



Effects of dietary supplementation of oregano essential oil on performance, rumen microbiota and morphometrics of feedlot cattle

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Introduction

A plethora of studies has shown that inclusion of essential oils in the diet of livestock species improves significantly their performance and the quality of their products. The notion is that essential oils are also a promising alternative to antibiotics due to their bactericidal properties.

Objective

To investigate the effects of dietary inclusion of encapsulated oregano essential oil on rumen microbiota and rumen epithelium histomorphometry in Limousin bulls.

Results

Table 1. Performance parameters of finishing cattle fed a diet supplemented with OEO.

	Treatments		SEM ²	P-value
	CON	OREG		
BW, kg				
Initial (day 1)	565.90	548.33	6.122	0.153
Final (day 90)	694.57	686.75	6.458	0.549
ADG, kg				
Days 1 - 90	1.25	1.30	0.028	0.381
DMI, kg				
Days 1 - 90	8.07 ^a	7.64 ^b	0.073	0.003
G:F				
Days 1 - 90	0.155 ^b	0.171 ^a	0.003	0.043

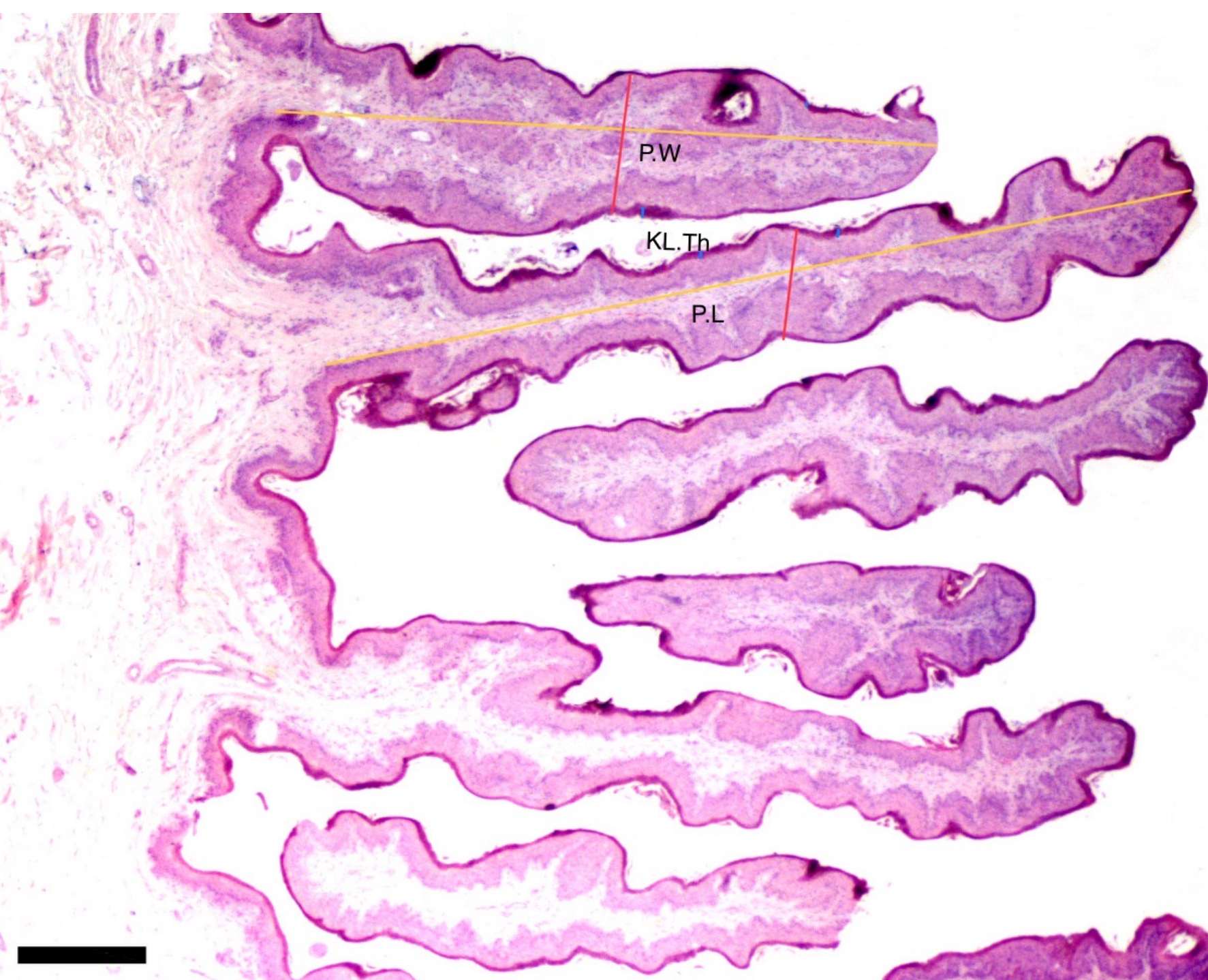


Figure 1. Histological section of a cattle ruminal papilla from the OREG group: Papillae length (PL_{yellow} line), papillae width (PW_{red} line) and keratinized layer thickness (KLTh_{blue} line) were measured using the ImageJ image processing and analysis program (NIH, Bethesda, MD, J 1.53k). HE, x4.

Table 2. Effect of OEO dietary inclusion on rumen epithelial morphometrics.

	Treatments		SEM ²	P-value
	CON	OREG		
Papillae length	773.42	771.61	18.637	0.968
Papillae width	153.77	145.68	4.764	0.582
Papillae surface area	119321.91	114207.46	4988.633	0.728
Keratinized layer thickness	13.05 ^a	8.66 ^b	0.513	0.004

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Materials & Methods

Animals: Total 68 Limousin bulls (16 ± 1.5 months old), allocated in two equal groups (n=34) with 5 pens each as replicates (4 pens with 7 bulls and 1 with 6 bulls)

Trial duration: 90 days

Diets:

- Basal diet was offered in TMR form
- Basal diet + Oregano Essential Oil (OEO) in microencapsulated form

Groups:

- CON group:** basal diet
- OREG group:** basal diet + 50 mg OEO/kg DM

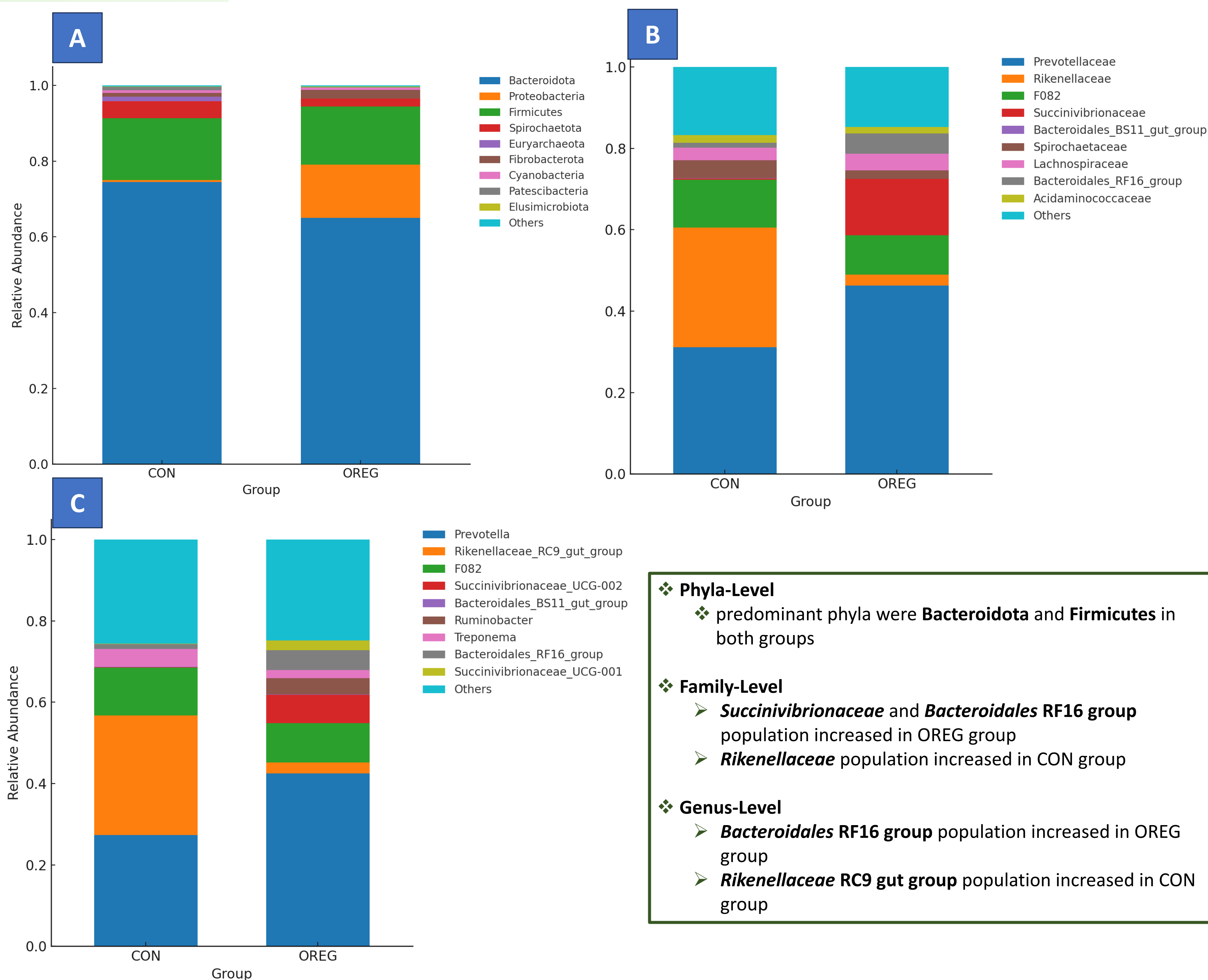


Figure 2. Effect of OEO dietary inclusion on composition of rumen microbiota of at family, phylum and genus levels. A: Phyla; B: Families; C: Genera. The microbial community was profiled using 16S rRNA gene sequencing.

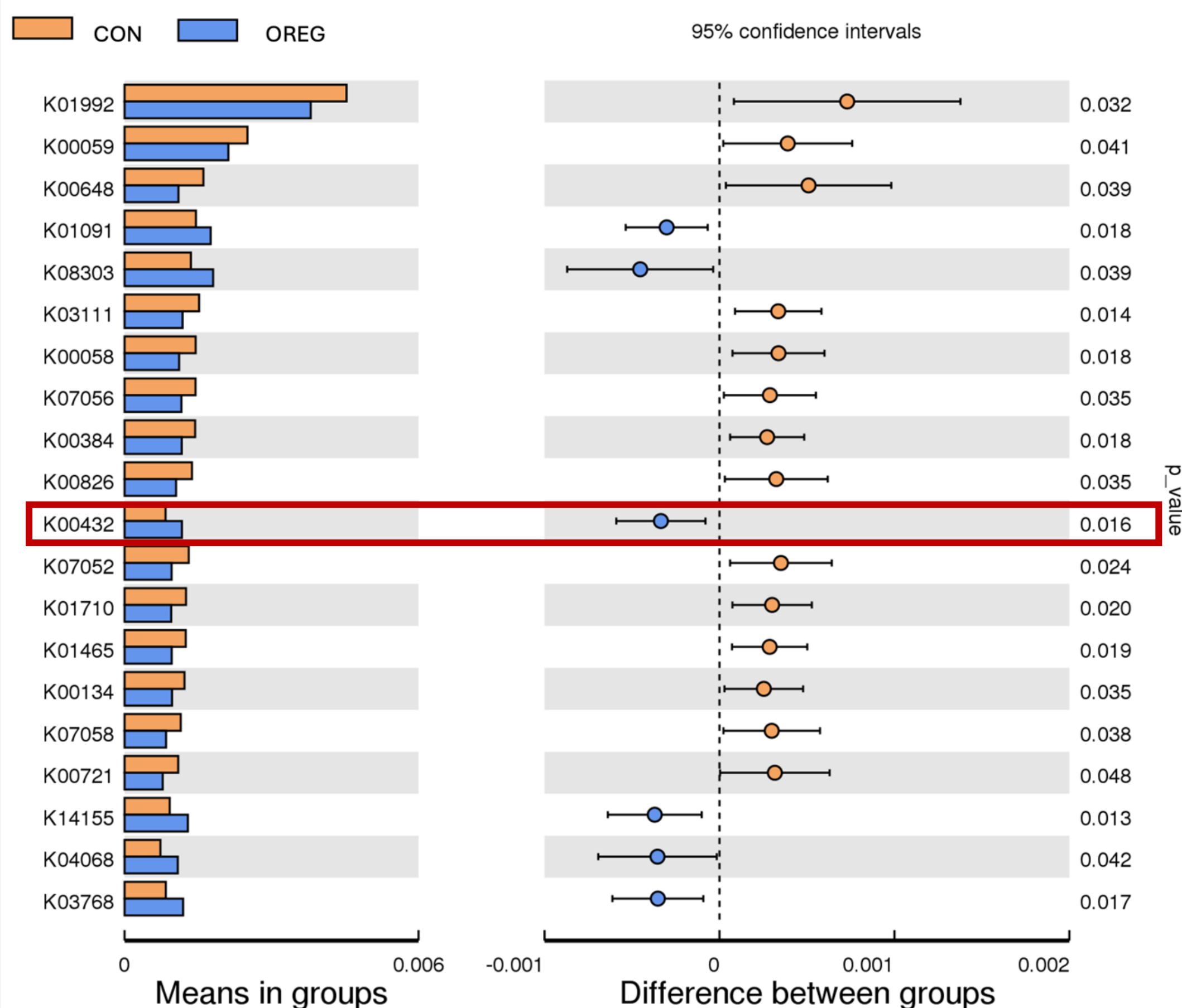


Figure 3. Effect of OEO dietary inclusion on rumen microbiota functional profile. KEGG Orthology database was used for each metabolic pathway identification.

❖ **K00432 metabolic pathway increased in the OREG group**, indicating higher antioxidant activity induced by oregano essential oil. This metabolic pathway is responsible for the reduction of hydrogen peroxide.

Conclusion:
Inclusion of 50 mg/kg DM OEO in the diet of bulls, resulted in lower DMI and higher G:F, hence better rumen function and utilization of feeds.



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