

## Comparison of Ricotta Cheese Containing Single Lactic Acid Bacteria to Those of Mixed Probiotic Bacteria. Short Communication

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### ABSTRACT

Cheese whey contains much nutrients and it is therefore could be used as raw material to make ricotta cheese. This study had an objective to develop Ricotta cheese in order to reduce waste of cheese industry cause to environment pollution. This study has compared ricotta cheese which made from cheese whey using *Streptococcus thermophilus* (ST) and mixed probiotic bacteria ABC (*Lactobacillus acidophilus* (A), *Bifidobacterium longum* (B), and *Lactobacillus casei* (C)). The ricotta cheese made by mixing whey and fresh milk then heated to 90°C for 10 minutes and stored in refrigerator for 30 days. The moisture, ash, and protein were checked in day 0 and 30. Data analyzed descriptively. The results showed that the cheese moisture decreased while the ash and protein increased. The moisture of ricotta cheese ST vs ABC in day 0 was 60.29% vs 59.49% and in day 30 57.17% vs 51.94%. The ash of ricotta cheese ST vs ABC in day 0 was 1.55% vs 1.33% and in day 30 1.70% vs 1.75%. The protein of ricotta cheese ST vs ABC in day 0 was 10.06% vs 10.21% and in day 30 11.36% vs 15.13%. From the data obtained could be concluded that ricotta cheese could be developed using mixed probiotic bacteria ABC and has no different effect on chemical quality of the cheese. Ricotta cheese that developed with single lactic acid bacteria belongs to soft cheese while developed with mix probiotic bacteria belongs to soft cheese and after storage belongs to semi hard cheese.

**Keywords:** Cheese whey, Ricotta cheese, Probiotic Bacteria, Lactic acid bacteria, Biochemical changes

### INTRODUCTION

Cheese is a main product made from cow's milk as well as other types of livestock by coagulating casein using rennet, lactic acid, or various enzymes and other acids, specifically fermented product made from milk casein in the form of a gel, more or less water-rich, awake almost all fatty materials, contains little lactose (partially converted into lactic acid), and contains a number of variations of mineral content (Lampert, 1975; Murti, 2004). Non

probiotic and probiotic Lactic acid bacteria common used as starter culture. Lactic acid bacteria always used in cheese making to produce organic acids for flavour (Murti, 1993 *cit* Nugraha, 2016).

Whey is a by-product of cheese making (Caldwell, 2014). Whey is obtained from the removal of the liquid phase formed when the agglomeration of milk by the addition of rennet and produced in very large quantities ranging from 9 L of 10 L of milk used in cheese making (Britz *et al.*, 2006). Guimarães *et al.* (2010) said that whey is produced from 85 to 95% of milk volume and still has 55% milk nutrient. The remaining nutrients include lactose 4.5% to 5% w / v, 0.6% to 0.8% w / v dissolved protein, 0.4% to 0.5% w / v fat, and mineral salts 8% to 10% dry matter. Whey still has potential utilization and need to be seen also in its economic value in order to be profitable.

The interest in the development of new products using whey is also associated with the high nutritional value of this by-product. This use provides an environmental friendly destination for the whey generated during cheese manufacture, which is a large source of environmental pollution when improperly disposed. Moreover, whey-based dairy products have been shown to be suitable substrate for harboring, protecting and delivering probiotic bacteria (Meira *et al.*, 2015). Ricotta cheese is the oldest whey cheese derived from clumping by heat Kamel *et al.*, (2013). Pintado *et al.*, (2001) Heating will cause clumping of whey protein, so whey can be used in the production of soft and semi soft cheeses. Making whey-based cheese can be done with a little extra milk. The addition of salt and acid in the production of whey cheese will improve the cheese yield. But until now still no references about the use of whey containing mix probiotic bacteria as substitution of lactic acid bacteria in Feta cheese whey to be developed for Ricotta. This study had an objective to develop Ricotta cheese in order to reduce waste of cheese industry cause to environment pollution.

## MATERIALS AND METHODS

**General.** Ricotta cheese ST was produced by combining Feta whey ST (*Streptococcus thermophilus*) and fresh milk 10% v/v then heated to temperature of 90°C for 10 minutes, while Ricotta cheese ABC was produced by combining Feta whey ABC (*Lactobacillus acidophilus* (A), *Bifidobacterium longum* (B), and *Lactobacillus casei* (C)) and fresh milk 10% v/v then heated to 90°C for 10 minutes (Mahran *et al.*, 1999 *cit* El-Sheikh *et al.*, 2010). Ricotta cheese than packed into 2 plastic containers and stored in refrigerator at 15°C for 30 days. Ricotta cheese got chemical evaluation including moisture, ash, and crude protein (AOAC, 2005) in day 0 and 30. One way experimental design in this res

**Statistic.** One way experimental design used in this research. There are two samples of cheese with two replication for it sample. It sample analyzed twice in day 0 and 30. Data analyzed descriptively.

## RESULTS AND DISCUSSION

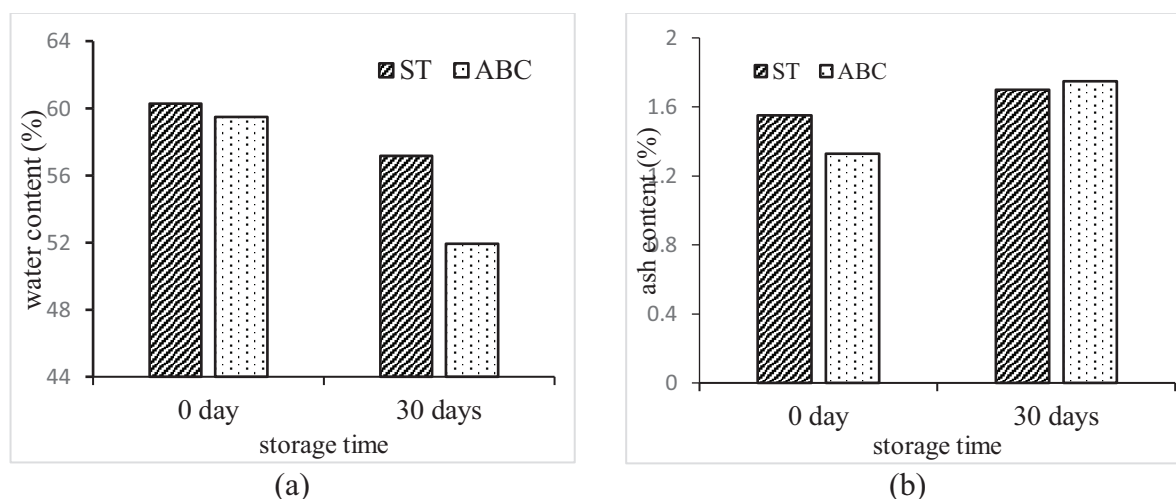
**Raw material.** Raw material used for this research was whey ST and ABC. Raw material quality of Ricotta cheese ST and Ricotta cheese ABC can be seen in tabel 1.

**Tabel 1.** Raw material quality of Ricotta cheese ST and Ricotta cheese ABC

Parameter	Result (%)	
	Whey ST	Whey ABC
Moisture	93.74	93.31
Total solid	6.26	6.69
Protein	0.44	0.59
Ash	0.60	0.59

Result showed that the Feta cheese whey ST and Feta cheese whey ABC still contain nutrients such as protein and ash. Total solid of whey Feta ST was 6.26% with protein 0.44%, fat 0.05%, and ash 0.60%. Whey Feta ABC total solid was 6.69% with protein 0.59%, fat 0.2%, and ash 0.59%. Muhvil and Donovan (1987) explained whey produced from cheese was sweet whey. Siso (1996) *cit* Guimarães *et al.* (2010) whey still have remaining nutrients composed of lactose 4.5% to 5%, 0.6% to 0.8% protein, 0.4% to 0.5% fat, and mineral salts 8% to 10% dry matter.

**Moisture content.** Moisture content of Ricotta cheese ST and Ricotta cheese ABC can be seen in figure 1.a.



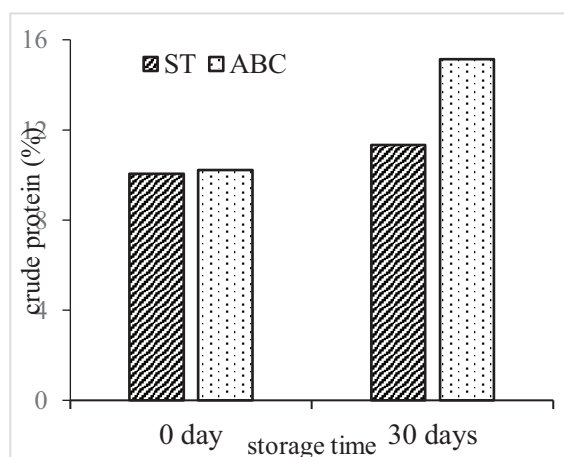
**Figure 1.** (a) moisture content and (b) ash of Ricotta cheese ST and ABC

The moisture content of Ricotta cheese ST vs ABC in day 0 were 60.29% vs 59.49% and in day 30 were 57.17% vs 51.94%. The result showed that the moisture of Ricotta ST were slightly different from Ricotta ABC. It showed reduction moisture during storage. During storage Ricotta cheese ST belongs to soft cheese while Ricotta ABC belongs become semi hard cheese. USDA (1981) *cit* Fox *et al.* (2004) stated ricotta has a maximum moisture about 80%. Scott (1981) *cit* Murti (2004) explained cheese clasification based on moisture content hard cheese had moisture content 20% to 42%, semi hard cheese had moisture

content 44% to 55%, and soft cheese had moisture content above 55%. Armahedi (2008) describes the decrease of moisture in cheese during storage occurs because the process of water expenditure (whey syneresis) persists during the storage process. Walstra *et al.*, (2006) explained moisture decreasing during storage was common due to the occurrence of proteolysis processes that require water.

**Ash content.** Ash of Ricotta cheese ST and Ricotta cheese ABC can be seen in Figure 1.b. The ash of ricotta cheese ST vs ABC in day 0 was 1.55% vs 1.33% and in day 30 1.70% vs 1.75%. The result showed that the ash of Ricotta ST were slightly different from Ricotta ABC. It showed increase during storage. The increasing could be due to the decreasing of moisture content during storage. Ash of Ricotta cheese ST and Ricotta cheese ABC in this reseach higher than standart. Fox *et al.*, (2004) stated ash content from ricotta cheese is about 1%.

**Crude protein.** The mean value of crude protein content of ricotta cheese ST and ABC can be seen in Figure 2.



**Figure 2.** Protein content of Ricotta cheese ST and ABC

The protein of ricotta cheese ST vs ABC in day 0 was 10.06% vs 10.21% and in day 30 was 11.36% vs 15.13%. The result showed that the protein content of Ricotta ST were different from Ricotta ABC. It showed increase during storage. The increasing could be due to the decreasing of moisture content during storage. Both of ricotta cheeses ST and ABC made can be said to have good protein content. Pintado *et al.*, (2001) said that the higher content of fresh milk in the raw material mixture of ricotta cheese making will raise the crude protein content in ricotta cheese. The content of crude protein ricotta cheese with the proportion of fresh milk addition 5% and 20% make protein content 7% and 16.3%.

## CONCLUSIONS

Ricotta cheese could be developed using mixed probiotic bacteria ABC (*Lactobacillus acidophilus* (A), *Bifidobacterium longum* (B), and *Lactobacillus casei* (C)) replacing the use

of *Streptococcus thermophilus* (ST) due to non different effect on chemical quality of both cheese. The Ricotta cheese ST belongs to soft cheese while Ricotta ABC belongs to semi hard cheese.

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