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## Comparison of two EU-approved zootechnical feed additives in post weaning piglets under commercial conditions

Peter Theobald<sup>1\*</sup>, Lena Lorenz<sup>2</sup> and Christian Lückstädt<sup>2</sup>

<sup>1</sup>Nürtingen-Geislingen University, Nürtingen, Germany; <sup>2</sup>ADDCON GmbH, Bonn, Germany

\*peter.theobald@hfwu.de

### Abstract

This study investigates the impact of potassium diformate (KDF) and benzoic acid (BA) on post weaning piglet performance. Both additives are registered as zootechnical additives for pigs in the EU. KDF (at 0.6%) and BA (at 0.5%) were used in 2 × 237 post weaning piglets (weaning age 28 days; Large white × Landrace × Piétrain cross) till day 42 of age. Feed (17.8% crude protein) and water were available *ad libitum*. Piglets were housed in pens with 10 pens per treatment (piglet initial weight 7.8 kg). The data were statistically analysed and a P<0.05 value was considered significant. At the end of the trial piglets in the KDF-fed group had a significantly higher daily feed intake (346 g vs 294 g), while the average daily gain was significantly increased by more than 40 g (315 g vs 273 g). However no statistical difference was observed for the feed conversion rate. These results show that the inclusion of KDF can enhance performance in piglets, even if compared against a positive control.

### Introduction

Organic acids have been used for decades in commercial compound feeds, mostly in feed preservation, where formic and propionic acids are particularly effective. In the European Union, these two organic acids and a number of others (e.g. lactic, citric, fumaric and sorbic acids) and their salts (e.g. calcium formate, calcium propionate) are used under the classification 'feed preservatives' (Lückstädt and Mellor, 2011). Although growth performance benefits have been shown in numerous studies over the past half-century (Cole *et al.*, 1968); the ban on antimicrobial growth promoters in the European Union in 2006 resulted in an increased scientific focus on organic acids. Since then, a limited number of organic acids/salts have also been approved for use as zootechnical additives (products that formerly included antibiotics and other growth promoters) for enhancing performance in pigs. To achieve this status for each life-stage of a species, a product (the approval is holder-specific) needs to show evidence of significant performance enhancement (FCR, live weight gain) in three separate trials for each recommended dosage. Such approval is granted for instance to benzoic acid (Vevovital<sup>®</sup>) and potassium diformate (Formi<sup>®</sup>). Vevovital is currently approved in piglets and fatteners, while Formi is the only performance enhancing acidifier which is registered for the whole pig-production cycle (sows, piglets, fatteners) – (EU, 2014).

At weaning, piglets are particularly susceptible to infection with intestinal pathogens, as well as being inadequately equipped physiologically to deal with solid feed. The buffering capacity of weaning feeds is also high, compounding the problem through a negative effect on pepsin activity in the stomach (Eidelsburger *et al.*, 1992), a problem that is addressed through the use of a dietary acidifier. Experience has furthermore shown that acidifiers are the most reliable product group of the non-antibiotic growth promoters available in Europe and can also be used safely and effectively with other additives.

A direct comparison of the two zootechnical additives mentioned above in post-weaning piglets under practical conditions formed the impetus for the trial.

## Material and methods

Two × 237 post weaning piglets (Large white × Landrace × Piétrain cross), with a weaning age of 28 days, were used for the study, which was carried-out in a commercial farm in Brittany, France. Both additives - benzoic acid (BA) and potassium diformate (KDF) – were used at their registered minimum dosages with 0.5% and 0.6% respectively. The trial duration was 14 days. Piglets were housed in pens (24 for in each) with 10 pens per treatment. Their initial weight was 7.8 kg. Feed and water were available *ad libitum*. The diet ingredients and its proximate composition are shown in tables 1 and 2 respectively.

Table 1: Composition of the commercial piglet diet used during the experiment

Ingredients	Quantity g/kg
Grains (wheat and barley)	680
Soy by-products	150
Biscuit meal	50
Vegetable protein concentrate	37
Sugar	10
Mono-calcium phosphate	11
Calcium carbonate	7
Salt	4
Amino acid premix	46/45
Vevovital/Formi	5/6

Table 2: Proximate composition of experimental diet (%)

Parameter	Percentage (%)
Dry matter	87.4
Crude protein	17.8
Crude fat	4.6
Crude ash	5.7
Crude fibre	2.8
Nitrogen free extracts	41.7
Lysine	1.46
Net energy [MJ/kg]	10.5

At the end of the trial the data for feed intake, feed conversion, final weight as well as daily gain were recorded. The data were statistically analysed using MINITAB and a  $P < 0.05$  value was considered significant.

## Results and discussion

All piglets grew well during the trial; the environmental parameters on-farm supported optimal growth. No mortality occurred in both groups during the 14 monitored days. Piglets fed the KDF-added diet had a significantly ( $P < 0.01$ ) higher feed intake by almost 18% compared to the BA-diet. Consequently, the final weight of KDF-fed piglets was significantly ( $P < 0.05$ ) increased by 5.2%. This led to an improved daily weight gain of 42 g or more than 15%. This increase was significant ( $P < 0.05$ ). The final results are displayed in table 3.

Table 3: Performance parameters of post-weaning piglets fed with dietary BA or KDF at 42 days of age

Parameter	0.5% BA	0.6% KDF	P-value
Final weight [kg]	11.6 <sup>a</sup>	12.2 <sup>b</sup>	<0.05
Feed intake [g/d]	294 <sup>A</sup>	346 <sup>B</sup>	<0.01
Avg. daily gain [g/d]	273 <sup>a</sup>	315 <sup>b</sup>	<0.05
FCR	1.09	1.12	NS*

Means within a row having different lower case superscripts are significantly different from each other ( $P < 0.05$ );

Means within a row having different upper case superscripts are significantly different from each other ( $P < 0.01$ );

\*NS = not significant

The impact on feed conversion was not significant, but with numerical improvements for the BA-diet.

It is widely been recognized that both BA (Torrallardona et al., 2005) and KDF (Roth et al., 1996; Windisch et al. 2001; Lückstädt et al., 2012) improve the performance of piglets against control diets. Kluge et al. (2006), for example reported similar growth for piglets fed BA or KDF, at higher dosages of both additives (1.0 and 1.2% respectively), compared to a negative control. However, a significant impact on feed conversion in favour of KDF was noted, when compared with the 0.5% BA-dosage. KDF has shown significant impacts when compared to a wide variety of other organic acids in a holo-analysis (Mellor, 2008), although BA was not included in this model. The significantly improved feed intake in the current study with KDF-fed piglets is supported by the findings of a preference feeding trial in post-weaned pigs (Suarez et al., 2010). Here, benzoic acid did not affect feeding preference at any of the tested dosages, including 0.5%. On the other hand, pigs demonstrated a preference for diets containing potassium diformate, up to the highest tested level (2%). Sour taste is known for acid preference in pigs and is mainly sensed through the taste buds of the tongue. Potassium diformate may trigger an innate sour taste, which is attractive to pigs, while its pungency in the diformate state is mild (less piquant) and remains unnoticed prior to intake. It is assumed that the significantly increased feed intake in the reported study was the main driver behind the significant impact on daily weight gain found. In general it can be concluded that the improved feed intake in the crucial period just after weaning in the KDF-group is a major step forward to optimized growth later on in the grower and fatter period. Further research is needed to validate these French results in other pig producing countries.

## Literature

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### Address of corresponding author:

Prof. Dr. Peter Theobald  
Nürtingen-Geislingen University  
Neckarsteige 6-10  
72622 Nürtingen  
E-Mail: [peter.theobald@hfwu.de](mailto:peter.theobald@hfwu.de)