

KRMIVA[®]

EFFECTS OF FLAVOMYCIN AND PROTEXIN ON GROWTH PERFORMANCE AND INTESTINAL MICROFLORA POPULATION OF BROILER FED DIETS WITH DIFFERENT LEVELS OF SOY OIL

DJELOVANJE FLAVOMICINA I PROTEKSINA NA RAST I POPULACIJU CRIJEVNE MIKROFLORE BROJLERA HRANJENIH OBROCIMA RAZLIČITE KOLIČINE SOJINOG ULJA

S. D. Sharifi, A. A. Khadem, E. Tavazoe, A. Barin, H. Moslehi

Original scientific paper - Izvorni znanstveni članak
Received - Primljeno: 8. february - valjača 2010.

SUMMARY

A study was conducted to determine the effects of supplementary flavomycin and protexin in diets containing different levels of soy oil on growth performance and intestinal microbial population of broiler chicks. Three hundred and sixty one-day old Ross broiler chicks were randomly allocated to 6 treatments, with 4 replicates and 15 birds per each replicate in a randomized complete block design. Treatments were: 3% soy oil + flavomycin (400g/t), 3% soy oil + protexin (500g/t), 3% soy oil without any growth promoter, 6% soy oil + flavomycin (400g/t), 6% soy oil + protexin (500g/t) and 6% soy oil without any growth promoter. The experimental period was 42 days and feed intake and body weight gain were recorded weekly. The ileal numbers of *Lactobacilli* and *E. coli* were counted at 21 and 42day of age. The results showed that addition of protexin to diets (containing 3 or 6% soy oil), reduced feed intake and weight gain significantly ($P < 0.05$). Supplementation diets with flavomycin, resulted in significantly lower counts of *Lactobacilli* and *E. coli*. *Lactobacilli* counts in the ileum of birds receiving protexin were significantly higher ($P < 0.05$) than those of the other treatments. It could be concluded that supplementing diets containing fat with protexin have negative effects on broiler performance and high numbers of *lactobacilli* may play a role in growth depression related to impaired fat absorption due to bile acid deconjugation.

Key words: Broiler, Flavomycin, Protexin, Intestinal Microbial Population

INTRODUCTION

The use of supplementary fat in commercial poultry diets has been wide-spread since the 1960s. In addition to their value as a dense source of energy, supplemental fats are an excellent source of essential fatty acids and enhance the absorption of

Seyed Davood Sharifi, PhD, Ali Akbar Khadem, E. Tavazoe, Department of Animal and Poultry Science, College of Aboureihan, University of Tehran, Iran; Abbas Barin, Department of Microbiology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran; Hamidreza Moslehi, Department of Animal Science, Institute of Scientific Applied Higher Education, Ministry of Jihad-e-Agriculture, Tehran, Iran.

fat soluble vitamins. The major part of the efficiency of nutrient digestion in poultry depends on the microorganisms which live naturally in its digestive tract (Apajalahti *et al.* 2003). It has been reported that intestinal microflora influences the absorption of fats (Pesti, 2002). Today, antibiotics and probiotics are used for manipulating the gut microflora in poultry production and act as growth-promoting agents. The probiotics could have a positive effect on bacterial population (such as *Lactobacillus spp.*) in the gastrointestinal tract. Addition of probiotic to diets has been found to improve tract and the growth performance (Smirnov *et al.* 2005). Antibiotics as a growth promoter could influence the numbers and types of bacteria resident in the small bowel of broilers, which is a major region of nutrient absorption (Renner, 1965). Thus, using these growth promoters will probably affect nutrients absorption, especially, dietary fats. The aim of this study was to evaluate the effects of supplementary antibiotics and probiotics in diets containing different levels of soy oil on intestinal microbial population and broiler performance.

MATERIALS AND METHODS

Three hundred and thirty six day-old Ross broiler chicks were randomly allocated to 6 treatments, with 4 replicates and 14 birds per each, with equal number of sexes, in a randomized complete block design. Treatments were: 3% soy oil + flavomycin (400g/t), 3% soy oil + protexin¹ (500g/t), 3% soy oil without any growth promoter, 6% soy oil + flavomycin (400g/t), 6% soy oil + protexin (500g/t) and 6% soy oil without any growth promoter. Diets were iso-energetic and iso-nitrogenous and sand was used as inert to diets containing high level of oil to adjust their metabolisable energy (Table 1). Feed and water were provided ad-libitum and a 24h lighting program was applied throughout the 42-day experiment. Feed intake and body weight gain were recorded weekly and feed consumption ratio was calculated. At 21 and 42 days of age, one bird of

¹Protexin is a multi-strain probiotic containing live beneficial bacteria. Each gram of protexin contains: *Lactobacillus acidophilus*, *Lactobacillus delbrouckii* subspecies *bulgaricus*, *Lactobacillus palantarum*, *Lactobacillus rhamnosus*; *Bifidobacterium bifidum*, *Enterococcus faecium*; *Straptococcus salivarius* subspecies *thermophilus*.

each sex from each replicate was randomly selected and ileal samples were collected after slaughtering. The ileal samples were assayed for *Lactobacilli* and *E. coli* counts. All collected data were analyzed using General Linear Model procedure of SAS (SAS Institute Inc., 1997), and means were compared by Duncan multiple range test.

RESULTS

The effects of soy oil levels and growth promoters on broiler performance and ileal microbial population are presented in Table 2. It indicates that the addition of probiotics to diets containing soy oil decreased feed intake and weight gain ($P < 0.05$). The numbers of *lactobacilli* and *E. coli* in the ileum were significantly decreased following addition of flavomycin to diets ($P < 0.05$). In comparison with no growth promoter and flavomycin-fed birds, higher numbers of *lactobacilli* were found in the ileum of birds fed protexin. Significantly lower *E. coli* counts ($P < 0.05$) were found in the ileum of birds fed diets containing 3 % fat and protexin. The probiotic effectiveness on broiler performance was correlated with levels of fat in diets and diets containing probiotic + 6% fat resulted the lowest weight gain ($P < 0.05$).

DISCUSSION

The results obtained in this experiment show a significant growth-depressing effect attributed to existence of protexin in the ration containing soy oil. The metabolic activity of specific bacteria in the small bowel might play a pivotal role in the efficiency of nutrient digestion and absorption, especially the deconjugation of conjugated bile salts by bacterial hydrolase activity, which is particularly observed in *lactobacilli* (Moser and Savage, 2001). In general, bile acids and their salts are known to be vital for proper fat digestion and absorption. When they are secreted into the gut, they are subjected to catabolism by a variety of bacterial species, primarily by *Lactobacillus* (Baron and Hylemon, 1997). Thus, the large number of *lactobacilli* bacteria in the ileum, which is induced by adding protexin to diet, may bring about growth depression due to reduced fat digestion and absorption. This is probably related to competition in nutrient uptake (Dashkevich and Feighner, 1989).

Table 1. Ingredient and chemical composition of experimental diets (g/kg)¹
Tablica 1. Sastojci i kemijski sastav pokusnih obroka

Grower (22-42 d)		Starter - Početni (1-21 d)		Ingredients and analyses Sastojci i analize
6% Soy oil 6% sojino ulje	3% Soy oil 3% sojino ulje	6% Soy oil 6% sojino ulje	3% Soy oil 3% sojino ulje	
555.9	638.4	514.9	579.9	Corn - Kukuruz
305.4	290.6	364.4	350.5	Soybean meal - Sojino brašno
60	30	60	30	Soy oil - Sojino ulje
11.9	12.5	13.3	13.4	Oyster shell - Školjka kamenice
14.3	15.1	16.6	16.5	Dicalcium phosphate - Dikalcijev fosfat
2	2	2	2	NaCl
2.5	2.5	2.5	2.5	Min. Premix ²
7.5	7.5	2.5	2.5	Vit. Premix ³
1.7	1.6	1.6	1.6	DL-Methionine
-	-	-	1.2	L- Lysin
38.8	-	22.1	-	Inert
				Calculated value - Izračunate vrijednosti
3150		3050		ME(kcal/kg)
19.8		22		Crude protein - Sirove bjelančevine (%)
0.88		0.95		Calcium - Kalcij (%)
0.44		0.47		Ava. phosphorus - Iskoristivi fosfor (%)
0.75		0.94		Methionine +Cystine (%)

1. 150 and 100 g/ton flavomycin and 400 and 400 g/ton protexin were added to diets at starter and grower, respectively.

² Mineral premix contained per kg: Mn, 64.5mg; Zn, 33.8mg; Fe, 100mg; Cu, 8mg; I, 640mg; Co, 190mg; Se, 8mg

³ Vitamin premix contained per kg: vitamin A 4400000IU; Vitamin D 72000 IU; vitamin E 14400 IU; Vitamin K 2000 IU; Cobalamin 640 mg; thiamine, 612 mg; riboflavin, 3000 IU; calcium pantothenate, 4896 mg; niacin, 12160; pyridoxine, 612 mg; folic acid, 1.5 mg; choline chloride, 260 g.

Table 2. The effects of treatments on performance and ileal number of *Lactobacilli* and *E. coli* of broiler chicks (log₁₀ cfu/g digesta)

Tablica 2. Djelovanje tretiranja na rezultate i broj *Lactobacilla* i *E. coli* u ileumu brojlerskih pilića

Treatments - Tretiranja	Performance - Rezultati			Intestinal bacteria - Crijevne bakterije	
	FI(g)	WG(g)	FCR	<i>Lactobaci</i>	<i>E. coli</i>
Fat - Mast(3%)+ No GP	4028.55 ^a	2233.90 ^a	1.77 ^b	7.86 ^a	5.93 ^a
Fat - Mast(3%)+Antibiotic	3883.90 ^a	2216.38 ^a	1.75 ^c	7.25 ^b	5.38 ^c
Fat - Mast(3%)+ Probiotic	3665.02 ^b	2059.14 ^b	1.77 ^b	8.10 ^a	5.67 ^b
Fat - Mast(6%)+ No GP	3652.60 ^b	1986.14 ^b	1.80 ^b	7.86 ^a	5.72 ^{ab}
Fat - Mast(6%)+Antibiotic	3902.65 ^a	2226.67 ^a	1.77 ^b	7.26 ^b	5.53 ^{bc}
Fat - Mast(6%)+ Probiotic	3468.42 ^b	1854.89 ^c	1.89 ^a	7.95 ^a	5.75 ^{ab}
SEM	75.70	42.90	0.03	0.19	0.08

^{a-c} Mean values with different superscripts on same column are significantly different (P<0.05). GP: Growth promoter, FI: Feed intake (g), WG: Weight gain (g) and FCR: Feed conversion ratio, SEM : Standard error of means.

It could be concluded that supplementing diets containing fat with protexin has a negative effect on broiler performance and the large number of lactobacilli may result in growth depression attributed to impaired fat absorption due to bile acid deconjugation.

REFERENCES

1. Apajalahti, J., Kettunen, A., Graham, H. (2004): Characteristics of the gastrointestinal microbial communities, with special reference to the chicken. *World's Poult. Sci. J.* 60:223–232.
2. Baron, S.F., Hylemon, P. B. (1997): Biotransformation of bile acids, cholesterol, and steroid hormones. Pages 470–510 in *Gastrointestinal Microbiology*. R. I. Mackie, B. A. White and R. E. Isaacson, ed. Chapman Hall, New York.
3. Dashkevicz, M. P., Feighner, S. D. (1989): Development of a differential medium for bile salt hydrolase-active *Lactobacillus spp.* *Applied Environmental Microbiology*. 55:11–16.
4. Moser, S.A., Savage, D.C. (2001) Bile salt hydrolysis activity and resistance to toxicity of conjugated bile salts are unrelated properties in *lactobacilli*. *Appl. Environmental Microbiology*. 67:3476–3480
5. Pesti, G. M., Bakalli, R. I., Qiao, M., Sterling, K.G. (2002): A comparison of eight grades of fat as broiler feed ingredients. *Poult. Sci.* 81:382–390
6. Renner, R. (1965): Site of fat absorption in the chick. *Poult. Sci.* 44:861–864. Sas Institute (1997): *Sas/Stat® User's Guide: Statistics, Version 6.12*, Sas Institute Inc., Cary, Nc.
7. Smirnov, A., Perez, R., Amit-Romach, E., Sklan, D., Uni, Z. (2005). Mucin Dynamics And Microbial Populations In Chicken Small Intestine Are Changed By Dietary probiotic and antibiotic growth promoter supplementation. *J. Nurt.* 135:187–192.

SAŽETAK

Provedeno je istraživanje radi određivanja djelovanja dodatka flavomicina i proteksina u obroke koji sadrže različite količine sojinog ulja na rast i crijevnu populaciju mikroorganizama u brojerskih pilića. Tristošezdeset jednodnevnih brojerskih pilića Ross podijeljeno je slučajnim odabirom u 6 tretiranja s 4 ponavljanja i 15 pilića po svakom ponavljanju u slučajnom potpunom bloku. Tretiranja su bila: 3% sojino ulje + flavomicin (400g/t), 3% sojino ulje + proteksin (500g/t), 3% sojino ulje bez promotora rasta, 6% sojino ulje + flavomicin (400g/t), 6% sojino ulje + proteksin (500g/t) i 6% sojino ulje bez promotora rasta. Pokusno razdoblje trajalo je 42 dana i tjedno je bilježen unos hrane i porast tjelesne mase. *Lactobacilli* i *R.coli* prebrojavani su 21. i 42. dana starosti. Rezultati su pokazali da je dodavanje proteksina u obroke (uz 3 ili 6% sojinog ulja) značajno smanjilo ($P < 0.05$) unos hrane i prirast tjelesne mase. Obroci s dodanim flavomicinom dali su značajno manji broj *Lactobacilla* i *E. coli*. Broj *Lactobacilla* u ileumu pilića koji su dobivali proteksin bio je značajno veći ($P < 0.05$) od broja u drugim tretiranjima. Može se zaključiti da je dodavanje proteksina obrocima koji su sadržavali mast negativno djelovalo na rezultate brojlera a visoki broj *lactobacilla* možda igra ulogu u smanjenju rasta u vezi sa smanjenom apsorpcijom masti zbog razdvajanja/dekonjugacije žučne kiseline.

Ključne riječi: brojler, flavomicin, proteksin, crijevna populacija mikroorganizama