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Impact of alpine pasture grazing on butter fatty acid profile and physicochemical properties

L. Serva, A. Zoroaster, L. Magrin, S. Segato, P. Berzaghi, G. Cozzi

Flash oral presentation • Poster Session 2 – Poster 9
Tuesday starting at 9:45 a.m

Mountain Grassland and Livestock Joint Conference
Plantahof, Landquart, Switzerland





Conference angle

Mountain farming systems are multifunctional systems: grasslands, livestock, cultural heritage, sustainability, and product quality.

From pasture to plate

Product quality

Alpine grazing

Our poster asks a simple question:

Can the production system be read in butter?

Poster Session 2 • Poster 9 • Tuesday coffee break

31 summer butter samples

The comparison separates feeding/production system from geographical location.

Lowland TMR



9 samples
3 plants

intensive dairy herds
corn silage-based TMR

Mountain hay-TMR



11 samples
4 plants

mountain plants
hay-based TMR

Alpine-grazing artisanal

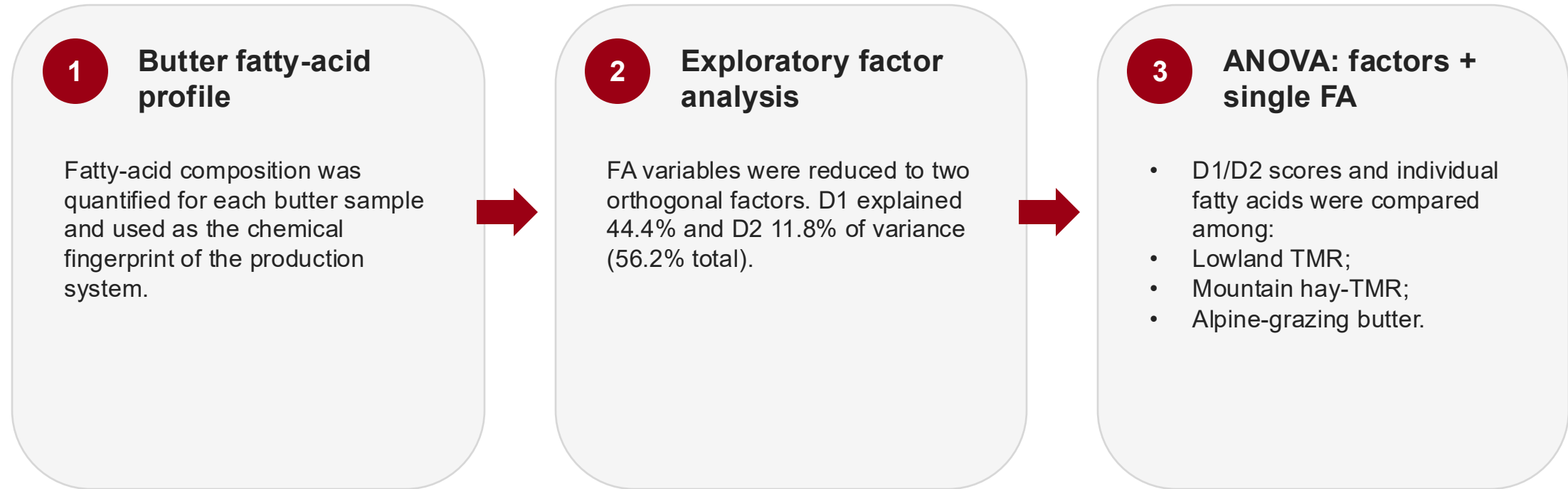


11 samples
5 small plants

alpine summer farms
pasture-based feeding

Analyses combined fatty-acid profiling, exploratory factor analysis, and colour/rheological measurements.

Analytical workflow applied to 31 summer butter samples from three production contexts.



Purpose: test whether the multivariate FA pattern is consistent with specific fatty-acid differences and functional butter traits.

A clear D1 gradient separated alpine-grazing butter from TMR-based butter.

Factor analysis explained 56.2% of FA variance



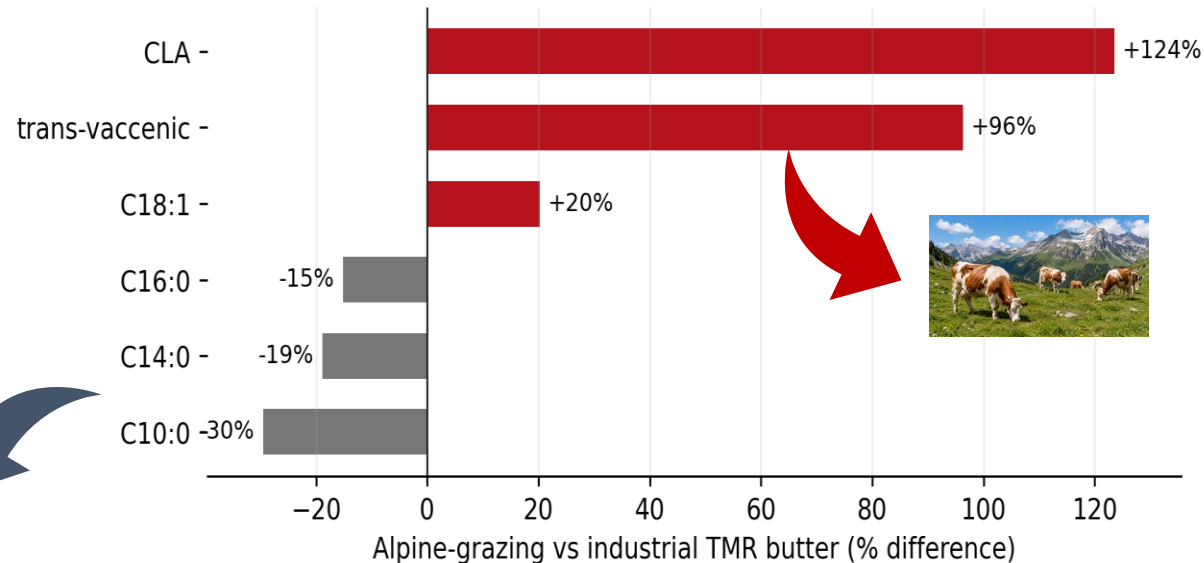
Lower contents in alpine butter

medium-chain saturated FA
(C6:0–C16:0)

Higher contents in alpine butter

C18:0, C18:1 isomers,
trans-vaccenic acid, CLA

Key fatty-acid shifts linked with alpine grazing



Interpretation

The fatty-acid profile captured the biological effect of grazing more strongly than the simple geographical label “mountain”.

D2 described a secondary gradient and did not mainly explain production context.

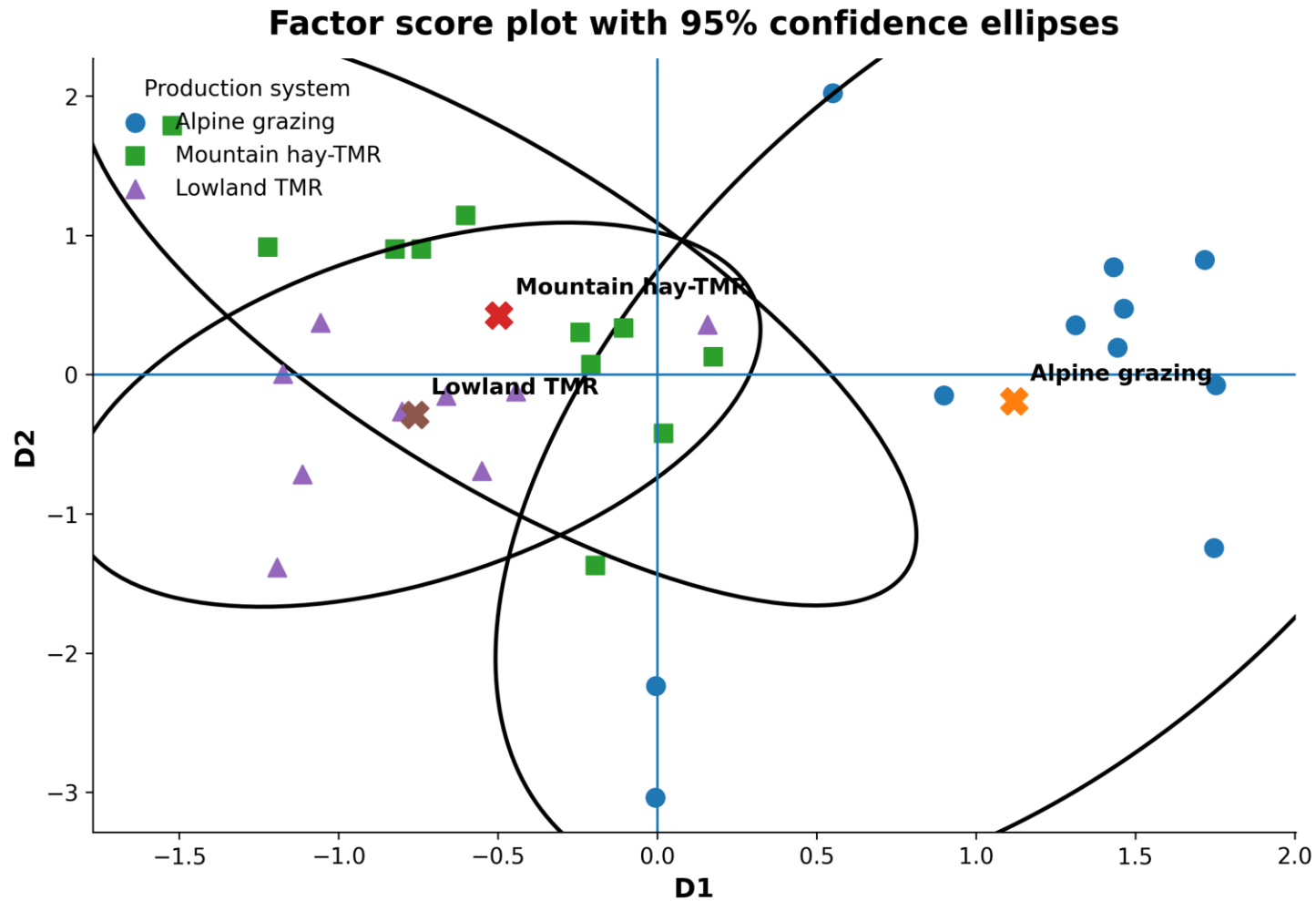


Selected fatty acids: LS-means and statistical differences among production contexts.

Fatty acid	Coordinates of factors	Alpine grazing	Mountain hay-TMR	Lowland TMR	P	Pattern
Main D1 markers: medium-chain saturated FA						
C6:0	D1 –	2.30 b	2.53 a	2.48 ab	0.028	lower in alpine
C8:0	D1 –	1.14 b	1.34 a	1.34 a	<0.0001	lower in alpine
C10:0	D1 –	2.04 b	2.88 a	2.91 a	<0.0001	lower in alpine
C12:0	D1 –	2.33 b	3.30 a	3.40 a	<0.0001	lower in alpine
C14:0	D1 –	9.21 b	11.5 a	11.2 a	<0.0001	lower in alpine
C16:0	D1 –	27.4 b	31.4 a	33.2 a	<0.0001	lower in alpine
Main D1 markers: long-chain / bioactive FA						
C18:0	D1 +	10.7 a	9.64 b	9.51 b	0.002	higher in alpine
C18:1n9ct	D1 +	24.1 a	20.1 b	20.0 b	<0.0001	higher in alpine
C18:1n11 trans	D1 +	4.25 a	2.56 b	1.77 b	<0.0001	higher in alpine
CLA (C18:2 c9t11)	D1 +	1.11 a	0.613 b	0.380 b	0.003	higher in alpine
Secondary D2 markers						
C15:0	D2 +	1.03 a	1.09 a	1.11 a	0.369	n.s.
C16:1n9	D2 –	1.61 a	1.49 b	1.62 a	0.016	mountain lower
C18:2n6c	D2 –	2.79 a	2.33 b	2.55 ab	0.008	mountain lower

Key message: the same FA pattern detected by factor analysis is statistically confirmed by ANOVA; alpine-grazing butter is lower in medium-chain saturated FA and higher in long-chain/bioactive FA.

Different letters within rows indicate significant differences among production contexts; n.s. = not significant.



Butter from alpine grazing systems was clearly separated along D1 from both TMR-based systems.



Alpine-grazing butter was not only chemically different.

It also showed measurable functional traits:

- **Greater yellowness**
consistent with a visually distinctive product
- **Shorter melting latency**
faster response in the melting test
- **Higher spreadability**
a texture difference relevant to consumers

Visit the poster for the full factor-analysis plot, detailed fatty-acid table, and physicochemical results.

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**Grazie – thank you –
danke schön – merci**

Lorenzo Serva

Email. lorenzo.serva@unipd.it



UNIVERSITÀ DI PADOVA
Dipartimento
di Medicina animale,
Produzioni e Salute