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▼ EFFECT OF BARLEY FERMENTED WITH LACTOBACILUS SPP. AND BARLEY SUPPLEMENTED WITH ENZYME ON PERFORMANCES OF BROILERS

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ABSTRACT

An experiment was conducted to study the effects of fermented barley with *Lactobacillus spp.* and barley supplemented with enzyme on performances of broilers. Two hundred forty one day old Ross broilers were assigned to four groups, with 5 replicate and 12 birds per each replicate. Experimental diets were: Control diet based on corn-soybean meal (T_1) and three other diets containing: 35% barley without any enzyme or fermentation (T_2), supplemented with enzyme (T_3) and fermented with *lactobacillus spp.* (T_4). Feed intake, weight gain and feed conversion were measured weekly. Blood lipid parameters (total cholesterol and triglycerides) were measured at days 21 and 42. Feed intake was decreased by diet containing barley with no treatment compared to control diet ($p<0.05$). Diet containing barley with no treatment had adverse effects on performance and blood lipid parameters of broilers. However, these effects were not significant. Enzyme supplementation resulted in increase in feed intake, body weight, weight gain compared to diet with no supplementation ($p<0.05$). Feed conversion and parts yields were not affected by experimental diets. However, these parameters were numerically improved by enzyme supplementation and lactic acid fermentation. The results of this experiment indicated that enzyme supplementation had positive effects on nutritive value of barley in broilers diet.

INTRODUCTION

In some countries like Iran producing corn crop is not conventional in all areas. Therefore, the production is not enough to meet the increase in demanding need of the animal and poultry feeds. Finding an alternative for corn in poultry diet seems to be an unavoidable in this kind of situations. Among cereals used for poultry feeds, Barley (*Hordeum vulgare*) has a high genetic capacity to grow in different climatic verities. Comparing this plant to other cereals, barley has a shorter growth period, less water demand and can cope better in hard climatic conditions. At the same time this plant has low energy content for metabolism and contains anti nutritional factors that limits its use in poultry diets. One of the anti nutritional factors in barley is its water dissolved Non-Starch Polysaccharides (NSP), among most important of these is β-glucans. Polymerized β-glucan is a glucose that bonds at 1-4 and 1-3 that separates glucan from cellulose and makes water dissolved NSP which ends up as adhesive compounds. It has been reported that β-glucans density in different barley varieties are between 4.4 to %8.98. The main anti nutritional factors of NSP are the dissolved compounds which have high viscosity that increase small intestine fluid content viscosity. The adhesive effects of NSP in digestive tract causes reduction in digestion and absorption of nutrients, effects pancreatic hormones secretion, increases; bacteria growth in digestive tract, length and weight, water absorption, water consumption of chicks and causes higher litter moisture. Enzymes in animal feeds have been widely used during the recent years primarily in countries that consume a high amount of cereals like barley and wheat. Especially in poultry, these enzymes have improved; feed conversion, growth rate, digestion tract health and reduced environmental pollution caused by waste discharge. The enzymes break down NSP compounds molecules and reduce digestion adherent and finally to some extend resulting in reduction of the negative effects of NSP compounds. Therefore, the performance of birds is improved. Skrede *et Al.* (2003), reported that lactic acid fermentation of barley and wheat diets compared to non fermented barley and wheat diets improved body weight and feed conversion of broilers. Also, Newman *et Al.* (1985) showed that fungal fermentation improved performance and increased quality of litter in chicks. The aim of the present study was to investigate the effects of fermented barley with *Lactobacillus spp.* and barley supplemented with enzyme on performances of broilers.

MATERIALS AND METHODS

In this experiment, 240 chicks of Ross broilers were used. Chicks of one day old were assigned randomly to four of the experimental diets, with 5 replicate for each treatment and 12 birds per each replicate pens. The chicks were maintained in floor pens with feed and water made available for *ad libitum* consumption. The experimental diets were formulated to meet or exceed the requirements of broiler chickens as established by the NRC (1994). The feeding program consisted of a starter diet fed to the chicks from 1 to 21 d of age, followed by a grower diet fed from 21 to 42 d of age. The four experimental diets consisted of a control diet based on corn-soybean meal (T_1), three other diets: containing 35% barley without any enzyme or fermentation (T_2), supplemented with the enzyme (T_3) and supplemented with fermented *lactobacillus spp.* (T_4). *Lactobacillus planetarium* was used for barley fermentation. The grounded barley was mixed on the ratio of 1:1 with water of 40 C and was fermented at 30 C for 16 hours in a way that the bacteria population reaches 1_10^6 /gram of the paste (Skrede *et Al.* 2003). The resulted paste was spread over a plastic at 40 C for three days to be dried. A liquid vegetable oil was used to meet the same energy level that had at least % 0.05 of 440 unit β-glucanase/gram of diets. Body weights, feed consumption and feed conversion were determined weekly and were calculated for day 1 to 21, 21 to 42 and 1 to 42. When the birds were 42 day of age, a bird per pen was identified by having body weights closest to the mean body weight of the pen and was killed and parts weights recorded for the wings, thigh, breast, liver and heart. Parts yields were calculated as a percentage of live body weight.

Table 1. Effects of treatment on feed intake weight gain and feed conversion

SEM	Treatments				
	T_4	T_3	T_2	T_1	
					Feed intake (g)
12.623	724.60^{ab}	749.78^{ab}	703.68^{b}	768.74^{a}	Day 1-21
48.837	2549.72	2670.62	2439.68	2654.54	Day 21-42
50.733	3274.32^{ab}	3420.40^{a}	3143.36^{b}	3423.28^{a}	Day 1-42
					Weight gain (g)
8.36	374.40^{ab}	389.60^{a}	342.60^{b}	381.36^{ab}	Day 1-21
47.50	1246.20	1322.80	1139.20	1272.80	Day 21-42
48.75	1620.60^{ab}	1712.4^{a}	1481.80^{b}	1654.16^{ab}	Day 1-42
					Feed conversion
0.49	1.94	1.93	2.06	2.02	Day 1-21
0.04	2.05	2.03	2.14	2.09	Day 21-42
0.36	2.02	2.01	2.12	2.07	Day 1-41

[a,b] Values within a column with no common superscript differ significantly ($P < 0.05$).

RESULTS

The experimental results are presented in Tables 1 and 2. Feed intake ($P< 0.01$) and weight gain ($p<0.05$) were significantly affected by different dietary treatments, but feed conversion was not significantly affected by different dietary treatments. When untreated barley diet was used a significantly reduction ($p< 0.01$) of feed intake was shown, but weight gain was not significantly affected by untreated dietary barley treatments. At the same time untreated barley diet treatment had the lowest weight gain between treatments with the highest numerically feed conversion that has a tendency to be significance.

Table 2. Effects of treatments on some parts yield (as live body weight)

EM	Treatments				Partis yield
	T_4	T_3	T_2	T_1	
1.046	66.57	66.91	65.16	67.01	Carcass weight (%)
0.771	19.42	19.42	19.97	19.97	Breast weight (%)
0:205	19.85^{a}	19.27^{ab}	18.97^{b}	19.59^{ab}	Thigh weight (%)
0.576	9.11	8.16	9.31	8.64	Wing weight (%)
0.708	25.78	26.24	24.66	26.32	Liver weight (g/kg)
0.369	7.31	7.59	6.96	7.57	Heart weight (g/kg)

a,bValues within a column with no common superscript differ significantly ($p< 0.05$).

DISCUSSION

Feed intake from 1-42 days in birds fed barley without treatment (T_2) was significantly less than control diet (P=0.0063). Enzyme supplementation significantly increased feed intake compared to T_2 (p=0.0068). Weight gain from 1-42 days in T_3 was significantly greater than T_2 (P=0.0193). Feed conversion from 1-42 days was least numerically in birds fed diet supplemented with enzyme and was greatest in groups fed barley with no treatment. Although lactic acid fermentation and enzyme supplementation (T_3 and T_4) resulted in numerically increase cholesterol and triglycerides of blood compared to T_2 but differences were not significance (the data not shown). Results indicated that lactic acid fermentation of barley can be used for increasing nutritive value of barley in broiler chickens. The results of the present study is in agree with Mathlouthi *et al.* (2002) study of supplementation of xylanase and β-glucanase to barley and wheat diets that improved weight gain and feed conversion but the enzyme supplementation of barley was not effected as of this study. Also, supports Moharrery (2006) that by using fermented barley obtained from rumen and enzyme improved feed intake and growth in broilers.

The effects of these treatments on parts yield are presented in Table 2. There were no significant or consistent treatment effects on most parts yield, except thigh weight. Also, there were no significant treatment effects on blood parameters of cholesterol and triglycerides which is generally inconsistent with work of Mathlouthi *et al.* (2002). In fact, the data from the present study suggest that performance of broiler chickens may be increased in barley containing diets supplemented with enzyme. Poultry industry should be able to significantly benefit from enzyme supplementation of barley in poultry diet particularly in countries similar to Iran.

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