

# AROMATIC AND FATTY ACID PROFILE OF FONTINA PDO CHEESE PRODUCED IN AOSTA VALLEY DURING SUMMER ALPINE PASTURE

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## INTRODUCTION

Fontina is an Italian semi-hard and semi-cooked cheese, labelled PDO. It is typically produced in Aosta Valley, from raw cow milk of Valdostana breed. Cheeses are ripened for at least 3 months in natural caves. In summer, Fontina PDO cheese is directly manufactured in alpine pastures where cows are grazed and moved progressively to higher altitudes. As is well known, cattle diet, based on different forage species, is strictly correlated with aromatic and fatty acids profiles. This correlation is found both in milk and in the final products such as Fontina PDO cheese (1, 2).



## MATERIAL AND METHOD

Analysis have been carried out on Fontina cheese produced in three mountain pastures (A1, A2, A3), located up to 2300 m above sea level, over three consecutive summer seasons. Three samples were collected during each season, at 90 days of ripening and analysed in duplicate or triple depending on the type of determination. Jiang et al. (1996) (3) and FIL-IDF: 182-1999 (4) methods were used for the extraction of the lipid component and fatty acids methyl ester esterification. The subsequent qualitative and quantitative analysis of fatty acid composition was carried out via GC/MS and GC/FID according to Cabiddu et al. (2009) (5). The qualitative and semi-quantitative evaluation of the volatile organic compounds profile was carried out using SPME-GC/MS method, referring to Bergamaschi and Bittante (2017) (6), with some modifications.

|                                 | %                 |                   |                   |
|---------------------------------|-------------------|-------------------|-------------------|
|                                 | A1                | A2                | A3                |
| $\Sigma$ saturated              | 61,13             | 61,11             | 64,28             |
| $\Sigma$ unsaturated            | 38,87             | 38,89             | 35,72             |
| $\Sigma$ monounsaturated        | 33,07             | 33,18             | 30,42             |
| $\Sigma$ polyunsaturated        | 5,80 <sup>a</sup> | 5,71 <sup>a</sup> | 5,30 <sup>b</sup> |
| $\Sigma$ CLA                    | 2,00 <sup>a</sup> | 1,92 <sup>a</sup> | 1,73 <sup>b</sup> |
| $\Sigma$ $\omega$ 3             | 1,47              | 1,36              | 1,36              |
| $\Sigma$ $\omega$ 6             | 2,21              | 2,33              | 2,11              |
| $\Sigma$ $\omega$ 6/ $\omega$ 3 | 1,50 <sup>b</sup> | 1,71 <sup>a</sup> | 1,56 <sup>b</sup> |

**Table 1.** Mean value (g/100 g FAT) for fatty acid classes of Fontina PDO from three mountain pastures (A1, A2, A3). Average values calculated considering 3 summer seasons, 3 samples per season extracted in duplicate and each analysed in duplicate ( $p < 0,05$ , test HSD di Tukey).

## CONCLUSION

This study confirms that a strictly correlation exists between the aromatic and fatty acids composition of diet and the final dairy products. Therefore it is necessary to promote maintenance and enhancement of the biodiversity typical of the alpine pastures and transhumance in order to produce high quality standards Fontina PDO cheese, very appreciated by consumers.

## ACKNOWLEDGEMENTS

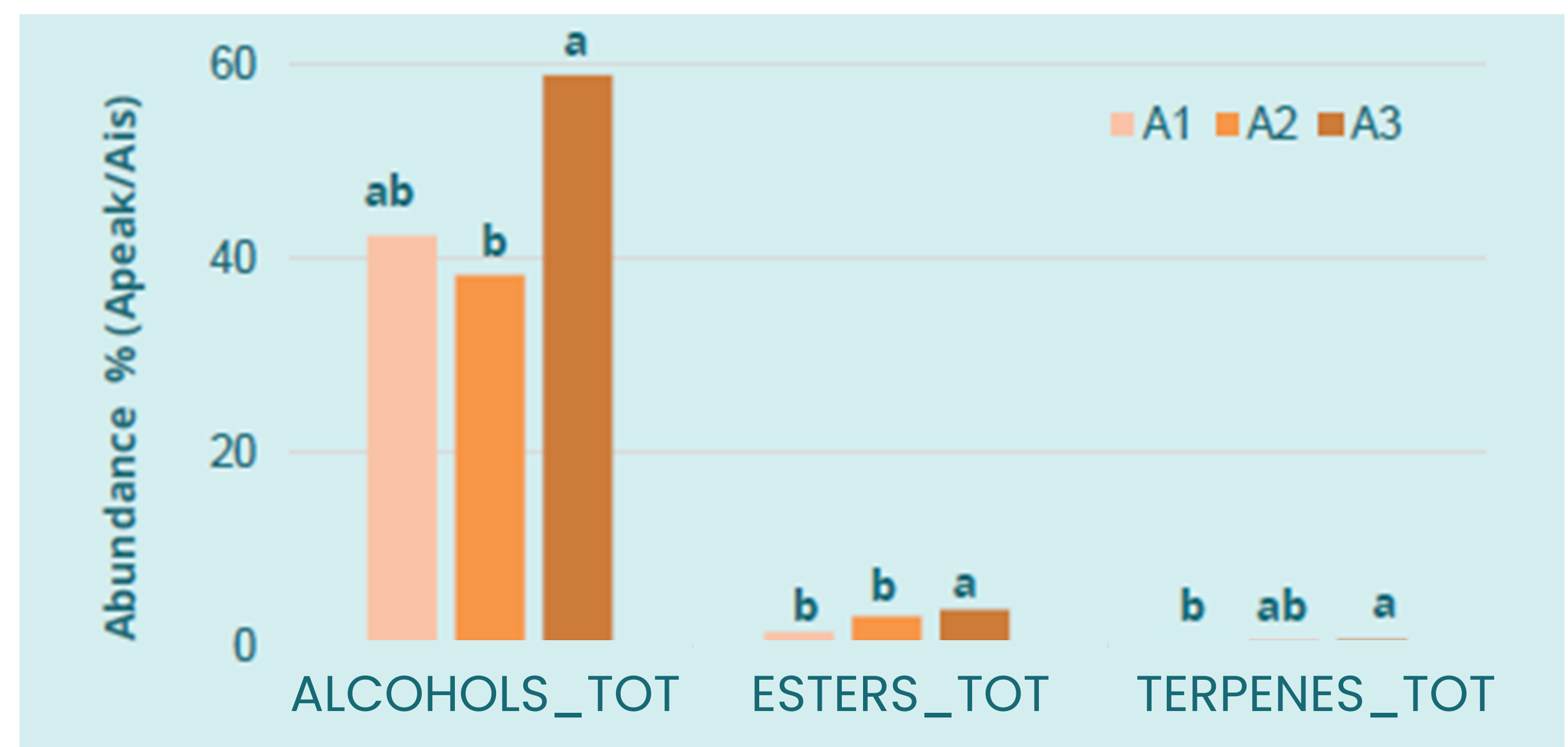
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**The aim of this work** was to support the practice of seasonal migration of livestock in high mountains to produce typical cheeses with high nutritional value and having unique organoleptic characteristics.



## RESULTS

Results obtained allow us to say that the alpine Fontina PDO cheese reflects the high nutritional characteristics of summer milk. Data show a large amount of PUFA, CLA and a good  $\omega$ 6/ $\omega$ 3 ratio, in all samples, confirming what has already been reported in the past by other authors. Among all, the Fontina PDO cheese of the A1 pasture is the richest in CLA (90% CLA 9c,11t) and shows the best ratio  $\omega$ 6/ $\omega$ 3 (Tab.1). Regarding mountain Fontina PDO cheese aromatic profile, it is known that altitude and botanical composition of pasture are factors determining the sensory quality of cheeses. In fact, results show that cheeses, especially those from the A3 mountain pasture, are rich in alcohols (ethanol and 3-methylbutanol), esters (ethylacetate) and terpenes ( $\alpha$ -pinene), which notoriously produce a typical fruity notes aroma (Fig.1).



**Figure 1.** Some of the identified classes, of Fontina PDO cheese from three mountain pastures (A1, A2, A3). Data are expressed as average abundance in %, based on internal standard area (Apeak/Ais), and relative to the total of the substances identified. Average values are calculated considering 3 summer seasons, 3 samples per season, each analysed in duplicate. ( $p < 0,05$ , test HSD di Tukey).

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