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Study of transformation of α-pinene from lactic acid bacteria using SPME/GC/MS

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Terpenes are lipophilic aliphatic compounds constituted of a variable isoprene unit number. In the last years many authors have highlighted that mono- and sesquiterpenes have been found in milk and cheese produced in pastures. In fact they are secondary metabolites of plants that are ingested by herbivore animals during grass feeding. Like other plant biomarkers such as carotenoids and phenolic compounds, they can be considered potential tracers of the geographical origin of foods (milk, cheese, meat and olive oil). Some researchers report that the terpene fingerprint can be used to discriminate cheeses of mountain or lowland origin. In this context traceability is an important component of quality policy in agribusiness to satisfy the rising demand for genuineness, quality and origin assurance of foods such as Protected Denomination of Origin (PDO) products.
In particular our experience has been focused on defining a cheese traceability in order to differentiate the production of a particular dairy product from different sites located in the same area [1]. Moreover much information contained in terpene profile of a dairy product has still to be understood since many factors affect terpene fingerprinting (cheese making, type and location of plant, etc). Recent investigations [2] suggest that terpenes may influence cheese flavour inhibiting microbial metabolism with a consequence on the sensory quality of dairy livestock products. Indeed the antiseptic property of many terpenes is well known. Processes based on the microbial transformation of terpenes have been highlighted. Microrganisms, belonging to the genus *Pseudomonas* are able to biodegrade terpenes by cometabolism using these substrates as the only source of carbon and energy [3]. Furthermore studies on biotransformation of limonene by bacteria, fungi, yeast and plants are known [4]. Then microbial flora may induce different chemical reactions on terpenes present in mountain dairy products. Nevertheless lots of information on the effects of the microbial flora of lactic acid bacteria (LAB) on terpenes present in mountain dairy products, is lacking. Lactic acid bacteria are microorganisms responsible for milk acidification and for cheese ripening. The aim of this preliminary study was to verify if different LAB strains form terpene molecules in a medium added to a selected terpene. We studied the production of terpene volatile compounds after the growth of different LAB strains in a medium added to a single monoterpene, the α-pinene, reported as biomarker in the mountain cheeses.
Six different LAB strains were aerobically grown in skim milk at 37°C. The extraction of volatile terpenes was performed with the Solid Phase Microextraction (SPME) method using a StableFlex 2 cm DVB/CAR/PDMS fiber (extraction time = 60 minutes, temperature 53°C) and the analysis was effected by GC/MS. All six different LAB strains were able to produce isoborneol when α-pinene was present in the growth medium but significant differences among isolates were shown. The consumption of α-pinene and the formation of isoborneol were estimated. Studies are in progress to better define if LAB strains are able to metabolize other terpenes.

[1] Zeppa, G. ; Giordano, M. ; Bertolino, M. ; Gerbi, V., *J. Chromatogr. A* **2005**, *1071*, 247-253
[2] Buchin, S. ; Martin, B. ; Hauwuy, A., *Xth Weurman Flavour Research Symposium*, Beaune, **2002**, 24-28 june
[3] Iurescia, S. ; Marconi, A.M. ; Tofani, D. ; Gambacorta, A. ; Paternò, A. ; Devirgiliis, C. ; Werf, M.J.; Zennaro, E., *Appl. Environ. Microbiol.* **1999**, *65(7)*, 2871-2876
[4] Duetz, W.A.; Bouwmeester, H.; Beilen, J.B.; Witholt, B., *Appl. Microbiol. Biotechnol.* **2003**, *61*, 269-277