

Alternatives for flavomycin in broiler chicken nutrition

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Abstract

In order to determine the efficiency of application of potential substitutes of antibiotic growth promoters, a feeding experiment was carried out on 480 one-day old Ross 308 cocks. The experimental design was as follows: flavomycin – group I (control), no additives – group II, probiotic – group III, symbiotic – group IV, symbiotic + acidifier – group V and symbiotic + acidifier + enzyme – group VI.

It was found that the mixture of additives applied in groups III, IV, V and VI exerted a positive influence on the feed conversion ratio (FCR) and body weight gains (BWG). These differences were statistically significant ($P < 0.05$) in relation to groups I and II. The applied antibiotic (flavomycin) did not show activity and the obtained results were very similar to those from the control group (without antibiotic). The applied acidifier and probiotic decreased the pH of the crop as well as the gizzard, although no differences in pH were observed in the case of the small intestine and the caecum.

Introduction

Feed antibiotics were first applied in animal nutrition in 1946. Throughout the period of application of antibiotic growth promoters, attention was paid to the possibilities of the occurrence of cross resistance in bacteria (Róžańska, 1999).

At present, only four antibiotics are allowed in animal nutrition in the European Union and, by 2006, a total ban on the application of antibiotic growth promoters is to be implemented.

The following preparations are currently available on the market of feed additives which can be treated as potential substitutes of the antibiotic growth promoters: probiotics, prebiotics, enzymes, acidifiers, herbal preparations and symbiotics. However, it should also be emphasised that their effectiveness has not always been confirmed (Barrow 1992; Fuller 1992).

Materials and methods

In order to determine the efficiency of the application of potential substitutes of antibiotic growth promoters, a feeding experiment was carried out on 480 one-day old Ross 308 cocks. The birds were kept in metal cages with wire flooring and the stocking rate was 16 birds per 1 square meter. The whole experiment lasted 35 days and was divided into two feeding periods: Starter and Grower. Throughout the experiment, the birds were fed *ad libitum* isocaloric and isoprotein diets. The applied diets were based on maize and the protein component was post-extraction soybean meal. Moreover, the mixtures were additionally supplied with fat (soybean oil) and appropriate micro- and macro-elements. The following experimental design was adopted: flavomycin – group I (control), no additives – group II, probiotic – group III, symbiotic – group IV, symbiotic + acidifier – group V and symbiotic + acidifier + enzyme – group VI. The applied antibiotic was flavophospholipol, the product of *Sterpromyces bambergiensis*, *ghanaensis* 20 ppm. The composition of the applied probiotic was made up of the following bacterial strains: *Enterococcus faecium* ATCC 53519, *Enterococcus faecium* ATCC 55593. The applied prebiotic was 1.5% whey and the acidifier - Salacid balance®. The diet of group VI contained a multi-enzymatic preparation Avizyme 1500® which contained the following enzymes: protease of 4000 U/g activity, alpha-amylase of 400 U/g activity, xylanase of 300 U/g activity and pectinase of 25 U/g activity. Throughout the

experiment, a coccidiostatic (salinomycine sodium salt), in the amount of 60 ppm, was used in all experimental groups.

Table 1. Mean value of BWG [g] and mean values of FCR [kg/kg] and mean pH values for individual segments of the gastrointestinal tract.

	Group						SE
	I	II	III	IV	V	VI	
Body weight gains							
Days 0-14	333.0	293.1 ^b	338.0	333.0	354.2	339.2	5.70
Days 15-35	1434.9 ^{ab}	1428.7 ^b	1435.3 ^{ab}	1463.5 ^{ab}	1500.6 ^a	1464.4 ^{ab}	8.86
Days 0-35	1767.9 ^b	1753.0 ^b	1773.3 ^b	1796.5 ^{ab}	1854.8 ^a	1803.6 ^{ab}	10.52
Feed conversion ratio							
Days 0-14	1.41 ^a	1.35 ^a	1.32 ^a	1.36 ^a	1.19 ^b	1.16 ^b	0.02
Days 15-35	1.64 ^a	1.67 ^a	1.53 ^c	1.61 ^{ab}	1.61 ^{ab}	1.58 ^{cb}	0.01
Days 0-35	1.60 ^a	1.61 ^a	1.49 ^{cd}	1.56 ^{ab}	1.53 ^{bc}	1.50 ^{cd}	0.01
pH value in individual segments of the gastrointestinal tract							
<i>Crop</i>	5.41 ^a	5.21 ^{ab}	5.31 ^a	4.69 ^c	4.79 ^{cb}	5.04 ^{abc}	0.06
<i>Gizzard</i>	4.03 ^{ab}	4.30 ^a	4.24 ^a	3.87 ^{ab}	4.02 ^{ab}	3.60 ^b	0.06
<i>Small intestine</i>	6.08	6.14	6.19	6.07	6.10	6.15	0.04
<i>Caecum</i>	6.75	6.79	6.80	6.49	6.42	6.50	0.05

Values designated with the same letters or not designated with a letter do not differ significantly at the level of $P \leq 0.05$. (SE – statistical error)

Results and discussion

Throughout the experiment, the group with the antibiotic (I) and the negative group without additives (II) did not differ from each other with regard to the body weight gains and feed utilisation per 1 kg body weight gain. It appears that the obtained results can be attributed to very good environmental conditions (management without litter on wire flooring) as well as the microbiological conditions of the experimental area. In general, the positive effect of antibiotic replacers and antibiotics themselves becomes most apparent in worse environmental conditions (Patterson et al., 2003). The group in which the probiotic was used exhibited a lower FCR and higher BWG, in comparison with the control (I) and negative (II) groups (Table 1). Similar results were found in the group which was fed the diet with lyophilised cultures of probiotic bacteria (Jin et al., 2000; Abdulrahim et al., 1999). However, it should be mentioned here that the effectiveness of probiotic application is sometimes questioned (Cavazzoni et al., 1998).

The use of the experimental symbiotic (group IV) reduced slightly feed consumption during the entire period of experiment in relation to the control group (I). With regard to the FCR and BWG, the applied additive (symbiotic) improved slightly these parameters but the differences were not statistically significant (Table 1).

In the case of group (V), which was fed a mixture of symbiotic and acidifier, the highest body weight gains of all the groups were observed as well as lower FCR values. Also Huyghebaerta (2003) reported a positive influence of acidifiers on production results. These results can be attributed to the acidification of digesta and, consequently, restriction of pathogen multiplication (Huyghebaert 2003).

In groups IV and V, a statistically significant pH reduction of the crop ingesta was observed, whereas in groups IV and VI – a trend towards lower pH in the gizzard contents. However, no influence of the examined preparations was found in the remaining parts of the gastrointestinal tract (small intestine and caecum). It appears that, for the proper activities of digestive enzymes (lipases and amylases), it is necessary to increase the pH value in these segments of the digestive tract.

The above-presented results of experiments do not seem to corroborate the theory that acidifiers reduce the pH value of digesta in the small intestine and caecum.

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