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► To cite this version:

Benoit Graulet, Lucie Auzance, Jennifer Ronholm, Céline Delbès, Isabelle Verdier-Metz, et al.. Impact of grass-based diet on vitamin B content in cow milk. 3rd Mountain Livestock Farming Systems Meeting of the European Federation of Animal Science, Jun 2024, Clermont-Ferrand, France. Book of Abstracts of the 3rd Mountain Livestock Farming Systems Meeting of the European Federation of Animal Science, 32, pp.38. hal-04748761

HAL Id: hal-04748761

<https://hal.science/hal-04748761v1>

Submitted on 23 Oct 2024

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Impact of grass-based diet on vitamin B content in cow milk

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Introduction

The content of B vitamins in cow milk can be altered by several factors and one of them is the diet of the cows ¹:

- Vitamin B₂ ² and B₉ ³ content in milk increase when cows have grass-based diet compared to corn-based diet
- B₅ level is improved in milk with a cow's diet richer in fodder ⁴
- B₁₂ content is increased with corn-based diet compared to grass-based diet ³

Materials and methods

40 dairy cows from Holstein and Montbéliarde breeds were split into 2 groups of 20 cows for 2 months: **AE**: pasture-based diet and **IN**: corn-based diet with limited access to pasture. For the next 2 months, each group was split again in 2 sub-groups of 10 cows differing in the amount of grass received in their diets:

AEC: Pasture-based diet; **AED**: AEC with a reduced access to pasture
INC: corn based diet with a limited access to pasture; **IND**: INC but no access to pasture

Tank milks from each 4 groups were collected before the morning meal 3 times in September and the B vitamin content was analyzed by UPLC Fluorometer for vitamin B₂ and B₆ (pyridoxin, pyridoxal, pyridoxamine) ⁵, by UPLC MS for vitamin B₅ and B₁ ⁶ and by chemiluminescence for B₉ and B₁₂ (MP Biomedicals).

Anova and t-test statistical analysis were performed on R software.

Objective of the study
 Relate the breeding practices: grass-based VS corn-based diet to the B vitamins content of cow milk

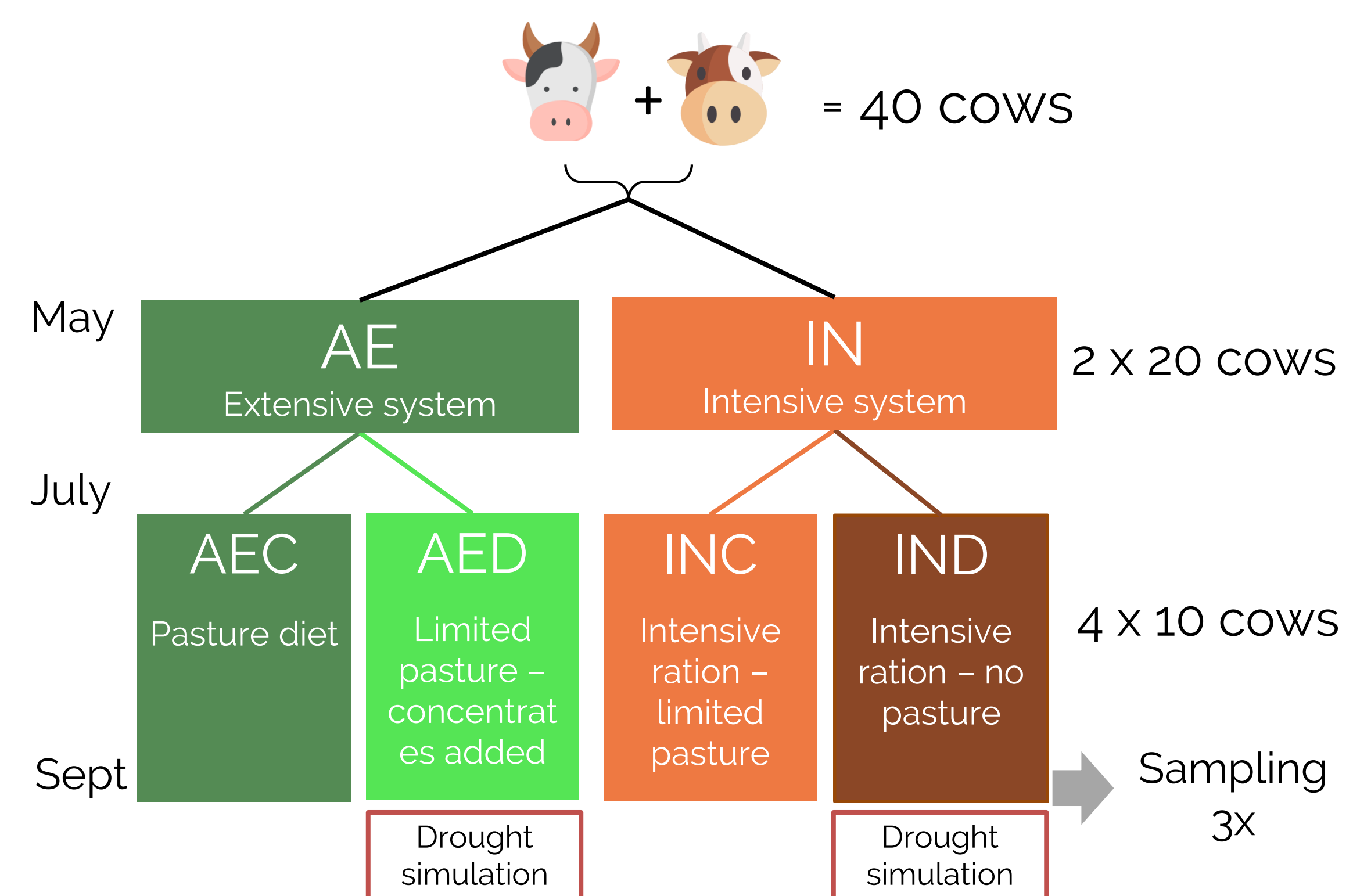


Figure 1: Experimental design of the study

Results

More B₂ and B₉ with grass-based diets

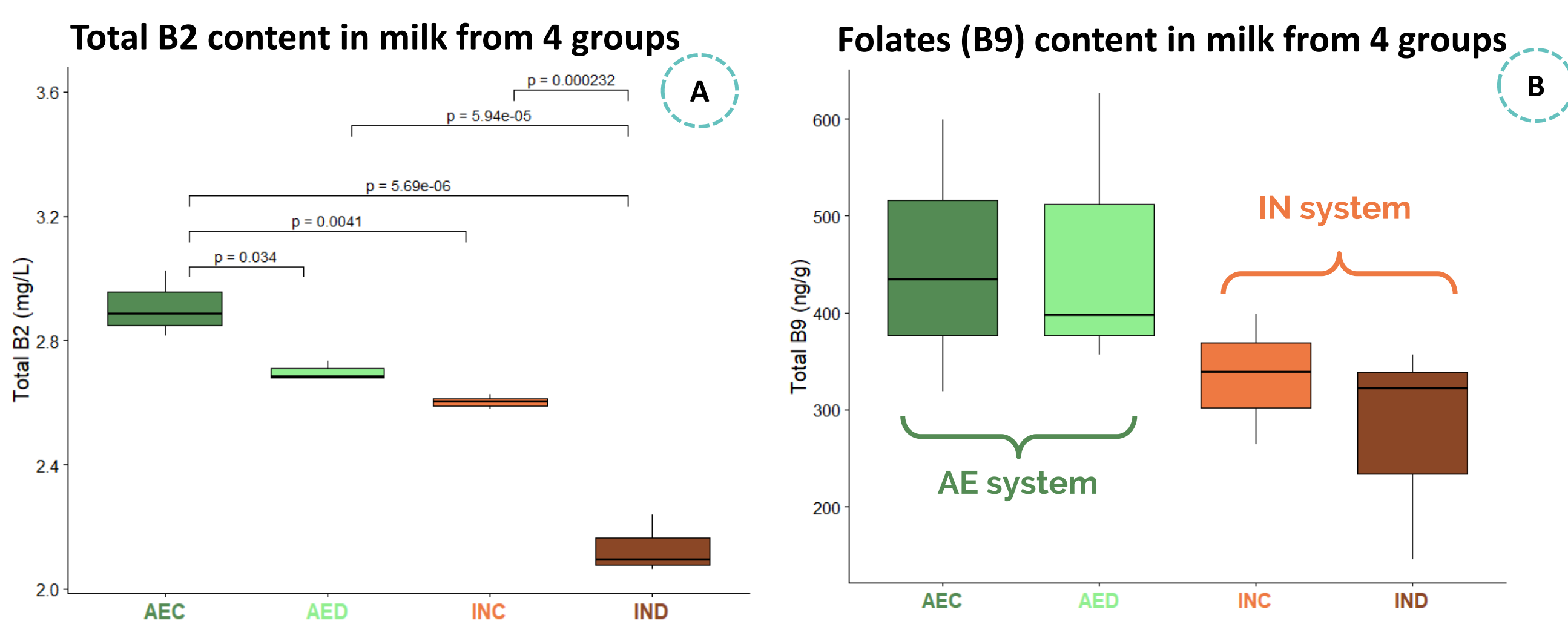


Figure 2: Effect of diet on the total vitamin B₂ (p < 0.05) (A) and B₉ (p = 0.06) (B) content of milk from the 4 groups of the study.

Milk was richer in total vitamin B₂ with more grass in the diet (p < 0.05) when comparing the 2 systems **AE** and **IN** (p < 0.01) (A).

- + **36.7%** B₂ in **AEC** compared to **IND**
- With a little access to pasture, **INC** milk was richer by + **22%** from **IND**.
- The drought simulation of **AED** decreased the content of milk by **-7%** compared to the diet with grass only **AEC**.

No significant results show the effect of the diet on vitamin B₉, but **trends** are visible (p = 0.06). The milk from AgroEcological system (**AE**) seems to be richer in B₉ compared to the Intensive system (**IN**) (B).

B₆ follow the same trend pattern: Pyridoxal (B₆) content of milks show the same trend as B₉ (p = 0.1). B₂ and pyridoxamine (B₆) are correlated (p < 0.01) at r = 0.95, for raw and dry matter datas.

B₁ and B₁₂ trends show optimum with corn-based diet and access to pasture

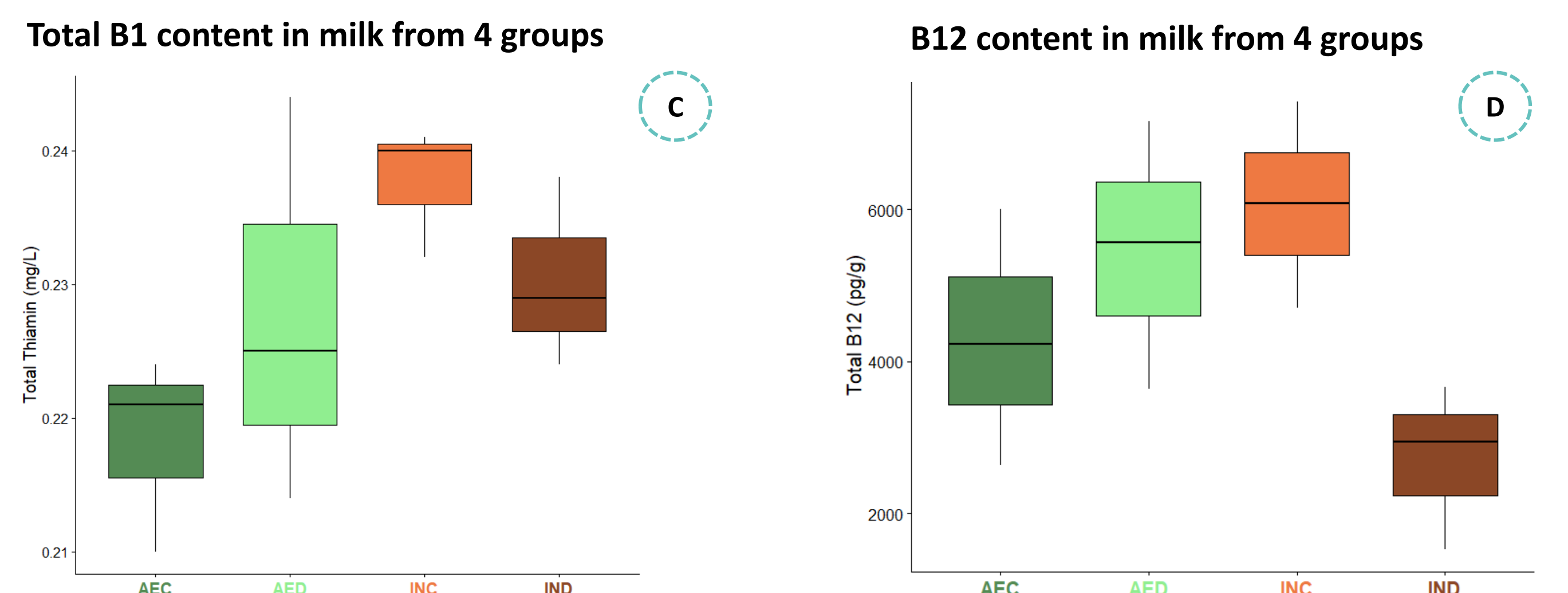


Figure 3: Effect of diet on vitamin B₁ (Thiamin) (p = 0.2) (C) and B₁₂ (p = 0.1) (D) content of milk from the 4 groups of the study.

Trends (p > 0.1) in vitamins B₁ (C) and B₁₂ (D) show that the content of the 2 vitamins seems to be higher in the milk of cows fed corn silage and having access to pasture for a small time of the day (**INC**). The **lowest content** was found in the grass-based diet (**AEC**) for **B₁**, whereas it was in corn-based diet (**IND**) for **B₁₂**.

More B₅ with corn-based diets

Diets have an impact on the vitamin B₅ content in milk (p < 0.001) (E):

- The **higher content** was found in **IND** milk, richer by + **27%** compared to **AEC** (p < 0.05)
- **Drought simulation increase** the vitamin B₅ content in milk (p < 0.01)
- An **effect of the system** is also observed with a **higher content** in milks from **IN** systems (corn-based diets) compared to **AE** systems (p < 0.01)

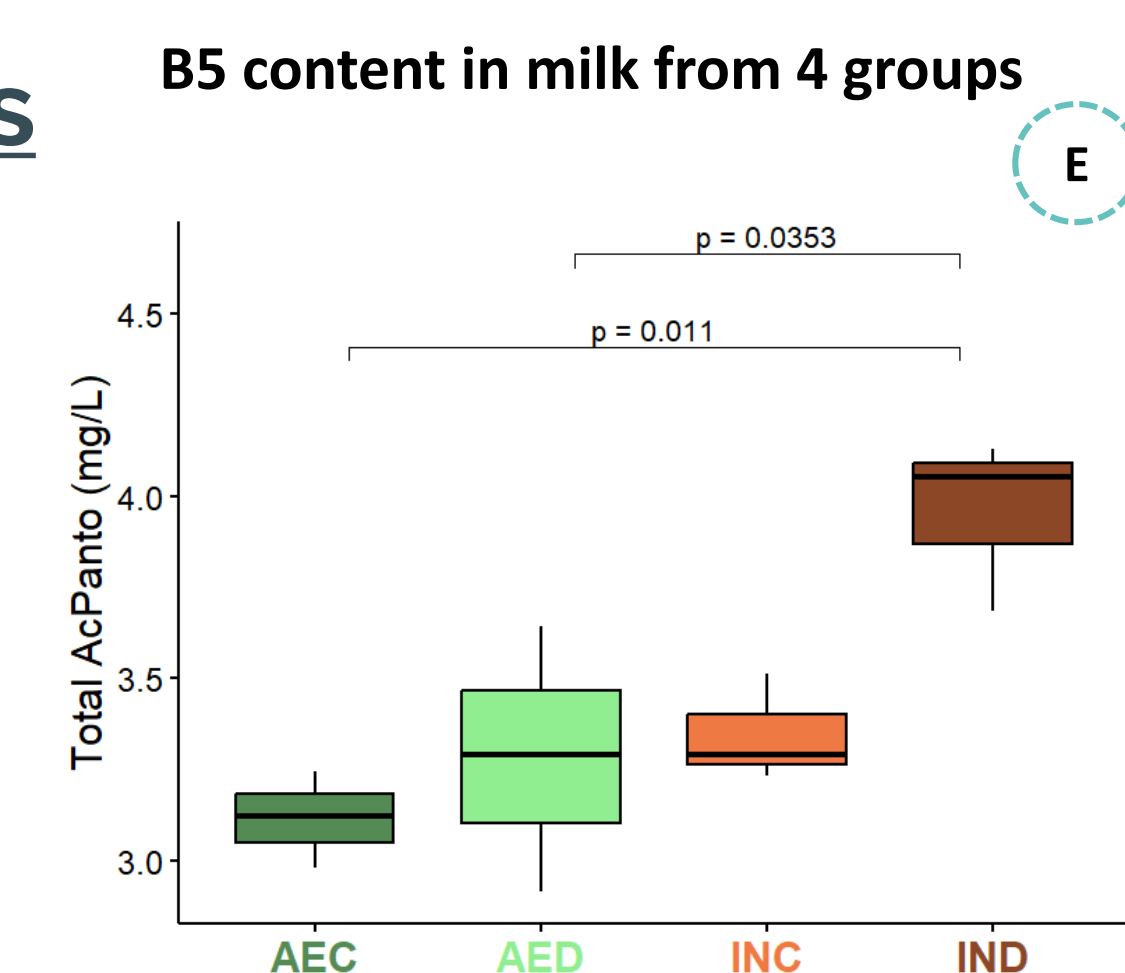


Figure 4: Effect of diet on vitamin B₅ (Pantothenic acid) (p < 0.05) (E) content of milk from the 4 groups of the study.

Discussion

Breeding practices seem to have an impact on the vitamin B content of cow milk and are in line with those found in the literature for B₂ and B₉ ^{2,3}:

- Pastoral systems would have milks richer in vitamin B₂ and B₉ (that could be partially explained by a concentration effect due to lower milk yield) but poorer in vitamin B₁, B₅ and B₁₂,
- Simulation of drought periods tends to decrease B₂ (B₁ and B₁₂ in intensive systems only) but to increase B₅ content.

➤ *Further studies on the vitamin B content of yogurts and cheeses produced from these milk will follow (Auzance et al. at EAAP, Florence, Italy, 2024).*

References:

1. GRAULET et GIRARD, Academic Press, 2017.
2. LAVERROUX et al., Joint Meeting of FAO-CIHEAM Mountain Pastures and Mediterranean Forages Resources Networks and Mountain Cheese Network, 2014
3. CHASSAING et al., Dairy Production in Mountain: farming systems, milk and cheese quality, 2011
4. RAGALLER et al., Journal of animal physiology and animal nutrition, 2011
5. LAVERROUX et al., Food chemistry, 2021
6. AUZANCE et al., 2024 (non published)

Acknowledgment

This work was performed thanks to the program "Investissement d'Avenir" (16-IDEX-0001 CAP 20-25) funded by the Agence Nationale de la Recherche of the French government, through doctoral grant of L. Auzance (Wow! Program) and the Region Auvergne-Rhône-Alpes through Pack Ambition Recherche Internationale 2023.

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