

Does feeding hay versus grass silage impact milk composition?

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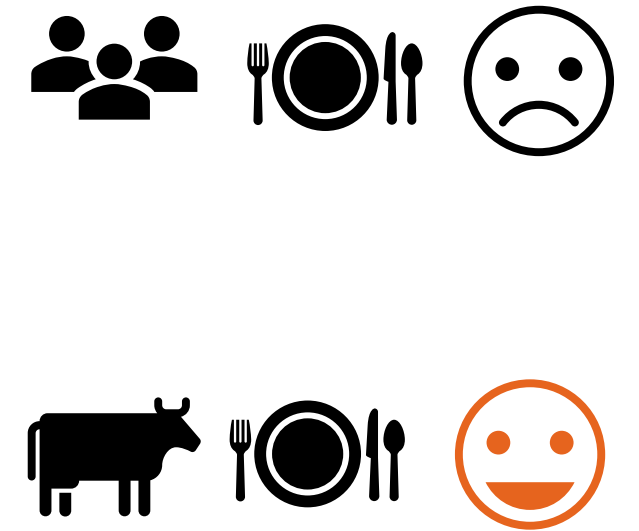


Introduction

- Ruminants ability to utilize forages → increase in **net human food supply**
 - 1.2 Mill. ha in Austria consist of permanent grassland
- **Forage conservation method:**
 - Ensiling → less dependent on weather conditions
 - Hay production → benefits biodiversity
→ improves formation of ruminal mat



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Conservation method affects:

- amount of available energy
- utilisation of feed protein for milk synthesis
- proteolytic activity of bacteria in milk
- sensory properties of milk

Relevance

... for cheese production:

- Low quality silage → risk of contamination with clostridial endospores
→ late-blowing defects in hard and semi-hard cheese

... for human nutrition:

Vitamin	Daily requirement (mg)	Content of milk (mg/L)	1 Liter of milk covers (%)
B1	1.0 – 1.2	~ 0.4	37
B2	1.2 – 1.4	~ 1.9	143
B6	1.2 – 1.5	~ 0.4	31
B12	0.003	~ 0.004	137

(Belitz et al., 2012)



Produced by microorganisms → almost exclusively found in food of animal origin

Aim

To test the effects of preserving forages as either **hay or grass silage** on raw milk composition in a forage-based feeding system with constant concentrate level

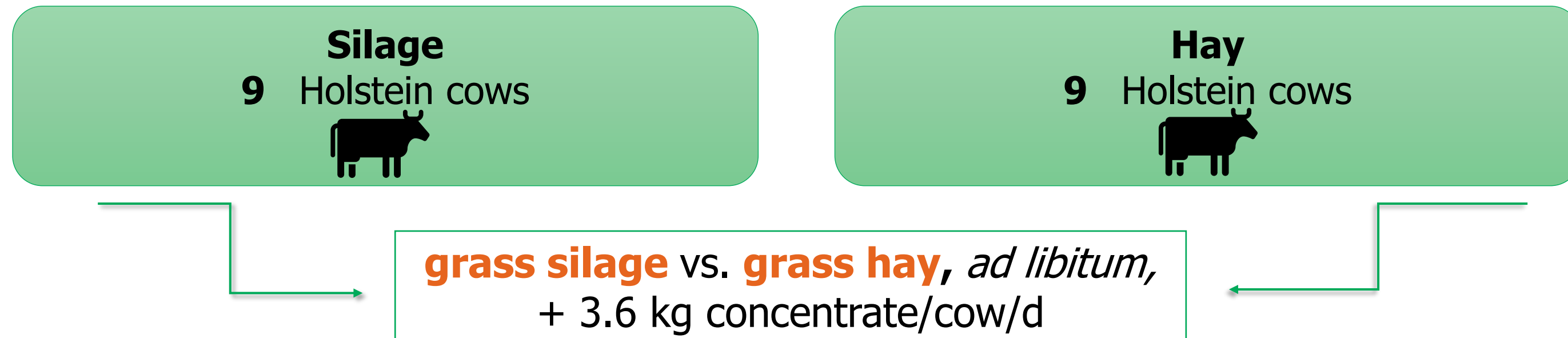
Research Question

What are the **effects of feeding hay vs. grass silage** on

1. concentration of **vitamin B** and **vitamin E**
2. **fatty acid** profile
3. **sensory properties**

of raw milk from cows?

Animals, Material and Methods



Nutrient and energy content:

Item (DM basis, unless stated otherwise)	Silage	Hay	Concentrate
DM (g/kg FM)	381	925	911
CP (g)	136	117	290
NDF (g)	521	524	215
WSC (g)	23.1	177	160
NEL (MJ)	5.45	5.53	7.62

- Ø DMI (18.8 kg), MY (26.7 kg), DIM (101 d), Parity (3.1), BW (645 kg)

Samling and Analyses

- 5 wks experimental feeding (incl. 2 wks adaptation)
- Milk samples on d 16, 26 and 34
 - Individual composite sample from 2 consecutive milkings for chemical analysis
 - Pooled samples (groupwise) for quantitative descriptive sensory analysis
 - 10 repetitions per date // 10 panelists
- Vitamin B1, B2, B6, B12 → UHPLC (Schmidt et al., 2019); Vitamin E → HPLC
- FA profile → GC (Paredes et al., 2018)

Statistical model (SAS 9.4)

Vitamins

- Proc glm
- Fixed effect: treatment
- Covariable: milk yield

Fatty acid profile

- Proc glm
- Fixed effect: treatment

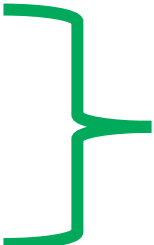
Sensory properties

- T-test
- Fixed effect: treatment

Results (I)

Content of B vitamins and vitamin E in raw milk (per L)

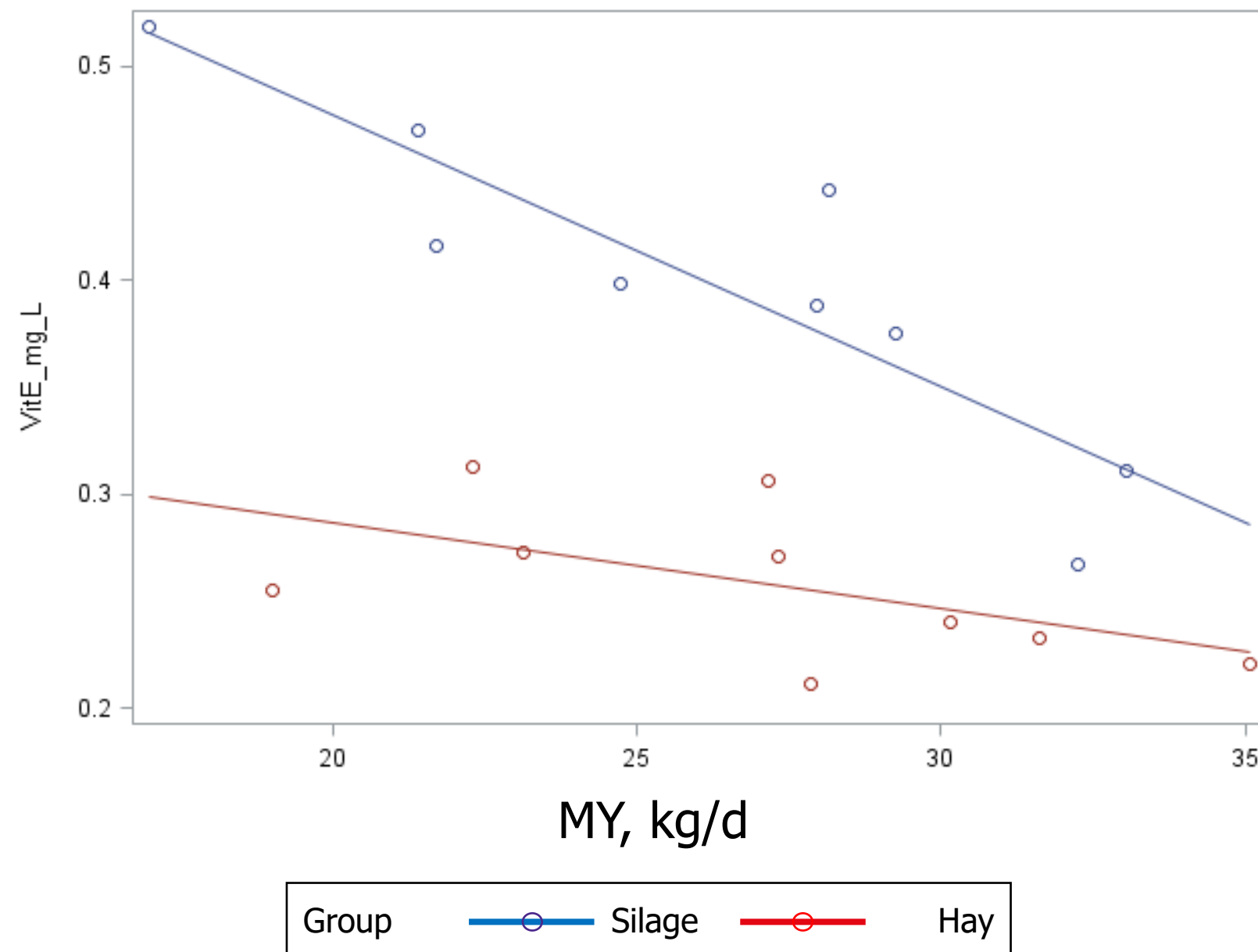
Vitamin	Silage	Hay	P-values		
			Treatment (T)	Milk Yield (MY)	T x MY
B1 (mg)	0.14	0.14	0.58	0.12	>0.10
B2 (mg)	1.08	1.05	0.65	0.096	>0.10
B6 (mg)	0.85	0.83	0.76	0.56	>0.10
B12 (µg)	3.83	2.49	0.01	0.21	<0.01
E (mg)	0.39	0.26	0.01	0.01	0.02



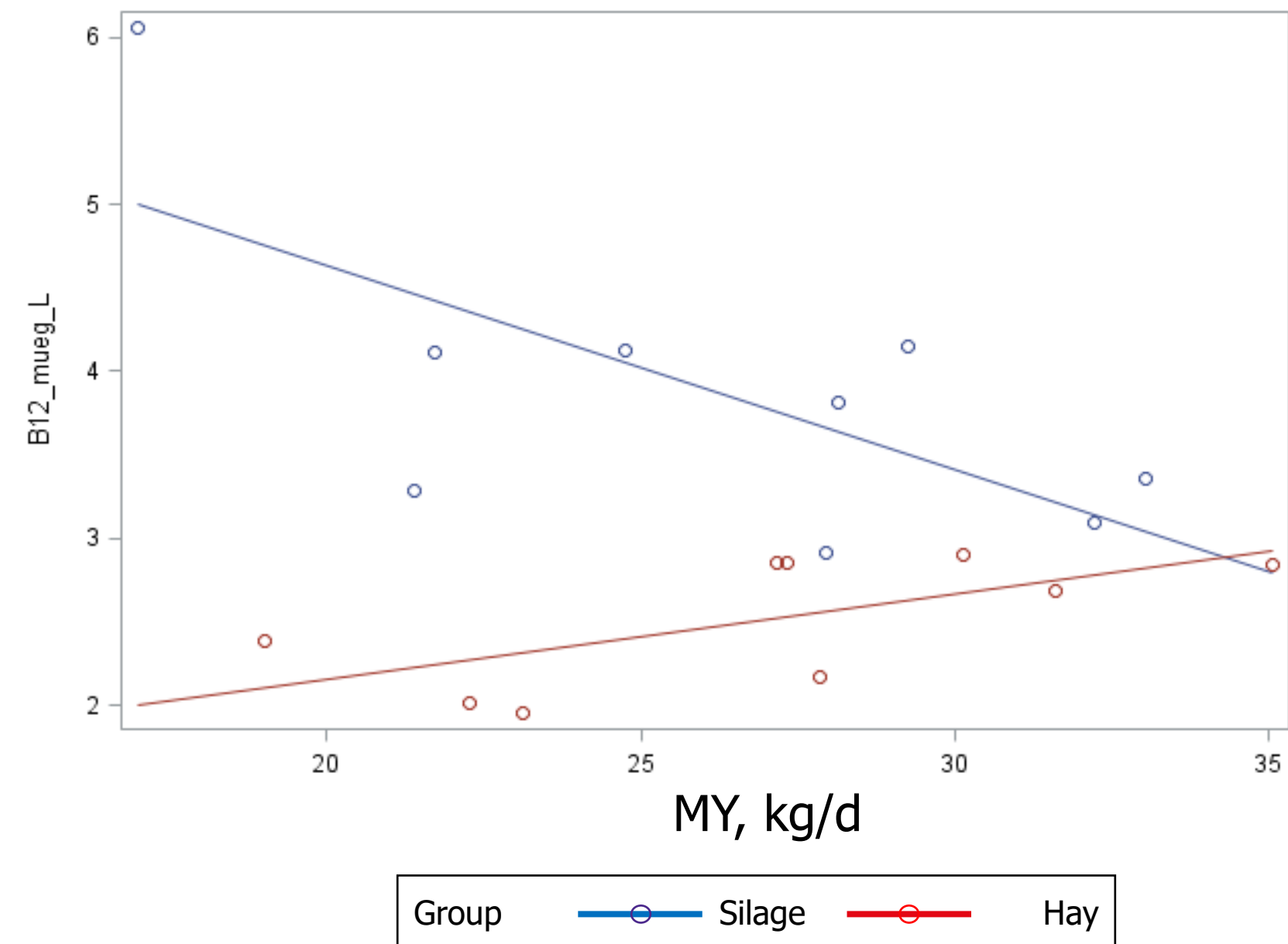
Fibrolytic bacteria

Interactions – vitamin concentration x MY

Analysis of covariance for Vit E (mg/L)

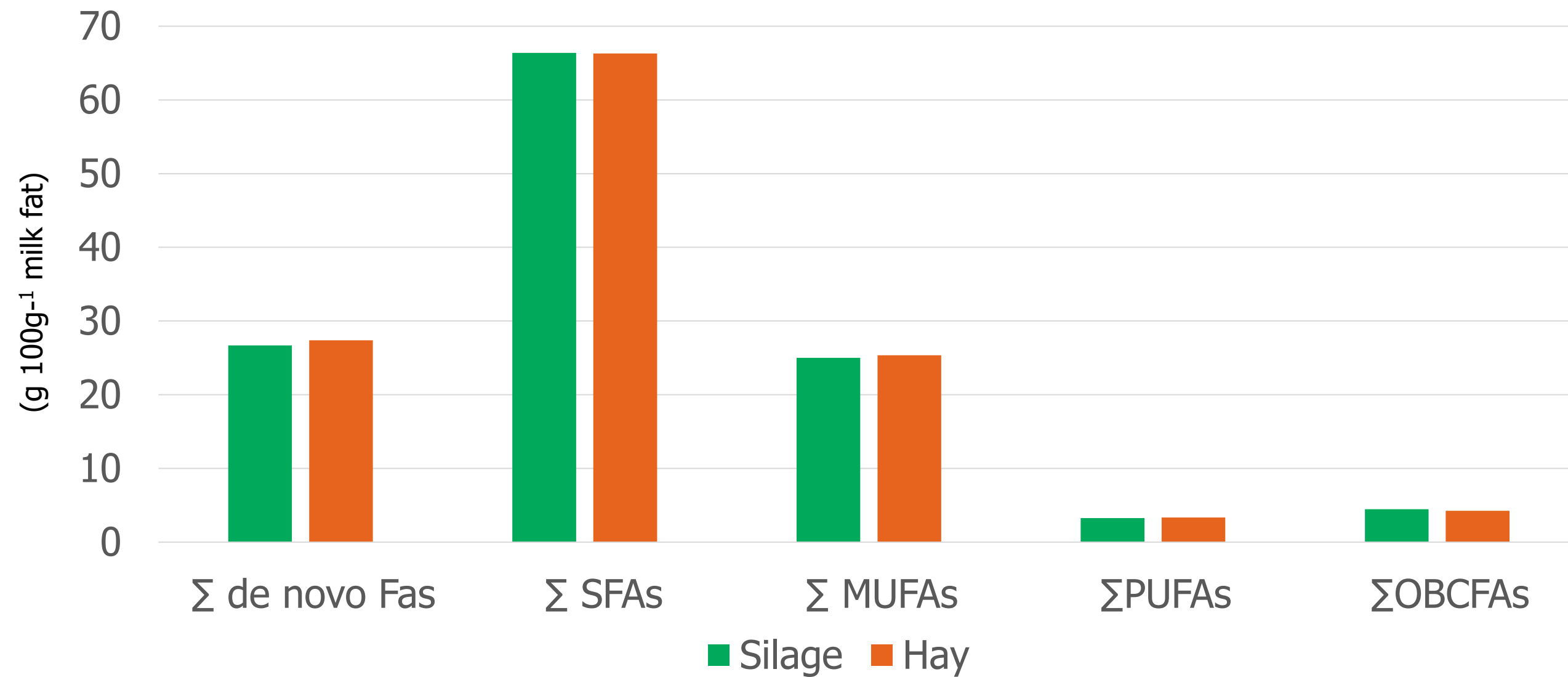


Analysis of covariance for Vit B12 (µg/L)



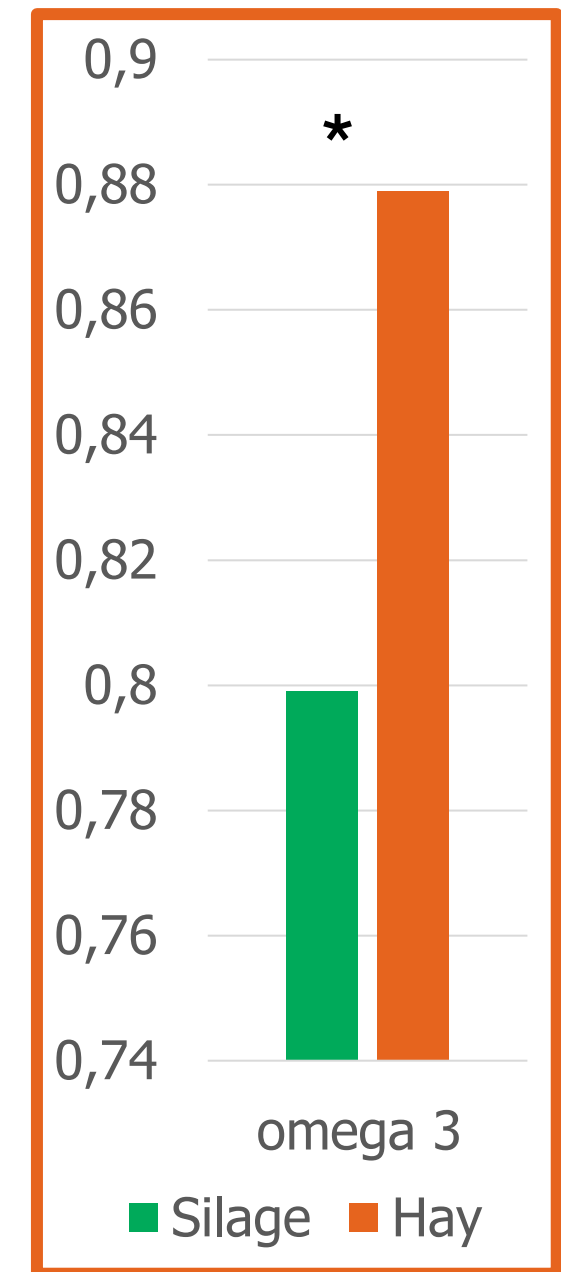
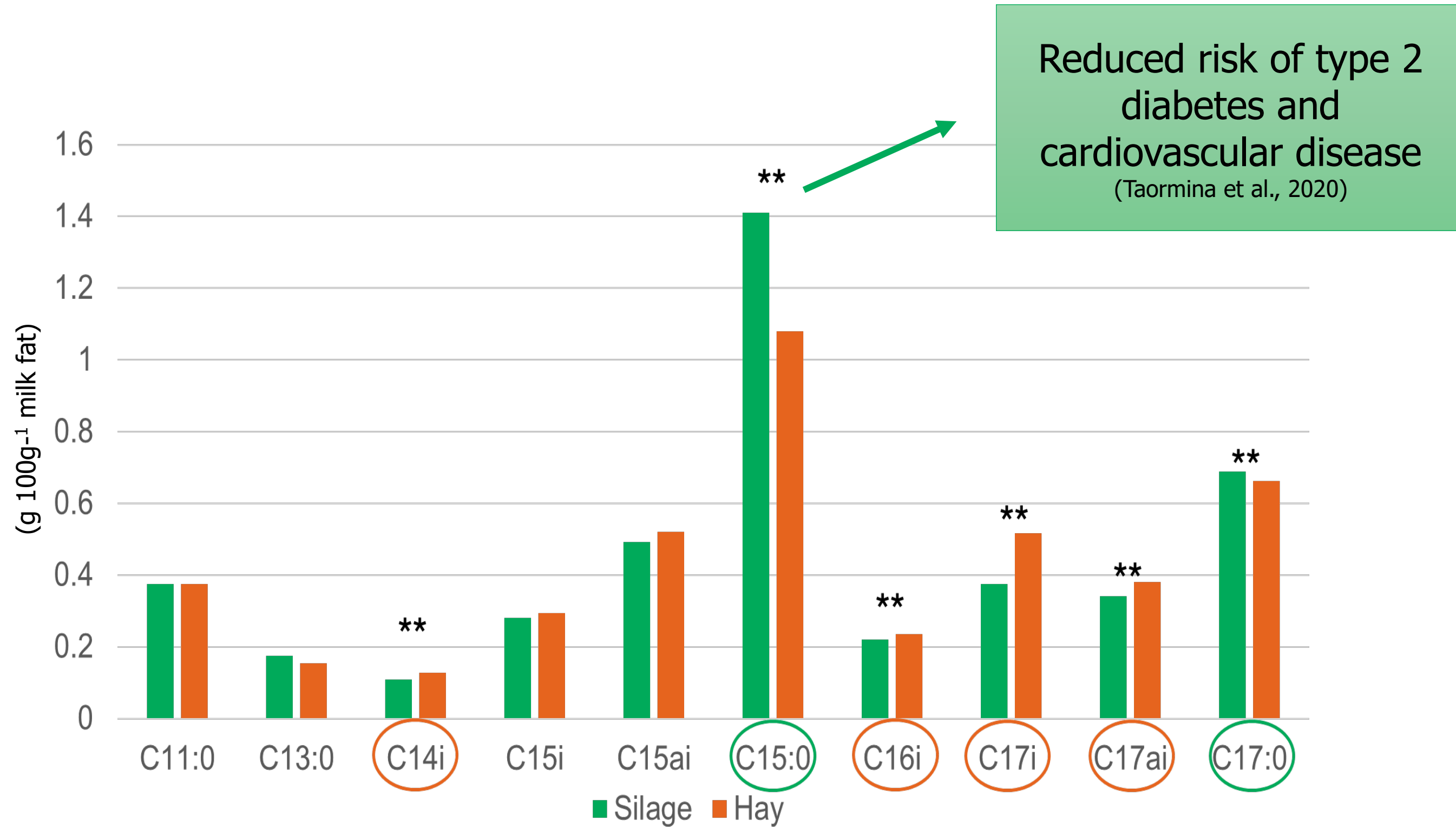
Results (II)

FA profile



Results (III)

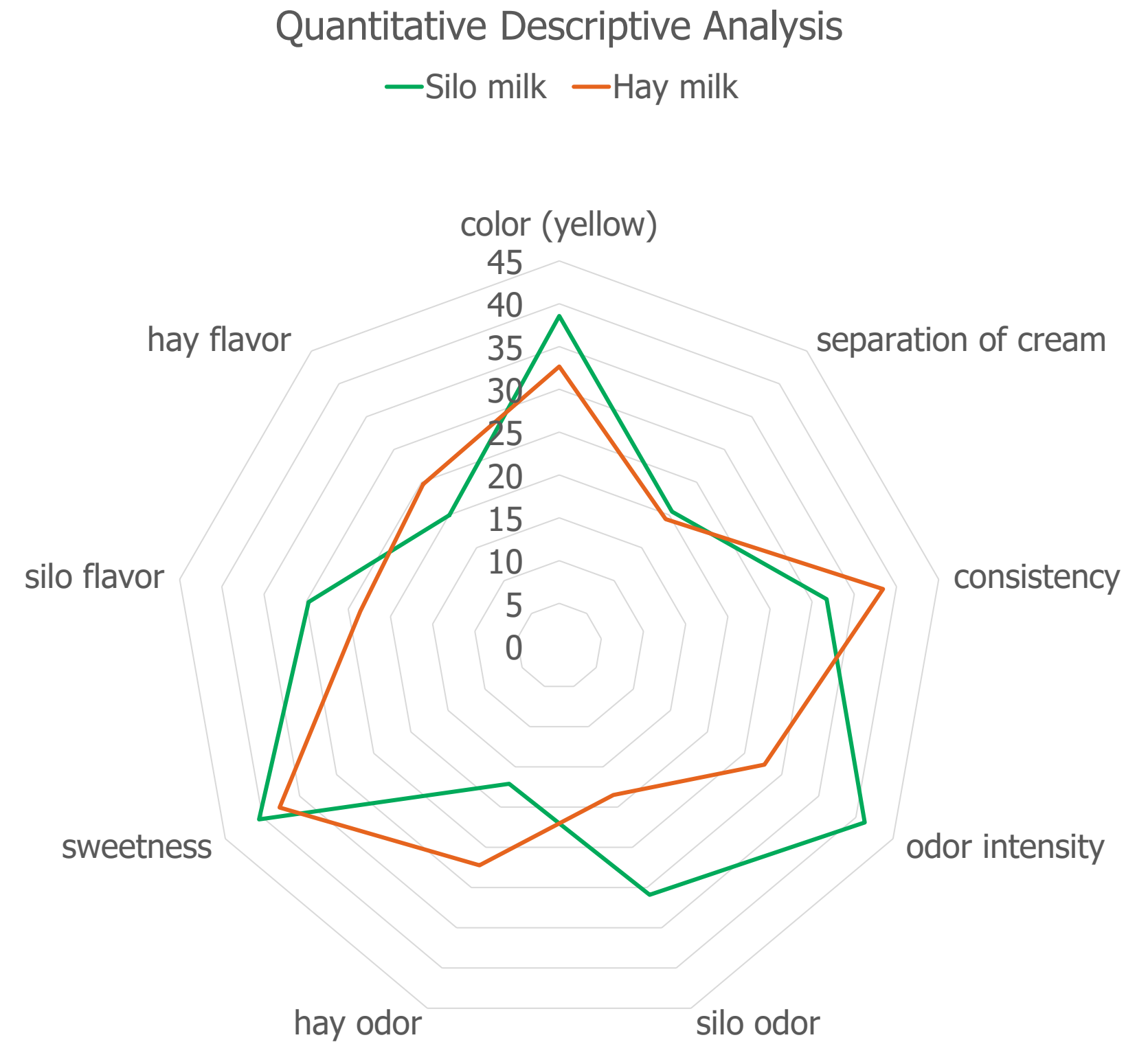
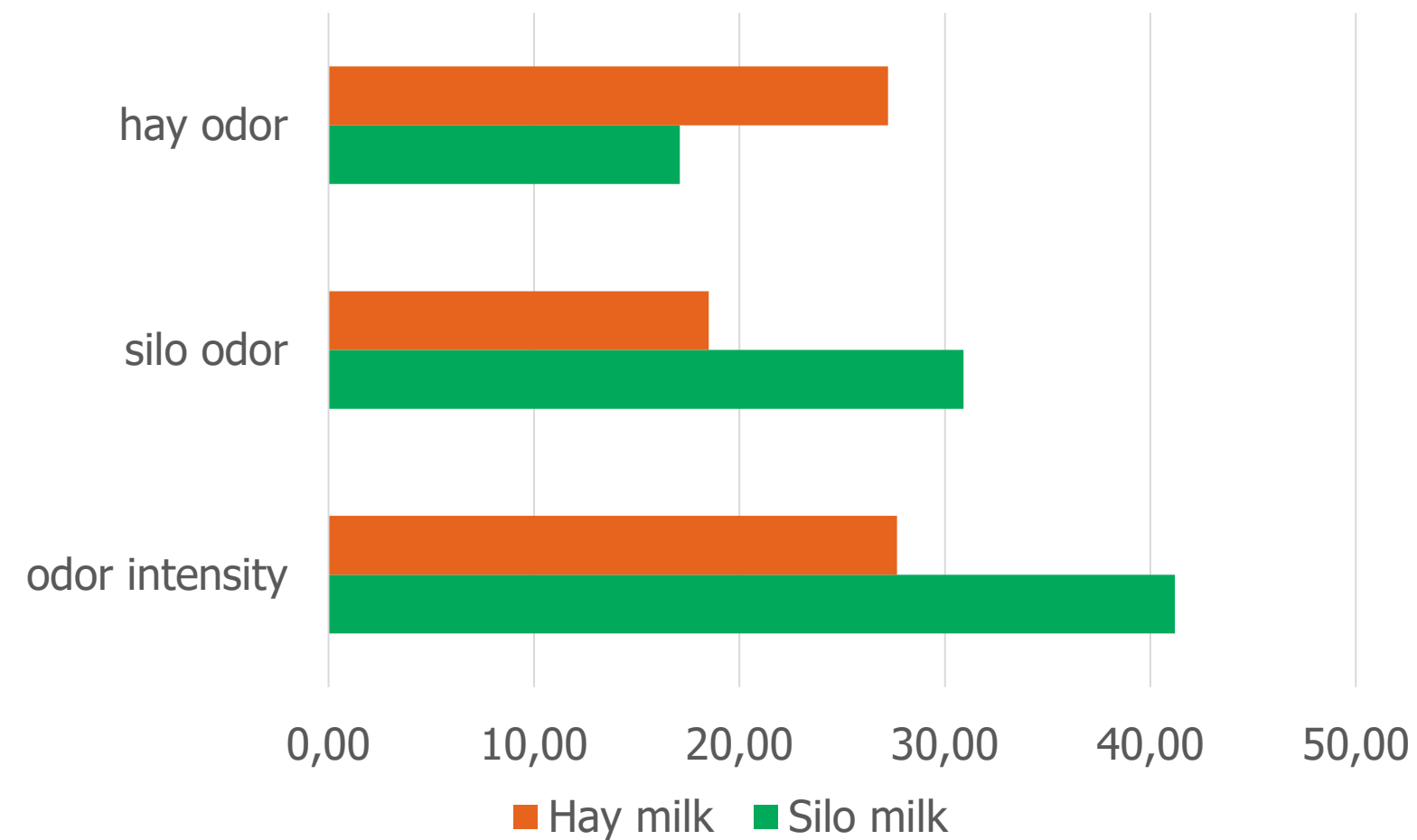
Odd- and branched-chain FAs



Results (IV)

Sensory Properties

- Panelists could discriminate silo / hay odor
- No significant differences



Conclusions

In a forage-based feeding system the **preservation method (barn-drying vs. ensiling)** **does have an effect** on nutritionally relevant substances in raw cow milk

- Higher Vit. B12 and Vit. E content in **silo milk**
- Beneficial BCFAs found in both milk types
- Sensory differences of varying intensity were detectable



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Thank you for your attention!