BY-PRODUCT OF FUNGAL FERMENTATION MAINTAINS GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF GROWER-FINISHER PIGS FED A LOW CRUDE PROTEIN DIET

Daniel Berghaus[1] and Charlotte Heyer[2]
[1] ISF GmbH, Wahlstedt, DE [2] Provita Supplements GmbH, Pinneberg, DE

INTRODUCTION

- Sustainable feeding concepts for pigs reduce excess supply of amino acids (**AA**), hindgut protein fermentation, and minimise nitrogen excretion and emissions
- Postbiotics of fungal solid-state fermentation (**SSF**) increase nutrient digestibility, animal performance and contain functional components strengthening gut integrity

OBJECTIVE

- To evaluate the effect of a by-product of fungal SSF in a low CP diet on growth performance and carcass characteristics in grower-finisher

MATERIAL & METHODS

- 200 pigs (Danbred × Duroc; initial BW 30.2 ± 2.4kg) randomly placed in one of 8 pens with 25 pigs per pen
- Complete randomized block design with two blocks and four observations per treatment for average daily feed intake (**ADFI**), feed conversion ratio (**F:G**) and 100 observations for average daily gain (**ADG**) and carcass data
- Rye-barley-wheat based diets (**Table 1**) containing variable amounts of crystalline AA (Lys, Met, Thr, Trp, Val, Ile)
- Two dietary treatments:
  (1) Control: precaecal (**pc**) digestible AA content meeting requirements for 850 g, 1050 g, and 1000 g ADG in Grower I, Grower II, and Finisher (GfE, 2008) by supplementing crystalline AA
  (2) SSF* (500 ppm): pc digestible AA content 8% (Lys) to 20% (Ile) below requirements (GfE, 2008)
- Data analysed by one-way ANOVA and differences among least squares means with $P \leq 0.05$ considered significant

* by-product of fungal SSF (*Aspergillus niger, Aspergillus tubingensis, Neurospora intermedia, Neurospora tetrasperma; Provita Supplements, Germany*).

Table 1. Ingredient composition and calculated nutrient content of experimental diets

	Grower I		Grower II		Finisher	
Item, % as-fed	Control	SSF	Control	SSF	Control	SSF
Rye	40.0		40.0		40.0	
Barley	25.0		25.0		25.0	
Wheat	18.0		23.0		28.5	
Soybean meal	11.0		5.00		-	
Mineral premix	3.50		3.00		3.0	
Soybean oil	1.50		1.00		0.5	
Others	1.00		3.00		3.0	
Calculated nutrient content, % as-fed						
Crude protein (N × 6.25)	14.5		12.5		11.0	
Lysine	1.10	1.03	0.88	0.82	0.76	0.70
Methionine + Cystine	0.65	0.60	0.57	0.54	0.54	0.50
Threonine	0.71	0.67	0.59	0.56	0.52	0.49
Tryptophan	0.22	0.19	0.19	0.16	0.17	0.14
Valine	0.75	0.63	0.63	0.53	0.55	0.45
Isoleucine	0.62	0.52	0.51	0.42	0.43	0.34
Crude fiber	3.66		3.88		3.72	
ME, MJ/kg	13.2		13.0		12.9	

RESULTS

- ADG and F:G of pigs did not differ ($P > 0.05$) between Control and MAXFERM/PRO for each feeding phase and the entire trial (**Figure 1-2**); ADFI (g/d) was 2,408 (d 1-89) for the Control and 2,399 (d 1-89) for the MAXFERM/PRO treatment group
- No difference ($P > 0.05$) in carcass weight and lean meat content between the two treatments (**Table 2**)

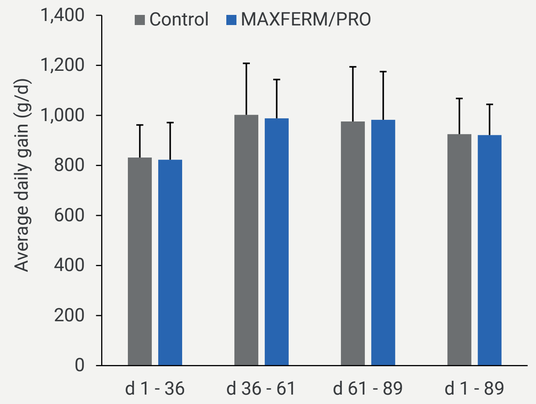

Figure 1. ADG of grower-finisher pigs fed diets supplemented with crystalline AA or a by-product of fungal fermentation

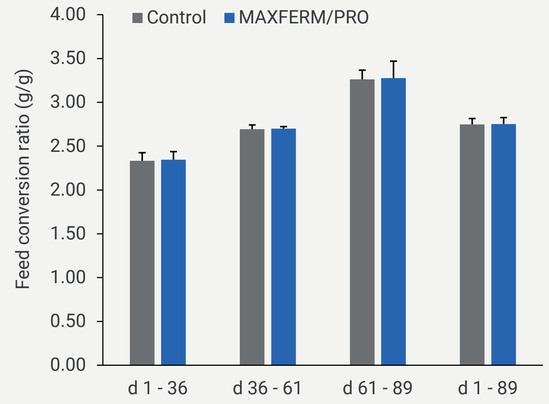

Figure 2. F:G of grower-finisher pigs fed diets supplemented with crystalline AA or a by-product of fungal fermentation

Table 2. Body weight and carcass data of grower-finisher pigs fed diets supplemented with crystalline AA or a by-product of fungal fermentation

	Initial body weight (kg)	Final body weight (kg)	Carcass weight (kg)	Lean meat content (%)
Control	30.2	112.5	91.5	57.1
MAXFERM/PRO	30.2	112.3	91.9	56.6
pooled SEM	0.49	1.82	1.29	0.45
P-value	0.972	0.900	0.759	0.289

DISCUSSION & CONCLUSION

- Postbiotics are preparation of inanimate microorganisms and/or their components that confers health benefit on the animal such as supporting gut integrity, depending on substrate and fungi used (overview in Graminha et al., 2008; ISAPP, 2024)
- As shown in several *in vitro* studies, functional components of the by-product of fungal SSF affects microbial composition and activity, supports the gut barrier function, thus possibly modulate nutrient absorption
- Further studies are needed to assess the effect of the by-product of fungal SSF on diet nutrient digestibility and the gastrointestinal microbiota

IMPLICATION

- **Supplementing a low CP diet with a by-product of fungal SSF maintained growth performance and carcass characteristics of grower-finisher pigs compared to the supplementation of crystalline AA**
- **Application of postbiotics of fungal SSF in grower-finisher diets enabled 14-53% savings of crystalline AA, possibly by modulating nutrient absorption and supporting gut barrier function**

REFERENCES

- GfE. 2008. Recommendations for the supply of energy and nutrients to pigs. Frankfurt am Main: DLG-Verlag.
- Graminha, E. B. N., A. Z. L. Gonçalves, R. D. P. B. Pirota, M. A. A. Balsalobre, R. da Silva, and E. Gomes. 2008. Enzyme production by solid-state fermentation: Application to animal nutrition. Anim. Feed Sci. Technol. 144:1–22. doi:10.1016/j.anifeedsci.2007.09.029.
- ISAPP. 2024. https://isappscience.org/wp-content/uploads/2021/05/Postbiotics_FINAL.pdf (October 11, 2024).

PERFECT COMPONENTS. MAXIMUM RESULTS.