Microbiological Quality of Probiotic Yoghurt Jelly Drink During Storage in Refrigerator

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Abstract

As a diversification product, probiotic yoghurt can be used as raw material to make a jelly drink. The jelly drink of probiotic yoghurt could be useful as a health drink because it contains lactic acid bacteria, probiotic and fiber. The objective of this research was to analyze the microbiological quality of the jelly drink made by probiotic yoghurt as raw material during storage in a refrigerator. Randomized complete design with three repetition was used as experimental design. The treatment was storage time of the product in refrigerator (day 0, day 7, day 14, day 21 and day 28). Data was processed by using ANOVA, then the results that showed significant treatment effects was further analyzed by using Tukey's test. The storage time decreased significantly (P<0.01) Total Plate Count (TPC), total lactic acid bacteria, total of Bifidobacterium longum and total of Lactobacillus acidophilus. The storage time influenced significantly to the number of mold and yeast in the product (P<0.01). Hygiene and sanitation of environment during processing and storage must be evaluated, because coliform was found in the product aged of 28 days storage. Base on the number of lactic acid bacteria observed, it could be concluded that probiotic yoghurt jelly drink may be regarded as a functional food. Due to the acidity of the product, the incorporation of antifungi is needed to preserve the probiotic yoghurt jelly drink from the growrh of mold and yeast during storage.

Keywords: jelly drink, lactic acid bacteria, probiotic, storage, functional foods

Introduction

Yoghurt is made by fermented milk and has many benefits, it can be can be consumed by people with lactose intolerance. Probiotic yoghurt is a yoghurt that resulted from a fermentation of milk by using yoghurt starter culture e.g *Streptococcus salivarius* spp., *S. thermophilus* and *Lactobacillus delbrueckii spp. Bulgaricus* that combined with probiotic bacteria such as *Bifidobacterium longum* and *Lactobacillus acidophilus*. A beverage of jelly drink made by probiotic yogurt could be

useful as health drink. It contains lactic acid bacteria and fiber. As a health drink, probiotic yoghurt jelly drink has high nutrition and water content. Consequently, it is a perishable food.

The objective of this research was to analyze microbiological quality of jelly drink made by probiotic yoghurt as raw material during storage in refrigerator.

Materials and Methods

Location and Time

This research was done in the laboratory of dairy processing at the Faculty of Animal Science, Bogor Agricultural University, in 2007.

Procedures

Stages of research were: (1) process of making yogurt probiotic, (2) process of making jelly drink with yogurt probiotic, and (3) storage. Based on viscosity and sensorial value in preliminary test, the best concentration of jelly powder for the jelly drink was 0.8%.

Parameters

Measured parameters in this research were total plate count, total lactic acid bacteria, total of *B. longum*, total of *L. acidophilus*, total of mold, total of yeast and total of coliform during storage (day 0, day 7, day 14, day 21 and day 28) in refrigerator (4-7 ^{o}C).

Experimental Design

Randomized complete design with three repetition was used in this experiment. The single factor of this experiment was storage duration (day 0, day 7, day 14, day 21 and day 28).

Results and Discussion

Microbiological quality of probiotic yogurt jelly drink during storage is shown in Table 1.

Total Plate Count and Total Lactic Acid Bacteria

Total plate count consists of total lactic acid bacteria , total of pathogen bacteria and total fungi. The number of bacteria decreased during observation. Storage time influenced significantly to decreased the number of lactic acid bacteria in the product. To be effective, probiotic strains must retain their functional health characteristics, including the ability to survive transit through the stomach and small intestine. then to colonize the human gastrointestinal tract (Tuomola *et al*. 2001). The optimum

Table 1. Microbiological quality of probiotic yogurt jelly drink during storage

Variable	Days of storage				
	0	7	14	21	28
	Log 10 cfu/ml				
Total Plate Count	$9.3^{A} \pm 0.01$	$9.00^{A} \pm 0.03$	$8.93^{A} \pm 0.01$	$8.34^{B} \pm 0.04$	$8.43^{B} \pm 0.03$
Total Lactic Acid Bacteria	$9.22^{A} \pm 0.04$	$8.94^{B} \pm 0.04$	$8.86^{B} \pm 0.01$	$7.39^{C} \pm 0.02$	$7.25^{D} \pm 0.05$
Total of *B. Longum*	$9.30^{A} \pm 0.01$	$9.00^{A} \pm 0.04$	$8.93^{A} \pm 0.03$	$7.98^{B} \pm 0.02$	$7.39^{C} \pm 0.06$
Total of *L. acidophilu*s	$9.25^{A} \pm 0.06$	$8.91^{B} \pm 0.04$	$8.59^{C} \pm 0.21$	$7.40^{D} \pm 0.06$	$7.30^{D} \pm 0.02$
Total of mold	< 1*	$1.86^{B} \pm 0.05$	$2.58^{C} \pm 0.07$	$2.95^{D} \pm 0.01$	$3.09^{E} \pm 0.02$
Total of yeast	< 1*	$1.54^{B} \pm 0.06$	$1.83^{C} \pm 0.16$	$2.20^{D} \pm 0.03$	$2.33^{D} \pm 0.03$
Total of coliform	< 1*	< 1*	< 1*	< 1*	1.00

Note: Means in the same row with different superscript very differ significantly (P<0.01).

number of probiotic bacteria required to provide the desired health or nutritional benefits for consumers is not known (Gilliland *et al*., 1989). Counts higher than 7 Log_{10} CFU/g have been suggested by Viderola and Reinheimer (2000) in order to ensure probiotic effects.

The decrease in the total amount of lactic acid bacteria until day 28 was still above the minimum of lactic acid bacteria as probiotic (7.25 Log_{10} CFU/g). The growth rate of lactic acid bacteria based on Table 1 was -6.5 X 10^4 generations per minute. These results indicated the presence of growth inhibition compared to the optimal growth rate at 35-45 ^{o}C temperature was 0.014 generations perminute (Widowati and Misgiyarta, 2002; Tamime and Robinson, 1999).

Total B. Longum

B. longum is a probiotic bacteria that has been recommended by Generally Regarded as safe (GRAS). The treatment of storage had a highly significant effect on the total of *B. longum* (P <0.01). The total of *B. longum* decreased during storage was caused by bacteriocin that from *S. thermophilus* *B. longum* was anaerobi bacteria (Holt *et al.*, 1994), therefore the existence of oxygen could hold the bacteria growth. *B. longum* population in the probiotic yoghurt jelly drink until the end of storage (7.39 log_{10} cfu/g) still fulfilled the standard probiotic bacteria requirement in food based on Shah (2000) which is 6.00 log_{10} cfu/g.

Total L. acidophilus

The treatment of storage had a highly significant effect on total of *L. acidophilus* ($P < 0.01$). *L. acidophilus* population in product decreased after 14 days of storage. It may have been caused by H_2O_2 accumulation from bacteria metabolism. Shah (2000) said that probiotic bacteria viability in yoghurt was influenced by production of H_2O_2. *L. acidophilus* is one of the *Lactobacilli* groups that could accumulate H_2O_2 in the product, because it was a negative catalayzed bacteria (did not have catalayzed enzyme to break H_2O_2 into O_2 and H_2O). Its bacteria population still fulfilled the standard probiotic bacteria based on Samona and Robinson (1994) *in* Viderola *et al*.(2000) which is a minimum 6.00 $\log_{10}$ cfu/g until the end of storage time (28 days).

Total Mold and Yeast

The treatment of storage had a highly significant effect on total of mold and yeast ($P < 0.01$). Total of mold and yeast increased during storage. Deteriorated microbes such as mold and yeast were less sensitive to the environment factor, so it is possible to grow and expand (Rahman *et al.,* 1992). Robinson (1981) said the maximal number of total mold is 2 $\log_{10}$ cfu/ml, and the maximal number of total yeast is 3 $\log_{10}$ cfu/ml. The yoghurt probiotic jelly drink was safe until 14th day for customers.

Total Coliform

Coliform is usually indicitave of poor process and contamination after food processing (Stringer and Dennis, 2000). Total coliform started to grow at 28th day. Robinson said the maximal number of total coliform is less more 1 log 10 cfu/ml. The yoghurt probiotic jelly drink was not safe until 28th day for customers.

Conclusion

Storage time had a higly significant effect on the microbiological characteristics of the yoghurt probiotic jelly drink. This product was still a functional probiotic food until 28th day. Otherwise based on total mold, yeast and coliform this product was safe until 14th day for customers.

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