

Effects of a Phytogenic Feed Additive (PFA), composed of Cinnamaldehyde, Carvacrol, 1,8-Cineole, Capsaicin, Garlic Extract, and Fenugreek on Performance and Post Weaning Diarrhea Incidences in weaned piglets, compared with zinc oxide

A.S. Mueller<sup>1</sup>, K. Syriopoulos<sup>1</sup>, R. Tona<sup>1</sup>, A. Diericx<sup>1</sup>, D. Kofel<sup>1</sup>, K. Maenner<sup>2</sup>

1) TriPlant - ERBO AG, Research and Development, Buetzberg, Schweiz; 2) Free University Berlin, Institute of Animal Nutrition, Berlin, Deutschland

Introduction

- Zinc oxide (ZnO) at pharmacological doses as growth promoter and as preventing agent against post weaning diarrhea (PWD) in piglets has been banned in the EU since 2020
- Phytogenic feed additives (PFA) turned out as promising candidates for ZnO replacement
- Essential oils (e.g. Carvacrol) have been demonstrated to reduce the virulence of enterotoxigenic E. coli bacteria by Quorum Sensing Inhibition (1)
- Fenugreek can prevent intestinal biofilm formation of pathogenic bacteria due to its high Galactomannan content (2)
- Pungents, like Capsaicin and Garlic help to improve nutrient digestion and absorption

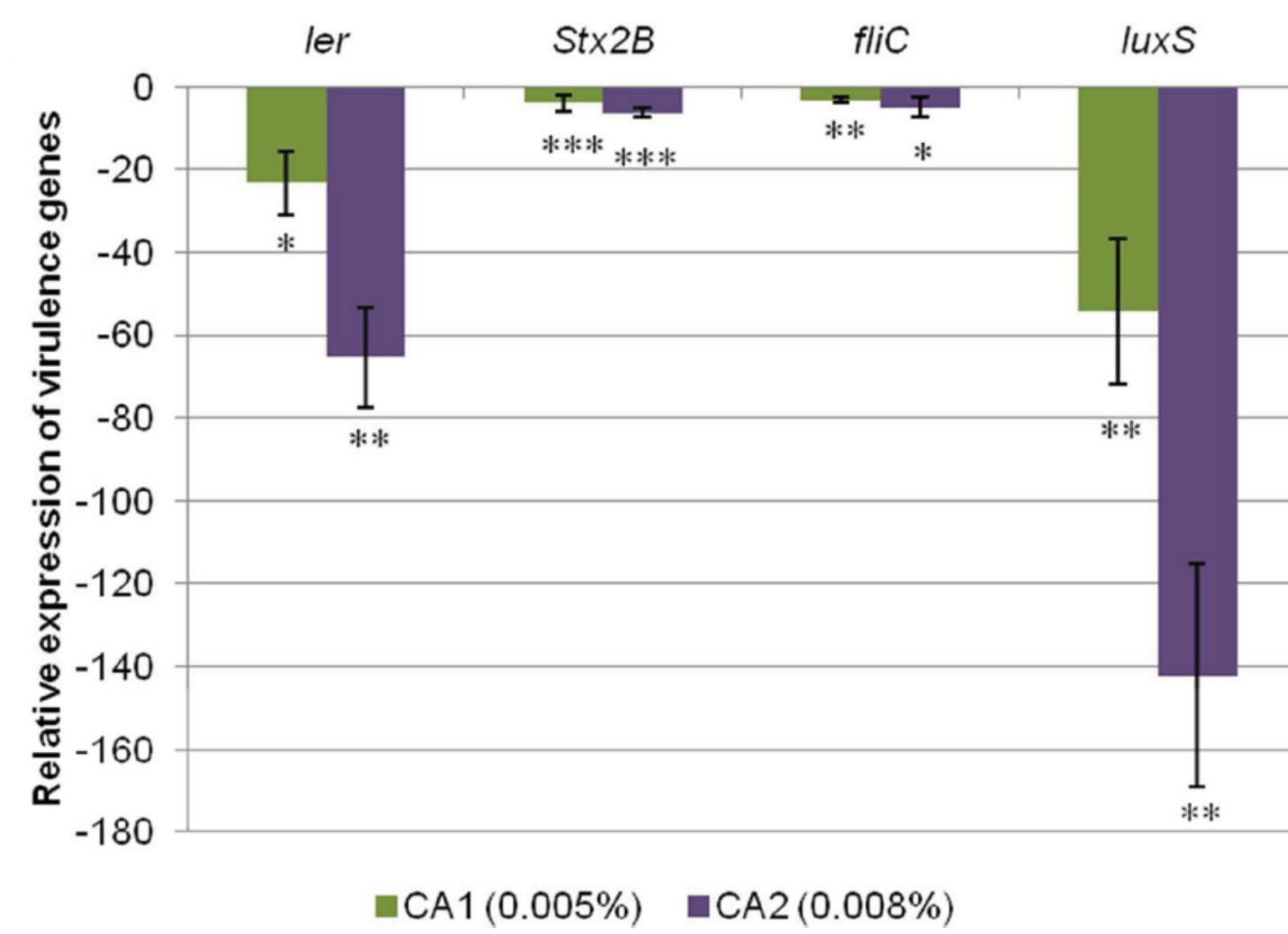


Figure 1: Carvacrol down-regulates major virulence factors in ETEC (Mith et al. 2014)

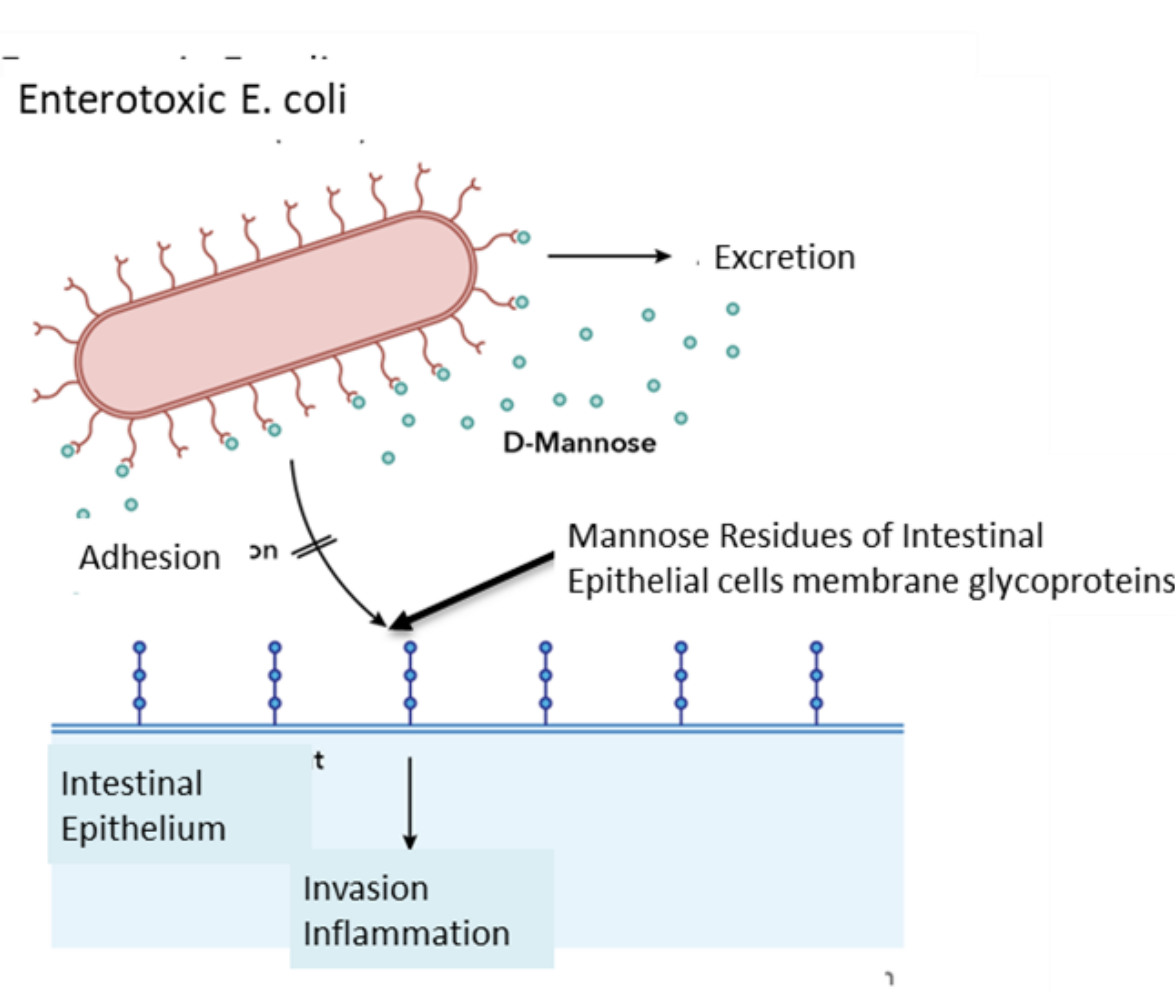


Figure 2: Galactomannans in Fenugreek can inhibit ETEC adhesion to intestinal epithelial cells (Majeed et al. 2017)

Thus, the aim of the current study was to investigate the efficacy of a phytogenic feed additive composed of 20% matrix encapsulated essential oils (Cinnamaldehyde, Carvacrol, 1,8 Cineole), 0,2% Capsaicin, 16% Garlic Extract and 63,8% Fenugreek Powder, compared to ZnO, on performance and diarrhea indices in weaned piglets under practical conditions. The single compounds of the PFA have been selected based on their Mode of Action (Figures 1 and 2).

Materials and Methods

Negative Control (NC)	Zinc Oxide (3000 mg/kg)	PFA (500 mg/kg)
80 weaned piglets 40 f / 40 m	80 weaned piglets 40 f / 40 m	80 weaned piglets 40 f / 40 m

Study of

- Growth Performance
- Post Weaning Diarrhea
- Other Diseases

for 6 weeks (Starter: Days 1 – 14; Grower: Days 15 – 42)

Statistics

All performance and diarrhea (health) parameters were analyzed by a one-way ANOVA using the software package SPSS (IBM SPSS Version 21)

Results

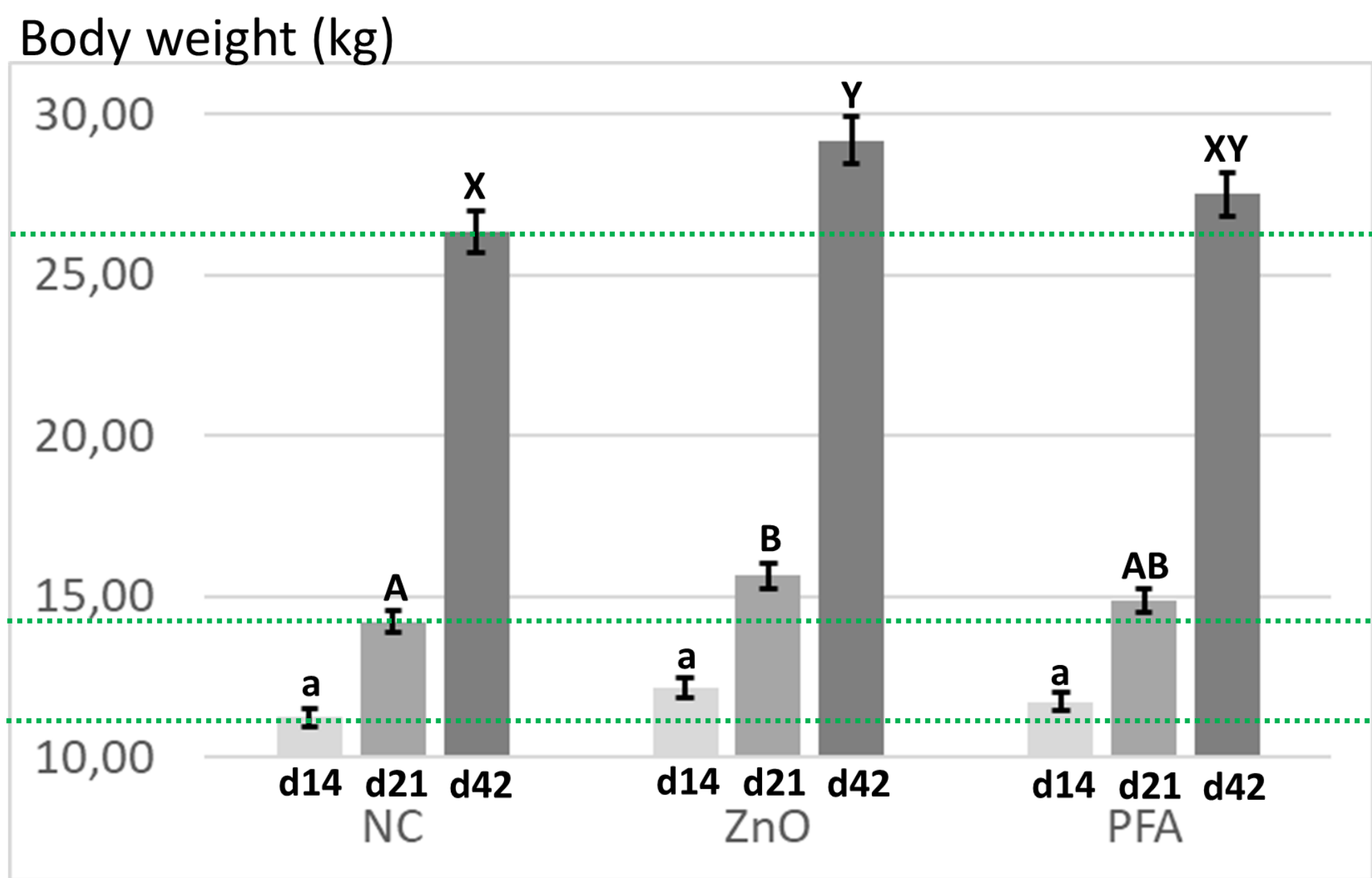


Figure 3: Body weight of weaned piglets supplemented with ZnO or PFA compared to non-supplemented littermates (NC) on days 14, 21 and 42 on experiment

	NC	ZnO	PFA
<b>FI (kg)</b>			
Days 1-7	2,38 ± 0,38	2,46 ± 0,24	2,55 ± 0,26*
Days 8-14	2,71 ± 0,37 <sup>a</sup>	3,22 ± 0,22 <sup>b</sup>	2,73 ± 0,36 <sup>ab</sup>
Days 15-42	23,12 ± 1,23 <sup>a</sup>	24,80 ± 1,01 <sup>b</sup>	23,46 ± 0,88 <sup>ab</sup>
<b>DWG (g)</b>			
Days 1-7	308 ± 36 <sup>a</sup>	331 ± 27 <sup>ab</sup>	341 ± 26 <sup>b</sup>
Days 8-14	310 ± 38 <sup>a</sup>	421 ± 20 <sup>b</sup>	348 ± 29 <sup>ab</sup>
Days 15-42	539 ± 67 <sup>a</sup>	608 ± 32 <sup>b</sup>	563 ± 27 <sup>a</sup>
<b>FCR (kg/kg)</b>			
Days 1-7	1,103 ± 0,054	1,059 ± 0,044*	1,065 ± 0,039*
Days 8-14	1,257 ± 0,090 <sup>a</sup>	1,091 ± 0,056 <sup>b</sup>	1,122 ± 0,071 <sup>ab</sup> *
Days 15-42	1,530 ± 0,040 <sup>a</sup>	1,459 ± 0,047 <sup>b</sup>	1,489 ± 0,048 <sup>ab</sup> *

\* indicates a statistical trend (p<0.1), compared to group NC

Table 1: Comparison of Feed Intake, Weight Gain and FCR in weaned piglets supplemented with ZnO or PFA compared to non-supplemented littermates between days 1 to 14 and days 15 to 42 on experiment

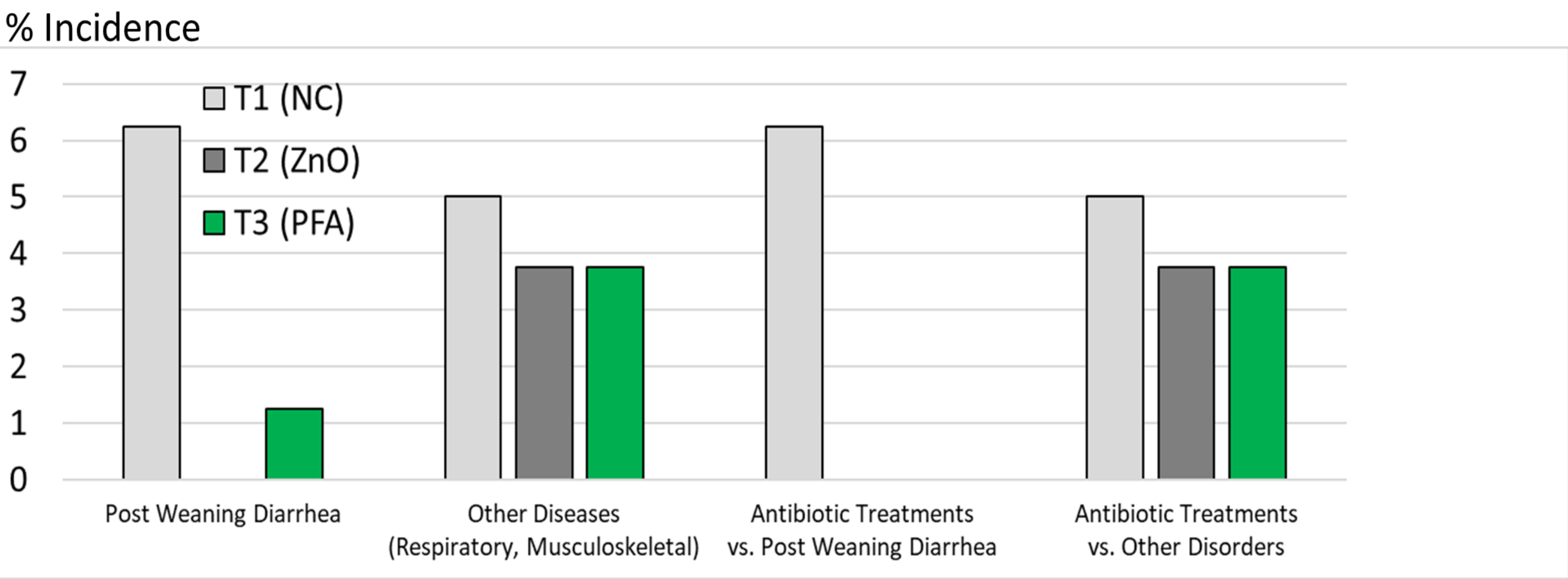


Figure 4: Incidence and Antibiotic Treatment of PWD and Other Diseases in weaned piglets supplemented with ZnO or PFA compared to non-supplemented littermates

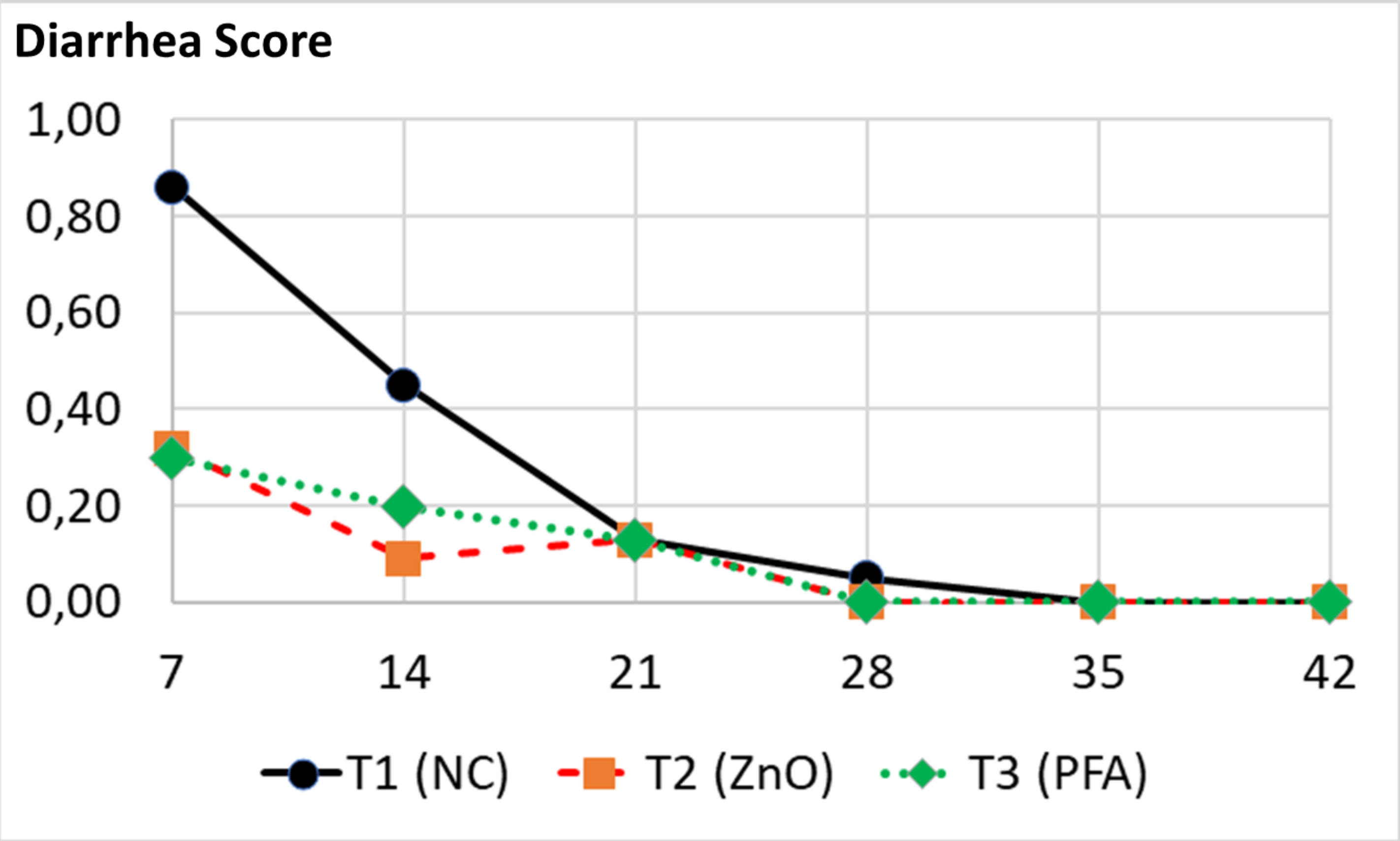


Figure 5: Fecal Scores of weaned piglets supplemented with ZnO or PFA compared to non-supplemented littermates during the 42 days experimental period

Discussion and Conclusions

With regard to the actual topic, namely reducing Post Weaning Diarrhea Incidence in weaned piglets, the PFA turned out as a genuine alternative to the treatment of piglets with a pharmacological ZnO dose. Regarding performance parameters ZnO was more effective. Nevertheless, the differences in performance by ZnO treatment were not significantly higher compared to the PFA. Thus, it can be concluded that PFA with a scientifically based formulation can be used as ZnO alternatives. This is of particular importance, when environmental aspects are considered.

References

[1] Mith H., Clinquart A., Zhiri A., Daube G., Delcenserie V. (2015) FEMS Microbiology Lett. 362: 1–7

[2] Majeed M., Majeed S., Nagabhushanam K., Arumugam S., Natarajan S., Beede K., Al F. (2018) Food Science & Nutrition 6: 666-673