

Effects of dietary probiotic supplementation on performance of broiler chicks fed on diets including full-fat sunflower seed

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The present study was conducted to evaluate full-fat sunflower seed (FFSS) as a source of protein and energy and determine the effect of supplemental probiotic on the nutrient value of FFSS-based diet.

Four hundred day-old Cobb broiler chicks were divided into 40 pens. Ten pens of birds were randomly assigned to each of four dietary treatment groups. A corn-wheat-soybean-based control diet (A) was formulated and three other iso-caloric and is-nitrogenous corn-wheat-soybean-based diets containing FFSS were prepared with and without two various commercial probiotics and named diet B (with no probiotic), C (Bioplus 2B[®]-supplemented diet), and D (Biosaf[®]-supplemented diet). Body weight (BW) and feed intake (FI) was measured on 21, 42 and 49 days of age. Data were subjected to analysis of variance as a completely randomized design using the GLM procedure of SAS. Body weight of chicks fed on FFSS-based diets was higher than those fed on control diet on day 49 of age. Chicks fed on FFSS-based diets had better feed conversion ratio (FCR) than chicks in control group during period of 3-49 days. Probiotic had no statistically significant effect on BW, FI and FCR.

Key words: full-fat sunflower seed; probiotic; performance; broilers

Introduction

Sunflower (*Helianthus annuus* L.) is one of the most widely cultivated oil seed in the world and ranks third in importance as a source of vegetable oil. Hybrid varieties of sunflower have a high oil content rich in essential fatty acids (Crum *et al.*, 1993) and a moderate amount of protein. Consequently, whole sunflower seed may provide a convenient method of adding additional energy to broiler diets, avoiding well known technical difficulties and quality problems of animal fat addition. Sunflower seed (SFS) has been previously used in poultry diets (Daghir *et al.*, 1980; Elzubeir and Ibrahim, 1991; Ortiz *et al.*, 1998; Arija *et al.*, 2000). Because of recent controversies on the use of antibiotics in animal feeds, efforts at using non-antibiotic growth promoters have been recently intensified. Although in recent years, experiments in broilers have indicated that full-fat sunflower seed (FFSS) can be used as a nutrient source for poultry diets, some of these studies have given conflicting conclusions about the effect of dietary level of FFSS on performance response of birds.

One such non-antibiotic growth promoter is yeast, *Saccharomyces cerevisiae* (Sc), a versatile innocuous microorganism that has ancient proven use in human foods. Bradley *et al.* (1994), Onifade and Babatunde (1996), Lyons (1997) and Onifade *et al.* (1999) have reported and discussed the benefits of yeast as feed supplement in poultry diets.

Kim *et al.* (1988) showed that supplementation of a commercial probiotic (*Lactobacillus sporegenes*) increased the weight gain of chickens given a diets containing mouldy maize. Consistent

improvements in body weight gain of chickens fed a culture of *L. sporegenes* have also been reported by others (Mohan-Kumar and Christopher, 1988; Kalbande *et al.*, 1992). In total, probiotics have been reported to provide digestive enzymes, a desirable effect for the host, and as a result of changes in the intestinal microflora, and synthesis of lactic acid leads to lowering of the intestinal pH, and prevention of ammonium synthesis. Although various reports on the effects of dietary enzymes on nutritional value of diets including FFSS and sunflower meal are available in the literature, no study has been reported the effects of dietary probiotic on FFSS-included diets. The present study was conducted to determine the effect of supplemental probiotic on the nutrient value of FFSS as a high fiber source of dietary protein and energy.

Materials and methods

Four hundred one-day old Ross broiler chicks were used as a 49-day long experimental period. The chicks were randomly allocated to 40 floor pens (1×1.2 m²) containing 10 chicks each with 10 replicates and assigned to receive one the 4 dietary treatments. A corn-wheat-soybean meal-based diet (control-1) was prepared in mash form and formulated to meet or exceed the nutrient requirement for growing broiler chicks recommended by the National Research Council (1994). Three other iso-caloric and iso-nitrogenous corn-wheat-soybean meal diets containing FFSS were formulated and two commercial probiotic preparations were added to create the following three experimental diets: (diet 2: no supplementary probiotic), (diet 3: diet 2 supplemented by Bioplus 2B, and (diet 4: diet 2 supplemented by Biosaf. All birds were fed starter, grower and finisher diets (ME=2800, 2900 and 2900 Kcal/Kg and CP=20.12, 18.12, and 16.31 %) during 3-21, 22-42, and 43-49 days of age, respectively. The composition of experimental diets is shown in table 1. Water and experimental diets in mash form were offered *ad libitum*.

Table 1 Ingredients and nutrient composition of the experimental diets (g/kg).

Ingredients	Starter diets		Grower diets		Finisher diets	
	Control	FFSS ¹	Control	FFSS	Control	FFSS
Corn	536.6	29.6	638.1	54.5	593.3	11.0
Wheat	101.6	484.6	57.1	498.5	162.3	601.7
Soybean meal	323.7	246.0	269.6	179.8	213.3	124.4
Sunflower seed	-	200.0	-	230.0	-	230.0
Dicalcium phosphate	13.4	13.4	9.9	9.9	7.8	7.8
Oyster shell	12.3	11.2	13.2	11.9	12.2	10.9
Salt	5.0	5.0	5.0	5.0	5.0	5.0
Vitamin premix	2.5	2.5	2.5	2.5	2.5	2.5
Mineral premix	2.5	2.5	2.5	2.5	2.5	2.5
DL-Methionie	1.3	1.2	0.5	0.5	0.2	0.1
Lysine hydrochloride	1.3	4.1	1.6	5.0	1.0	4.1
<i>Calculated analysis</i>						
ME (Kcal Kg ⁻¹)	2800	2800	2900	2900	2900	2900
Crude protein %	20.12	20.12	18.12	18.12	16.31	16.31
Ether extract %	2.55	7.16	2.78	8.09	2.83	8.13
Crude fiber %	4.51	10.68	3.89	10.98	4.50	11.58
Calcium %	0.87	0.87	0.81	0.81	0.72	0.72
Available phosphate%	0.39	0.39	0.31	0.31	0.27	0.27

¹FFSS: Full fat sunflower seed

House temperature was maintained at 33°C for week 1, 30°C for week 2, 27°C for week 3, and approximately 24°C thereafter by thermostatically controlled heater fan. The house was artificially

ventilated and incandescent light was provided for 24 h per day throughout the experiment. The birds and feed consumed were weighed on days 21, 42, and 49 to allow the calculation of feed intake, and feed: gain ratio. Mortality was recorded daily and dead birds were weighed to correct feed intake and feed to gain data for mortality. Data were analyzed using the GLM procedures of SAS. Means were separated for significance by Duncan's multiple range test at significance level of $P < 0.05$.

Table 2 Body weight (g), body weight gain (g /chick /day), feed intake (g /chick /day) and feed conversion ratio (g: g) of chicks fed on control diet and full fat sunflower seed-based diets supplementing by

Treatments		Body weight (g)				
		Day 3	Day 14	Day 21	Day 42	Day 49
Diets	Probiotic					
Control	No Probiotic	50.07±0.48	270.2±3.7	578.5±17.4	1936.8±203.1	2064.2±246.7 ^b
FFSS ¹	No Probiotic	49.85±0.76	259.3±36.4	593.1±75.0	2148.8±118.4	2397.0±143.1 ^a
FFSS	Bioplus 2B ²	49.60±0.51	273.5±25.8	618.6±53.4	2098.5±122.6	2297.8±210.8 ^a
FFSS	Biosaf ³	49.92±0.30	258.3±11.3	576.6±29.7	2032.1±143.9	2400.1±73.0 ^a
Pooled MSE		0.342	14.64	31.10	95.42	114.5
		P values				
Source of variation						
Treatment		0.582	0.659	0.523	0.180	0.031
		Feed intake (g/chick/day)				
		Days 3-14	Days 15-21	Days 22-42	Days 43-49	Days 3-49
Diets	Probiotic					
Control	No Probiotic	36.18±3.16	67.59±1.81	205.5±10.5	297.6±38.1	146.5±7.57
FFSS	No Probiotic	33.54±5.77	65.96±5.29	210.9±8.3	297.5±14.5	149.3±5.29
FFSS	Bioplus 2B	33.43±2.84	71.16±5.34	209.4±5.7	289.8±15.5	147.2±3.74
FFSS	Biosaf	32.47±2.07	67.02±4.44	206.5±5.3	303.0±10.5	147.7±3.32
Pooled MSE		2.36	2.82	4.92	14.21	3.32
		P values				
Source of variation						
Treatment		0.460	0.316	0.674	0.829	0.856
		Feed conversion ratio (g/chick/day)				
		Days 3-14	Days 15-21	Days 22-42	Days 43-49	Days 3-49
Diets	Probiotic					
Control	No Probiotic	1.80±0.156	1.53±0.09	3.09±0.317	3.83±0.290	2.90±0.17 ^a
FFSS	No Probiotic	1.76±0.089	1.39±0.10	2.71±0.069	3.58±0.44	2.63±0.07 ^b
FFSS	Bioplus 2B	1.65±0.154	1.44±0.06	2.84±0.193	3.80±1.15	2.69±0.17 ^b
FFSS	Biosaf	1.71±0.163	1.47±0.07	2.86±0.277	3.12±0.420	2.63±0.049 ^b
Pooled MSE		0.091	0.054	0.148	0.425	0.082
		P values				
Source of variation						
Treatment		0.389	0.093	0.112	0.343	0.014

¹ Full fat sunflower seed, ² Bioplus 2B, ³ Biosaf

Results and discussion

The results of experiment on the performance of broiler chicks, in which birds were fed control and FFSS-based diets with or without probiotic, are summarized in table 2. Statistical analysis of the data showed that the diets containing FFSS yielded body weights that were significantly higher than those obtained with the control diet on day 49; however, the differences were not statistically

significant on days 21 and 42 of age. The ME of FFSS used in our study may be underestimated. Feeding FFSS improved feed conversion efficiency on the whole period compared to control diet. Rodriguez *et al.* (1998) reported that there were no significant differences in feed intake, weight gain and feed efficiency among chicks fed diets with graded level of hulled FFSS (up to 250 g Kg⁻¹ diet). Rodriguez *et al.* (2005) reported that broilers fed the diets containing 100 and 200 g high oleic acid sunflower seed/kg gained less weight than those fed the diet containing no sunflower seed. Probiotics had no statistically significant effect on BW, FI and FCR. The reason for no beneficial effects of probiotic in our study is not clear. It can be suggested that a greater amount of probiotic may be required to maximize birds' performance.

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