape singkong juice (treatment E) that is 3.27% although the differences were not statistically significant (p>0.05) with treatment D (3.44%) and C (3.65%). The acidity of fermented milk with tape singkong juice is between 0.38%-1.85%. The acidity of fermented milk was significantly (p<0.01) influenced by the level of tape singkong juice, where the acidity a keep on increasing as the level of tape singkong juice is also increased. It could be seen on treatment E that adding of tape singkong up to 10% has increased acidity of fermented milk (p<0.01) significantly to be highest (0.85% TTA) among all treatment, followed by the acidity at treatment D, C, B and the lowest acidity is at treatment A (0.85% TTA).

The statistic result on Table 1 show that lactose content of fermented milk will be decrease when the adding tape singkong juice increased. It could be seen on treatment E that adding of tape singkong juice increased up to 10% has decreased lactose content of fermented milk (p<0.01) significantly to be lowest (1.79%) among all treatment although not difference with lactose content at treatment D (2.19%). The lactose content of fermented milk with tape singkong juice is highest at treatment A (3.44%).

Similar to acidity in fermented milk, the alcohol content of fermented milk will be increase, where the alcohol content a keep on increasing as the level of tape singkong juice is also increased. Table 1 showed that treatment E that adding of tape singkong up to 10% has increased alcohol content of fermented milk (p<0.01) significantly to be highest (1.49%) among all treatment, followed by the alcohol content at treatment D, C, B and the lowest acidity is at treatment A.

The bacteria colony count of fermented milk was significantly (p<0.01) influenced by the level of tape singkong juice, where if higher the adding of tape singkong juice up to 5% at treatment C the bacteria colony count of fermented milk will increase, that is 100 x 10^6 CFU/ml. However, when the adding tape singkong juice more than 5% the bacteria colony count of fermented milk decreased, that is 82 x 10^6 CFU/ml for treatment D where the adding tape singkong juice is 7.5% and 76.25 x 10^6 CFU/ml for treatment E where the adding tape singkong juice up to 10%.

DISCUSSION

The decrease of moisture content of the fermented milk is in line with the increase of *tape singkong* juice given, because in tape singkong juice contains khamir that increases the activity of *Lactobacillus acidophilus* in modifying lactose to lactic acid through the fermentation process. It resulted in producing more lactic acid, khamir and *Lactobacillus acidhopilus* together creates lactic acid. As has been suggested by Frazier and Westhoff (1994) and Surono (2004) that the addition of *khamir* into fermented milk can increase lactic acid bacteria growth, so that lactic acid production will increases. Buckle *et al*. (1978) report that the high level of lactic acid will create coagulation on protein and fat milk fermentation, so that its moisture content will be decreased. Finally, the higher air tape juice was added in fermented milk will increase the lactic acid bacteria growth followed by the increase of lactic acid production and the decrease of moisture content in fermented milk.

The decrease of fat content in fermented milk following the adding tape singkong juice, because in tape singkong juice contain khamir. The presence of khamir in *tape singkong* juice has same ability as Lactobacillus *acidhopilus* to produce lipase enzyme that has the role to hydrolyze fats into simpler forms which is glycerol and fat acid. This condition is initiates the decreasing of the fat content on fermented milk as the increase of *tape singkong* juice added to the fermented milk. As said by Rahman *et al*. (1992) and Soeparno (1996), bacteria and khamir is lipolitik microorganism that produces lipase enzyme that will break fat into fat acid and glycerol. The enzymatic change that occurs in the fat acid

will make the acids and short chained acids to evaporate and disappear easily.

The increase of acidity of the fermented milk as well as the increase of *tape singkong* juice given, because in tape singkong juice contains khamir that increases the activity of *Lactobacillus acidophilus*. This microbe has activity in modifying lactose to lactic acid through the fermentation process. It resulted in producing more lactic acid, khamir and *Lactobacillus acidhopilus* together creates lactic acid. As has been suggested by Frazier and Westhoff (1994) that the addition of *khamir* into fermented milk can increase lactic acid bacteria growth. The khamir in the fermented milk will utilize glucose and galactose as modified by *Lactobacillus acidhopilus* that will produce lactic acid and as a result the production will increase. Consequently, the higher air tape juice was added in fermented milk will increase the lactic acid bacteria growth followed by the increase of lactic acid production and the increase acidity in fermented milk.

The decrease of lactose content in the fermented milk is due to the increasing amount of the air tape juice added, because its contains khamir with *Lactobacillus acidhopilus* that hydrolyze lactose with the help of lactase enzyme to become a simpler component which is glucose and galactose. This is in accordance to Murti's (2002) opinion, who mentioned that the lactose in the milk could hydrolyze with enzyme that is yeast produced. Added by Surono (2004) that lactic acid bacteria will breakdown lactose into glucose and galactose to be used by khamir that will produce acid products that contains alcohol and CO_2 that will cause the decrease of lactose level. The higher air tape juice was added in fermented milk will increase the lactic acid bacteria growth followed by the increase of lactic acid production and the decrease of lactose content in fermented milk.

The alcohol content of fermented milk coincides with the increase of air tape juice was added in fermented milk. This is caused by the khamir in the juice that has the ability to produce alcohol. Alcohol is formed as a result of the breakdown by *Lactobacillus acidhophilus* which is on the fermented milk that became glucose and galactose, which will furthermore used by khamir in the juice to be changed into lactic acid, alcohol and CO_2 (Frazier and Westhoff, 1994). So that, when adding tape singkong juice increased could speed up the breakdown lactose to became glucose and galaktose that used by khamir to be changed into alcohol beside lactic acid and alcohol content of fermented milk increased also. Apritantono (2001) mentioned that halal alcoholic food product standard that was issued by Majelis Ulama Indonesia has the maximum alcohol level of 1%. The alcohol content on this research for all treatment except for treatment E (1.49%) is beyond the standard, so the product is proper to consumption.

The increase of the bacteria colony count at adding tape singkong juice up to 5% is caused by the condition which is the most optimum phase to the microorganism growth. This is marked with the presence of water and other nutrients that are enough to supply the needs of the microorganism. But when adding the tape singkong juice increased more than 5% (Table 1) it creates the decrease of the bacteria colony count. This is caused by the large amount of microorganism while the decrease of the nutrients and water that could not fulfill their needs. This leads to the fact that some microorganism will survive and others will die, this is marked with the decrease of the bacteria colony count in the fermented milk. This is consistent with Buckle *et al.* (1978) report that the main factor which influence microbial growth or development include: nutrient supply, water, pH, time, temperature and oxygen availability.

It is concluded that the increase of adding tape singkong juice up to 7.5% was significantly decreased the content of moisture, fat and lactose and increased the acidity, alcohol content and bacteria colony count of fermented milk.

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