THE ORGANOLEPTIC AND PHYSIC CHARACTERISTICS AND LACTIC ACID CONTENTS OF YOGHURT WITH COMMERCIAL STARTER ADDED *Bifidobacteria bifidum*

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ABSTRACT

Bifidobacteria bifidum is probiotic bacteria which inhibit negative bacteria in human ulcer. Adding B. bifidum in commercial yoghurt starter, may increase yoghurt quality. To know yoghurt quality, organoleptic and physic characteristics and lactic acid contents of yoghurt with commercial starter added B. bifidum was observed. B. bifidum concentrations added were 1:4, 2:4, 3:4 (v/v). Organoleptic characteristics were conducted by 18 panelists, physics were visually detected and lactic acid contents were by titration method. The results show that accepted yoghurt characteristics were yoghurt with commercial starter added B. bifidum 1:4 (v/v), and fat yoghurt were more acceptable than that skim. The higher B. bifidum concentrations used, the stronger flavours (after expiry date) and colours (at and after expiry date) of yoghurt, while yoghurt homogenity decreased (at and after expiry date). Fat yoghurt flavours were stronger than that of skim. The higher B. bifidum concentrations and storage times, the higher yoghurt lactic acid contents. Lactic acid contents of fat yoghurt with various starters, were higher than that skim at storage 0-15 days. The fat yoghurt lactic acid contents were 0.99%-1.44%, while that skim were 0.95-1.20%. Based on organoleptic and physic characteristics and lactic acid contents, fat yoghurt were more acceptable that that skim.

***Key words**: yoghurt, skim, B. bifidum, starter, lactic acid*

INTRODUCTION

Pasteurized milk as raw material of yoghurt fermentation consist of whole milk (fat milk) and skim milk (free/very low fat milk), fat content of whole milk were higher than skim milk (Ng, 1991; Deeth *et al*., 2002), and lactic acid content of skim milk was different to that of whole milk (Khusniati *et al*., 2007). At refrigerated storage, both whole milk and skim milk spoiled due to the activity of psychrotrophic bacteria (Craven and Macauley, 1993; Deeth *et al*., 2002; Ng, 1991). The spoilage characteristic between the two milk of whole milk and skim milk was different (Deeth *et al*., 2002; Janzen *et al*., 1982; Sorhaug and Stepaniak, 1997). The different spoilage characteristic between whole milk and skim milk may result in the different quality between yoghurt whole milk and yoghurt skim milk.

Yoghurt quality was affected by the type of bacteria used in yoghurt starter during yoghurt fermentation (Adam, 1995; Deeth and Tamime, 1981; Robinson and Tamime, 1985), concentration yoghurt starter (Gilliland *et al*., 1984; Robinson, 1994), the time used for yoghurt fermentation (Nakazawa and Hasono, 1992a; 1992b) lactic acid produced during yoghurt fermentation (Robinson, 1994; Robinson and Tamime, 1985), the nutritional compound of yoghurt produced, and the time and temperature of storage used for yoghurt (Deeth and Tamime, 1981; Robinson and Tamime, 1985; Robinson, 1994).

Commercial yoghurt used yoghurt starter with lactic acid bacteria of *Lactobacillus bulgaricus* and *Streptococcus thermophillus* (Salminen and Wright, 1998; Robinson, 1994; Robinson and Tamime, 1985) without probiotic bacteria of *B. bifidum* in which this bacteria inhibit negative bacteria in human ulcer (Hoover, 1993; Rasic and Kurmann, 1983). Beside, *B. bifidum* as probiotic bacteria contain antibacteria (Braner, 1993; Rasic and Kurmann, 1983) which it may inhibit psychotrophic bacteria in yoghurt during storage. Adding *B. bifidum* in commercial yoghurt starter, may increase yoghurt quality.

The quality of yoghurt with commercial starter added *B. bifidum* haven't been reported. To know yoghurt quality with commercial starter added *B. bifidum*, organoleptic and physic characteristics and lactic acid contents of yoghurt with commercial starter added *B. bifidum* was observed.

METHODS

Preparation of yoghurt

Yoghurt was prepared by making yoghurt with raw materials of skim and whole pasteurized milk. The starter used for yoghurt fermentation was commercial starter

in which the starter used *Lactobacillus bulgaricus* and *Streptococcus thermophillus*. Production of yoghurt was conducted by modified method of Robinson and Tamimie (1985).

Preparation of commercial starter added *B. bifidum*

Commercial starter used were added by various concentrations of *B. bifidum*. The concentration of *B. bifidum* were 1:4, 2:4, 3:4 (v/v). The added commercial starter were then used for yoghurt fermentation

Organoleptic characteristics

Organoleptic characteristics (tastes and favours) of both yoghurt with whole milk (fat yoghurt) and yoghurt with skim milk (skim yoghurt) with various concentration of *B. bifidum* were conducted by 18 panelists.

Physic characteristics

Physics characteristics (colours and homogeneous) of both yoghurt with whole milk (fat yoghurt) and yoghurt with skim milk (skim yoghurt) with various concentration of *B. bifidum* were visually detected and conducted by 18 panelists.

Lactic acid contents

Lactic acid contents of treated yoghurt samples were detected by titration method. The 10 mL of the samples were poured into erlenmeyer 100 mL and added several drops of phenolphtalein. The solutions were titrated by NaOH 0.1 N up to pink colors formed. The formula of acidity (based on lactic acid) was A.B. 90.1000/C [A: volume of Na OH used (mL); B: concentration of NaOH standardized (N); C: volume of milk titrated (mL); D: BE lactic acid (g/ekivalen)]

Statistical Analysis

All treatments were statistically analyzed by ANOVA, Factorial Complete Randomized Design with three replications

RESULTS AND DISCUSSION

The results show that accepted yoghurt characteristics were yoghurt with commercial starter added *B. bifidum* 1:4 (v/v) (Table 1). This show that commercial starter added *B. bifidum* 1:4 is the best starter composition than the other starter, based on the organoleptic and physic characteristics (taste, colour, flavour and homogeneous) of both fat yoghurt and skim yoghurt. It has been reported that the physical performance of yoghurt were affected by the concentration of starter used (Gilliland *et al*., 1984; Robinson, 1994). The organoleptic characteristics of fat yoghurt were more acceptable than that in skim (Table 1). This show that fat contain in fat yoghurt may result in the more organoleptic and physically acceptable in taste, colour, flavour and homogeneous of fat yoghurt than skim yoghurt. It has been reported that fat contain in whole milk were higher than that in skim (Ng, 1991; Deeth *et al*., 2002), and the quality of yoghurt were affected by the nutritional compound of yoghurt produced (Deeth and Tamime, 1981; Robinson and Tamime, 1985; Robinson, 1994).

The higher *B. bifidum* concentrations used, the stronger yoghurt flavours (after expiry date), and fat yoghurt flavours were stronger than that skim (Table 2). This show that after expiry date (10 days and 15 days of storage), the strongest flavours of yoghurt was occurred on yoghurt with commercial starter added *B. bifidum* 3:4; and fat contain of fat yoghurt may result in the more stronger flavour of fat yoghurt than skim yoghurt.

Table 1. Organoleptic characteristics of yoghurt, with commercial starter and added various concentrations of *B. bifidum*

Starter composition	Taste	Colour	Flavour	Homo-geneous
Fat yoghurt				
0:4 (control)	4.11	3.78	3.73	3.67
1:4	4.28	3.89	3.78	4.16
2:4	4.22	3,78	3.75	3.67
3:4	4.11	3.73	3.70	3.61
Skim yoghurt				
0:4 (control)	3.89	3.72	3.67	3.11
1:4	4.25	3.85	3.72	4.06
2:4	3.83	3.75	3.70	3.50
3:4	3.61	3.70	3.56	3.56

Table 2. Yoghurt flavour with commercial starter and added various concentrations of *B. bifidum* in various times of storage

Starter composition	0:4	1:4	2:4	3:4
Fat yoghurt				
0 day	+2	+2	+2	+2
5 days[1]	+3	+3	+3	+3.5
10 days	+4	+4.5	+5	+5.5
15 days	+5	+5.5	+6	+6.5
Skim yoghurt				
0 day	+1	+1	+1	+1
5 days[1]	+2	+2	+2	+2.5
10 days	+3	+3.5	+4	+4.5
15 days	+4	+4.5	+5	+5.5

Note: [1]at expiry date

The higher *B. bifidum* concentrations used, the more decrease fat and skim yoghurt homogenity (at and after expiry date) (Table 3), and the stronger fat and skim yoghurt colours (at and after expiry date) (Table 4).

Table 3. Homogenity of yoghurt with commercial starter and added various concentrations of *B. bifidum* in various times of storage

Starter composition	0:4	1:4	2:4	3:4
Fat yoghurt				
0 day	+1	+1	+1	+1
5 days[1]	+1	+1	-0.5	-1.0
10 days	+1	-1	-2	-2.5
15 days	+1	-2	-3	-3.5
Skim yoghurt				
0 day	+1	+1	+1	+1
5 days[1]	+1	+1	-0.5	-1.0
10 days	+1	-1	-2	-2.5
15 days	+1	-2	-3	-3.5

Note: [1]at expiry date

Table 4. Colour of yoghurt with commercial starter and added various concentrations of *B. bifidum* in various times of storage

Starter composition	0:4	1:4	2:4	3:4
Fat yoghurt				
0 day	white	white	white	white
5 days[1]	white	white yellowish (wy)	wy	wy+1
10 days	white	wy	wy+1	wy+1.5
15 days	white	wy	wy+2	wy+2.5
Skim yoghurt				
0 day	white	white	white	white
5 days[1]	white	wy	wy	wy+1
10 days	white	wy	wy+1	wy+1.5
15 days	white	wy	wy+2	wy+2.5

Note: [1]at expiry date

It can be seen that at and after expiry date (5 days,10 days and 15 days of storage), the concentrations of *B. bifidum* affected the homogenity of fat and skim yoghurt (Table 3), and at and after expiry date (5 days, 10 days and 15 days of storage), the concentrations of *B. bifidum* affected the colours of fat and skim yoghurt (Table 4). It has been reported that the quality of yoghurt (flavours, homogeneity, colours) were affected by the concentration of starter used (Gilliland *et al.*, 1984; Robinson, 1994), and the time and temperature of storage used for yoghurt (Deeth and Tamime, 1981; Robinson and Tamime, 1985; Robinson, 1994).

The higher *B. bifidum* concentrations and storage times, the higher lactic acid contents of fat yoghurt and skim yoghurt (Table 5). This show that at storage times, the concentrations of *B. bifidum* affected the lactic acid content of fat and skim yoghurt. It has been reported that the lactic acid contents of yoghurt were affected by the concentration of starter used (Gilliland *et al*., 1984; Robinson, 1994), and the time and temperature of storage used for yoghurt (Deeth and Tamime, 1981; Robinson and Tamime, 1985; Robinson, 1994).

Lactic acid contents of fat yoghurt with various starters were higher than that of skim at storage 0-15 days (Table 5). The lactic acid contents of yoghurt were 0.99%-1.44% (fat yoghurt) and 0.95-1.20% (skim yoghurt). Based on organoleptic and physic characteristics, and lactic acid contents, fat yoghurt were more acceptable that that skim (Table 1-5).

Table 5. Lactic acid content of yoghurt, with commercial starter and added various concentrations of *B. bifidum*, in various times of storage

Times of storage	Starter composition			
	0:4	1:4	2:4	3:4
Fat yoghurt				
0 day	0.99 a	1.00 a	1.03 a	1.06 b
5 days[1]	1.06 b	1.09 c	1.20 d	1.23 e
10 days	1.13 f	1.21 d	1.24 e	1.29 g
1 5 days	1.16 h	1.24 e	1.32 i	1.44 j
Skim yoghurt				
0 day	0.95 a	0.97 a	1.00 a	1.03 b
5 days[1]	0.97 a	1.03 b	1.12 c	1.20 d
10 days	1.05 b	1.12 c	1.15 e	1.23 f
1 5 days	1.10 c	1.14 e	1.17 g	1.20 h

Note: different letters in the same yoghurt show significantly different ($P<0.05$)
[1]at expiry date

CONCLUSION

The accepted yoghurt characteristics were yoghurt with commercial starter added *B. biftdum* 1:4 (v/v), and fat yoghurt were more acceptable than that skim. The higher *B. bifidum* concentrations used, the stronger flavours (after expiry date) and colours (at and after expiry date) of yoghurt, while yoghurt homogenity decreased (at and after expiry date). Fat yoghurt flavours were stronger than that skim. The higher *B. bifidum* concentrations and storage times, the higher yoghurt lactic acid contents. Lactic acid

contents of yoghurt with the various starters, were higher than that skim, at storage 0–15 days. Based on organoleptic and physic characteristics and lactic acid contents, fat yoghurt were more acceptable that that skim.

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