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ORIGINAL ARTICLE

Studies on the Comparative Effect of Organic and Synthetic Feed on the Growth and Serum Metabolites of Broiler Chicks

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ABSTRACT

Introduction: Modern broiler production efficiency is built on the improved feed for high growth and egg output. Growth performance of broilers greatly influenced by the feed contents.

Objective: The objective of this study was to analyze the impact of organic and synthetic feed on the growth, feed utilization and serum metabolites of broilers chicken.

Material and Methods: This experiment was conducted for 28 days on broiler chickens. Broilers were divided into five treatments such as T0, T1, T2, T3 and T4. Control group T0 received basal diet. T1 and T2 received organic feed. T3 and T4 received synthetic feed.

Results: All the feed were given at the levels of 3% and 6%. Feed were given orally in the form of pellets.

Practical implication: Growth performance were observed and recorded at weekly basis. After the completion of trial, blood sample were taken for the analysis of serum metabolites.

Conclusion: Results showed that value of WG, absolute weight gain and SGR were increased significantly ($p<0.05$) in combine treatment T2 (6% organic feed) with respect to T0 (control group). Feed intake and FCR was significantly ($p<0.05$) in treatment T2. Serum metabolites i.e. cholesterol, triglycerides, glucose and total protein were significantly analyzed ($p<0.05$).The result of present study explained that T2 having organic feed showed better growth performance of broiler chickens.

Keywords: broilers chicken**,** feed requirement, weight gain, FCR, serum metabolites,

INTRODUCTION

Poultry industry is globalized and expanding due to rising demand of food. Broiler sector is the fastest expanding and most adaptable sector of livestock industries[1] . Good quality in feed formulation and better growth performance improve efficiency of the broilers farming. Broilers generally achieve the highest growth rates and minimum cost per unit of production owing to strong feed conversion which gives them an edge over other livestock species especially ruminants which cannot do so to the same level[2].

Food processing sector estimates a worldwide production of 130 million tons of chicken meat in 2020 and become the world's most widely consumed animal meat[3]. Aspects including increasing human population, rising income, urbanization and the health-benefit relationship all contribute to the product's high demand, which in turn leads to higher production[4]. Broiler industry in developing countries is troubled by feed ingredients shortage. Feed cost comprises 70 percent of the overall cost of broiler production and the requirement of low cost feed is the main issue for industry. Specialists in livestock are pursuing natural feed materials that are healthy for both people and the environment [5].

Feeding is most important input in chicken's production. High-quality feed is critical for broilers growth. Nutritional values of the diet in broilers depend upon its high palatability and accessibility of ingredients. Feed form is considered to have a very significant impact on broiler growth [6]. Pellet form of feeding improved growth performance by increased digestibility and high protein bioavailability . Feed containing strong balance of feed conversion ratio resulted in maximum growth development. The more effective and promising approaches of feeding in broilers are organic and synthetic feed[7].

Organic feed is produced without utilization of any foreign substances such as synthetic, pesticides, antibiotics or hormones[8]. Organic feed is natural and untreated provides healthier flock and more nutrition. It delivers a richer and better taste [9]. Food substances or products that are manufactured artificially rather than through natural processes are referred to as synthetic feed. Synthetic substances supply essential amino acids like methionine and lysine. These amino acids enhance the protein synthesis and feed efficiency of broilers .The organic food sector has grown at a rapid rate of up to 20% each year. Due to the rising demand for meat and egg products, broilers fed organic feed are increasingly accessible to the typical consumer [10]. Organic feed requires intensive human labor. There are following ingredients are needed to mix organic diet on farm like wheat corn and soybean[11]. Wheat is one of the best organic feed ingredients. It is commonly available and good source of energy. Corn is the easiest grain for chickens to digest and is low in fiber. It provides 7.5% crude protein [12]. For broilers, soybean is a rich source of fat and protein. Soybean seed contains a trypsin inhibitor that can severely interfere with digestion in a broilers gut and used must be heat treated to inactivate this compound [13]

Synthetic feed added to the basic feed, usually in small amounts, to raise the feed's quality. Along with increasing the feed ingredients' digestibility, it enhances the health and performance of broilers. There are following ingredients are used in the formation of synthetic feed like fishmeal and poultry by products meal [14]. Fishmeal is an excellent source of protein in broilers. Unsaturated fatty acids, essential minerals and vitamins are well-balanced in fishmeal. Broilers diet with the inclusion of poultry byproduct meal provides high protein content. Although broiler nutrition is used up to 7.5% of poultry byproduct meal, efficiency and egg production are still not negatively affected [15].

Growth performance traits like increased body weight and growth rate have been produced due to strong selection pressure. It enabling broilers to have a greater hunger and as a result consume more voluntary feed per day[16]. Blood parameters are crucial for determining the feed utilization and growth in broilers are serum metabolites. Serum metabolites which are serum glucose and cholesterol used as a feed intake predictors [17] Broilers with improved feed conversion have higher digestive efficiency and they will achieve high growth rate [18].Therefore, The purpose of the experiment was to examine the effects of organic and synthetic feed on broiler chicken growth, feed utilization and serum metabolites.

Objectives: The main objectives of the present study were:

- To examine the influence of serum metabolites in broilers chicken when given to organic and synthetic feed.
- To determine the impact of organic and synthetic feed on the growth and feed utilization of broilers.

MATERIALS AND METHOD

Poultry production has recently received more attention worldwide. Its high productivity is due to latest advances in broilers chicken production and now marked by great competition and developed technical feeding approaches. The present study was done to determine the effect of organic and synthetic feed on growth, feed utilization and serum metabolites of broilers chicken. The experiment was launched at research farms in Department of Zoology, Wildlife and Fisheries in UAF Community College Pars.

Experimental conditions: Twenty broiler chickens of 1 week were required for this experiment. For 28 days all of the broilers were confined in research area of UAF community college PARS. Before the trial, the broilers were acclimatized for one week in cages. They were divided into five equal groups (four broilers in each group) kept at 27◦C. Temperature was monitored by thermometer. The broilers were accessed to basal feed, distilled water and twelve hour of light and dim cycle. All animal ethics were followed during whole experimentation set by moral committee of Agriculture University Faisalabad.

Formation of feed ingredients: Ingredients of experimental diets were purchased from a local market and before being used in diets, these ingredients passed a chemical analysis in accordance with AOAC guidelines (1995).Before making experimental synthetic and organic diets, ingredients were ground and stained for getting specific particle size. Four experimental diets were made by supplementing different ingredients of synthetic and organic feed (E1-Kasheif et al., 2011). Five treatments were made (T1, T2, T3 and T4) and control (T^0). Control group was provided only water and basal feed. T1 and T2 were the treatments having organic feed at the levels of 3% and 6%. T3 and T4 were the treatments having synthetic feed at the levels of 3% and 6%. The composition of organic and synthetic feed were given in table I (a and b respectively).

Table 1a: Composition of organic feed:

Ingredients	Control	T1	T2
Corn	45.0g	45.0g	45.0g
Soybean	0.0g	1.5g	3.0g
Wheat offal	29.0	26.0g	23.0g
Cod liver oil	0.0g	1.5g	3.0g
Vitamins and minerals mix	1.0g	1.0g	1.0g
Rice bran	24.0g	24.0g	24.0g
Ascorbic acid (Antioxidant)	1g	1g	1g
Total	100g	100g	100g

Table 1b: Composition of synthetic feed:

Ingredients	Control	T1	T2
Fishmeal	45.0g	45.0g	45.0g
Poultry by product meal	0.0g	1.5g	3.0g
Meat meal	29.0	26.0g	23.0g
Cod liver oil	0.0g	1.5g	3.0g
Vitamins and minerals mix	1.0g	1.0g	1.0g
Rice bran	24.0g	24.0g	24.0g
Ascorbic acid (Antioxidant)	1g	1g	1g
Total	100g	100g	100g

Feeding Protocol: Broiler chicks were fed twice a day throughout the feeding trial. Four chicks were stocked in each experimental cage. The feeding session was lasted for 4-4.5 hours. Remaining feed removed from the cages and the cages were cleaned. Unconsumed feed was used for FCR determination.

Feed utilization and growth performance: Feed utilization and growth performance were determined in terms of absolute weight gain, WG, rate of particular growth and FCR.

Weight gain (%): Equation was used to determine gaining weight:

$$\text{Weight gain } \% = \frac{\text{Final weight} - \text{Initial weight}}{\text{Initial weight}} \text{X}100$$

Absolute weight gain: AWG of broiler chicks were calculated by subtracting final weight from initial weight.

Absolute weight gain (g) = $F_w - I_w$

Specific growth rate: SGR of broiler chicks was determined as:

$$\text{SGR} = \frac{\text{In}[\text{Initial weight (g)} - \text{Final weight (g)}]}{\text{Experimental duration in days}} \text{X}100$$

Feed Conversion Ratio: Feed utilization was determined by calculating feed conversion ratio.

$$\text{FCR} = \frac{\text{Total dry feed intake (g)}}{\text{Wet weight gain (g)}}$$

Serum Metabolites

Blood samples were collected by puncture the ulnar vein. After 6 hours of fasting, sanitized syringes were utilized. 3mL sample of blood was taken and placed in sterile tubes without anticoagulant. Specimens were moved at 6000rpm for ten minutes. Obtain sera were relocated to micro tubes and placed at -20℃. This sample was used for serum metabolite analysis. Serum metabolites were determined enzymatically colorimetric method adopting accessible kit like total protein: biuret test; triglycerides: GPO approach; glucose: GOD-POD technique and cholesterol: CHOD-PAP method.

Statistical Analysis: Statistical analysis of data was done by applying ANOVA (One-way analysis of variance) using CRD and possibility of $p<0.05$ was used (Snedecor, 1991). Treatments are placed together along with sources and various feed levels in table II.

Table 2: Following treatments were assembled according to origin of feed and level of feed:

T0	Basal feed
T1	3% Organic feed
T2	6% Organic feed
T3	3% Synthetic feed
T4	6% Synthetic feed

RESULTS AND DISCUSSION

Growth performance and feed utilization: Broiler chickens were in good health throughout the entire experimental period. Mortality was low and no appreciable differences in mortality were observed among treatments. The effects of dietary organic and synthetic feed on broiler performance were detailed. WG, AWG and SGR were affected by dietary feed source. Feed intake and feed conversion ratio were higher ($p< 0.05$) in chicks fed the organic feed than in those fed the synthetic feed across all time periods (1 to 28 days).

Table 3: Effect of organic and synthetic feed on growth performance and feed utilization of broiler chicks (n=4)

Parameters	Maximum value Mean ±SD	Minimum value Mean ±SD
Weight gain (g)	$302±16.4^a$	$135±8.8^c$
Absolute weight gain (g)	$403±74.2^a$	$111±12.2^b$
Specific growth rate (g)	$21.4±0.8^a$	$16.7±0.4^b$
Feed intake (g)	$412±50.7^a$	$226±13.2^{bc}$
FCR (g)	$3.0±0.4^a$	$0.7±0.07^d$

The means for the same row with various superscripts differ significantly ($p< 0.05$).

In Table III the WG was significantly ($P<.05$) enhanced by dietary supplementation of organic feed as compare to synthetic feed. The highest weight gain was achieved in the chickens fed with 6% organic feed in treatment T2 as (302±16.4) compared to treatment T0 as (135±8.8) fed with basal feed. That might be due to organic feed performed better in enhancing the weight gain then treatment animals fed with basal feed. The addition of organic feed fed to rats improved the body weight gain[19]. The broilers' performance in terms of growth was improved by using organic feed on a daily basis [20].

Absolute weight gain of chicks showed that treatments treated with organic feed achieved higher absolute weight gain compared to control treatment. Maximum absolute weight gain was observed in treatment T2 as (403±74.2) treated with 6% organic feed. Minimum absolute weight gain was observed in T0 as (111±12.2) given basal feed. Chicks attained maximum absolute weight gain might be due to high feed utilization and protein

sparing effect. Organic feed supplemented in broiler improved weight gain and feed conversion ratio[21].

Specific growth rate of broilers showed significant results p<0.05. Maximum specific growth rate in treatment T2 as (21.4±0.8) treated with 6% organic feed. Minimum specific growth rate was showed in treatment T0 as (16.7±0.4) treated with basal feed. Highest SGR was showed in T2 treatment. This might be due to high rate of feed conversion ratio and gained more body weight. These high rate of feed conversion ratio increase the body weight of albino mice [22]. broilers organic feed significantly improved their performance[23].

Maximum value of feed intake showed in treatment T0 as (412±50.7) treated with basal feed. Minimum value of feed intake showed in treatment T2 as (226±13.2) treated with 6% synthetic feed. The FCR was found significant (p<0.05) among all the treatments. Maximum value of feed conversion ratio was observed in treatment T0 as (3±0.4) treated with basal feed. Minimum value of FCR was showed in treatment T2 as (0.7±0.07) treated with organic feed. Low level of FCR illustrated little feed intake increased weight gain in broiler chicks. Treatment T2 showed small value of FCR and gained high body weight. That might be due to broilers fed organic feed in their diet gained more body weight due to improved nutrient utilization. The improvement in the FCR with organic feed supplementation showed higher BW due to improved nutrition utilization [24].

Serum Metabolites: Serum metabolites are much affected by feed ingredients. Components of serum metabolites like Cholesterol, triglycerides, serum glucose and total protein showed significant results (p<0.05).

Table 4: Effect of organic and synthetic feed on growth performance and feed utilization of broiler chicks (n=4)

Parameters	Maximum value Mean ±SD	Minimum value Mean ±SD
Cholesterol (mg/dl)	136.6±3.0^a	124.9±1.80^b
Triglycerides (mg/dl)	144.9±1.9^a	125.1±2.3^c
Serum glucose (mg/dl)	121±7.5^a	105±2.3^b
Total proteins (mg/dl)	43.3±1.5^a	36.5±1.4^c
Serum urea (mg/dl)	6.1±1.2^a	4.0±0.4^a
Creatinine (mg/dl)	2.7±0.1^a	1.5±0.3^b

The means for the same row with various superscripts differ significantly (p< 0.05).

Cholesterol is a major sterol found in the body's intracellular membrane and cell surface. In Table IV maximum value of cholesterol was showed in treatment T4 as (136.6±3.0) treated with 6% synthetic feed. Minimum value of cholesterol was observed in treatment T0 as (124.9±1.80) treated with basal feed. Higher level of cholesterol in T4 might be due to an excessive accumulation of lipid in the liver and other tissues.

Broilers showed maximum value of triglycerides in treatment T4 as (144.9±1.9) treated with 6% synthetic feed. Minimum value of triglycerides showed in treatment T0 as (125.1±2.3) treated with basal feed. Minimum level of triglycerides might be due to dietary fibre reduce the level of triglycerides through adsorbing bile acids. The broiler with feed to find out the decline in triglycerides at the trial of 25 to 32 days [25]. The reduction in organic feed was responsible for the decrease in serum proteins [26].

Serum glucose of chickens showed that maximum value of serum glucose in treatment T4 as (121±7.5) treated with synthetic feed. Minimum value of serum glucose showed in T0 as (116±3.4) treated with basal feed. Higher serum glucose level might be due to higher weight gain and feed intake. These broiler chicks that increased serum glucose level due to intake of synthetic feed[27]. The adding supplements to broilers' meals causes the concentration of glucose to decrease [28].

Maximum serum total proteins of broiler chicken in the present study were observed in treatment T4 as (43.3±1.5) treated with synthetic feed. Minimum value of serum total proteins was showed in treatment T0 (36.5±1.4) treated with basal feed. That might be as a result of mRNA transcription failure or an inability to transport amino acids, which stops protein synthesis. These decreased protein concentrations demonstrated hypoproteinemia. Maximum concentration of urea and creatinine in combine treatment T0 as (6.1±1.2 and 2.7±0.1) indicating severe kidney damage when compared to other groups. A severe injury to the renal tubules could be the cause of the rise in serum urea and creatinine concentration.

CONCLUSION

Overall outcome of the research analysis showed that dietary organic feed exploited growth parameters as high weight gain, specific growth rate, better feed utilization and improved serum metabolites with respect to synthetic feed. Organic feed have beneficial effect as high palatability and increased protein bioavailability. Synthetic feed showed less growth performance due to some anti- nutritional factors.

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