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THE CHANGE OF CHEMICAL COMPOSITION AND CONSUMER PREFERENCES OF RIPENED CHEESES SUPPLEMENTED WITH YAKULT'S AND YOGHURTS BACTERIA

Tridjoko W. Murti , D. Rahardian and Harialeza
Laboratory of Dairy Science and Industry, Faculty of Animal Science
University of Gadjah Mada at Karang Malang-Yogyakarta 55281

ABSTRACT

Cheese is normally made by rennet action either completed or not by the role of lactic acid bacteria during ripening. The ripened cheese in the present of lactic acid bacteria will offer not only a specific flavor depended on the kind of bacteria used, but also for prolonging its shelf life. Farm house farm type cheese has been developed using kids rennet which has the force 1:20.000 and supplemented by bacteria normaly life in yakult (P1) and yoghurt (P2) as compared to white cheese without supplemnented by LAB, and incubated at 39^0C during 40 hrs, separated from whey, cut, pressed salted and ripened during 3 month at refrigeration. The results indicated cheese were being producted classified as soft cheeses (DM < 45 %) and chemical change of its composition during ripening of cheese supplemented by LAB, are generally related to crude protein content rather than total fat, and the use of LAB would reduce it's final pH. Lactic acid are higher in P2 than P1 or P0 before ripening and reduce during ripening due to unclear reaction, while pyruvic acid were increased. Consumers have had more preferences to P1.

Key Words. : Cheese, Lactic Acid Bacteria, Ripening, Composition and Preferences.

INTRODUCTION

At the present time, the international market trends have placed cheese as one of milk products which have large distribution channels and the industrialization of technological processes of cheeses is on either modern basis or traditional one. Cheese is normally made by rennet action either completed or not by the role of lactic acid bacteria during ripening. The ripened cheese in the present of lactic acid bacteria will offer not only a specific flavor depended on the kind of bacteria used, but also for prolonging its shelf life. Fermented milks offer tremendous potential for promoting health, improving nutrition and reducing the risks of various diseases. Advances in fermented milks production technology have led to various products (Kefir, yakult, yoghurt, Ymer, Lang-fii, bifidus milk, acidophilus milk, koumiss etc) that suit diverse cultural tastes. Infants, children, adults, and elderly can consume fermented milks for their good taste, health function and their general nutritional value. Those with special medical needs can turn to fermented milks to provide added nutrition, solve the intestinal disorders, improve immune function and optimize gut ecology. Fermented milks show particular promise in reducing the incidence of mal nutrition, lactose intolerance and diarrhea. These conditions are prevalent not only in developing countries, like Indonesia, but also common in developed countries. As evidence of the

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health benefits of fermented milks mounts, and modern production makes these products available to world population, one can anticipate that the consumption of fermented milk products will reach new milestone. Lactic acid bacteria that ware generally used is presented at Table 1 as below.

Lactic acid bacteria, either mesophilic or thermophilic or intestinal bacteria are may be considered as probiotic cultures which improve generally health status of the host. At present, the following are the most frequently utilized species for promoting the health:

Bifidobacterium : *B.bifidum, B. longum, B. infantis*
Lactobacillus : *L. acidophilus, L. casei*
Streptococcus : *S. faecium*
Propionibacterium: *P.freudenreichii subs. Shermanii*

The yoghurt bacteria *L. delbrueckii subs. bulgaricus* and *S. thermophilus* are not mentioned (false claimed as probiotic culture) because they are not typical for the intestinal flora of man. Lactobacillus casei used generally in Yakult production and especially Bifidobacterium are among the probiotic cultures which defined by Fuller as: a live microbial feed supplement which beneficially affect the host (animal) by improving its intestinal microbial balance". This definition of probiotics was improved by Schrezemeir and de Vresse (2001) as "One product contain specific live microbe at the sufficient numbers and change the microbial balance leading to health effect for the host". Many of probiotic products on the market at the moment contain LAB, the populations of which tend to be a relatively small proportion of the total gut micro flora. More than 400 bacterial species have been identified in human flora, but only ten species cohabit at the highest population levels. These are strict anaerobe and most of them are very sensitive to contact with atmospheric oxygen

This study was to detect the change of chemical composition and consumer preferences of cheese made in the present or not lactic acid bacteria (*L. casei* and yoghurt bacteria: *S. thermophilus* and *Lactobacillus delbrueckii subs. bulgaricus*) during 3 month of ripening in refrigeration.

MATERIALS AND METHODS

Starter's preparations.

Starter cultures for Farm house cheese type were prepared from commercial products, recultured in skim milks at 30 ^{0}C for yakult bacteria (*L. casei*) and 39 ^{0}C for yoghurt bacteria) during 3 x 24 hrs, and stored at refrigerated before used which no more than 1 weeks.

Cheese preparations

Farm house cheese type has made using rennet from kid abomasums which slaughtered according Islamic law's and calculated having force of coagulation 1:20.000. Homogenize milk was pasteurized at 76^{0}C during 10 minutes, cooled at 33^{0}C and added with 10 % (v/v) of starters (yakults and yoghurts bacteria) followed by short incubation during 45 minutes. Rennet was then added and incubated at 39^{0}C during 40 hrs. Curd was then separated from whey, cut, pressed at 0, 14 kg/cm^2, salted by saturated Na Cl as mentioned by Murti (2004) and stored at refrigerated (7-10^{0}C) during 3 months.

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Table I. Types of fermentation in lactic acid bacteria

Genus	Fermentation type	Main products	Lactate isomers
Streptococcus	Homo	Lactate	L
Pediococcus	Homo	Lactate	L, DL
Lactobacillus:			
-obligate homo	Homo	Lactate	L, D or DL
-Facultative hetero	Homo	Lactate	L, D or DL
	Hetero	Lactate, Acetate	L, D or DL
Obligate hetero	Hetero	Lactate, Acetate, CO2	L, D or DL
Leuconostoc	Hetero	Lactate, Acetate, CO2	D
Bifidobacterium	Hetero	Lactate, acetate	L

Dellaglio, 1988

Cheese analysis

Analysis of chemical composition has performed to detect the change of protein, ether extracts, rendements, pH, organic acids as well as consumer preferences. Crude protein has detected by Kjeldhal method, while ether extracts has been detected by extraction method. Rendements was measured after oven treatments of the samples, while pH was detected using pH meter. Organic acids has been measured using HPLC, while consumer perceptions and preferences was analyzed by 10 entrained panelists which known very well the standards of 4 basic tastes, i.e.: acid, bitter, salt, and sweet (5 scale, with score 4 as maximum) as modification of Watts et al (1989) in Puji Lestari (2003).

Data Analysis

Analysis of crude protein, ether extracts, pH and rendement were using completely randomized Design (CRD), 3 x 2. While consumer preferences was analyzed descriptively due to non parametric data.

RESULT AND DISCUSSION

Chemical composition

The change of chemical composition during ripening was in Table 2 as below:

All of cheeses were considered as soft cheeses, due to low content of dry matter (less than 45 %). These were probably influenced by low pressure used after salting process (0, 14 kg/ cm ^{2}) lower than normally used in cheese processing (0, 4-1, 5 kg/ cm$^{2)}$. Chemical composition studies have indicated that crude protein contents were highest in cheese supplemented by yoghurt bacteria (P2) followed by cheese supplemented by yakult bacteria (P1) and control (P0). It's seemed that proteolysis activities of yoghurt bacteria were higher than that of yakult bacteria, lead to the higher production of free amino acids. The presence of more quantity of amino acids would influence directly to the taste of final products due to the role and relation of free amino acids on bitter taste.

While the level of total fat detected were almost stabile during the ripening processes. It is well known that lactic acid bacteria not considered as species which high level of lipolytic enzymes. The higher level of total fat after ripening were happened by higher level of dry matter that in early ripening that used as calculation base. The more

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the presence of lactic acid bacteria the more acid the products. as indicated by lower pH value of P2 than P1 or P 0. Mutualism cooperation and or commensalisms among yoghurt bacteria are well known, and even bigger than each bacteria grown separately.

Table 2. Chemical composition of ripened cheese supplemented by yoghurt bacteria (P2),yakult bacteria (P1) and controls no supplementation (P0)

	Detection time	P0	P1	P2
Dry Matter contents, %	Early	41.3	41.08	39.1
	Late	45.3	42.88	38.9
Crude Protein*, %	Early	22.87[a]	24.67[b]	27.3[c]
	Late	32.35[a]	32.76[a]	34.09[b]
Total Fat*	Early	49.68[a]	48.75[a]	46.24[b]
	Late	57.02[a]	54.35[b]	57.09[a]
pH	Early	3.81[a]	3.62[b]	3.39[c]
	Late	3.84[a]	3.78[b]	3.59[c]

[a,b,c] different superscripts in the same rows indicated significantly different ($P < 0.05$)
* As dry matter basis, and should be multiplied by DM value for total basis.

Table 3. Average of organic acids (ppm) in cheeses before and after 3 month ripening

Treatments	Organic acids	Before ripening	After 3 month
P 0	Lactic acid	249.15	106,16
	Pyruvic acid	32.05	38.79
P 1	Lactic acid	260.84	189.98
	Pyruvic acid	37.94	31.98
P 2	Lactic acid	450.44	157.79
	Pyruvic acid	32.08	35.4

Organic acids presents in fermented milk using lactic acid bacteria (LAB) are generally lactic, pyruvic and acetic acid which are depended on species of LAB used. It presents also citric, butyric, orotic acids as the results of metabolism in cows, post harvest treatments or rancidity. The average of organic acids detected are in table 3 as below. Although there were more than 3 peaks, but the only 2 organic acids detected (lactic and pyruvic acids) in cheeses have made us to verify what happened with the detection method. These were probably due to UN HPLC's grade of some acids standards used in this study. Lactic acid was the most numbered in all cheeses products, ranged between 105-450 ppm. Cheese in presents of yoghurts' bacteria have contained the most concentration of lactic acid at the beginning of ripening, and reduced sharply (66%) during the ripening period, probably due to conversion to other compounds. While pyruvic acid was slightly increased during ripening indicated slow growth of bacteria.

Sensorial detection using entrained panelists have made 2 type of detection, i.e: flavor score on 4 basic tastes intensity and note of consumer preferences. Acidity and sweetness in fermented milk are generally the most appreciated by consumers (Murti *et al.*, 2003), while for white cheese are saltiness and bitterness (Alais, 1984;Murti, 2004). Cheese without supplementationj (white cheese) are releviely stabile on flavor score of all basic tastes, while with LAB have changed its flavor score during ripening.

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*Table 4. Flavor note *and score of consumers preferences** on cheeses before and after 3 month of ripening*

Treatments	Tastes	Before	After 3 month
P 0	Bitterness	2.125	2.125
	Sweetness	1.25	1.25
	Acridness	3.125	3.125
	Saltiness	2,75	2.85
	PREFERENCES	1.41	1.56
P 1	Bitterness	1.625	2.5
	Sweetness	1.25	1.75
	Acidness	3.25	2.125
	Saltiness	3.5	3.125
	PREFERENCES	1.56	2.06
P 2	Bitterness	2.375	3.375
	Sweetness	1.25	1.375
	Acidity	3.25	2.375
	Saltiness	2.875	2.0
	PREFERENCES	1.22	1.75

* Five scale of flavor note (0=no taste, 1= slightly, 3= Moderate, 3= normal,4= Strong
** Five scale of flavor preferences (0= dislike, 1= slighty like, 2= moderately ly, 3= like, 4= like very much).

Cheese supplemented in LAB have presented the change in acidity, saltiness as well as bitterness (Murti and Sutikno, 2006). Consumers have preferred P1 than P2 or P0. This was probably due to the reduction on acidity and less bitterness. Bitterness in P2 are suspected from proteolytic reaction involving *Lactobacillus delbrueckii* subs. *bulgaricus* whis is generally higher than *L.casei* normally present in yakult.

CONCLUSION

Chemical change of composition of cheese supplemented by LAB, are generally concerned about crude protein content rather than total fat, and the use of LAB would reduce the more it's final pH. Lactic acid are higher in P2 than P1 or P0 before ripening and reduce during ripening due to unclear reaction, while pyruvic acid were increased. Consumers have had more preferences to P1 which were less bitter, salty and acid than P2. The ratio between and among the 4 basic tastes play an important role to the acceptability of consumers.

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