



Relationship between Different Grassland Types and Their Volatile Patterns to Enhance the Traceability of Italian Typical Alpine Dairy Products

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Presenter Information

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Key words: mountain dairy production systems, pastoral vegetation, traceability markers

Introduction Defining operative models for the characterization and valorization of mountain typical cheeses is a major topic in Italian Alps, in order to overcome the structural difficulties of mountain livestock farms. The Pro-Alpe Project was carried out to investigate the main components of food chain (pastoral resource, dairy cattle, milk production, processing and quality, cheese characteristics) and the relations among them, aiming at defining traceability models from pasture to cheese and obtaining technical information to improve the efficiency of Italian alpine production systems. The Project preliminary results achieved at the end of the first year are presented in this paper.

Materials and methods The food chain was investigated in two sites, Piedmont and Venetia Alps, each with two different vegetation types. Each one was characterized using 42 transects of 50 point quadrat. The 4 types were evaluated, both from the ecological point of view, on the basis of an indirect analysis performed applying to species Landolt indices, and computing average indices for each transect (weighted on species relative abundance). Ecological gradients among coenosis were analysed by PCA using Landolt indices as variables. Extraction of volatiles compounds was performed by steam distillation and the obtained essential oils analysed by GC and GC/MS and by using solid phase microextraction (SPME/GC/MS).

Results The dominant species of the 4 vegetation types were (relative abundance in brackets): (FPAs) *Agrostis tenuis* (15%), *Achillea millefolium* (12%), *Trifolium repens* (11%); (FMAs) *Festuca nigrescens* (14%), *Agrostis tenuis* (9%), *Potentilla crantzii* (8%); (FSt) *Festuca nigrescens* (27%), *Alchemilla vulgaris* (13%), *Phleum alpinum* (7%); (TSt) *Trifolium alpinum* (37%), *Nardus stricta* (22%), *Carex sempervirens* (12%). The 4 vegetation types were well differentiated from an ecological point of view (Figure 1), with some similarity between FPAs and FMAs. Preliminary chemical analysis showed that volatiles were ascribed at several different chemical classes of compounds of which terpenes (ranging from 2.6 to 581.6 mg/g of fresh weight in the different vegetation types), aldehydes (5.3-13.9), alcohols (7.6-24.6) and esters (1.1-14.1) were the most abundant. Chemical analysis on grass and on milk obtained from cattle fed exclusively on a single vegetation type, allowed to identify a number of compounds most interesting at defining traceability models (Table 1).

Table 1 Quantity of terpenes, found both in grass (µg/g of fresh weight) and milk (not reported here), differentiated by vegetation type.

Compounds	FPAs	FMAs	FSt	TSt
limonene	216.1	834.6	-	< 0.1
p-cymene	-	-	-	0.1
caryophyllene	16.2	11.9	1.0	0.1
bicyclogermacrene	7.2	2.4	0.1	10.2
limonene	8.40	8.43	-	-
p-cymene	-	-	-	2
caryophyllene	2	1	5	3
bicyclogermacrene	-	-	-	3

Conclusions Results here presented are necessarily preliminary: in the first year, the goal was centred on the feasibility of the setting up of the whole Project and experimental design was simplified compared with the one of subsequent years. Nevertheless, if we focus on compounds found both in grass and milk (compounds that could be markers for traceability of typical Alpine dairy products), the wide variability existing between vegetation types suggests that it is possible to enhance the traceability in mountain dairy production systems. More refined analysis (now in progress) should strengthen this hypothesis. Precise determination of botanical and ecological differences between vegetation types studied and their comparison with differences in volatile patterns, will point out at which extent the approach proposed could be used to assess traceability of mountain typical products.

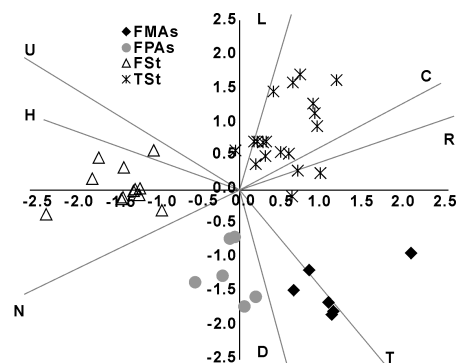


Figure 1 Vegetational survey in the ecological space represented by 1st (x-axis) and 2nd (y-axis) component (cumulate variance: 75%) of the PCA. Variables: Landolt indices: brightness (L), temperature (T), continentality (C), soil moisture (U), soil reaction (R), nitrogen needs (N), humus (H), soil dispersion (D).