UMR Herbivores

Team Performances of animals and herds (Peraq)

Forage system is the key driver of mountain milk specificity

The aims of this work were to determine the effect of mountain origin on milk composition when comparing similar lowland and mountain production system and to highlight the factors responsible for the added value of mountain milk from commercial farms in France, Slovakia, and Slovenia. When the forage system of farms is similar, le composition of mountain milk is very similar to that of lowland milk. Mountain milks are slightly richer aromatic compounds, in terpenes and in unsaturated fatty acids while lowland milks are yellower and richer in carotenoids. These differences could be most likely attributable to the utilization of highly diversified and extensively managed semi-natural grasslands in mountain. In practice, this work clearly demonstrates that the specific composition of mountain milk, often observed in previous studies, is directly attributable to the utilisation of grass, in particular from semi-natural grasslands. Therefore, in a context of global warming that will make possible to grow maize in mountain, farmers will have to maintain a high proportion of grass from semi-natural grasslands in the diet of cows in order to maintain the specific composition of mountain milk.

In Europe, mountain areas account for 14.2% of the total utilizable agricultural area. Mountains have 17.8% of the total EU agricultural holdings, and dairy cows represent approximately 10.5% of the total dairy livestock units. These farms are important for the preservation of the environment (biodiversity, natural hazards) and contribute to the landscape shaping. Because they maintain human activities in mountain areas, they actively contribute to the attractiveness of the territories and to the development of other economic activities like tourism. To face the higher costs for the production and collection of milk, commercial strategies based on the differentiation of the products have been historically adopted to increase the value of mountain dairy products [i.e., specific labels for mountain productions]. The promise made to consumers, willing to pay more for mountain products, must however be based on specific qualities. The objective of this work was to decipher the raisons of the specific composition of mountain milk in order to provide the farmers the knowledge allowing to better differentiate their products. This work, made in collaboration with the Association des Producteurs de Lait de Montagne (APLM, Trade mark MontLait ©), consisted in the characterisation of the fine composition of tank milk issued from 264 French, Slovenian and Slovakian farms located in lowlands and mountains. In each country, the farms were balanced according to their origin (lowland or mountain) and within mountain or lowland groups, according to the forage systems: corn-based or grass-based forage system.

The milk from mountain and lowland areas differed in their contents of a few constituents. Mountain milk was richer in some aromatic compounds (4-methylpentylbenzene, 1-methyl-2-n-hexylbenzene) and terpenes (β-caryophyllene) than lowland milk. These differences could be most likely attributable to the utilization of highly diversified and extensively managed semi-natural grasslands. The higher forbs content of mountain pastures could be related as well to the richness in unsaturated fatty acids including linolenic and rumenic acids observed in mountain compared with lowland milk during the outdoor season. In contrast, grazing on lowland pastures rich in grasses gave a yellower milk that was richer in β-carotene. Out of the few compounds showing a significant effect of origin or its interaction, most of the milk constituents were unaffected by the origin at all when forage systems are similar in lowland and in mountain. However, almost all milk constituents differed according to the forage system and the season, and the differences observed between seasons can be attributed to differences in the cow diet composition. Pasture milks are particularly rich in fat-soluble vitamins, in antioxidants, in aromatic and phenolic compounds as well as in favourable fatty acids The higher content in aromatic compounds of mountain milks are slightly richer aromatic compounds, in terpenes and in unsaturated fatty acids while lowland milks are yellower and richer in carotenoids. These differences could be most likely attributable to the utilization of highly diversified and extensively managed semi-natural grasslands in mountain.

In practice, this work clearly demonstrates that the specific composition of mountain milk, often observed in previous studies, is directly attributable to the utilisation of grass, in particular from semi-natural grasslands. Therefore, in a context of global warming that will make possible to grow maize in mountain, farmers will have to maintain a high proportion of grass from semi-natural grasslands in the diet of cows in order to maintain the specific composition of mountain milk. These results were used by the APLM farmers to define the specifications for the production their mountain milk MontLait©.

Publication

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