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GARLIC AS ALTERNATIVE FOR ANTIBIOTICS IN DIET FOR GROWING PIGS

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Abstract: The effects of the use of antibiotics and garlic powder in the nutrition of weaning piglets were compared. The trial included 120 weaned piglets of the same genotype (Large White) distributed in three feeding treatments. In the first study period (day 27-56), a feed mixture with 20% protein was used, while in the second period (day 57-84), a mixture with 18% protein. The control group was fed with mixtures containing antibiotics in the amount of 0.2%, while the two experimental groups were fed with mixtures containing fermented garlic powder (FGP) in the concentration of 0.05% and 0.2%. The obtained results showed that the use of FGP, instead of antibiotics, resulted in better gain in second trial group, and also better feed conversion ratio, in both trial groups by 3.84% and 6.93% respectively, during the entire research period.

Key words: piglets, growth promoters, nutrition, production results

Introduction

Garlic (*Allium sativum*) is widely used as culinary or medicinal supplement for the prevention and treatment of various heart and metabolic diseases *(Konjufca et al., 1997; Amagase et al., 2001)*. Garlic contains a sulfur volatile active component that has antibacterial, anti-inflammatory and antioxidant biological properties *(Wilson and Demming-Adams, 2007)*, it has been examined as a potential alternative to antibiotics in pig production. The alternative growth promoters including herbs, prebiotics and/or eubiotics deserve special attention *(Grela et al., 2011)*. Garlic inclusion levels widely varied in those studies, being added at levels as low as 0.1% to as high as 4% to piglet diets. *Cullen et al. (2005)* have suggested that a better feed conversion could be observed when the garlic was supplemented at levels of 1 or 10 g/kg to the pigs. Various experiments also reported that garlic bulb, paste, oil, powder, husk and leaves could positively

influence the animal production performance *(Birrenkott et al., 2000; Chowdhury et al., 2002).*

Those functions are mainly attributed to the bioactive components of garlic, including sulphur-containing compounds such as alliin, diallylsulphides and allicin *(Amagase et al., 2001). Tatara et al. (2005)* have reported that process of ageing could convert the odorous, harsh and irritating compounds in garlic into stable and safe sulphur compounds such as S-allyl cysteine and S-allyl mercaptocysteine. Some authors *(Kakimoto et al., 2000)* also suggested that fermented garlic powder had an antioxidative activity several times greater than that of raw garlic as well as antidiabetes activity, anticancer activity, immunity enhancing activity and cholesterol-reducing activity. Some previous studies have suggested that the supplementation of fermented garlic powder could be beneficial the swine *(Yan et al., 2010; Yan et al. 2011; Wang et al., 2011).* Therefore, the objective of this study was to evaluate the effects of fermented garlic powder on growth performance in growing pigs.

Material and methods

The trial included 120 pigs of the same genotype (Large White) distributed in three feeding treatments (Table 1). Immediately after the piglets were weaned, groups of 10 piglets were formed on the basis of uniform initial weight, taking into account that in each group the sex ratio is the same. There were 4 repetitions per treatment. All piglets were placed in solid wall boxes, with lattice floor each containing 10 feeding places. Average initial weight of piglets was from 7.56 to 8.73 kg. All piglets came from 12 different mothers, and same father. In the initial period of the experiment, animals were fed during 39 feeding days, with a starter mixture containing 20% of the crude protein, and in the final period of the experiment, which lasted 17 feeding days, the meals were formulated to contain 18% of the crude protein.

The first group of piglets, control, was fed with mixtures based on the use of antibiotic Neodox in concentration of 0.2%, and the other two group of piglets with mixtures where instead of antibiotics, fermented garlic powder (FGP) was included in a concentration of 0.05% and 0.2 % of the diet (Table 1). Food and water were *ad libitum.*

Table 1 . Composition of diets for weaned piglets in the trial

	Starter, Day 27-56			Grower, Day 57-84		
Group	C (control)	T_1 (trial)	T_2 (trial)	C (control)	T_1 (trial)	T_2 (trial)
Ingredients, g/kg						
Maize	528.00	529.50	528.00	-	-	-
Amiloprotex*	-	-	-	638.00	639.50	638.00
Barley	100.00	100.00	100.00	100.00	100.00	100.00
Triticale	-	-	-	50.00	50.00	50.00
Milk replacer	20.00	20.00	20.00	-	-	-
Ekofish meal	40.00	40.00	40.00	30.00	30.00	30.00
Soybean meal	200.00	200.00	200.00	70.00	70.00	70.00
Oil	10.00	10.00	10.00	10.00	10.00	10.00
Mineral–vitamin premix 1**	100.00	100.00	100.00	-	-	-
Mineral–vitamin premix 2**	-	-	-	100.00	100.00	100.00
Antibiotic	2.00	-	-	2.00	-	-
FGP	-	0.50	2.00	-	0.50	2.00
Calculated nutrient composition, g/kg of feed						
Crude protein	207.40	207.40	207.40	180.50	180.50	180.50
Lysine	13.10	13.10	13.10	11.10	11.10	11.10
Methionine	5.20	5.20	5.20	4.00	4.00	4.00
Cysteine	3.30	3.30	3.30	3.00	3.00	3.00
Threonine	8.50	8.50	8.50	7.00	7.00	7.00
Tryptophan	2.20	2.20	2.20	1.90	1.90	1.90
Crude fibre	36.70	36.70	36.70	54.80	54.80	54.80
Crude fat	44.30	44.30	44.30	70.80	70.80	70.80
Calcium	12.00	12.00	12.00	9.82	9.82	9.82
Phosphorus	7.26	7.26	7.26	6.55	6.55	6.55
DE content, MJ/kg	14.05	14.05	14.05	13.62	13.62	13.62

*Amiloprotex is mixture of maize and full fat soybean, in ratio 70:30, heat treated prior to mixing into diet

**The commercial premixes (10% premix for piglets) without any antibiotics or phytoadditives included

During the research period, the following production indicators were monitored: body weight, average daily gain, average daily food consumption and food conversion, by trial periods. The data obtained were processed using the software package "STATISTICA" (Stat Soft Inc, 2012). ANOVA was used while

the Tukey test served to determine the statistical significance of the differences between individual means values.

Results and discussion

Production performances were shown in Table 2. During the starter and grower period, it was found that there were no significant differences in average daily gain or feed conversion. Major statistical significance was noted in feed intake, it was much lower in trial compared to control (C) group. The introduction of garlic powder instead of antibiotics in the mixture has led to increasement of gain in second trial group (T_2). Second group had an increase of 5.15 g/d compared to the C group and 11.01 g/d compared to T_1. Experimental groups had lower feed intake per feeding day, by 5.94% and 4.39%. The use of FGP in the mixture caused the feed conversion to improve by 3.84% and 6.93% compared to diet based on antibiotics.

Table 2. Production performance

	Treatments			SEM	p
	C	T_1 0.05%	T_2 0.2%		
Starter period (27-66d)					
FI, g/d	518.07[a]	486.24[b]	486.26[b]	0.042	p<0.05
ADG, g/d	234.42	230.77	241.92	0.037	0.820
FCR, g/g	2.21	2.12	2.01	0.181	0.134
Grower period (66-83d)					
FI, g/d	992.95[a]	943.59[b]	951.79[b]	0.086	p<0.05
ADG, g/d	470.59	460.29	471.18	0.076	0.921
FCR, g/g	2.11	2.05	2.02	0.194	0.173
Whole period (27-83d)					
FI, g/d	662.23[a]	625.08[b]	627.58[b]	0.040	p<0.05
ADG, g/d	306.10	300.04	311.15	0.009	0.746
FCR, g/g	2.16	2.08	2.02	0.092	0.051
Mortality, %	0.50	0.25	-	0.019	0.364

SEM, Standard error of the means; FI, feed intake; ADG, average daily gain; FCR, feed conversion rate; [a, b, c] In a row, the least squares means with a different superscript differ significantly (p<0.05)

Some previous study also showed that garlic supplementation can improve intestinal health and nutrient digestibility owing to its antimicrobial effect *(Chen et al. 2008; Ao et al. 2010; Grela and Klebaniuk, 2007)*. However, some studies have asserted that garlic supplementation has no detectable effect on the growth performance of pigs *(Freitas et al. 2001; Bampidis et al. 2005; Chen et al. 2008)*. This inconsistency may be attributable to the different garlic levels and animals

used in each study. Moreover, it has been previously demonstrated that the fermentation step could provide several advantages, such as improved flavor and enrichment with desirable metabolites generated by microorganisms *(Buckenhüskes et al. 1990). Kakimoto et al. (2000)* also reported that FGP has an anti-oxidative activity several times more potent than that of intact garlic, as well as higher anti-diabetes activity, liver protective activity, anti-cancer activity, immunity enhancing activity, and cholesterol-reducing activity.

Conclusion

The overall results obtained showed that fermented garlic powder can be used as a substitute for antibiotics in diets for growing pigs. Some further research, on a larger number of animals, could be done in order to conclude does FGP implementation only significantly benefits conversion or it can influence some other production parameters. Also economic cost could be implemented into calculation for further research.

Beli luk kao alternativa za antibiotike u ishrani prasadi u odgoju

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Rezime

Ispitivani su uticaji korišćenja antibiotika i fermentisanog belog luka u ishrani prasadi u odgoju. Ogled je sproveden na 120 prasadi, genotipa Veliki jorkšir, podeljenih u dve grupe tokom celog perioda istraživanja. U prvom periodu istraživanja korišćena je smeša hraniva sa 20% proteina, dok je u drugom korišćena smeša sa 18% proteina. Prva kontrolna grupa je hranjena smešama sa antibiotikom u količini od 0,2%, dok su ogledne grupe hranjena smešama sa belim lukom u koncetraciji od 0,05% i 0.2%. Dobijeni rezultati su pokazali da korišćenjem belog luka, umesto antibiotika, dolazi do poboljšanja prirasta u drugoj oglednoj grupi, kao i konverzije hrane u obe ogledne grupa za 3.84%;6.93% u toku celog perioda istraživanja.

Ključne reči: prasad, promoteri rasta, ishrana, proizvodni rezultati

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