



IMPACT OF COMPLETE REPLACEMENT OF CORN BY MILLET WITH ENZYME IN BROILERS DIET ON SOME PHYSIOLOGICAL PARAMETERS AND PERFORMANCE

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Abstract

The present study investigated the effect of total substitution of corn by millet in broiler diets on physiological and productive characteristics. Where 200 chicks (Ross) divided into two groups. The first group was considered control group C and the other group was treatment T group. The control group was fed on commercial diet produced by Al-Hadetha company for animal and agricultural production, while the treatment group was fed on the same diet after complete replace corn with millet. food and water were *ad libitum* for all experimental groups. The daily weight was calculated every 5 days, feed was calculated weekly to calculate the conversion factor. Blood samples were taken from the jugular or wing vein at day 25th to measuring the complete blood picture and to prepare the serum to measuring lipid profile, liver enzymes activity (GPT, GOT and ALP) and blood proteins. The results showed a significant increase in the body weight in the treatment group over the period of the experiment compared with the control group, also showed a decrease in the conversion factor of the treatment group compared to the control group. On the other hand, the results of the current experiment did not show any significant difference between the experimental groups in the physiological parameters such as red blood cells White blood cells, hemoglobin, hematocrit, liver enzymes AST, ALT, ALP, triglycerides, cholesterol and blood proteins.

We conclude from the above that the complete substitution of corn by millet in the broilers feed has a good effect in raising the productivity efficiency of broiler without affecting the natural physiological functions of chickens.

Key words: Millet, broiler performance, corn replacement, liver enzymes, broiler diet.

Introduction

For decades, corn has been the major utilized grain in poultry diets with inclusion rates often exceeding 50%. Since 2006, the new era of the corn-ethanol industry for biofuel production has increased divergence of corn to this energy sector. Consequently, together with increased consumptions of corn by the growing human population and marginal increase in corn production coupled with poor production per hectare, the gap between the supply and demand is going to widen and this may put lots of pressure on the price, corn prices have considerably increased over the past years. This unprecedented diversion of corn to the corn-ethanol industry and increasing human consumption have contributed to higher

feed costs in poultry production. Therefore, to help alleviate increased production costs and sustain economic feasibility of poultry production, the poultry industry requires alternative grains to corn (Kumaravel and Natarajan, 2014)

Millet can be grown in rainless season as low as 200-250 mm. Therefore, it is the only trusted productive grain in the driest rain-fed regions of the arid and semi-arid tropics. This properties make the millet is the most drought-tolerant of all domesticated grain (Bidinger and Hash, 2003).

Rama Rao *et al.*, (2002) reported that cost (Rs) of feed required to produce one kg of live weight gain in corn fed group was 18.22, whereas in *Pearl Millet*, finger millet and sorghum fed groups, it was 15.52, 18.19 and

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17.27, respectively. It was Rs. 2.70 less by replacing the corn with *Pearl Millet*. Feed cost per unit gain and meat yield were significantly ($P < 0.05$) less in all *Pearl Millet*-soya based diet. The feed cost per unit meat yield was less in diets with 51 per cent millet replacing 75 per cent corn and also supplementation of enzyme reduced the cost of feed per unit gain marginally (Elangovan *et al.*, 2003). Satyanarayana Reddy *et al.*, (1991) concluded that millet can replace corn completely without adversely affecting the broiler performance. It is in agreement with those of Asha Rajini *et al.*, (1986) and Abate and Gomez (1984). Rama Rao *et al.*, (2004) recommended that corn can be replaced in to with millet on weight basis without affecting growth, feed efficiency, carcass traits and immunity in broilers. Similarly, Raju *et al.*, (2004) concluded that millet and jowar could replace corn on part by part basis. Jha nisha and Kumar naresh (2008) suggested that corn can be replaced by millet up to 100 percent level in broiler diet without affecting their performance. Bulus *et al.*, (2014) concluded that, complete replacement of corn with millet, finger millets or with yellow guinea corn in broilers diet did not impair feed intake, body weight, feed conversion ratio and nutrient retention. corn could be replaced successfully with *Pearl Millet* in broiler chicken (Kumaravel and Natarajan, 2014). The present study was conducted to investigate the physiological and production effect of complete replacement of corn by local millet in broiler chicken.

Materials and Methods

This study was carried out at the animal house of the College of Agriculture, University of Sumer, Iraq during the period extended from March 17, 2018 to April 17, 2018.

Experimental design

Two hundred unsexed one day old Ross chicks were individually weighed and randomly allocated into two groups (100 chicks per each) vaccinated against most common infectious diseases Newcastle, avian Influenza and Infectious Bursal disease (Intervet. Holland). The experimental periods were extended for 32 days. First group broiler checks were fed on basal diet (commercial diet) and served as control group. Commercial starter and grower diets (compose from corn, soybean, multivitamin, minerals, Methionine, Di-calcium,, choline chloride, Lysine, and vegetable oil with crude protein 23% and digestible energy 3010 Kcal/kg for starter and crude protein 21% and 3100 Kcal/kg for grower) from Al-Hadetha Co., Iraq was used as basal diet.

Second group broiler chicks were fed on commercial

diet with complete replacement of corn by millet with commercial enzyme (Inracol Ltd, Belgium), the millet was grind and mixed with other diet constituent (except corn) then the whole diet was prepared as a pellet by special instrument. Broiler checks were weighed initially and every 5 days interval. Wing blood samples were obtained at the end of experiment for assessment of total RBC, Hb and differential WBC count (Bergmayer and Bernt 1974). ALT, AST, ALP (Tietz, 1970), total cholesterol (Verley, 1975) and Triglyceride (Tietz, 1998) concentrations were assessed using spectrophotometric methods.

Statistical analysis

The results were expressed as mean \pm SD. T test was used to compare between experimental groups. Difference at a level of $p < 0.05$ was considered as significant. Statistical analysis was performed using the GraphPad Prism-version 5 (Graph Pad Software, Inc. California, USA).

Results

The results of body weight and food conversion in the present study which represented in table 1 showed significant ($p \leq 0.05$) elevation in body weight of treated group compared to that of control group started at day 5. Furthermore, the different between experiment groups was increase at day 25 and 30 when was become more significant ($p \leq 0.01$) and the treated group was recorded 1660 ± 25 g at end of the experiment while the control recorded 1469.44 ± 20 g at the same time.

Food conversion factor (FCF) was calculated at the end of study. The treatment group was recorded FCF significantly ($p \leq 0.05$) lower than that of control group, also the deferent between the two groups in the accumulative food consumption was insignificant ($p \geq 0.05$).

The results of blood parameters which were measured at this study table 2 were showed insignificant ($p \geq 0.05$) differences between experimental groups in WBC and RBC count, Hb concentrations, HCT and H/L ratio in the samples which were collected at the end of this study.

Results of lipid profile and some blood proteins table 3 were recorded insignificant ($p \geq 0.05$) decrease in the cholesterol and tri-glycerid concentrations, also total protein and albumin concentration were recorded insignificant ($p \geq 0.05$) difference between the experiment groups.

Table 4 showed the results of measurement of the liver enzymes activity which were showed insignificant

Table 1: Effect of complete replacement corn by millet in broiler feed on body weight and conversion factor.

Age per day	Treatment group			Control group		
	Body weight per g	Accumulative feed per g	Food conversion factor	Body weight per g	Accumulative feed per g	Food conversion factor
0	48±4 a			48±5 a		
1	± 5 a56			55±4 a		
5	120.41±4 a			90.66±6 b		
10	230±10 a			210±7 b		
15	466.18±6 a			410.41±8 b		
20	789.6±10 a			696±10 b		
25	1363.8±20 a			1292±11 b		
30	1660±25 a	3030a	1.825a	1469.44±20 b	3070a	2.089b

Values were expressed as mean ± SD (n=15 of broiler chicks), Different small letters refer to significant differences ($p < 0.05$) between groups of experiment.

Table 2 : Effect of complete replacement corn by millet in broiler feed on blood parameters.

Groups	WBC (1000/ml)	RBC (10*12)/L	HB g/dl	HCT	H/L ratio
Control	24±0.3 a	2.36±0.02a	10.5±0.01a	27.5±0.02a	0.27±0.01a
Treatment	24.1±0.2 a	2.37±0.03a	10.4±0.02a	27.7±0.03a	0.27±0.02a

Values were expressed as mean ± SD (n=15 of broiler chicks), Different small letters refer to significant differences ($p < 0.05$) between groups of experiment.

Table 3: Effect of complete replacement corn by millet in broiler feed on lipid profile and some blood proteins.

Groups	Chol. mg/100ml	Tri. Mg/100ml	Protein g/100ml	Albumin g/100ml
Control	±6 171.33a	±3 71.9 a	5.6±1 a	1.92±0.4 b
Treatment	±5 165.8 a	±2 65.5 a	5.5±1 a	1.93±0.23 a

Values were expressed as mean ± SD (n=15 of broiler chicks), Different small letters refer to significant differences ($p < 0.05$) between groups of experiment.

Table 4: Effect of complete replacement corn by millet in broiler feed on the activity of the liver enzymes.

Groups	AST µ/L	ALT µ/L	ALP µ/L
Control	7.9±0.5a	20.4±2a	4347±11a
Treatment	8.1±0.5a	20.25±3a	3048±8b

Values were expressed as mean ± SD (n=15 of broiler chicks), Different small letters refer to significant differences ($p < 0.05$) between groups of experiment.

($p \geq 0.05$) increase in the activity of the GPT, while the activity of GPT was recorded insignificant ($p \geq 0.05$) difference between the two groups of the present study. Otherwise, the measurement of ALK showed significant ($p \geq 0.05$) decrease in the treated group compared with that of control group.

Discussion

The finding of chicken performance in the present study was not agreed with many researchers whose using the millet as partial or complete substitution to corn, Satyanarayana Reddy *et al.*, (1991) reported that 50% or 100% replacement corn by millet in broiler feed could not exert any significant influence on body weight, Rama Rao *et al.*, (2002) observed that broiler body weight was

significantly ($p \leq 0.05$) lower at 3 and 5 weeks of age when feeding on diet with totally replaced corn by millet but not at 7 weeks of age. Also, Rama Rao *et al.*, 2003 mentioned that body weight was depressed when replacing corn with millet at all the levels of inclusion in the diet at 21 day of age. This finding may be due to the absence of enzymes and the method of food preparation (millet grinding and pellet formation), enzyme supplementation improved body weight in chicken fed diet having millet replacing 25, 50 and 75% of corn (Elangovan *et al.*, 2003). Afsharmanesh *et al.*, 2016, also reported that, the diet contain millet with enzyme required less soya bean meal and can improved growth performance.

From other aspect, our results were agreed with that of Tornekar *et al.*, (2009) whose fund that the replacement of corn by millet grains in experimental diet resulted in increased body weights of experimental birds. Also, Neerusha Baurhoo (2011) reported that replacing corn with millet in broiler diet caused significant improvement in growth parameters.

Results of some blood parameters were recorded insignificant ($p > 0.5$) deference between experimental groups, and the values recorded in the present study were in the range of normal values of broiler (Banerjee, 1998).

Cholesterol and triglyceride levels were insignificantly ($p \geq 0.5$) decreased in the samples of treatment group compared with that of control, this findings were agreed with Rama Rao *et al.*, (2003) whose reported that cholesterol and triglyceride levels were not altered during first 3 weeks of broiler age, but they were significantly ($p \leq 0.01$) decreased at 42 days of age after complete replacement corn by millet.

Liver enzymes activity were not altered due to complete replacement of corn by millet, this mane the millet not contain harmful effect on lever cells and can be used without any prior preparations like soya bean (Mojgan, *et al.*, 2012).

In conclusion complete replacement of corn by millet with enzyme in broiler diet for 32 days of age improve chicken performance and has no significant ($p \geq 0.05$) on blood parameters, lipid profile and liver enzymes activity.

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