

Valorization of dairy production in inland areas: product and process innovation

CAROLINE VITONE – c.vitone@studenti.unimol.it

Dept. Agriculture, Environment and Food Sciences, University of Molise, Campobasso, Italy

Tutor: Prof. Alessandra Fratianni, Co-tutor: Prof. Gianfranco Panfili

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Introduction

During the activities of the PhD thesis project sampling of milk and dairy products from the company was carried out. Samples were analyzed for their chemical composition and their content of retinols (vitamin A), tocols (vitamin E) and carotenoids.

Materials and Methods



Type of analysis	Method used
Moisture, Protein, Ash, Fat	AOAC, 2000
Tocols, Carotenoids, Retinols	Panfili et al., 2003; 2004; 2008
Titratable acidity	AOAC, 2000
pH	Potentiometry

Results and Discussion

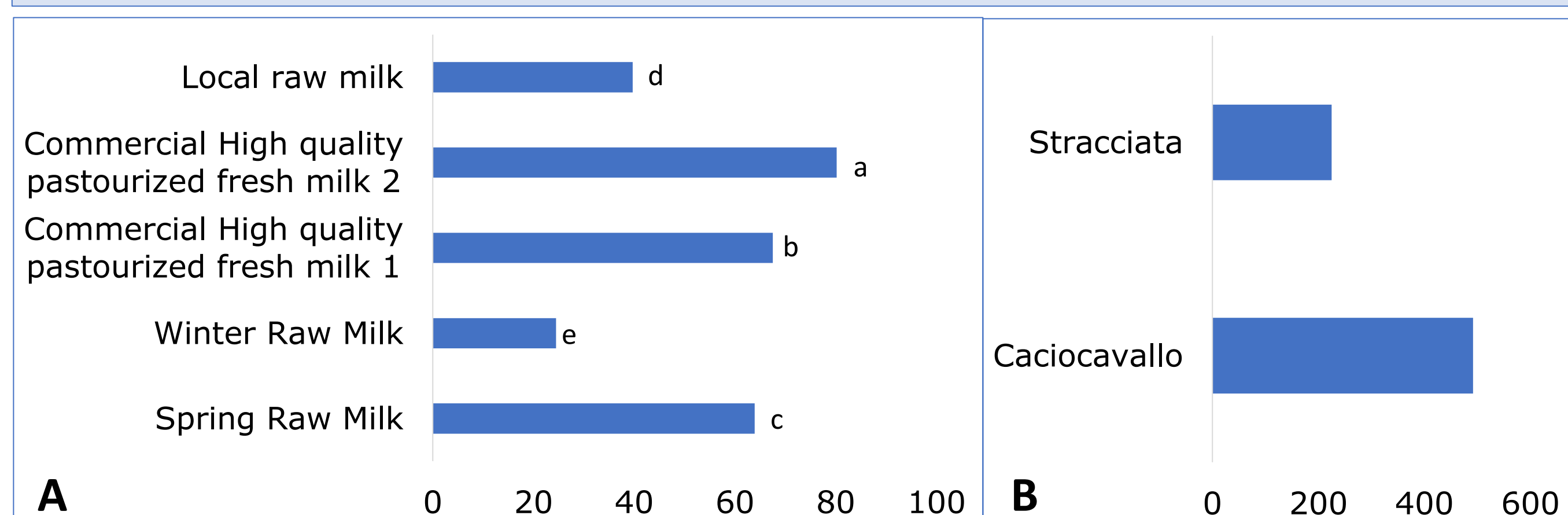
In the following tables and figures the compositional analysis (Table 1), content of tocols (Figure 2), carotenoids (Figure 3) and retinols (Figure 4) are reported.

Table 1. Compositional analysis of raw milk and dairy products from the company (g/100 g fresh weight- f.w.).

	Moisture (%)	Ash (%)	Protein (%)	Fat (%)
Raw Milk	88.5 ± 0.1	0.7 ± 0.0	3.1 ± 0.06	3.7 ± 0.0
Caciocavallo	36.4 ± 0.1	4.1 ± 0.0	27.1 ± 0.9	32.7 ± 0.2
Stracciatella	66.2 ± 0.4	1.2 ± 0.0	15.4 ± 0.4	18.8 ± 0.2

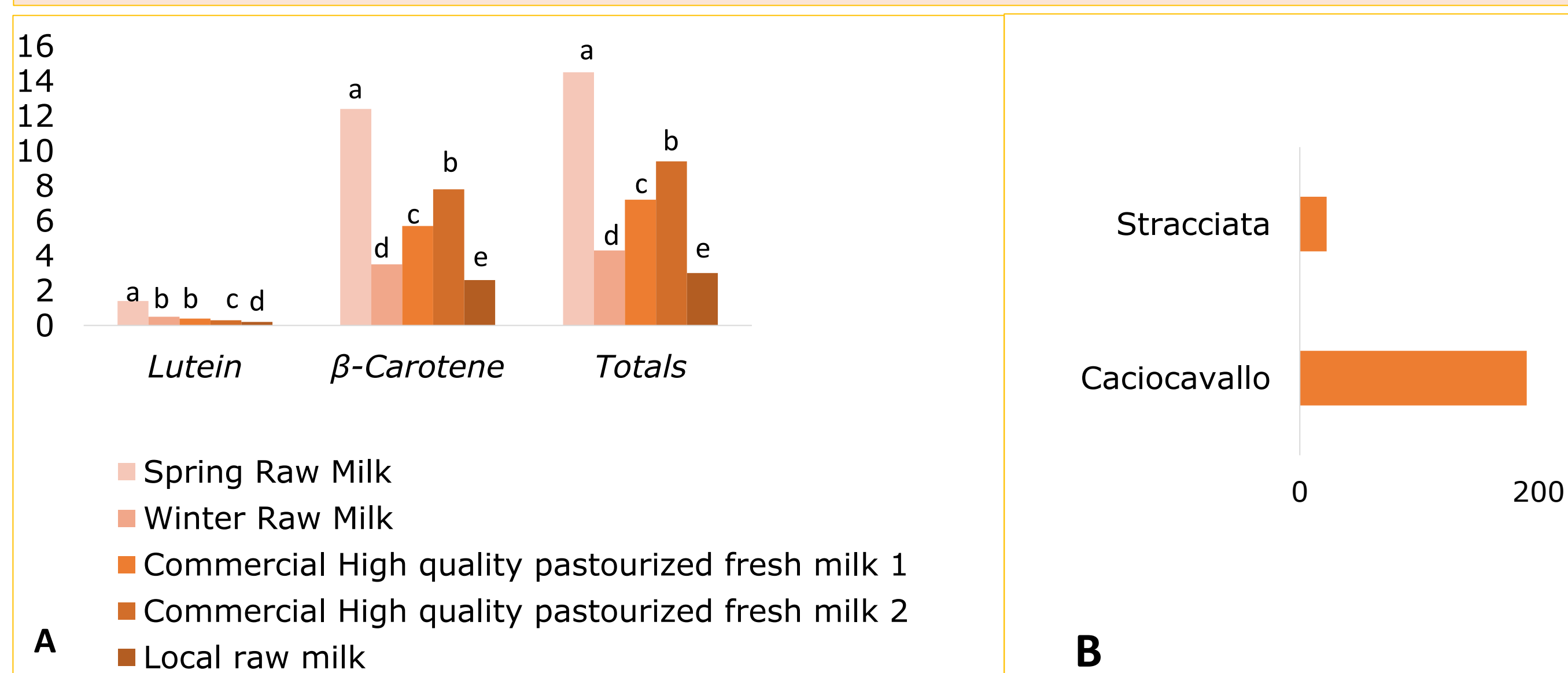
Values are expressed as mean ± standard deviation (n=3).

Figure 1. A) α -Tocopherol content of raw milk from the company, commercial and local milk ($\mu\text{g}/100\text{ ml f.w.}$), B) α -Tocopherol content of stracciatella and caciocavallo from the company ($\mu\text{g}/100\text{ g f.w.}$).



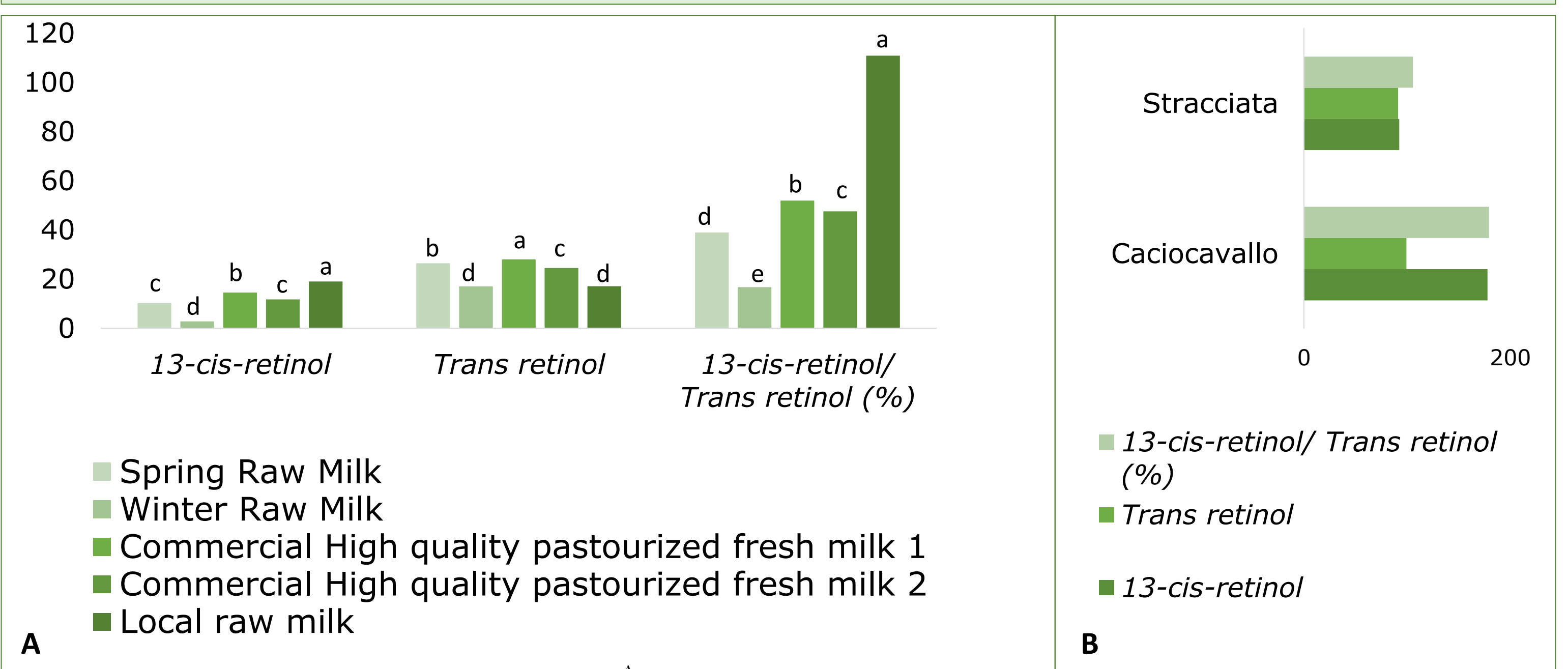
Values are expressed as mean ± standard deviation (n=3). Statistical significance was attributed to p values < 0.05 and was obtained by using the least significant difference (LSD) test.

Figure 2. A) Main carotenoid content of raw milk from the company, local and commercial milk ($\mu\text{g}/100\text{ ml f.w.}$), B) β -carotene content of stracciatella and caciocavallo from the company ($\mu\text{g}/100\text{ g f.w.}$).



Values are expressed as mean ± standard deviation (n=3). Statistical significance was attributed to p values < 0.05 and was obtained by using the least significant difference (LSD) test.

Figure 3. A) Retinol content of raw milk from the company, commercial and local milk ($\mu\text{g}/100\text{ ml f.w.}$), B) Retinol content of stracciatella and caciocavallo from the company ($\mu\text{g}/100\text{ g f.w.}$).



Values are expressed as mean ± standard deviation (n=3). Statistical significance was attributed to p values < 0.05 and was obtained by using the least significant difference (LSD) test.

[Figure 1] Only α -Tocopherol was present, which gives the main contribution to the vitamin E activity, expressed as Tocopherol Equivalents (TE) (mg/100 g). Taking into account the vitamin E Recommended Daily Allowance (RDA) of 12 mg/day of TE (Regulation EU No 1169/2011), 100 ml of raw milk contributes a maximum of 1% of the RDA.

[Figure 2] Lutein and β -carotene were the main detected compounds in milk (10% and 80%). Beta-carotene was at the highest levels and was higher in milk sampled during spring, when animals are fed with pasture.

[Figure 3] 13-Cis and all-trans retinol were the main detected compounds (14% and 77%); the 13 cis- trans ratio is also reported. All-trans retinol is defined to possess 100% vitamin A activity, expressed as Retinol Equivalent (RE) (mg/100 g). The ratio between 13-cis-retinol and trans retinol is a process/product indicator. In raw milk from the company, the ratio is lower. In the high pasteurized milk samples the higher ratio could depend on the heat treatment while in caciocavallo and stracciatella it could depend on the microbial evolution (Panfili et al. 2008). Taking into account the vitamin A Recommended Daily Allowance (RDA) of 800 $\mu\text{g}/\text{day}$ of RE (Regulation EU No 1169/2011), 100 ml of raw milk contributes a maximum of 3% of the RDA.

The microbiological and genomic analysis of milk, products and by products are under investigation. Starting from the microbiological analysis, the study of a sustainable packaging able to extend the shelf life of the products will be carried out. Finally, the use of edible wild plants from the territory rich in bioactive compounds for the realization of dairy innovative products will be investigated.

References

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