Veterinary Letters
ISSN 2581-2416
DOI: https://dx.doi.org/10.29244/avl.9.2.57-58
https://journal.ipb.ac.id/index.php/arshivetlett

Chemical quality assessment of organic cow's milk at KPSP Setia Kawan Nongkojajar using Lactoscan® technology

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ABSTRACT: Organic cow milk is produced from cows raised in natural, low-stress environments without the use of growth hormones or synthetic additives, resulting in milk with high nutritional value and safety for direct consumption. This study aimed to evaluate the quality of organic cow milk, specifically its lactose, fat, protein content, and freezing point, to ensure compliance with the Indonesian National Standard (SNI) 3141.1:2011for fresh milk. Quality testing was conducted using the Lactoscan® method on eight samples collected from different milk storage posts at the Setia Kawan Dairy Farming Cooperative in Nongkojajar, Pasuruan Regency. The analysis revealed average levels of 4.36% fat, 2.86% protein, and 4.36% lactose, all of which met or exceeded the SNI requirements for fresh cow milk. These findings affirm that the cooperative's organic milk meets the national quality standards and can be considered a nutritious and safe dairy product.

Keywords:
milk quality, Lactoscan® test, organic cow milk, Indonesian National Standard

■ INTRODUCTION

The dairy farming sector is vital to nutrition in Indonesia, particularly in East Java. As industry grows, small-scale farmers form cooperatives for production and distribution. One such cooperative is the Setia Kawan Dairy Cattle Farming Cooperative (Koperasi Peternakan Sapi Perah; KPSP Setia Kawan) in Nongkojajar Village, Tutur District, Pasuruan Regency. As East Java's largest dairy cooperative, KPSP Setia Kawan uses organic farming practices, emphasizing animal welfare and minimal synthetic chemicals, to produce milk with a distinct aroma and richer taste.

Milk quality is crucial for dairy product safety and nutrition (Shodiq *et al*. 2023). According to the SNI 3141.1:2011, fresh milk must meet the physical, chemical, and microbiological criteria (Direktorat Pengolahan dan Pemasaran Hasil Peternakan 2005). Changes in color, aroma, taste, viscosity, and nutritional degradation are indicative of spoilage and health risks (Yuliati *et al*. 2015). Chemical composition, particularly fat, lactose, and protein content, indicates milk quality (Sigit *et al*. 2021). These components define nutritional value and affect milk characteristics. Milk quality depends on cattle breed, feed, and farm management (Christi *et al*. 2022). The Lactoscan® method monitors milk quality (Sriyono et al. 2023). This method measures fat, protein, and lactose levels (Puspitarini & Herbani 2018). At KPSP Setia Kawan, Lactoscan® supports quality control, ensuring that milk meets the SNI 3141.1:2011 standards and remains safe. This study aimed to evaluate the chemical quality of organic cow milk at KPSP Setia Kawan using Lactoscan® to determine conformity with Indonesian National Standards and ensure safety for consumption.

■ MATERIALS AND METHODS

This study was conducted at the Setia Kawan Dairy Farming Cooperative in Nongkojajar between October and November 2024. Eight fresh organic milk samples were collected from 25 organic Friesian Holstein dairy farmers, with five replicates for each collection point. Dairy cows were raised under organic farming principles, emphasizing animal welfare to minimize stress and ensure quality milk production. Samples were obtained from eight collection posts in the Pasuruan Regency: Dukutan, Wonosari, Pungging 1, Kalipucang 3, Tlogosari, Sumberpitu 1, Ngembal, and the central collection point (Collective).

Milking was performed using the whole-hand technique, which involves a full-hand grip and downward rhythmic squeezing motion. Milk from each post was transported to the KPSP Setia Kawan headquarters for quality testing using a Lactoscan® device. This study used a descriptive, quantitative design. Milk quality analysis at the KPSP Setia Kawan laboratory measured the fat, protein, lactose, and salt levels. The data were analyzed using IBM SPSS Statistics 25.0 to assess compliance with the Indonesian National Standard (SNI 3141.1:2011) for fresh milk.

Received: 14-03-2025 | **Revised:** 18-04-2025 | **Accepted:** 23-04-2025

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Table 1 Lactoscan® test of KPSP Setia Kawan organic dairy cow's milk and minimum standards for fresh milk quality according to SNI 3141.1:2011

Parameters	Organic milk at KPSP Setia Kawan	Milk quality on the SNI 3141.1:2011
Fat (%)	4.36%	3.0%
Protein (%)	2.86%	2.8%
Lactose (%)	4.36%	3.9%

Note: KPSP= Koperasi Peternakan Sapi Perah; SNI= Indonesian National Standard

■ RESULTS AND DISCUSSION

The Lactoscan® analysis results of organic cow milk from KPSP Setia Kawan are shown in Table 1. The chemical composition, fat, protein, and lactose content meet the SNI 3141.1:2011 quality requirements for fresh cow's milk. A detailed explanation of this is as follows.

Fat Content: The fat content of organic cow milk from KPSP Setia Kawan averaged 4.36%, exceeding the SNI 3141.1:2011 minimum requirement of 3%. This value surpasses the fat content of 3.28%–3.51% reported by Suhendra *et al.* (2018). Fat contributes to the creamy texture, flavor, and economic value of milk (Hidayat & Anggraeni 2023). Milk fat levels are influenced by the feeding time, feed composition, and milking schedule (Christi *et al.* 2022, Larasati 2016). Feeds rich in crude fiber increase milk fat, whereas excessive crude fat may decrease it (Suhendra *et al*. 2020). Ariani *et al*. (2021) reported fat levels of 3.68% in morning milking and 4.29% in afternoon milking, with lower morning levels attributed to longer intervals causing higher milk volume and fat dilution.

Protein Content: The protein content in the samples was 2.86%, meeting SNI's minimum requirement of 2.8% for SNI. According to Putri (2016), the acceptable milk protein content ranges from 1.82% to 4.26%. Milk protein is synthesized in the udder and provides essential amino acids for human growth and development. Dietary protein intake in cattle directly influences milk protein concentration; a higher feed protein leads to a greater milk protein content (Christi *et al*. 2022).

Lactose Content: The lactose content of KPSP Setia Kawan's organic milk was 4.36%, which complies with SNI 3141.1:2011. High lactose levels contribute to sweet taste, which is distinct from that of conventional carbohydrates. Lactose synthesis in milk is related to glucose metabolism in cows. According to Imanto *et al*. (2018), propionic acid in the feed affects glucose synthesis, which influences lactose production. Glucose serves as a precursor in lactose biosynthesis; thus, more glucose leads to higher lactose content in milk, and vice versa (Vidyanto *et al*. 2015).

■ CONCLUSION

Based on Lactoscan® analysis, organic cow milk from the Setia Kawan Dairy Farming Cooperative contains 4.36% fat, 2.86% protein, and 4.36% lactose. These values met the chemical quality standards set by SNI 3141.1:2011 for fresh milk. Therefore, the milk produced by KPSP Setia Kawan is of high quality and suitable for consumption.

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