SHORT COMMUNICATION

ANALYSIS OF TOTAL SOLIDS CONTENT FOR FRESH MILK QUALITY GRADING IN PERAK FOR THE YEAR 2018

KALAAVATHI, M.*, BOHARI, M., NOOR AKMI, M.N. AND HAZLIANA H.

Veterinary Research Institute, 59, Jalan Sultan Azlan Shah, 31400 Ipoh, Perak
*Corresponding author: kalaa_vathi@yahoo.com

ABSTRACT. Total solids content in milk is measured to ensure the quality of fresh milk. In Malaysia, The Department of Veterinary Services (DVS) monitors the quality and safety of fresh milk from the dairy farm to milk processors through the Milk Collection Centre (MCC). The aim of this study is to assess the quality of milk produced by dairy farmers from four MCCs in Perak based on the milk's total solids content. This parameter was used to grade fresh milk into Grade A, Grade B and Grade C, and used by DVS of Perak state for milk pricing. The Veterinary Research Institute (VRI) had received a total of 2397 samples of fresh milk from MCCs in Perak in the year 2018. Statistical analysis showed that the mean total solids content in milk from the four MCCs were significantly different ($p<0.05$) (Sg. Siput: 13.26%, Tapah: 12.60% Parit 12.87% and Taiping 12.99%). Overall, about 69.17% of samples were that of Grade A, 24.81% were Grade B and 6.02% were Grade C. This study showed that Sungai Siput MCC was the main contributor for Grade A milk while Taiping MCC was the highest contributor of Grade C milk. The result of this study also indicated that milk produced by dairy farmers in Perak was of good quality, yet there are still the needs for improvement in providing constantly high quality of milk.

Keywords: total solids content, quality of fresh milk, milk collection centre, milk grading parameters

INTRODUCTION

Fresh milk is greatly known for rich source of essential nutritious value not only of protein, but in vitamins and minerals (Annigan, 2018). As the domestic demands of dairy products are increasing, Malaysia highly relies on imports. In fact, for decades, Malaysia has been unable to supply the demand for fresh milk (Suntaralingam, 2015). Few factors such as genetics, environment, stages of lactation, disease, season, age, and nutrition of the cow play huge part to produce good quality milk (Looper, 2012).

The Department of Veterinary Services (DVS) monitors the quality and safety of fresh milk from dairy farms to milk processors through Milk Collection Centre (MCC). The MCC plays an important role between the dairy farmers (milk producers) and the milk processor by monitoring and providing technical services to farmers in order to supply high-quality, safe and adequate milk required by dairy processors. There are four MCCs in Perak which are located at Tapah, Sungai Siput, Parit and Taiping. MCCs gathered fresh milk samples from the farmers and then sent them to the Veterinary Research Institute (VRI) for quality testing.

The milk quality testing is performed routinely at VRI throughout the year and thereby could continuously provide the value of total solids in fresh milk for milk processor. Total solids content in milk refers to protein, carbohydrates, lipid, vitamins, dissolved gas, and dissolved salts (Mourad *et al*., 2014). These components are important as they affect the processing and final dairy products, as well as determine the milk quality. Therefore, dairy farmers or milk producers will receive the incentive from the milk processors based on the milk quality results obtained.

To date, there have not been any recent studies conducted on the milk quality that is collected at the MCCs. This study aims to access the performance of dairy farms from four MCCs in Perak based on the milk's total solids parameter for fresh milk grades that are set by the DVS, Malaysia for milk pricing.

MATERIALS & METHODS

A total of 2397 samples were received from MCC in Tapah (711), Sungai Siput (1167), Parit (464) and Taiping (55). These samples were tested for total solids content using the Gravimetric Method (Bureau of Indian Standards New Delhi, 1997). Briefly, 5ml of the fresh milk sample at room temperature were weighed into a flat-bottomed glass dish of 50mm diameter. The milk was then dried in a forced-air oven at 103°C for three hours. The calculation of total solids is the difference in mass of dish with dried sample (M_2) and mass of dish (M_0) divided by the difference in mass of dish with sample (M_1) and mass of dish (M_0) and expressed in percentage.

Calculation

Total Solid Content $= \dfrac{M_2 - M_0}{M_1 - M_0} \times 100$

Where,

M_0 - mass in g of dish
M_1 - mass in g of dish and sample
M_2 - mass in g of the dish and dried sample

The results were analysed by grouping the percentage of total solids content according to the three milk grades namely Grade A (>12.50%), Grade B (11.76% - 12.49%) and Grade C (<11.75%) (Lily Shuhaida et al., 2013). Further, statistical analysis using One-Way Analysis of Variance (ANOVA) using IBM SPSS Statistics Version 22 was applied to examine whether there were significant differences of mean total solids content in milk among MCCs.

RESULTS

The total solids contents of milk in all MCCs are presented in Table 1. Based on the results

Table 1: Descriptive analysis of total solids for fresh milk quality grading

	Milk Collection Centre				
	Sungai Siput	Parit	Tapah	Taiping	Total
Grade A, n (%)	930 (79.69%)	311 (67.49%)	382 (53.72%)	33 (60%)	1656 (69.17%)
Grade B, n (%)	195 (16.7%)	135 (29.28%)	256 (36%)	8 (14.54%)	594 (25.81%)
Grade C, n (%)	42 (3.59%)	15 (3.25%)	73 (10.26%)	14 (25.45%)	144 (6.02%)
No. of sample, n (%)	1,167 (48.69%)	464 (19.36%)	711 (29.67%)	55 (2.29%)	2,397 (100%)
TS content mean $\pm$ S.E	13.26$\pm$0.03[a]	12.87$\pm$0.04[c]	12.60$\pm$0.03[b]	12.99$\pm$0.24[c]	12.98$\pm$0.02

Notes: TS: Total solids, SD: Standard deviation. Total solids are expressed in %
[a-c] Mean values with different superscripts within the same row indicate significant differences (p<0.05)

obtained, 69.17% of the samples tested were Grade A, 24.81% were Grade B and 6.02% were Grade C. Sungai Siput MCC had the highest production of Grade A fresh milk at 79.69%, followed by Parit MCC at 67.46%, Taiping MCC at 60% and Tapah MCC at 53.72%. Taiping was the highest contributor of Grade C milk followed by Tapah, Sungai Siput and Parit. The statistical analysis showed significant differences in the mean of total solids content ($p<0.05$) between MCCs except for Taiping and Parit MCCs ($p>0.05$) as presented in Table 1.

DISCUSSION

These findings indicated that MCCs in Perak produced high-quality fresh milk (Grade A) which meets the quality requirements of the dairy processors and thus could provide higher incentives to the dairy farmers. The normal range of mean for the total solids in unpasteurised cow's milk was between 10%-14% (Gwandu et al., 2018; Malcolm et al., 1979). According to the European Union, a high-quality cow's milk should contain total solids that are not less than 12.5% (FAO/WHO, 2007). The range of mean for the total solids found in this study was 12.60 to 13.26. However, the study also showed constant and repetitive trends in the production of milk with low quality (Grade C) by milk producers in Perak. This study indicated that milk producers need to be given training and monitoring in order to solve the issue. Milk producers should also be educated on the importance of producing the highest quality milk (Grade A) as it could benefit them in greater incentives. Farms that are performing well in producing the highest milk grade can become a model to other farms. The usage of local herbal galactagogue in increasing the milk yield and quality can be implemented too as it is lower in cost and available locally (Preciado et al., 2011). Factors like genetics, environment, stage of lactation, disease, season age of the cow and nutrition have to be considered in providing technical aid to the milk producer.

CONCLUSION

This study indicated that the milk quality from MCCs in Perak was good. However, improvement is still needed to constantly produce high-quality milk. This study also provided baseline data for the quality of milk collected at MCCs in Perak and should be expanded to all the MCCs in Malaysia. It is also suggested that other parameters such as milk's protein, fat, solid non-fat, lactose and pH be analysed for a more comprehensive study in assessing the quality of milk in Perak.

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