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The Effects of Bio-Mos® Mannan Oligosaccharide and Antibiotic Growth Promoter Performance of Broilers

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Abstract: This study has been conducted to evaluate the use of Bio-Mos®, mannan oligosaccharide derived from the cell wall of yeast, as a potential replacement of growth promoting antibiotics in the diet of broilers. Effects of an antibiotic growth promoter (Avilamycin) and mannan oligosaccharide (Bio-Mos®) on performance have been examined in 320 days-old Ross 308 broiler chicks. These chicks were randomly grouped into two treatments with eight replicates of 20 chicks each. Commercial corn-soybean based broiler starter, grower and finisher diets were formulated as basal diets. Basal diets were supplemented with an antibiotic growth promoter (0.1% Avilamycin) and a mannan oligosaccharide (starter 0.15%, grower 0.1%, finisher 0.05% Bio-Mos®). Live weight, weight gain and feed intake, feed conversion ratio were not affected significantly by dietary treatments throughout the experiment ($p>0.05$). Mortality rate, hot carcass yield and feed cost for kg live weight gain did not show any significant differences among the groups ($p>0.05$). Mannan oligosaccharide (Bio-Mos®) has the potential to be an alternative to antibiotic growth promoters in broiler diets.

Key words: Antibiotic, broiler, mannan oligosaccharide, performance, growth promoter

INTRODUCTION

The use of antibiotics for growth promotion in poultry species has been banned in many countries and there is a strong possibility that they may face similar legislation in other areas of the world. Since the early 1950's antibiotics have been widely used in poultry feeds, at first primarily to control disease and more recently to promote growth and improve feed conversion. Use of antibiotics has been severely limited or eliminated in many countries and legislative action to limit their use is probable in many others.

Therefore, alternatives to antibiotics are of great interest to the poultry industry. Bio-Mos®, a mannan oligosaccharide derived from the cell wall of the yeast *Saccharomyces cerevisiae* has shown promise in suppressing enteric pathogens, modulating the immune response and improving the integrity of the intestinal mucosa in studies with some poultry species (Waldroup *et al*., 2003a, b; Iji *et al*., 2001; Sonmez and Eren, 1999; Spring *et al*., 2000).

Many studies have been conducted on MOS effects on various parameters in vide range of animal species and they have postulated that MOS improved body weight, feed conversion ratio and disease resistance in various animal groups without giving much attention to the digestion and carcass parameters (Yalcinkaya *et al*., 2008a). In many of the research conducted till today, the effects of alternatives have been evaluated against the control group or antibiotic. In some studies, a comparison was made between the alternatives. This objective of this study is to compare the effects of Bio-Mos® and the antibiotic growth promoters Avilamycin on broiler performance. The following study was conducted to evaluate the use of Bio-Mos® in diets for growing chickens in comparison to commonly used growth-promoting antibiotics.

MATERIALS AND METHODS

Feed: Diets were formulated for starter (0-21 days), grower (21-35 days) and finisher (35-42 days) periods that provided a minimum of 110% of the amino acids recommended by NRC (1994). Starter diets contained minimal added fat with reduced energy levels as an attempt to reduce the incidence of ascites (Dale and Villacres, 1986; Arce *et al*., 1992). The diets were supplemented with complete vitamin and trace mineral mixes obtained from a commercial poultry integrator. Composition of the diets is shown in Table 1.

Animals and housing: The study was performed in Bandirma Vocational High School research pen. Total 320 (Ross 308) mixed-sex one-day old broiler chickens were randomly assigned to one of two dietary treatments Avilamycin (0.1% Avilamycin) or Bio-Mos® (starter

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Table 1: Composition (g kg^{-1}) of experimental diets

Ingredients	0-21 days	21-35 days	35-42 days
Yellow corn	58.81	63.09	72.02
Soybean meal (47%)	29.98	23.70	19.17
Rasmol	5.10	5.07	3.05
Meat and bone meal	2.55	5.07	2.54
Poultry oil	1.02	1.27	1.27
Dicalcium phosphate	0.93	0.32	0.43
Ground limestone	0.70	0.56	0.71
Iodized salt	0.26	0.30	0.22
Sodium carbonate	-	-	0.16
Alimet	0.21	0.22	0.12
Liquid lysine 50%	0.16	0.16	0.14
Choline Cl (70%)	0.10	0.08	0.05
Trace mineral mix[1]	0.14	0.13	0.10
Vitamin premix[2]	0.03	0.02	0.01
Natuphos 5000 liquid phytase)	0.01	0.01	0.01
Calculated composition			
Energy (ME; kcal kg^{-1})	3070	3185	3200
Dry matter (%)	87.65	87.70	87.44
Crude protein (%, calculated)	22.30	21.10	18.22
Crude protein (%, analyzed)	22.16	20.94	18.46
Methionine (%)	0.60	0.52	0.40
Lysine (%)	1.20	1.10	0.95
Met + Cys (%)	0.90	0.86	0.72
Calcium (%)	0.90	0.80	0.75
Available phosphorus	0.43	0.37	0.33

[1]Provides per kg of diet: Mn (from $MnSO_4$*H_2O)100 mg; Zn (from $ZnSO_4$ $7H_2O$) 100 mg; Fe (from $FeSO_4$ $7H_2O$) 50 mg; Cu (from $CuSO_4$. $5H_2O$) 10 mg; I from $Ca(IO_3)_2$.H20), 1 mg. [2]Provides per kg of diet: vitamin A (from vitamin A acetate) 7714 IU; cholecalciferol 2204 IU; vitamin E (from dl-alpha tocopheryl acetate) 16.53 IU; vitamin B 0.013 mg; riboflavin 6.6 mg; niacin 39 mg; pantothenic acid 10 mg; menadione (from menadione dimethylpyrimidinol) 1.5 mg; folic acid 0.9 mg; thiamin (from thiaminemononitrate) 1.54 mg; pyridoxine (from pyridoxine hydrochloride) 2.76 mg; d-biotin 0.066 mg; ethoxyquin 125 mg; Se 0.1 mg (NRC, 1994)

0.15%, grower 0.1%, finisher 0.05% Bio-Mos®). There were eight replicates of each of the two treatments (in 14 groups of 20 birds for 42 day trial). Eight replicates groups were assigned to each treatment. Chicks were housed on shavings at a density of 15 birds m^{-2} water and feed were given *ad libitum*. Light was provided 24 h a day during the trial period.

Live weight, weight gain, feed intake, feed conversion ratio and mortality rate were recorded weekly during the entire six weeks experiment. At the and of the trial, 6 birds with live weights close to the average weight were obtained from each group and were slaughtered to determine the hot carcass yield. The average feed cost for 1 unit of live weight gain was found by dividing the number that is found by the multiplication of feed comsumption of each group the feed cost to the number found by the average live weight gain in weeks 0-6. Results were analyzed using ANOVA for a completely randomized design.

RESULTS AND DISCUSSION

The performance data obtained from the research trial are given in the Table 2-4 according to feeding periods. Live weight, weight gain and feed intake, feed conversion

Table 2: Effect of Bio-Mos® and Avilamycin on weight gain in broilers

Weeks	Avilamycin Average	Avilamycin SD	Bio-Mos® Average	Bio-Mos® SD
1	146.1	3.74	139.7	4.73
2	342.2	5.51	349.1	3.92
3	636.5	9.07	640.3	11.64
4	1044.4	16.34	1059.7	18.41
5	1521.4	15.65	1534.2	19.04
6	1959.2	26.74	2009.4*	35.21

SD: Standart Deviation. *Means Differ ($p<0.05$)

Table 3: Effect of Bio-Mos® and Avilamycin on feed intake (g) and FCR

Effects	0-21 days	21-35 days	35-42 days	0-42 days
Avilamycine				
Feed intake (g)	1.158	2.014	1.276	4.448
FCR	1.275	1.628	2.231	1.637
Bio-Mos®				
Feed intake	1.180	2.099	1.271	4.554
FCR	1.295	1.630	2.222	1.641

Table 4: Effect of Bio-Mos® and Avilamycin on mortality rate, hot carcass yield and feed cost for kg live weight gain

Effects	Percentage
Avilamycine	
Mortality rate (%)	3.34
Hot carcas yield (%)	74.3
Feed cost for live weight gain (YTL)	1.362
Bio-Mos®	
Mortality rate (%)	3.24
Hot carcas yield (%)	73.4
Feed cost for live weight gain (YTL)	1.335

ratio were not affected significantly by dietary treatments throughout the experiment ($p>0.05$). Mortality rate, hot carcass yield and feed cost for kg live weight gain did not show any significant differences among the groups ($p>0.05$). However, compared to the growth promoter Avilamycin group, the live weight gain was higher in group fed Bio-Mos® based mixture in the last week ($p<0.05$). In terms of average feed consumption and carcass yield, the differences observed between the groups were not important statistically ($p>0.05$). Although, mortality rates were not affected significantly by the different treatments ($p>0.05$).

When feed cost was analyzed for each unit of live weight gain, the lowest cost was found in the group fed with antibiotic growth promoter Avilamycin although, the difference was not very significant compared to the Bio-Mos®.

Bio-Mos® has generated considerable interest among researchers and commercial poultry producers as an in-feed alternative to antibiotic growth promoters in feed. It was seen that the different treatments used in the trial did not have any significant effect on performance criterion as like FCR and feed intake. While, there are studies that show positive results on live weight gain (Ferket, 2002; Wilson and Kenyon, 2002; Fritts and Waldroup, 2003), there are also studies that show no improvement on performance of these types of additives are used (Stanley *et al*., 1996; Ceylan *et al*., 2003;

Bilal *et al*., 2000). It is interesting to see the improvement in performance towards the end of the trial, especially in the last week. However, compared to the growth promoter Avilamycin group, the live weight gain was higher in group fed Bio-Mos® based mixture in the last week ($p<0.05$).

Waldrup *et al.* (2003a) was conducted to evaluate the response of broilers to diets containing a mannan oligosaccharide (1 g kg^{-1} diet), antibiotics (55 mg kg^{-1} bacitracin methylene disalicylate to 42 days of age followed by 16.5 mg kg^{-1} virginiamycin to 56 days of age), or a combination of antibiotics and mannan oligosaccharide. Results of the study indicate that body weight of broilers was not significantly influenced by the antibiotic treatment, addition of Bio-Mos, or the combination of antibiotics and Bio-Mos. Feed conversion at 42 days was significantly improved by both the antibiotic treatment and by the addition Bio-Mos. At 56 day, the feed conversion of birds fed the antibiotics or the combination of antibiotics and Bio-Mos was improved compared to that of birds fed the negative control.

Mohamed *et al.* (2008) was conducted that a natural growth promoter (MOS) was compared with an antibiotic growth promoter (enramycin) on performance and carcass characteristics of broiler chicks. MOS were added at 1 g kg^{-1} from 1-28 days of age and at 0.5 g kg^{-1} from 29-42 days of age. Enramycin was added at 0.35 g kg^{-1} to 28 days of age followed by 0.20 g kg^{-1} to 42 days of age. The results indicated that addition of MOS, enramycin or the combination of both did slightly improve ($p>0.05$) body weight gain during the finishing (29-42 days of age) and the overall experimental period (1-42 days of age) by about 2% compared to the control diet. Feed conversion ratio at 14 and 28 days were significantly ($p<0.05$) improved by the addition of MOS, enramycin or the combination of both. As a result, in this study was obtained that Mos might be used as an alternative to growth-promoting enramycin in broiler diets.

Yalcinkaya *et al.* (2008b) was conducted to investigate the effects of Mannan Oligosaccharides (MOSs) at the different levels (0.05-0.10-0.15%), which are commonly used as alternatives to antibiotics, on the growth performance and some blood parameters in broiler chickens.

They were determined that Body Weight Gain (BWG), Feed Intake (FI) and Feed Conversion Ratio (FCR) were not significantly different ($p>0.05$) between MOS treatment groups during the experimental period (0-6 weeks). Jamroz *et al.* (2004) was indicated tha the response of broiler chickens on supplemented diets with Avilamycin (10 mg kg^{-1}) or mannan oligosaccharides 1.0 or 2.0/1.0/0.5 g kg^{+} analysed on basic of performance, carcass quality, number of microorganisms in jejunum and caecum content, was determined. Obtained results show that a clear positive response to the doses of MOS or antibiotic were significant only in very young chickens (21 days) and were seen in body weight and reduced mortality and selection of birds. In feed conversion the best effect was obtained by use of dose of 2.0/1.0/0.5 g kg^{-1} of MOS.

CONCLUSION

It is possible to say with the findings obtained in this research that alternative additives can be used in broiler production in order to improve performance, especially in this period in which the usage of antibiotic growth promoters is being questioned increasingly.

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