

Performance of carotenoid contents in colostrum of dairy cows during the initial to five days of lactation

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Abstract. Colostrum is the main food for newborn calves, due to contain immunoglobulin, vitamin, zinc, magnesium, riboflavin, folic acid and carotene. This research was conducted to performance of carotene contents in the colostrum of lactating dairy cows. This research was held on testing laboratory of food quality and food safety Faculty of Agriculture Technology Universitas Brawijaya. The material of this research had using total of 10 pregnant dairy cows. After giving birth to the calf/parturition, colostrum samples were taken from all cows on different milking days (milking fifth days). The method in this research was used case study an data obtained with exploratory descriptive. Based on the research results, the highest carotene level was 4.12 µg/g on the first day of milking

1 Introduction

Colostrum is the first milk produced by dairy cows immediately after calving. It is crucial for the health and development of newborn calves due to its high nutrient content, including essential bioactive compounds like carotenoids. Carotenoids play a vital role in enhancing the immune system and overall health of both cows and their offspring. They are known for their antioxidant properties and their potential to boost calf immunity, which is especially important during the initial days of life when the calf's immune system is not yet fully developed. Furthermore, carotenoids contribute to the distinctive yellow color of milk [1]. Carotene is a precursor of vitamin A. Carotenoids can be categorized into two main groups, namely carotene and xanthophyll. Carotenes consist of nonpolar hydrocarbons and include compounds such as β -carotene, α -carotene, and lycopene. On the other hand, xanthophyll is characterized by having a hydroxyl or keto end group, making it a more polar compound. This group includes lutein, zeaxanthin, canthaxanthin, and β -cryptoxanthin [2]. β -carotene has the potential as an antioxidant and also has the potential to help improve the immune system for newborn calves [3]. Apart from that, β -carotene has an important role in vision, growth and reproduction [4].

Cows that are fed on pasture and feed rich in carotenoids (grass silage) three weeks before giving birth, produce colostrum which is rich in milk fat and high in lutein, β -carotene, vitamin A and vitamin E [5]. Colostrum has much higher levels of beta-carotene than milk,

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and during the first week postpartum, these levels decrease rapidly [6]. The importance of maintaining feed intake for the mother before and after giving birth. According to [7], supplementation of beta-carotene in cow feed can increase the concentration of beta-carotene in colostrum, change the color of colostrum, and increase serum beta-carotene in newborn calves in pregnant cows that have received sufficient intake vitamin A. The aim of this research is to determine the performance of carotene contents in cow colostrum during the first to five days of lactation.

2 Materials and Methods

The research method was used a case study and data was collecting field data at KPSP Setia Kawan Nongkojajar, Pasuruan, and the data obtained with exploratory descriptive. The sampel was used Peranakan Friesien Holstein (PFH) dairy cows with purposive sampling. The criteria of postpartum cows producing colostrum on days 1-5 with a lactation period of 1 - 6. The feed ingredients used for steaming up in the form of forage and concentrate were given more than normal feeding. The material used for the research using total of 10 pregnant dairy cows. After giving birth to the calf/parturition, colostrum samples were taken from all cows on different milking days (milking fifth days). After the mother gives birth, the colostrum is milked before being fed to the calf at $\pm 30 - 45$ minutes after parturition. Colostrum was milked from day 1st to day 5th. The colostrum was put into a 100 ml sterile glass bottle, then put into a cooler bag filled with ice gel to be taken to the laboratory. Bottles containing colostrum will be stored at $-20\text{ }^{\circ}\text{C}$ until analyzed for carotene. Testing for colostrum carotene content used a UV-VIS Spectrophotometer (Shimadzu 1601) in the food quality and safety laboratory, Faculty of Agricultural Technology, Brawijaya University.

3 Results and discussion

The carotene contents in the colostrum who had steaming up treatment had higher carotene content, this was due to the fact that the amount of forage and concentrate given was higher than that given to normal cows feed in the dry period before calving. According to [5], it was explained that feeding grass silage (high carotenoid) vs corn silage (low carotenoid) to PFH dairy cows during the dry period, the result was in a higher concentrations of carotenoids in plasma, it was affected by the characteristic of forage was gave during the dry period. So that, indicated that plasma concentrations of fat-soluble micronutrients involved in the nutritional. Additional, steaming feed up should be added to dry period cows to increase carotenoid levels in colostrum.

Table 1. Caroten content in different treatmens

	Category											
	Steaming Up (SU)						Without Steaming Up/Control (CO)					
Milking day	1	2	3	4	5	Avg	1	2	3	4	5	Avg
Total of Caroten Content ($\mu\text{g/g}$)	4.12	0.83	1.26	0.23	0.16	1.32	0.10	0.03	0.02	0.04	0.02	0.042

The result of table 1 showed that the average carotene content that were given steaming up was $1.32\text{ }\mu\text{g/g}$, while the average carotene content that were not given steaming up was

0.042 $\mu\text{g/g}$, and the highest carotene content on day 1 of milking was 4.12 $\mu\text{g/g}$ and the lowest carotene content was 0.16 $\mu\text{g/g}$ in cows that were steamed up. Meanwhile, the dairy cow that were not given steaming up, the highest and lowest carotene levels were 0.10 $\mu\text{g/g}$ and 0.02 $\mu\text{g/g}$. These results show that the carotene content on day 1 had increased and the day 2 – 5 had decreased, due to the steaming feed up in the form the forage and concentrate were given more than regular feeding. That's In line with [8] during the first few days of lactation, the levels of carotenoids decrease dramatically and then stabilize around day five as udder gland secretion changes to regular milk. Calderon et al. [5] reported that the concentrations of the carotenoids content in colostrum were initially highest and decreased sharply during the first week of breastfeeding. According to [4] dairy cows have a higher milk fat concentration in the first day of milking colostrum due to micronutrients that can dissolve in milk product fat, namely β -carotene. Colostrum contains higher levels of beta-carotene compared to milk, and these levels decrease rapidly during the first week after postpartum. This is associated with a rapid decrease in peripartum plasma concentrations, particularly evident one week before birth and reaching their lowest point at birth for retinol or one week after birth for carotene, as described by [6] This decline is likely due to not only a minor reduction in dietary intake but also an increased uptake by the mammary glands. When cows are provided with dietary supplements during this period, it can help limit the decrease in plasma carotene and retinol levels, as observed in a study by [9]. According to Brandano, Rassu, and Lanzu [10], various factors affect the quality and quantity of colostrum, including individual characteristics, breed, the feed consumed during the dry period, the duration of the dry period in confinement, the timing of colostrum collection after birth, and the body condition score (BCS).

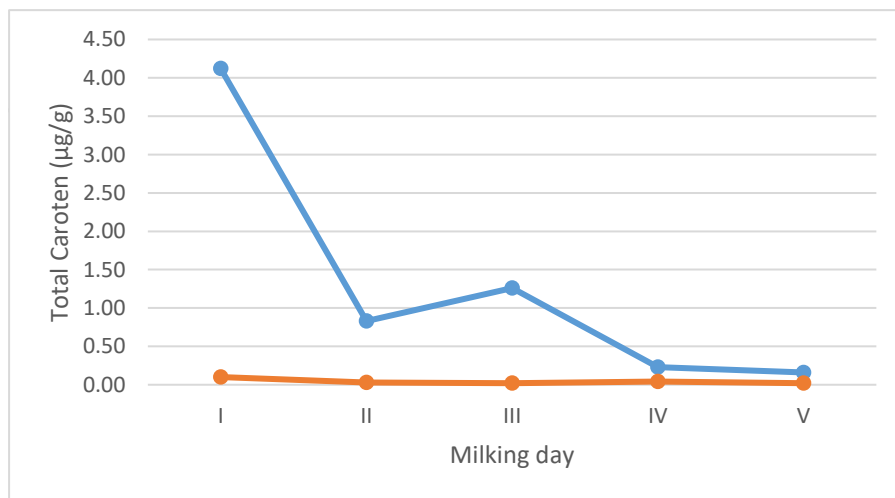


Fig 1. Carotene content on different milking days

4 Conclusion

The conclusion of this research:

1. the average carotene content that were given steaming up was 1.32 $\mu\text{g/g}$, while the average carotene content that were not given steaming up was 0.042 $\mu\text{g/g}$, that means the steaming feed up in the form the forage and concentrate were given more than normal feeding.

2. the highest carotene content of colostrum on day 1 of milking was 4.12 µg/g and the lowest carotene content was 0.16 µg/g in cows that were steamed up, due to carotene has the potential as an antioxidant and also has the potential to help improve the immune system for newborn calves.
3. The dairy cow that was not given steaming up had the highest and lowest carotene levels were 0.10 µg/g and 0.02 µg/g, because of steaming up is giving feed with high nutritional content aims to supply cows to have sufficient energy during and after giving parturition.

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