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Investigation on the microbial evolution of cow milk in the passage from stable to mountain pasture, and evaluation of Bitto cheese microbial community

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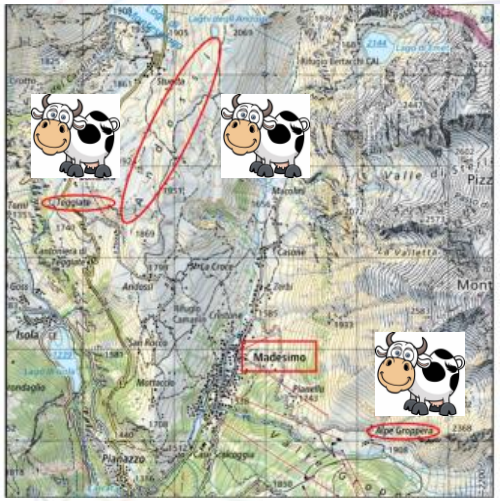
PSR 2014 2020 LOMBARDIA L'INNOVAZIONE METTE RADICI

Regione Lombardia

Fondo Europeo Agricolo per lo Sviluppo Rurale: l'Europa investe nelle zone rurali

Summer transhumance of dairy cows is a seasonal pastoral system practiced in many European countries from ancient times.



Three groups of cows, moving from stable plain farms to alpine pasture in upper Valchiavenna region (Italy) during the summer period were considered.

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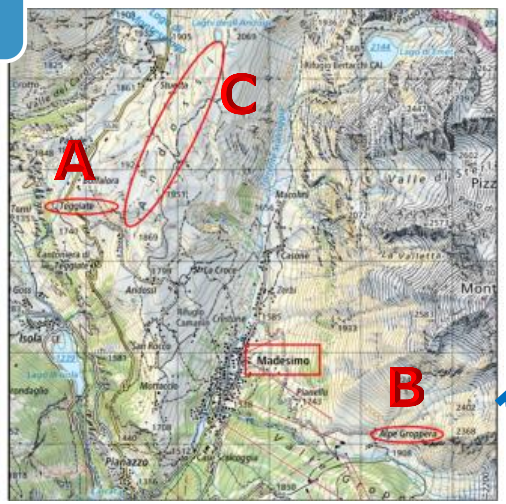
MILK

Step 1



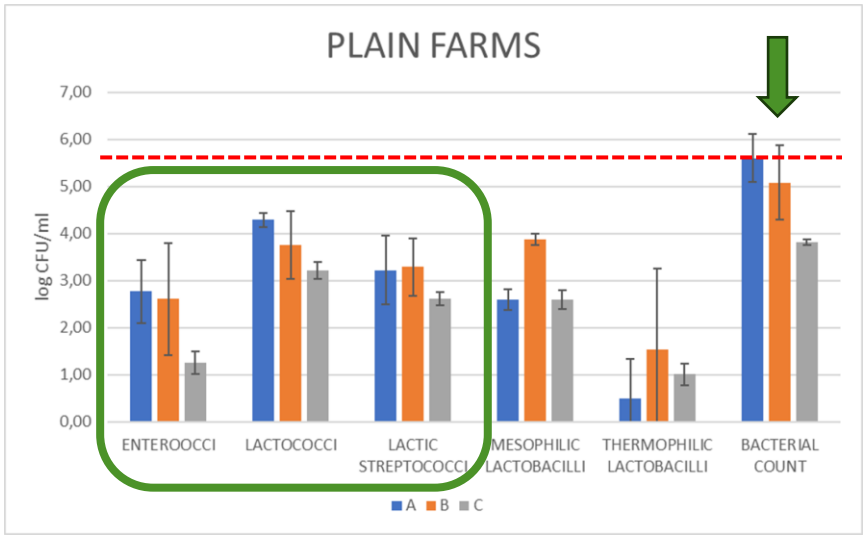
- 12 milk samples from plain farms
- 12 milk samples from alpine pasture
- From 3 milk suppliers
- Collected june-august

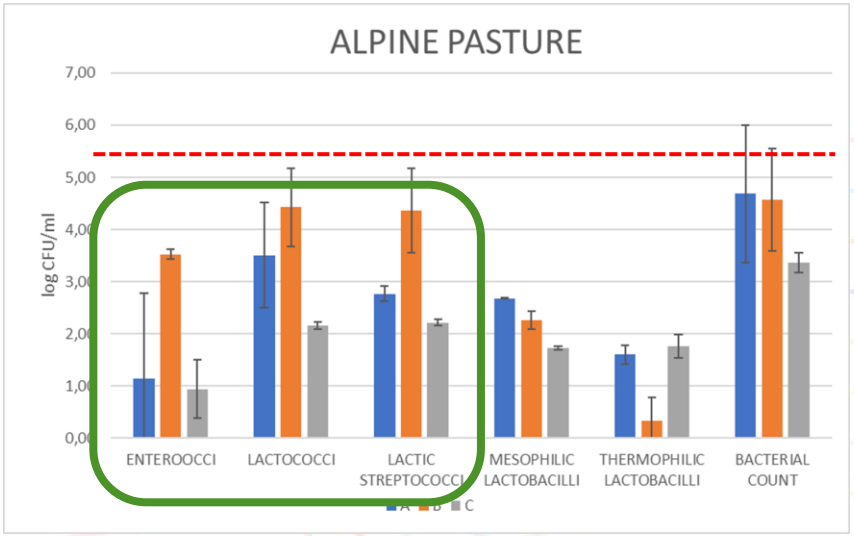
To investigate the microbial evolution of the milk samples and evaluate whether the alpine pasture could influence the composition of milk microbiota compared to plain farms.

Microbiological analyses

Metataxonomic analyses

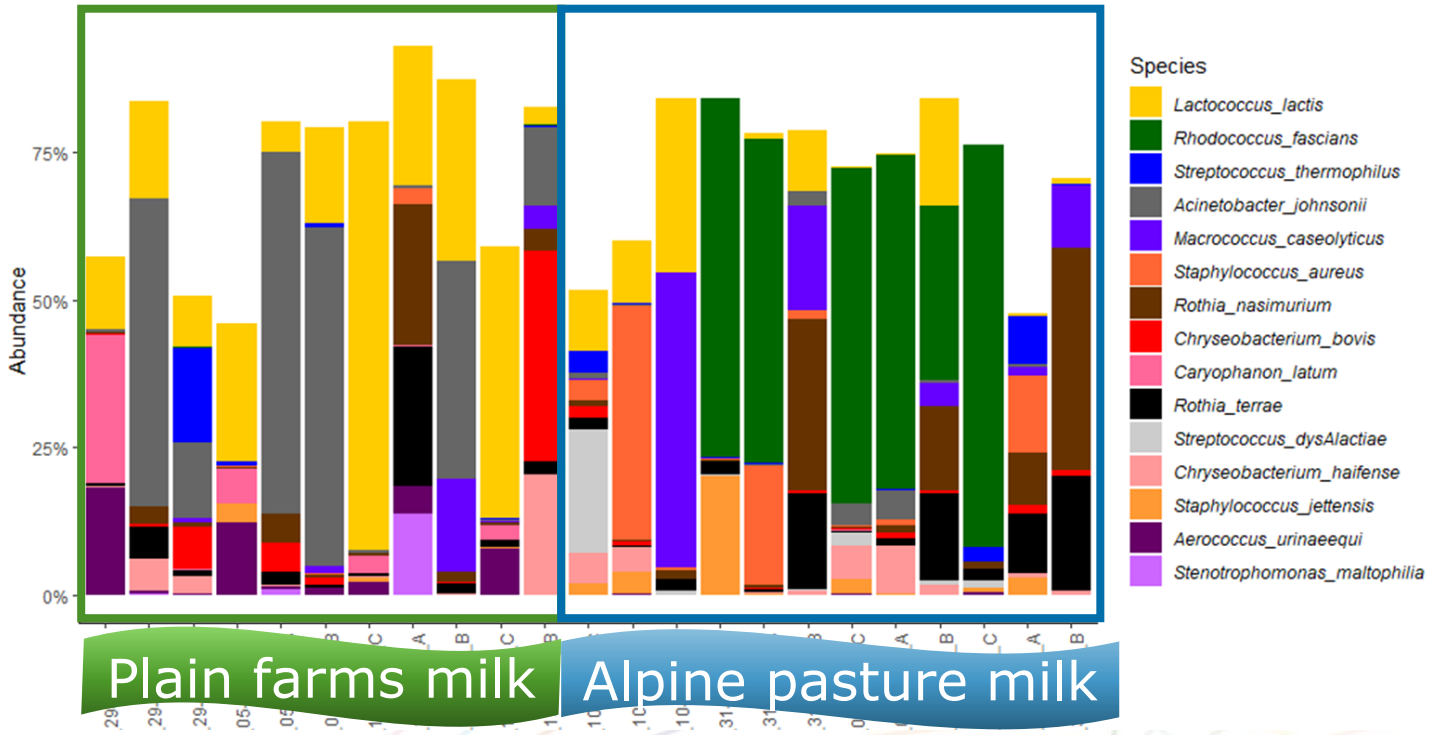
Microbiological analysis





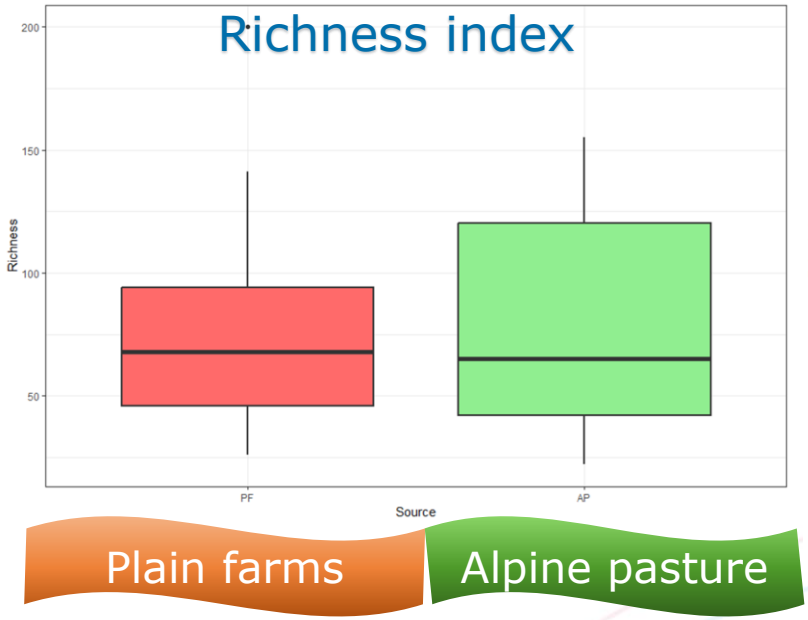
- Under the law limit to be processed (ER 853/2004)
- Higher total bacterial count in plain farms compared to alpine pasture samples.
- Prevalence of cocci followed by mesophilic lactobacilli in all the samples

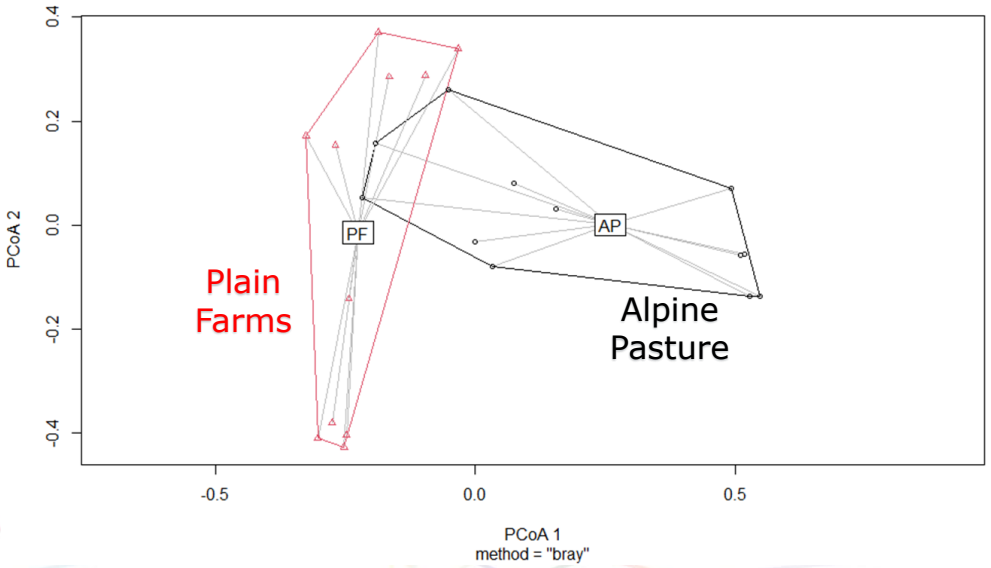
Metataxonomic analyses



- *Lactococcus lactis* was the most abundant species retrieved.
- High relative abundance of *Rhodococcus fascians*
- High abundance of *Acinetobacter johnsonii* was detected in plain farms milk samples

Metataxonomic analyses: area of production

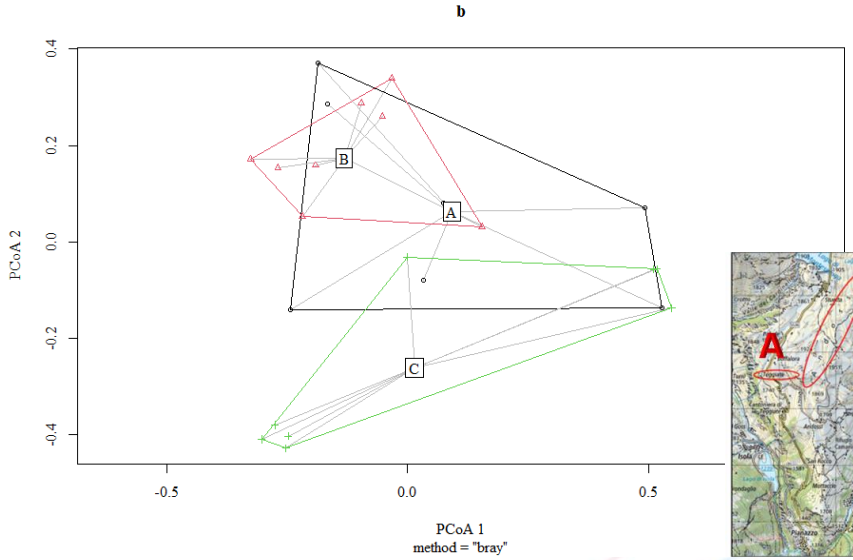




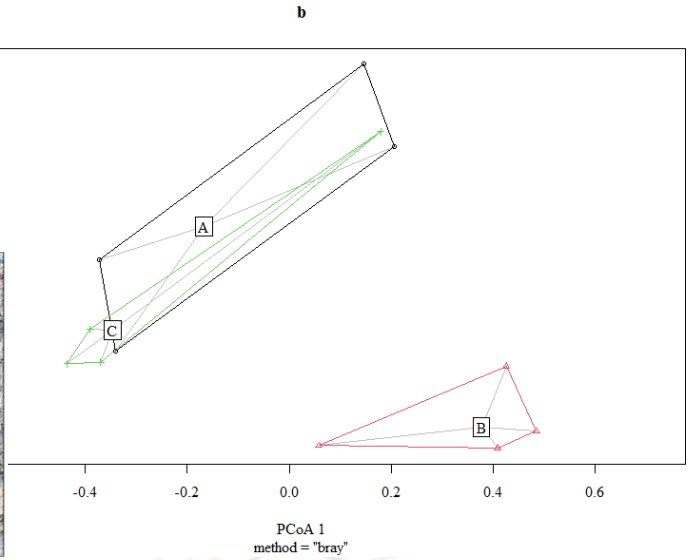
- Higher richness of species in alpine pasture milk samples compared to plain farms
- Differences between the microbiota of plain farms and alpine pasture milk samples

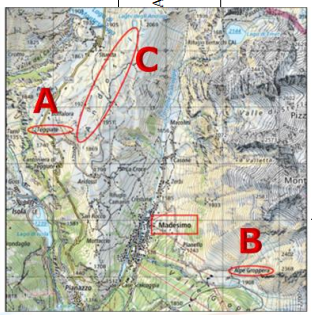
Metataxonomic analyses: milk suppliers

Plain Farms



Alpine Pasture





- No statistical differences between milk samples from the milk suppliers in plain farms
- Statistical differences between milk samples from milk suppliers B compared to A and C in alpine pasture

Step 2

FROM MILK TO CHEESE

The alpine pasture milk bulk from the three groups of cows is used to obtain Bitto, a PDO raw milk cheese produced only in summer, when the cows graze on high alpine meadows.

The microbiota of six Bitto PDO cheeses was studied

Microbiological analyses

Metataxonomic analyses

Bitto PDO cheese

Bitto is produced exclusively with milk from alpine pastures of the province of Sondrio and in some zones of the Upper Brembana Valley and of the province of Lecco. The production period is exclusively summer and coincides with the alpine pastures.

Bitto is produced with freshly milked cow's milk, processed within 2 hours of milking

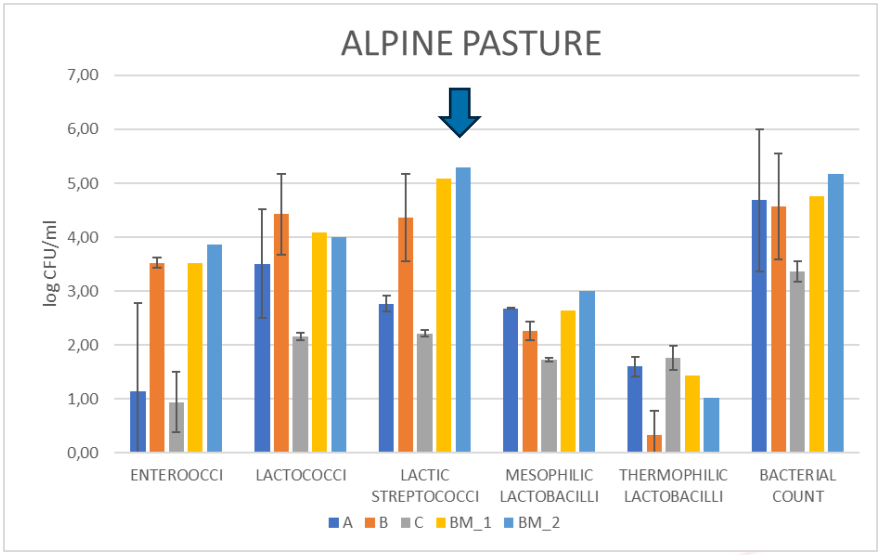
The cows are mainly fed from pasture grass from the alpine pastures in the production area.

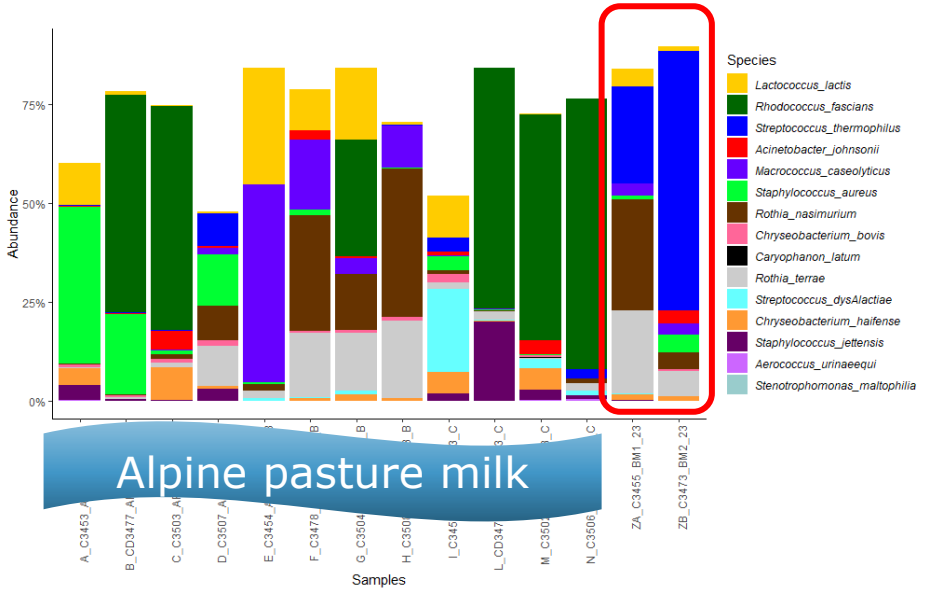
An autochthonous milk starter mainly thermophilic is used.

The curd is cooked at a temperature between 48° and 52°C.

The ripening must be prolonged for at least 70 days and begins in the alpine dairies.

Bulk milk samples





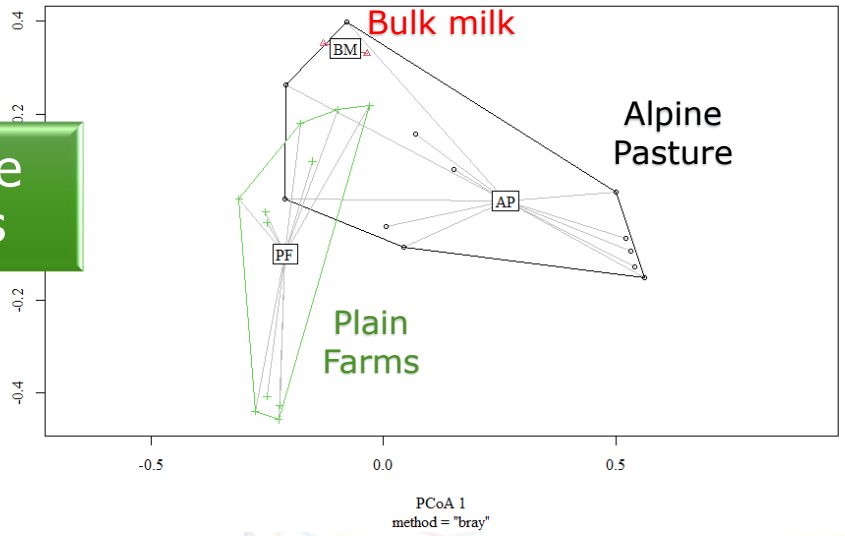
- Predominance of cocci in bulk milk samples, in particular lactic streptococci
- High relative abundance of *Streptococcus thermophilus*, due to autochthonous milk starter

Bulk milk samples

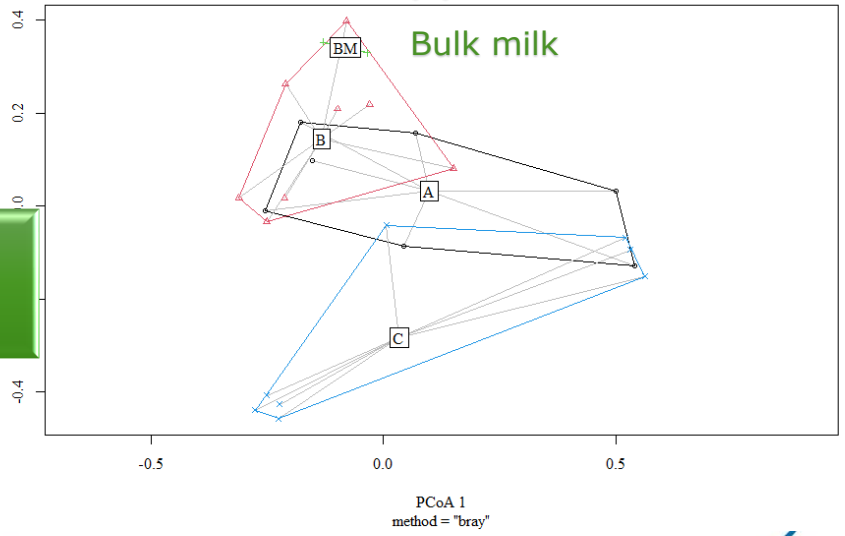
Bulk milk samples grouped with

- Alpine pasture milk samples
- Milk samples of supplier B

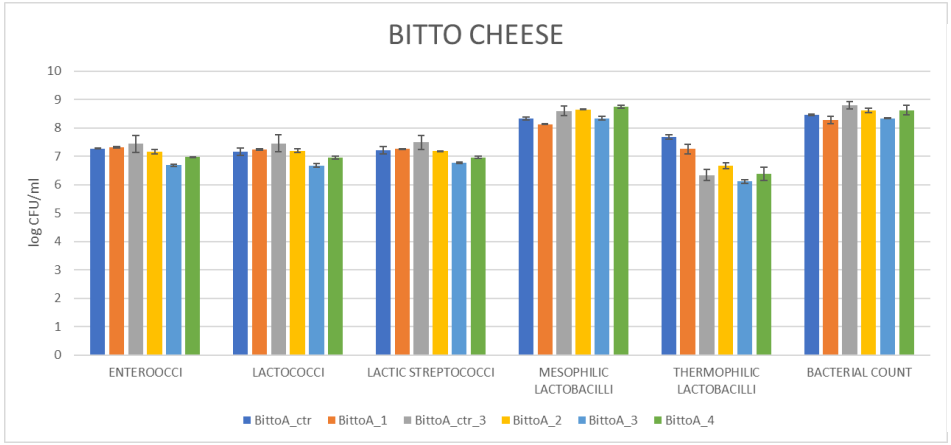
Area of production

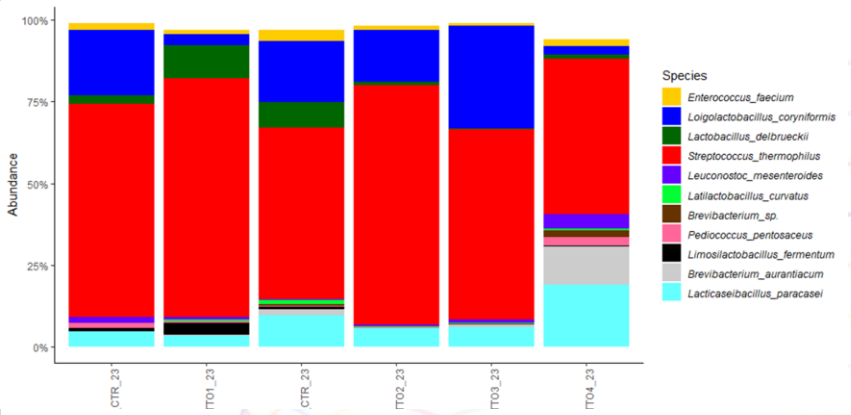


Milk suppliers



Bitto PDO cheese





- No statistical differences between the microbiota of the six Bitto cheeses.
- Microbial counts highlighted the development in the cheese of the lactic flora normally present in the natural milk starter and the raw milk microbiota.
- High abundance of *S. thermophilus*, *Lactocaseibacillus paracasei* and, to a lesser extent, *Enterococcus faecium*

CONCLUSIONS

Step 1

Alpine pasture has an impact on the microbial composition of cow milk, showing the presence of some bacterial groups related to vegetation and increasing the richness of microbial species in alpine pasture milk.

Step 2

Bitto cheeses showed no differences in microbiota. Main presence of species was related to the thermophilic autochthonous milk starter together with non-starter LAB species growing during cheese ripening.

CREA-ZA

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Azienda agricola Paggi Roberto
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This work was done on the project PASCOLI-AMO, funded by Regione Lombardia with the co-financing of the European Union—FEASR, Rural Development Program 2014-2020.

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Thank you for your attention