

The effect of acidifying preparations in feed mixtures and no antibiotic growth stimulant on production results in growing pigs

A. Frankiewicz, M. Urbaniak, M. Kasprowicz and P. Sawarzyński

*Department of Animal Nutrition and Feed Management,
August Cieszkowski Agricultural University
Wołyńska 33, 60-637 Poznań, Poland*

ABSTRACT

Three experiments were conducted to assess the effect of replacing a feed antibiotic (flavomycin 12 mg/kg) with acidifying preparations, Agracid W, Bolifor FA 2000 S, Polcid 1, or Polcid 2, in compound feeds on the health, weight gain, and feed conversion rate of growing pigs. The study showed that none of the tested preparations used to replace the feed antibiotic led to deterioration of health or production results of the growing pigs.

KEY WORDS: acidifying preparations, growing pigs, feeding

INTRODUCTION

Organic acids and their salts are ecologically safe feed additives, and are being used with increasing frequency in animal feeding. Their activity goes in two directions. On the one hand, they inhibit adverse microbiological processes occurring during the storage of feeds. On the other hand, they maintain the proper pH and modify the microflora in the digestive tract by inhibiting the growth of pathogenic microorganisms, thereby contributing to a significant degree to the improvement of health and production results, particularly in young animals (Bolduan et al., 1988; Gedeck et al., 1992). Studies showed that the efficacy of individual acids or their salts is not uniform (Roth and Kirchgessner, 1988; Eckel et al., 1992; Roth et al., 1993; 1996; Kirchgessner et al., 1995; Paulicks et al., 1996;). It may be significantly improved by adding so-called acidifying preparations, which consist

of several organic acids as well as their salts, in appropriate proportions, and a suitable carrier combined in a suitable physical form of the preparation.

It seems that acidifying preparations may constitute an alternative for antibiotic growth stimulants, which are being withdrawn from animal feeding in the European Union (Partanen and Mroz, 1999) and soon also in Poland.

The aim of the conducted investigations was to determine the effect of the addition of acidifying preparations-differing in their composition-to feed mixtures with no antibiotic growth stimulant on the weight gain, feed conversion rate, and health of piglets.

MATERIAL AND METHODS

Three experiments were carried out on growing pigs. Animals were weaned in the 6th week, and fed a commercial concentrate for weaners until the beginning of the experiments. The first experiment was conducted on 48 growing pigs, cross-breeds Ha x (Polish Large White x Polish Landrace) with an average initial body weight of 18.3 kg. The animals were divided into two groups of 24 piglets each and were fed *ad libitum* with a complete feed based on soyabean meal, meat meal, wheat, barley and mineral-vitamin premix. The nutritive value of the experimental diets was (%): crude protein, 18.1; lysine, 1.0; methionine with cystine, 0.58; threonine, 0.60; Ca, 0.91; P, 0.71; and Na, 0.18 and ME, 13.1 MJ. Piglets from group 1 were fed a mixture containing 12 mg/kg of flavomycin, an antibiotic growth stimulant. Group 2 received a mixture without the antibiotic, but this time with an acidifying preparation, Bolifor FA 2000 S made by Kemira Keni AB (Helsingborg, Sweden) (a mixture of lactic, orthophosphoric, and formic acids, plus citric and sodium formate). In the second and third experiments, the animals were assigned to three groups, 12 animals in each, and were fed *ad libitum* with complete feed according to the experimental design presented below.

Experiment 2

Group 1 (control) – standard feed mixture with the addition of 12 mg/kg flavomycin,

Group 2 – feed mixture without the antibiotic, but with 0.2% Agracid W,

Group 3 – feed mixture without the antibiotic, but with 0.2% Selacid Dry.

Experiment 3

Group 1 (control) – standard feed mixture with the addition of 12 mg/kg flavomycin,

Group 2 – feed mixture without the antibiotic, but with 1.0% Polcid 1,

Group 3 – feed mixture without the antibiotic, but with 1.0% Polcid 2.

Agracid W and Selacid Dry are preparations readily available on the market. The acidifying preparation Polcid 1 is a mixture of formic, lactic, phosphoric, fumaric and citric acids, calcium formate and higher fatty acids; whereas Polcid 2 is a mixture of formic, lactic, citric and phosphoric acids as well as calcium formate.

The average nutritive value of the mixtures used in experiment 2 and 3 was similar to that in experiment 1. During the experimental period piglets were kept 2 animals per pen. Individual weight gain and feed consumption were recorded during the experiments.

Experimental results were analyzed statistically using STATGRAPHICS software.

RESULTS

The replacement of a feed antibiotic (flavomycin) in feed mixtures with the tested acidifying preparations did not result in deterioration of the piglets' health. The experimental results given in Table 1 show that when Bolifor FA 2000 S, Agracid W, Selacid Dry, or Polcid 1 were added, daily weight gains improved nonsignificantly ($P>0.05$) by 1.5 to 4.2% in comparison with the piglets fed mixtures containing flavomycin. The feed conversion ratio in piglets receiving acidifying preparations were 0.5% (Agracid W) to 3.7% (Bolifor FA 2000 S) lower than in the control groups. In experiment 3, similar average daily weight gains (496 g) and feed conversion ratio per kg weight (2.45 kg) were obtained for piglets fed a mixture containing flavomycin (group 1) or Polcid 2 (group 3). However, piglets fed a mixture with the addition of Polcid 1 (group 2) showed 4.2% better weight gains, but at a feed conversion ratio that was 2.5% higher per kg than in the animals from the control group.

DISCUSSION

The effect of 5 acidifying preparations was investigated in this study. The most advantageous, although not confirmed statistically ($P>0.05$), effect improving weight gain in comparison with the control groups (on average by 4.4%) was found when Selacid Dry and Polcid 1 were given. However, no significant effect of the investigated preparations was observed on the feed conversion ratio. Roth and Kirchgessner (1998), Partanen and Mroz (1999), and Øverland et al. (2000) obtained improvement of weight gain and feed conversion ratio by adding organic acids to feed mixtures. They also observed a reduction in the populations of harmful bacteria and their metabolites in the digestive tract of pigs. As confirmed by

TABLE 1
Performance and feed utilisation of pigs fed a feed mixture with the addition of flavomycin or acidifying preparations

Item	Experiment 1		Experiment 2			Experiment 3		
	Flavomycin	Bolifor FA2000	Flavomycin	Agrid W	Selacid dry	Flavomycin	Polcid 1	Polcid 2
No. of animals	24	24	11	11	12	12	12	12
Initial body weight, kg	18.7	17.9	19.45	20.14	21.58	23.31	23.43	22.74
Final body weight, kg	39.19	38.67	29.81	31.11	33.65	30.87	31.04	30.87
Daily weight gain, g	585 ± 13	594 ± 14	508 ± 29	518 ± 23	531 ± 23	498 ± 30	519 ± 34	493 ± 22
%	100.00	101.54	100.00	101.97	104.53	100.00	104.22	99.00
Feed consumption, kg/d	1.28	1.25	1.04	1.06	0.99	1.20	1.28	1.25
%	100.00	97.65	100.00	101.92	95.19	100.00	106.67	104.17
Feed conversion ratio, kg	2.19 ± 0.14	2.11 ± 0.25	2.05 ± 0.13	2.03 ± 0.07	2.04 ± 0.08	2.41 ± 0.18	2.47 ± 0.16	2.43 ± 0.13
%	100.00	96.35	100.00	99.02	99.51	100.00	102.5	100.83

studies conducted by Eckel et al. (1992), Roth et al. (1993, 1996), Kirchgessner et al. (1995, 1997), Paulicks et al. (1996), and Roth and Kirchgessner (1988; 1998), among others, the efficacy of individual acids or their salts is not uniform. It also depends on the amount of the additive and the age of the animal. The producers of the acidifying preparations used in the current study do not give their quantitative composition, which makes it difficult to interpret and compare the obtained results with those of other authors. However, the conducted investigations indicate that the replacement of the feed antibiotic flavomycin in the feed with any of the tested acidifying preparations did not result in the deterioration of health, weight gain, or feed conversion ratio in piglets. Most of the organic acids (including particularly formic acid), similarly as feed antibiotics, exhibit antibacterial properties, and inhibit the development of harmful microorganisms (Bolduan et al., 1988; Geddeck et al., 1992). Moreover, it was found that the addition of organic acids to feed mixtures has a similar effect as an antibiotic growth stimulant on the improvement of protein and amino acid digestibility in the small intestine in pigs (Blank et al., 1998, 1999; Mroz et al., 1998; Roth and Kirchgessner, 1998; Hennig et al., 2000).

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STRESZCZENIE

Wpływ dodatku preparatów zakwaszających do mieszanek pozbawionych antybiotykowego stymulatora wzrostu na wyniki produkcyjne warchlaków

W trzech doświadczeniach oceniano wpływ zastąpienia antybiotyku paszowego (flawomycyny 12 mg/kg) w mieszanekach dla warchlaków preparatami zakwaszającymi: Agracid W, Bolifor FA 2000 S, Polcid 1 i Polcid 2 na zdrowotność, przyrosty masy ciała oraz wykorzystanie paszy. Stwierdzono, że wycofanie antybiotyku paszowego z mieszanki na rzecz któregośkolwiek z testowanych preparatów zakwaszających nie wpłynęło na zdrowotność oraz pogorszenie wyników produkcyjnych warchlaków.