

The effect of an essential oil blend on performance, feed efficiency, methane emission and rumen microbiome in lactating dairy cows

C. F. BØRSTING, S. J. NOEL, S. LASHKARI AND A. L. F. HELLWING.

Dep. Animal and Veterinary Sciences, Aarhus University, Blichers Allé 20, DK-8830 Tjele



ORGANIC COWS

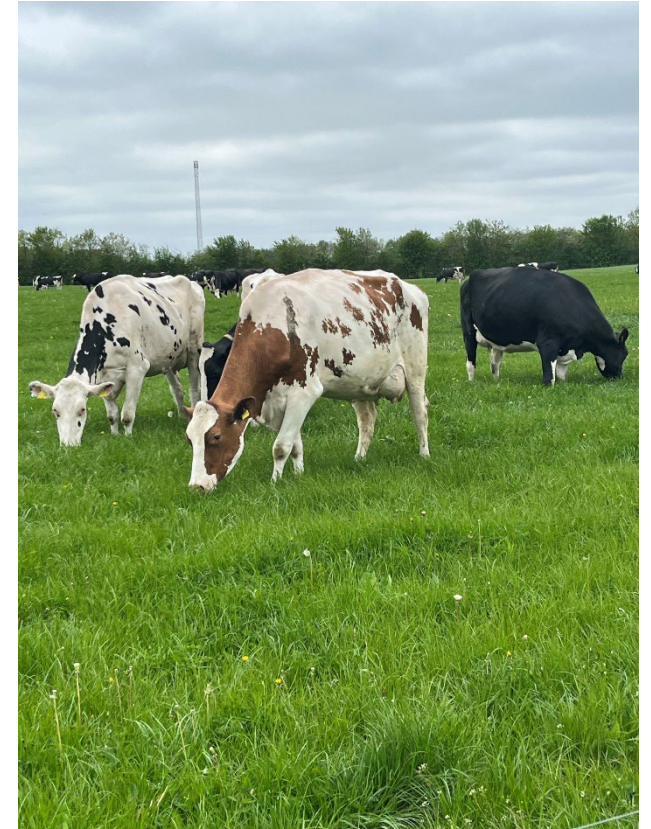
CAN METHANE EMISSION BE REDUCED?

Restrictions in ration composition, feedstuffs and additives

- At least 60% forage
- No chemical additives allowed
- GMO modified crops are forbidden



- Organic dairy farmers have less options for reducing CH_4 compared conventional farmers
- But essential oils are allowed

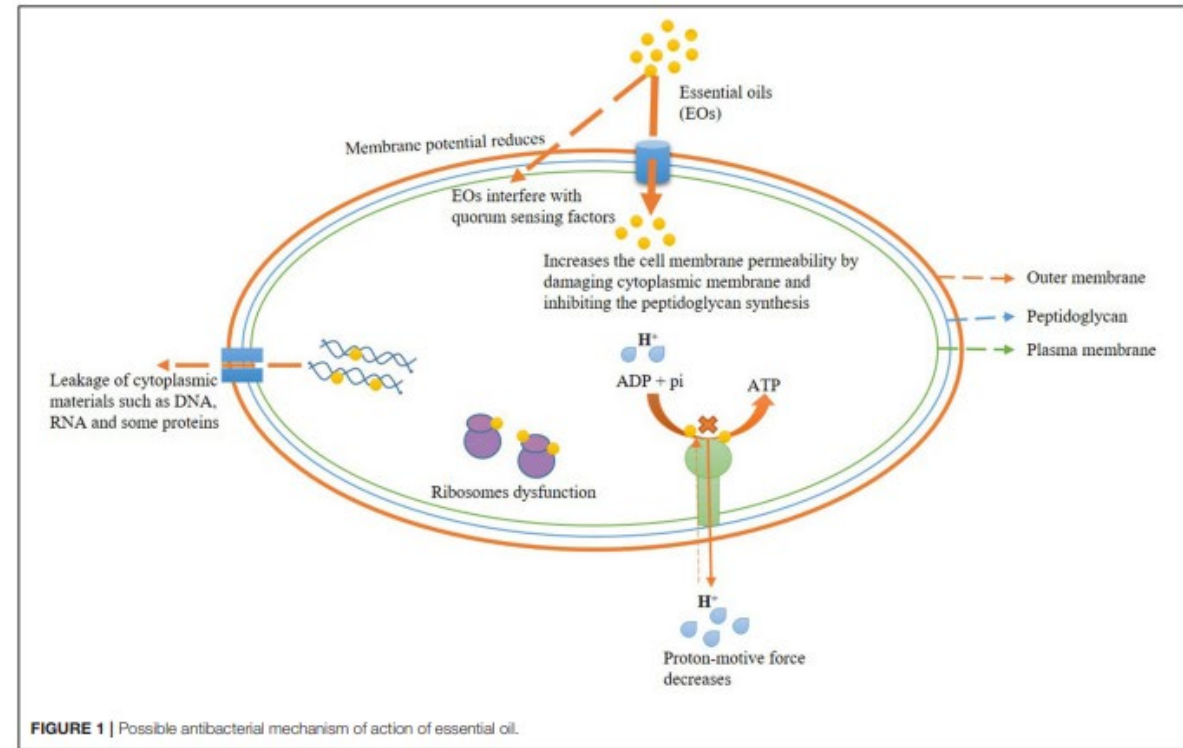


ESSENTIAL OILS

Essential oils affects microbes in different ways.

The company Agolin SA provided a feed additive containing **20% of essential oils** with the main active components:

- Eugenol from clove oil extracts 20%
- Linalool from basil 25%
- Synthetically produced geraniol 20%



Maurya et al. 2021 Frontiers in sustainable Food Systems

AIM AND HYPOTHESIS

Aim:

The aim of the study was to test the effect of the blend of essential oils delivered by Agolin SA on methane emission, milk production and feed efficiency, as well as the impact on rumen parameters.

Hypothesis:

- The blend of essential oils would reduce methane emission.
- The blend of essential oils would give a higher feed efficiency.
- The blend of essential oils would not have adverse effects on rumen parameters.

EXPERIMENTAL SETUP

- Two treatments
 - **CON:** Control
 - **EO:** Control + approximately **1 g/cow/day** of the additive with a blend of essential oils from Agolin SA
 - Equivalent to **0.044 g (= 44 mg) additive/kg DM**
 - Equivalent to **0.0088 g (=8.8 mg) essential oils/kg DM**
- Continuous experiment with a duration of 10 weeks
 - Data from the last 6 weeks included in the statistical analysis
- 36 Holstein cows
 - 18 primiparous and 18 multiparous cows
 - Cows were divided into 3 separate pens with one Greenfeeder per pen

DATA REGISTRATION



Feed intake

- Incentec feed bins – one bin per cow.



Milk yield and composition

- Milk parlour
- Once a week milk samples



Methane measurements

- Greenfeeders (GF) – 12 cows per unit



Rumen sample

- Flora oral scope

DIETARY COMPOSITION (G/KG DM)

	CON	EO
Maize silage	61	61
Grass-clover silage, 1 st cut	572	572
Sugar beet pulp	69	69
Rape seed meal	82	82
Rape seed cake	82	82
Spring barley, rolled	123	123
Sodium Chloride	3	3
Premix with limestone and minerals	9	
Premix with limestone, minerals and blend of essential oils from Agolin SA		9

CHEMICAL COMPOSITION ANALYZED (G/KG DM)

	CON	EO
Ash	75	76
Crude protein	153	156
Fat	39	38
NDF	310	306
Gross energy, MJ/kg DM	18.0	18.0

44 mg/kg DM additive from Agolin SA

Primiparous 0.82 g additive/day and multiparous 1.03 g additive/day

STATISTICAL MODEL

Data averaged by week.

Data from the last six weeks analysed in PROC MIXED SAS as repeated measurements.

Fixed effects:

- Treatment, Parity, Week, Treatment * Parity, Treatment * Week and Parity * Week

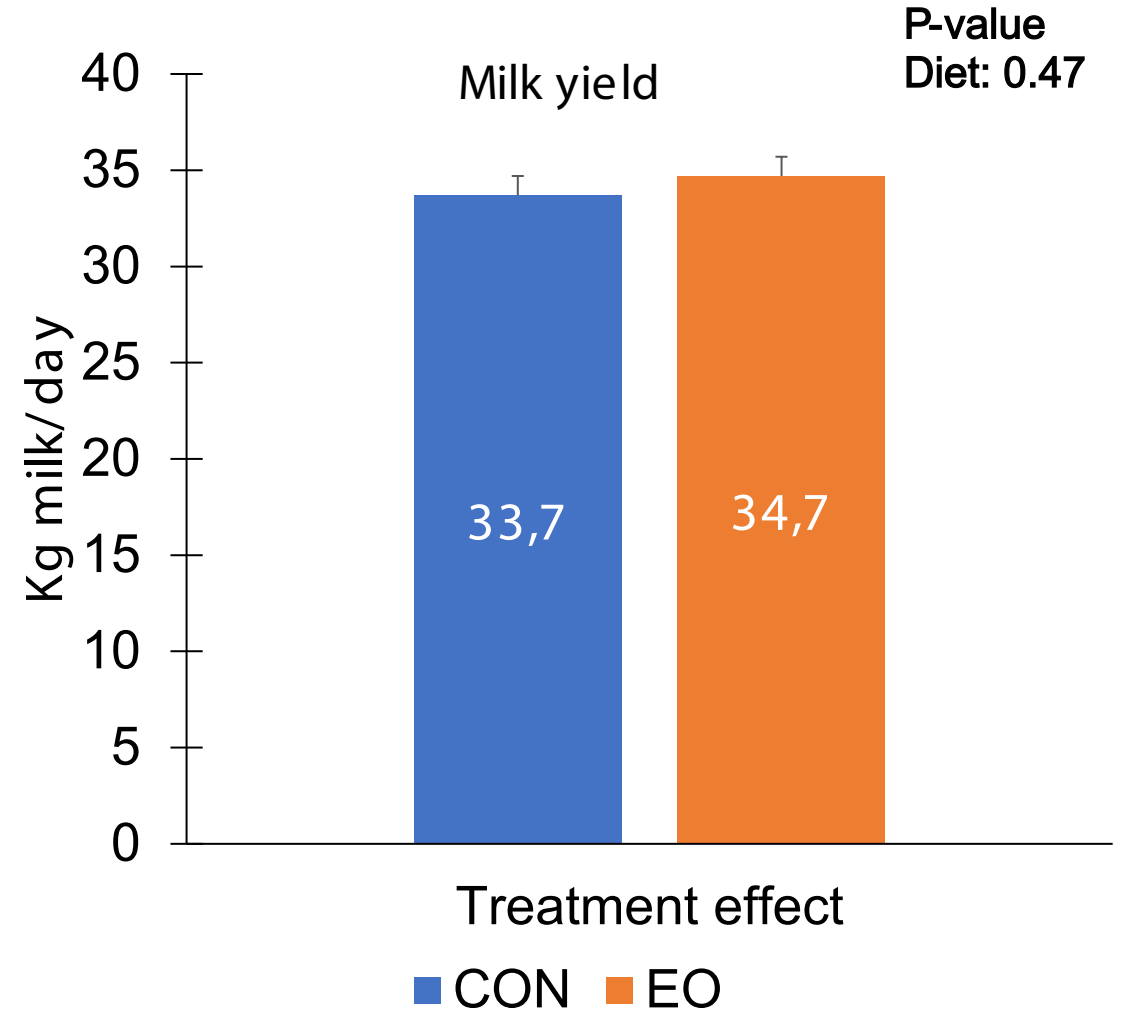
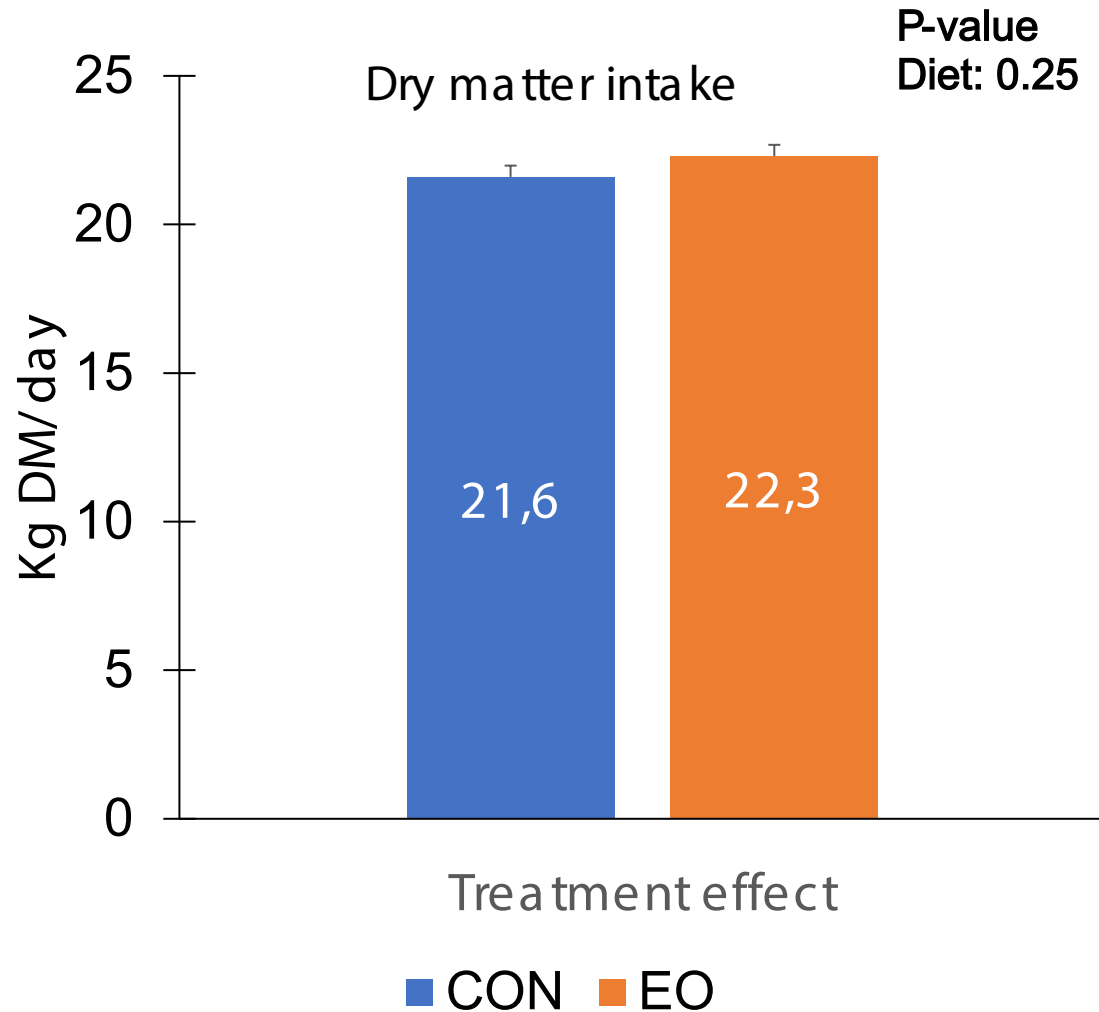
Random effects:

- Pen

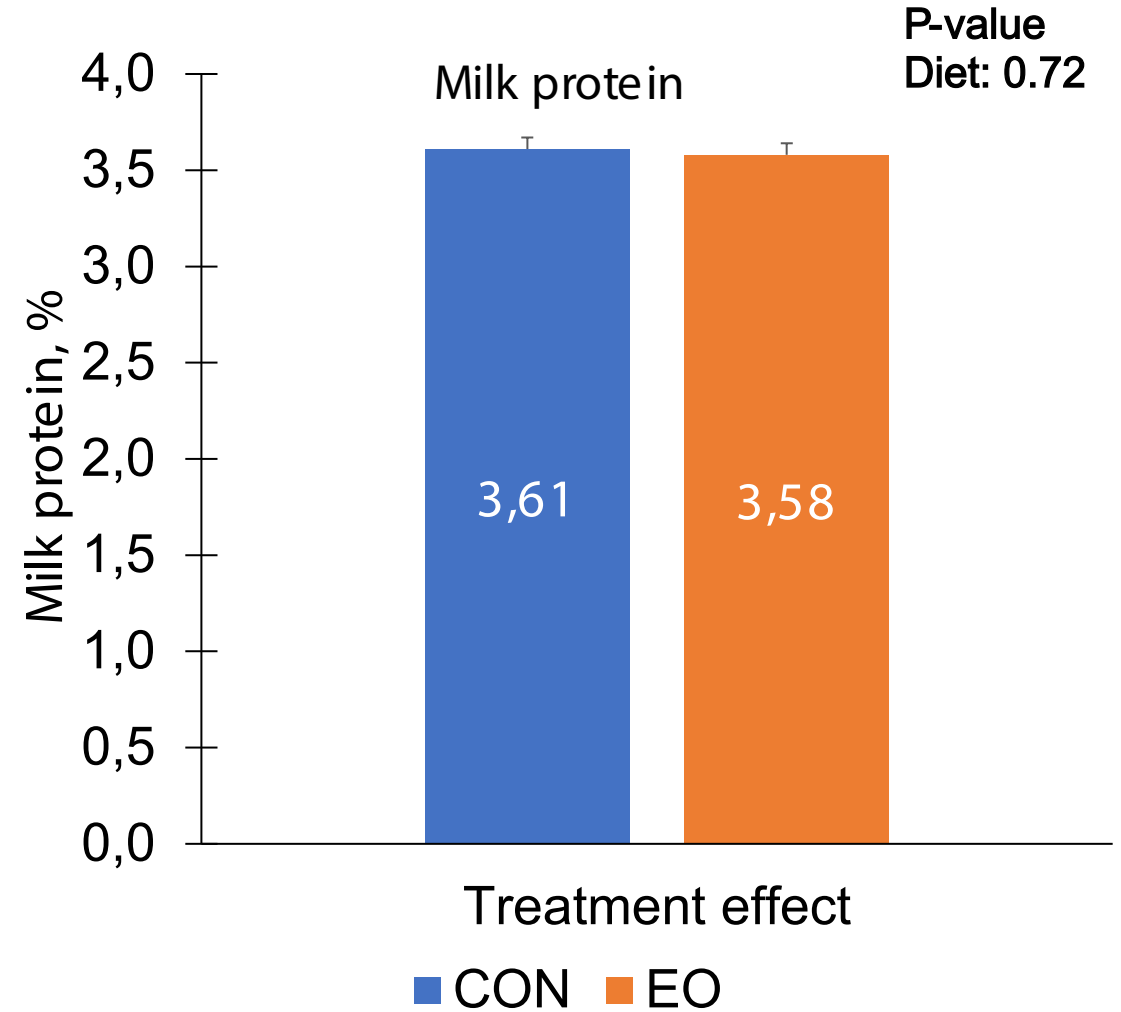
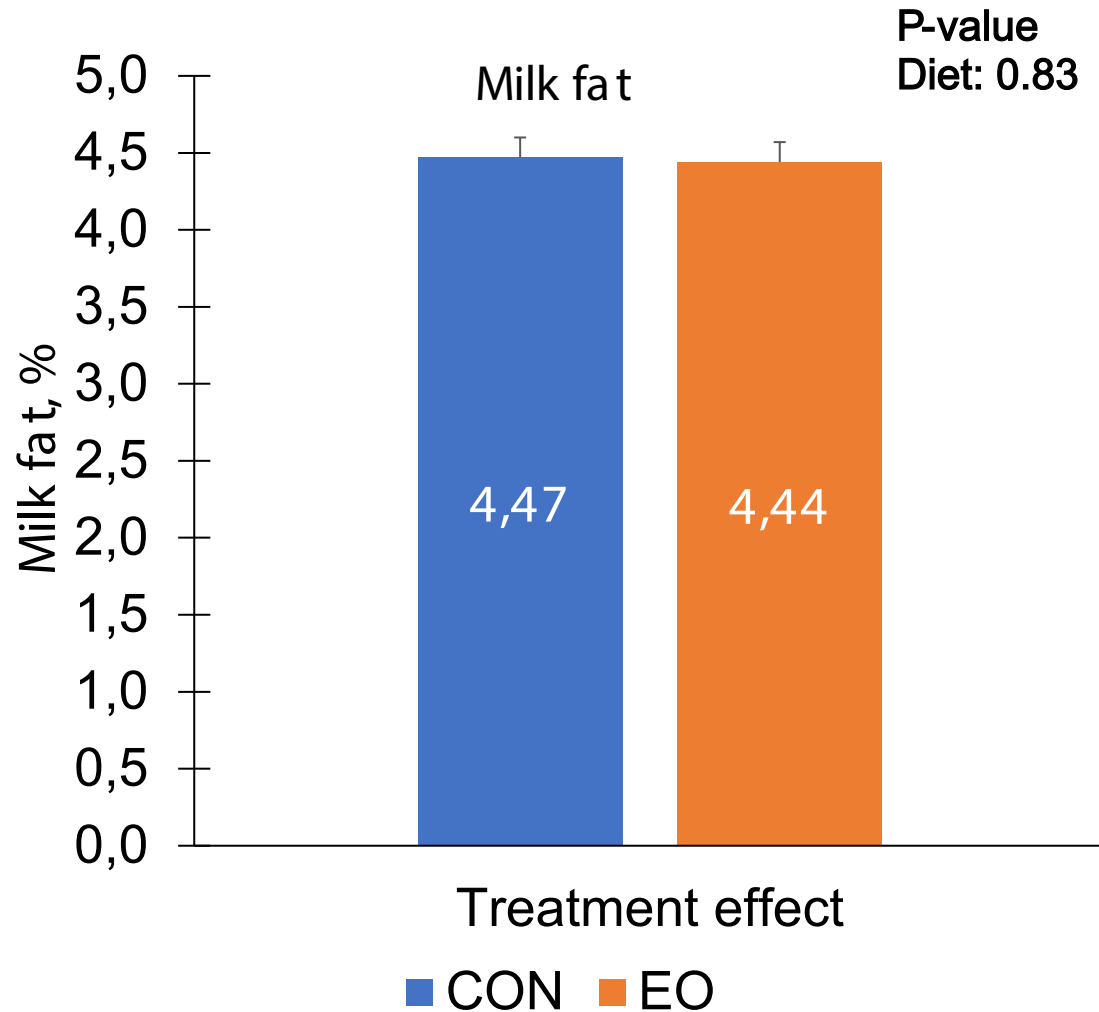
Repeated measures:

- Week was repeated within cow.
- AR(1) was used as covariance structure.

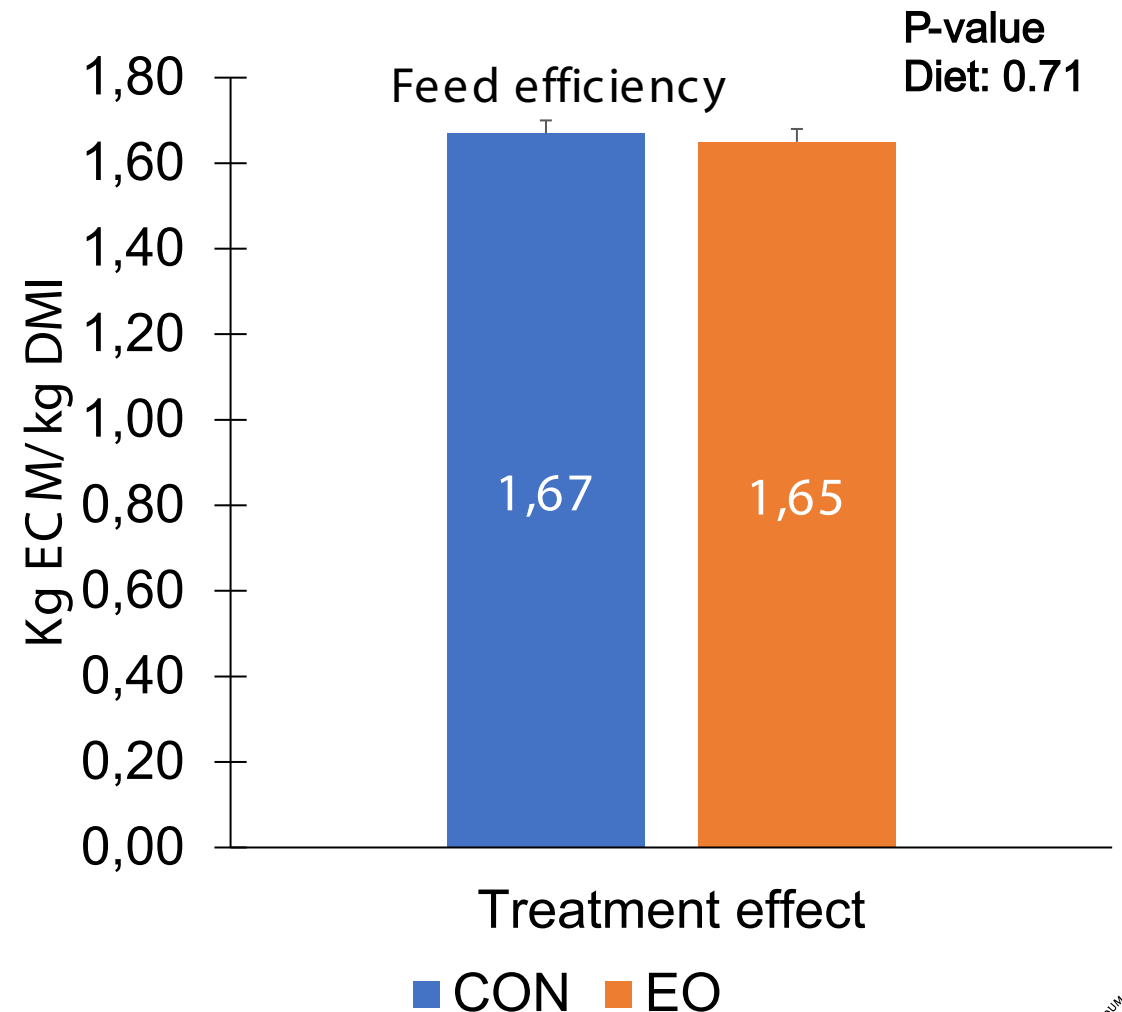
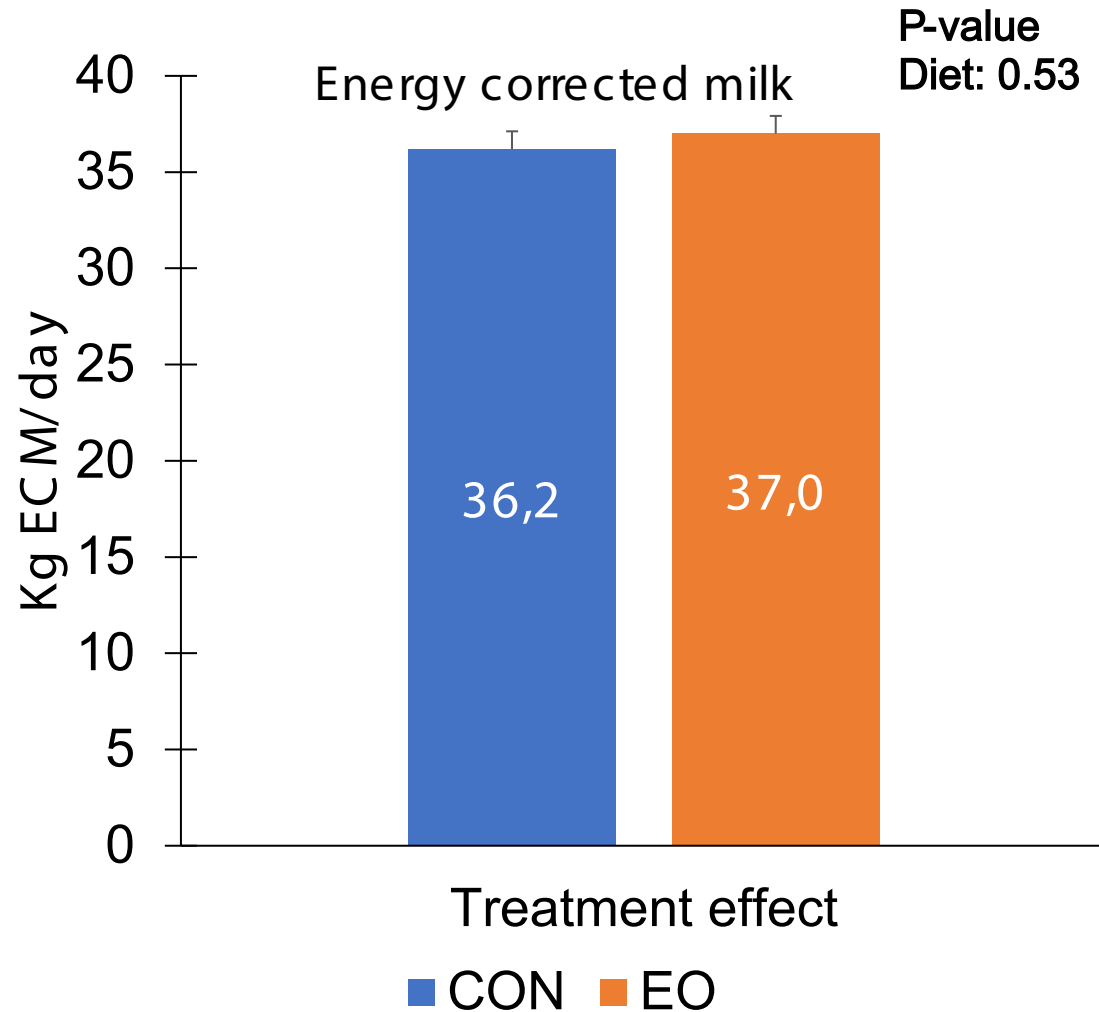
DRY MATTER INTAKE AND MILK YIELD



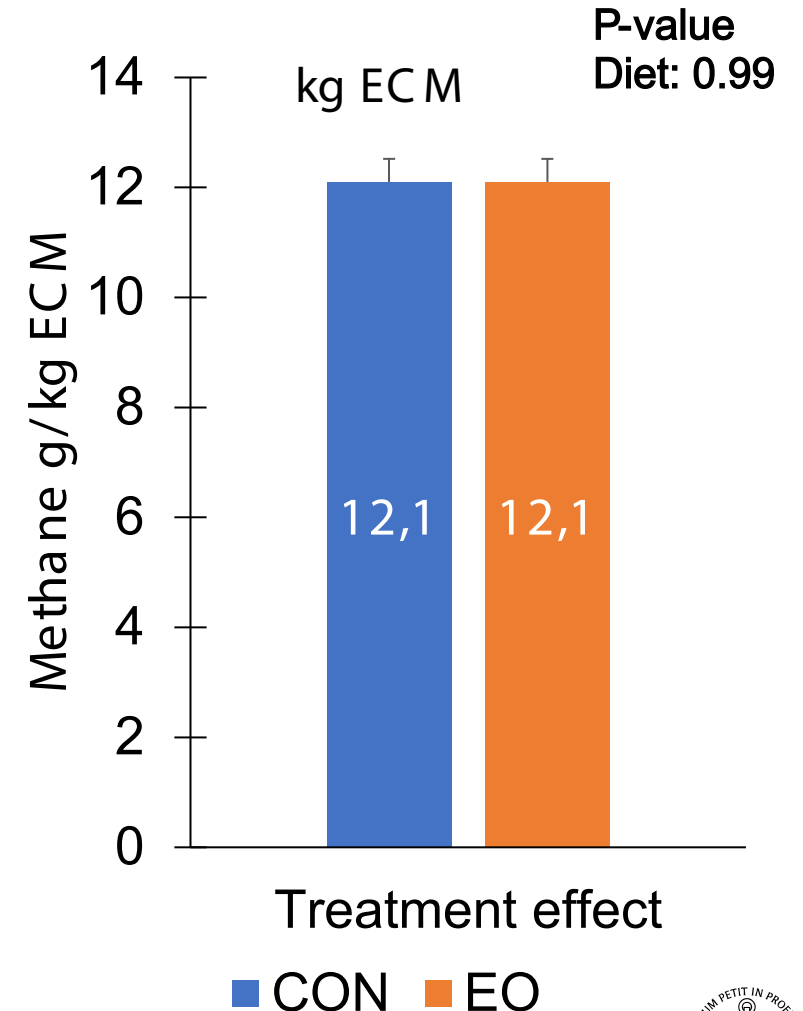
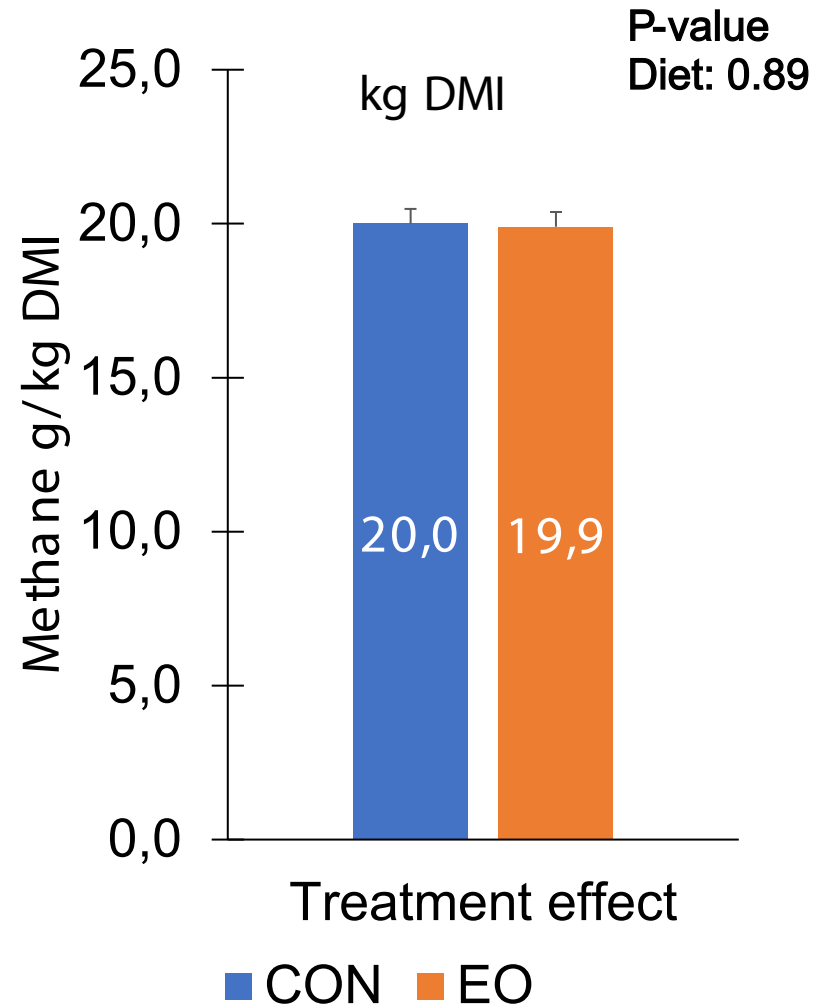
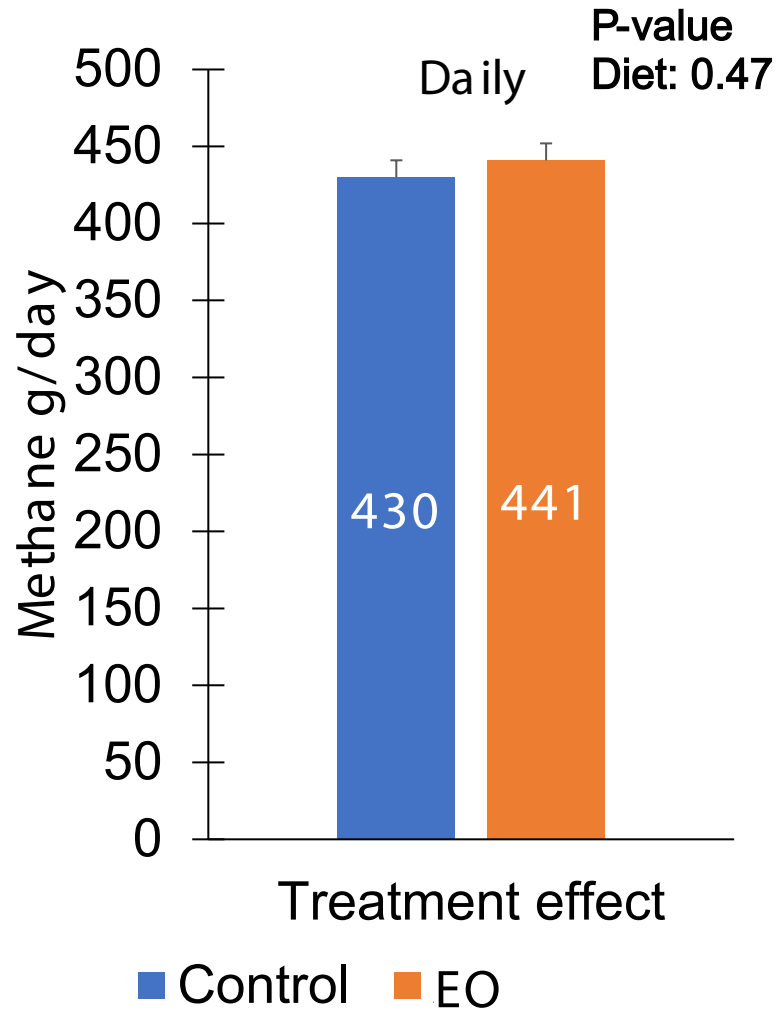
MILKFAT AND PROTEIN CONCENTRATION



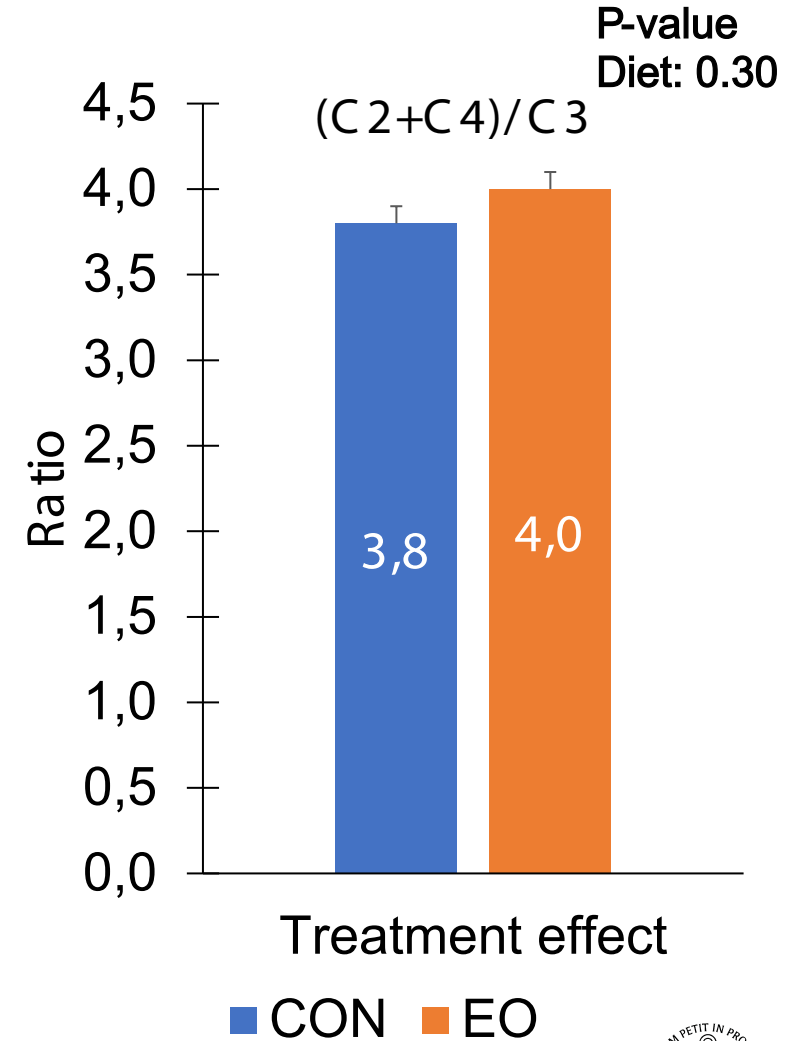
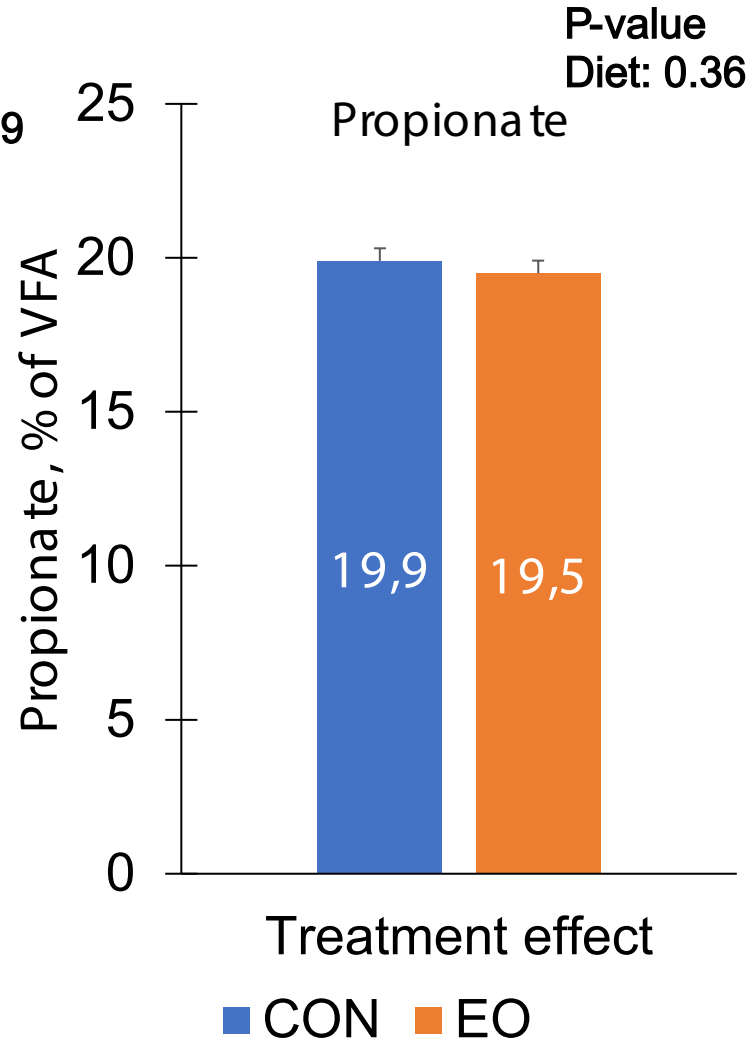
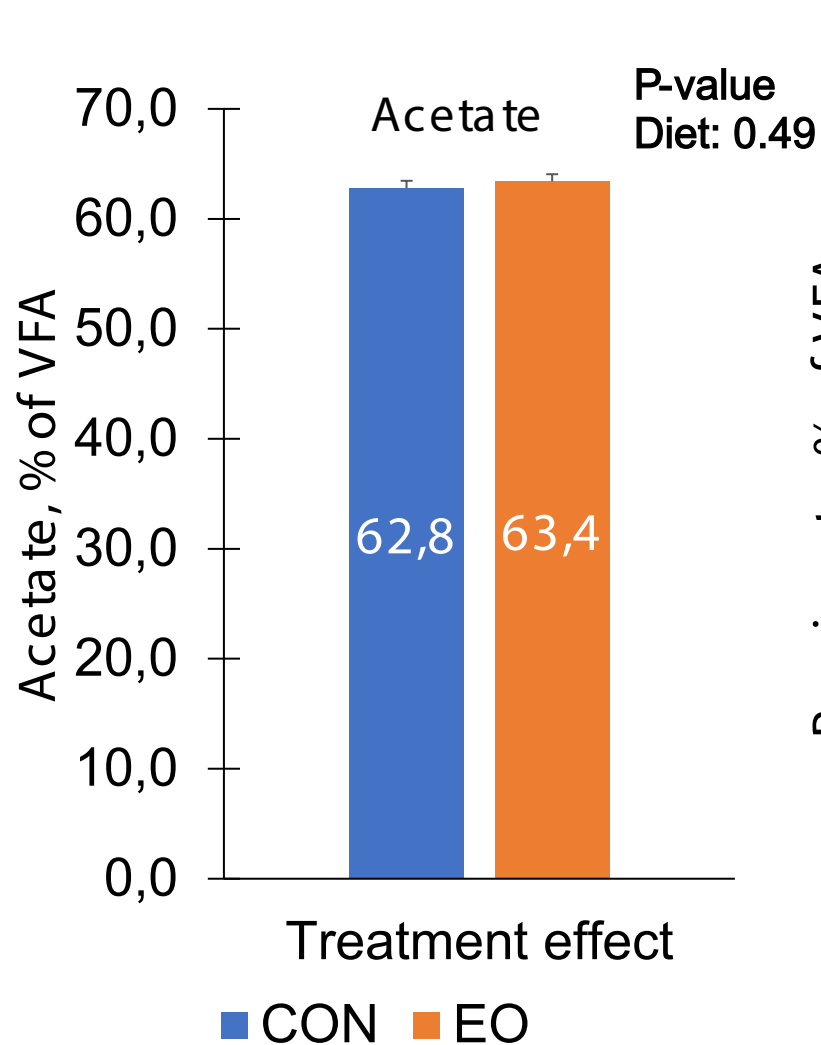
ECM AND FEED EFFICIENCY



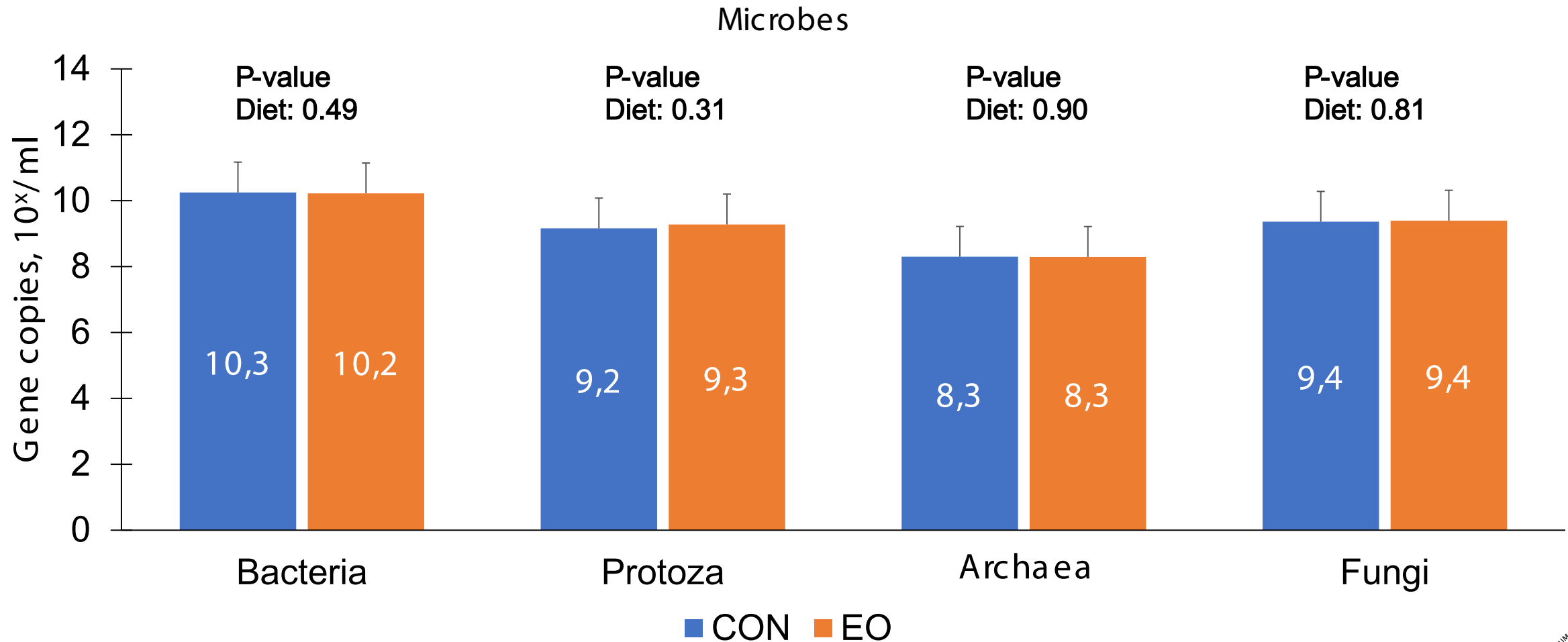
METHANE



VOLATILE FATTY ACIDS



NUMBER OF MICROBES



CONCLUSION

- No significant effect of the blend of essential oils from Agolin SA on
 - Dry matter intake
 - Milk yield and composition
 - Feed efficiency
 - Methane emission per day, per kg DM or ECM
 - Rumen parameters

Hypothesis:

- ÷ The blend of essential oils would reduce the methane emission.
- ÷ The blend of essential oils would give a better feed efficiency.
- ✓ The blend of essential oils would not have adverse effects on rumen parameters.

THANKSFORYOURATTENTION

Acknowledgementto

Agolin SA for financial support to perform the study

The staff of the Danish Cattle Research Center, Aarhus University





AARHUS
UNIVERSITY