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The effect of combined preparation, probiotic and phytase on performance parameters and vitality of weaned piglets.

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Abstract

A combined preparation with probiotic Schaumalac F 80M BONVITAL 4b 1841 (2,5 x 1010 KBE Enterococcus faecium DSM 7134) and phytase was supplemented to a basal ration with 4%. The effects on growth performance on thirty five weaned piglets/each group were studied for thirty days experimental period. The supplementation of combined preparation improved slightly Daily Weight Gain (DWG), Feed Consumption (FC) and Feed Conversion Ratio (FCR), kg feed/kg weight gain. At the end of experimental period, daily weight gain was increased 6% more and feed conversion ratio was decreased 3.4%, compared to the control group or without supplementation. The results indicate that the combined preparation may be less suppressive to the Escherichia coli. Overall a positive effect of the probiotic and phytase on growth performance was observed.

Keywords: Combined preparation, probiotic, phytase, performance parameters.

Abbreviations: Growth Performance, (GP), Body Weight (BW), Daily Weight Gain (DWG), Feed Consumption (FC) and Feed Conversion Ratio (FCR).

1. Introduction

The first concept of probiotics was originally developed by [14]. He suggested that ingested bacteria could have a positive influence on the normal microbial flora of the intestinal tract. Probiotics are considered as growth and health stimulators and are used extensively in animal feeding, especially in pig and poultry production. Probiotics have been defined also by [3] as "*a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance*". There is a relatively large volume of literature that supports the use of probiotics to prevent or treat intestinal disorders. Currently, the best studied probiotics are the lactic acid bacteria, particularly *Lactobacillus sp* and *Bifidobacterium sp.* Therefore, an intensive research work is carrying out in this topic from many researcher groups in different countries. Many years later, probiotics were determined as: viable microbial feed supplements, which are believed to stimulate growth and the health as well as to modify the ecology of the intestine in a beneficial manner for the host, [1, 13, 16]. Probiotics should lead to beneficial effects for the host animal due to an improvement of the intestinal microbial balance [5] or of the properties of the indigenous micro-flora [7]. There are also many mechanisms by probiotics enhance intestinal health, including stimulation of immunity, competition for limited nutrients, inhibition of epithelial and mucosal adherence, inhibition of epithelial invasion and production of antimicrobial substances [15].

Possible modes of actions are the modification of the intestinal microorganisms and the nutrient availability with response to the morphology and histology as well as the transport physiology. Significant positive effects of probiotics on performance, health, vitality, gut ecology as well digestibility are observed in many studies, although the mode of action of probiotics is not still completely explained [10, 17, 9, 2]. Efficiency probiotic on a focus of combined preparation have hardly been concluded.

2. Material and methods

Seventy piglets (White x Duroc) were transferred after weaning (28 days) to flat decks and randomly allocated in 2 groups with thirty five animals/each group. The private farm of pigs was located in Fushe-Mamurras. The basal diet (see Table 1) was supplemented with 4% or 40g/kg of the combined preparation (experimental group) or without supplementation (control group). The diet was offered

ad-libidum and animals had free access to water. The combined preparation contained probiotic Schaumalac F 80M BONVITAL 4b 1841 (2,5 x 10^{10} KBE *Enterococcus faecium* DSM 7134) and phytase also.

During thirty days experimental period, Body Weight (BW), Daily Weight Gain (DWG) and Feed Conversion Ratio (FCR), kg feed/kg body weight gain were measured weekly. Data are presented as arithmetic means with standard deviations (Mean ± SD). One-way analysis of variance and Student's t-test ($P< 0.05$) were performed to test the differences between two groups.

Table 1 Diet composition and calculated nutrient concentration.

Diet composition, %	*Control group*	*Experimental group*
Maize	55.6	55.2
Soybean meal	25.0	25.0
Fish meal	5.0	5.0
Dry Whey	10.0	10.0
NaCl	0.3	0.3
Vitamin mineral Premix[a]	1.5	1.5
Soja oil	1.0	1.0
Dicalcium phosphate	1.3	1.3
Calcium carbonate	0.3	0.3
Supplement	0.0	0.4
Total	**100.0**	**100.0**
DM, (%)	90.28	90.20
ME Mcal/kg	3.31	3.31
CP, (%)	20.89	20.89
Lys, %	1.23	1.23
Cys + met (%)	0.71	0.71

[a] Contents in 1 kg: 1,200,000 IE vit. A, 120,000 IE vit. D_3, 4000 mg vit. E, 200 mg vit. B_1, 600 mg Vit. B_2, 2500 mg Niacin, 400 mg Vit. B_6, 4500 µg Vit. B_{12}, 20,000 µg Biotin, 1800 mg Pantothenic acid, 160 g Na, 50 g Mg,10,000 mg Zn, 7500 mg Fe, 7500 mg Mn, 150 mg J, 70 mg Co and 40 mg Se.

2. Results and Discussions

The results of the growth parameters are presented in Table 2.

At the end of experimental period, final body weight was improved 3.02% more, daily weight gain was increased 6% more and feed conversion ratio was decreased 3.4%, compare to the control group or without supplementation. The results indicate that the combined preparation may be less suppressive to the *Escherichia coli*. Overall a positive effect of the probiotic and phytase on growth performance was observed.

In last ten years, most of the experiments with probiotics were performed with piglets. According to the literature review, in many trials showed positive effects of probiotics on weaned piglets and also there were no significant effects of growing and finishing pigs.

Table 2 Effects of probiotic preparation on performance parameters (Mean ± SD).

Parameters	*n*[1]	*Control group*	**Experimental group**
	35		
Production			
Initial BW, kg		8.00±0.26	7.97±0.25
Final BW, kg		18.20±0.53	18.75±0.6
Feed Consumption, gr/day		619	635
DWG, g [2]		340.2±14.6	360.9±18
FCR [3]		1.82	1.76

[1] Number of animals/every group
[2] DWG for whole experimental period.
[3] FCR for whole experimental period.

The same results showed [6] on the experiments with weaned pigs and growing-finishing swine, used 1g/kg *Lactobacillus acidophilus*, which contains $4x10^6$ viable cells per gram. Supplementation of the diet with 1g/kg *Lactobacillus acidophilus* on weaned pigs did not improve daily gain, feed intake or feed efficiency. Daily weight gain and feed intake of pigs, treated with 500 mg/kg *Lactobacillus acidophilus* showed non significant trends.

Reduction of diarrhoea by probiotics and vitality of piglets is one of the second topics in this study, because diarrhoea is the main problem for weaned piglets, especially during the first week after weaning. After two weeks of probiotic supplementation, we showed a reduction of diarrhoea of treated group. Reduction of diarrhoea by probiotic supplementation was study frequently by many scientist groups. Some of the trials showed significant effects, but the others have collected not significant data. [12, 8, 18, 11] have used the same probiotic *Bacillus cereus* in different age of piglets, respectively 8 weeks piglets, 1-85 day after birth, 7-21 day after birth and 2 weeks post weaning. They showed statistical significance of diarrhoea reduction. [4] showed non significant effects, while they used *Bacillus cereus* in pigs 24-66 days of life.

4. Conclusions

Based on the achieved results in the present investigations, it could be concluded that the supplementation of combined preparation (probiotic and phytase) as a feed additives led to an improvement of production parameters in piglets, especially under the extensive farm conditions. However the differences were not significants. Feeding combined preparation slightly improved daily weight gain 6% more and reduce feed conversion ratio 3.4% less, compare with control group.

5. References

1. Breves G, Walter C, Burmeister M, Shröder B: **In vitro studies on the effects of *Saccharomyces boulardii* and *Bacillus cereus* var. *toyoi* on nutrient transport in pig jejunum**. J. Anim. Physiol and Anim Nutrition, 2000, 84: 9-20.
2. Brooks PH, Beal JD, Dmeckova V, Niven S: **Probiotics for pigs and beyond**. In: Van Vooren and B. Rochet. Role of probiotics in animal nutrition and their link to the demands of European consumers, ID-Lelystad, 2003, 49-59.
3. Collins MD, Gibson GR: **Probiotics, prebiotics and synbiotics: approaches for modulating the microbial ecology of the gut.** Am. J. Clin Nutr. 1999, 69 (Suppl):1052S-1057S.
4. Eidelsburger U, Kirchgessner M, Roth FX: **Zum Einfluss von Fumarsäure, Salzsäure, Natriumformiat, Tylosin und Toyocerin auf tagliche Zunahmen, Futteraufnahme, Futterverwertung und Verdaulichkeit**: 11. Mitt. Journal of Animal Physiologie and Animal Nutrition; 1992, 68: 82-92.
5. Fuller R: **Probiotics in man and animals**. J. Appl. Bacteriol, 1989, 66: 365-378.
6. Harper AF, Kornegay ET, Brayant KL, Thoman HR: **Efficacy of virginiamycin and a commercially-available *Lactobacillus* probiotic in swine diets**. Anim Feed Sci Technol, 1983, 8: 69-76.
7. Havernaar R, Ten Brink B, Huis in't Veld JHJ: **Selection of strains for probiotic use**. In: Probiotics. The scientific basis. R.Fuller (Ed.). Chapman& Hall, London, 1992, 209-224.
8. Iben Ch, Leibetseder J: **Untersuchung der leistungsfördernden Wirkung von Toyocerin in der Ferkelaufzucht.** Wien. Tierärztliche Monatsschrift; 1989, 76: 363-366.
9. Jadamus A, Vahjen W, Simon O: **Growth behaviour of a spore forming probiotic strain in the gastrointestinal tract of broiler chicken and piglets**. Archiv of Anim. Nut, 2001, 54: 1-17.
10. Jadamus A, Vahjen W, Simon O: **Influence of the probiotic bacterial strain, *Bacillus cereus var. toyoi* on the development of selected microbial groups adhering to intestinal mucosal tissues of piglets**. J. Anim. Feed Sci; 2000, 9: 347-362.
11. Jadamus A: **Untersuchungen zur Wirksamkeit und Wirkungsweise des sporenbildenden *Bacillus cereus* var. *toyoi* im Verdauungstrakt von Broilern und Ferkel**. Degree Dissertation, Free University, Berlin; 2001.
12. Kyriakis SC, Tsiloyiannis VK, Vlemmas J, Sarris K, Tsinas AC, Alexopoulos C, Jansegers L: **The effect of probiotic LSP 122 on the control of post-weaning diarrhea syndrome of piglets**. Research Veterinary Science; 1999, 67: 223-228.
13. Männer K, Jadamus A, Vahjen W, Frackenpohl U, Simon O: **Effekte probiotischer Zusätze auf Leistungsparameter und intestinale Mikroflora**. Proc. 7. Tagung, Schweine und Geflügelernährung; 2002, 78-80.
14. Metchnikoff E: **The prolongation of life**. Heinemann, London, UK, 1907.
15. Rolfe R: **Colonization resistance**. In R I Mackie, B A White and R E Isaacson (ed), Gastrointestinal microbiology. Gastrointestinal microbes and host interactions. Chapman and Hall. New York, 1996, 2: 501-536.
16. Simon O, Vahjen W, Scharek L: **Microorganisms as Feed Additive-Probiotics**. Proc. 9 th International Symposium on Digestive Physiology in Pigs, Banff, Canada; 2003, Vol 1: 295-318.

17. Solano-Aguilar GI, Vengroski KG, Beshah E, Lunney JK: **Isolation and purification of lymphocyte subset from gut-associated lymphoid tissue in neonatal swine**. Immunological Methods; 2000, 241: 185-199.

18. Zani JK, Weykamp da Cruz F, Freitas dos Santos A, Gil-Turnes C: **Effect of probiotic CenBiot on the control of diarrhoea and feed efficiency in pigs**. Journal of Applied Microbiology; 1998, 84: 68-71.