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# EFFECT OF REPLACEMENT WATER HYACINTH MEAL (*EICHHORNIA CRASSIPES*) BY WHEAT IN PRODUCTION AND CARCASS TRAITS IN ROSS BROILER CHICKENS

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## Abstract

The study was carried out at the Animal Production Department, Faculty of Agriculture, University of Kufa to investigate the effect of replacing *water hyacinth* meal (WHM) with wheat in the broiler diets. Starter diets (23.82% C. P and 3029.7kcal ME/kg) feed were gave to the birds from week 1 to week 3 of age, and finisher diets which contained 20.94% C. P and 3204.5 kcal ME/kg were gave from week 4to week 6 of age. Three hundred one day old Ross 308 chicks were randomly divided into five groups with three replicate (20 bird /replicate) per group. Each group was subjected to the one of the following treatments (T1) 10% wheat without WHM, (T2) 7.5% wheat+2.5% WHM, (T3) 5.0% wheat + 5.0% WHM, (T4) 2.5% wheat +7.5% WHM, (T5) 0.0% wheat+10.0% WHM). Randomized completely Block Design (RCBD) was used. Live body weight, weight gain, feed consumption, feed conversion and mortality rate were measured to the 6 weeks of age , and for the slaughter weight , dressing percentage , weight percentage of carcass–cuts. Result showed that there were significant differences ($P<0.05$) among treatments in weight gains at all periods. Treatment 2 showed the highest live body weight at 6 weeks of age; however, Tr.5 showed the lowest value. There were significant differences ($P<0.05$) in the rate of feed consumption among treatments during the different periods. Birds in Tr.5 consumed the highest amount of feed compared with control. Also, there was significant differences in feed efficiency among all treatment groups at all periods where, the highest value was found in (Tr.5), and the lowest value was recorded in (Tr.1). There was a significant differences in dressing percentage among treatments at (6) weeks of age, where (T2) was the highest value, compared with other treatments. Also, significant differences ($P<0.05$) in giblets weights and carcass-cuts percentages among treatments.

***Key words :*** Water hyacinth meal, carcass traits, broiler chickens.

## Introduction

Cereals make up more than 50% of the components of poultry diets especiallyin broilers diet (Alkassar, 2012). Globally, maize and maize grains are the most important used diets, however the global trend towards bio-fuel production from fermentation of maize grain, led to increase their prices and low supply (Malik *et al*., 2016). Wheat grains are known worldwide for their human consumption. Producers are looking for alternatives to these grains, especially local ones, because the cost of feed constitutes more than 70% of the total cost of running poultry projects, being cheap and non-competitive on human consumption (Alkassar, 2017). Some countries began to benefit from herbs and weeds, including the water weeds called *WATER HYACINTH* known for its rapid growth and spread over rivers, lakes and the consequent environmental damage and obstruction of maritime and river navigation. The world wide, the cost of mechanical and chemical control of eliminatory this water weed is hundreds of millions of dollars annually (Mohamed, 2013). In Iraq, the weed spread in southern regions and which cost the government huge sums to remove it from the rivers .Several attempts were made to replace local feed with imported feed. In the world over the past ten years feed for cows In the form of a silage (Thamand Uden, 2013), Goats (Dada, 2000), Sheeps (Abdalla *et al*., 1987), Pigs (Men *et al*., 2006), Ducks (Jianbo *et al*., 2008), for finger fish (Konyeme *et al*., 2006; El-Sayed, 2003; Saha and Ray, 2011). Plant roots were used to purify the sewage because the plant have ability to absorb heavy metals such as lead, cadmium and mercury. It can be used as raw materials for biogas production, organic fertilizer for agricultural farming and

food sources for humans in some countries (Ogle *et al*., 2001). It is possible to manufacture ropes, baskets, carpets and some local furniture in some countries (Malik, 2007). In view of the spread of this harmful water grass in Iraq and the disbursement of large sums of money to get rid of it in the rivers and strems. The objective of this study were to determine the nutritional value of this costless water weeds and to use it as a partial or total replacement instead of wheat grains in the starter and finisher diets, and the effects of feeding it through the biological reflection of the production and physiological performance of the Ross 308 chicks.

## Materials and Methods

The study was conducted according to the International Guidelines for research involving animals (Directive 2010/63/EU), specially slaughtering birds according to the Islamic procedures.

### Preparation of water hyacinth powder

This was carried out using the procedure of Malik *et al*. (2013). Whole plants of water were collected from the River in Najaf State. The green plants were harvested freshly from the water surface, roots were cut manually. Shoots (stems and leaves) were transferred to the Animal Production Laboratory. They were washed and carefully inspection to remove all unwanted matters (river debris, leather wrappings and other extraneous materials) and sun-dried for about three days. They were then kept in apolythene sacks for further processing. Collections of thewater hyacinth plant were carried out at one period of the year at the peak of the hot season, during July, 2017. They were then dried in forced-oven at 40°C for about 24 h to a moisture content of about 10%. The dried plants were then grinded using an attrition mill and sieved through a 1 mm sieve to obtain water hyacinth meal (WHM: Steam and leaves without roots), which was then stored in large plastic containers with tight-fittinglids until needed. The photograph of the WHM is shown in Pictures 1, 2.

### Chemicalanalysis measurement of essential ingredients of diets

Chemical composition of the WHM was determined using the standard procedures of A.O.A.C. (1990). All determinations have been done in triplicates (table 2). Including Mineral composition, Fibre composition (table 1), the anti-nutritional factors in WHM (table 2), amino acids (table 3), heavy metals Cd, Pb. Also made approximate chemical analysis for all ingredients in diets (Corn, wheat, soybean meal) (table 4).

### Experimental procedure

Each experimental group was fed *ad-libitum* with its own diet for 42 d. Feed intake, gain weight and feed conversion ratio were determined in each period weekly. The study was conducted according to the International Guidelines for research involving animals (Directive 2010/63/EU), specially slaughtering birds according to the Islamic procedures.

### Birds and plane of nutrition

A total of 300 one-day-old mixed-sex Ross 308 broiler birds were obtained from commercially hatched eggs (Green World company, Najaf). They were raised from dayoldat the Poultry farm of the Animal Production Department.

Birds with one day-old-age were randomly allocated to 15 floor pens (2 × 1. 5 m) with woods havings (20 birds per pen). The floor pens were located in an open-sided house, and each pen was equipped with an automatic bell drinker and 1 tube feeder. The pen was considered as experimental unit for performance measurements. The birds were randomly allocated to five dietary treatments of 20 birds per replicate and three replicates per treatment in a randomized completely block design. Each treatment was subjected to one of five levels of WHM (0%, 2.5%, 5%, 7.5% and 10%) instead of wheat dietary inclusion levels. The percentage composition of the experimental diets for the starting and finishing is shown in (table 1). These diets were formulated to be iso energetic and iso nitrogenous according to NRC (1994), nutrient requirements for broiler, in particular the recommendations for Ross 308 strain. The birds were reared and grown to market age 6 weeks. The birds were also given standard medication and prophylactic treatments as recommended by the Iraqi Veterinary Medical Association for this region. Birds were provided free access to feed and water, with constant illumination of 23 h of light and 1 h of dark per day during theen tire growing period. Feed consumption and mortality were recorded daily and BW was recorded at 0, 7, 14, 21, 28, 35 and 42 d of age, by pen (average BW of all birds) to determine the FCR and ADG.

### Performance traits

Feed consumption (FC:g/bird/period) and body weight gain (BWG, g/bird /period) were recorded at the beginning of the experiment (day 1) until the end of the starter period 21$^{th}$ d of age, finisher period 22$^{th}$-42$^{nd}$d of age and total period 42 d of age (Alkassar, 2012). Feed conversion ratio-FCR) was calculated by dividing feed consumption /body weight gain (Alkassar, 2010). On the final day of the experiment, (42 d-of-age), two bird from each replicate

**Table 1 :** Mineral composition of water hyacinth meal.

| Mineral | Composition (ppm) |
|---|---|
| Iron (Fe) | 328.5 ppm |
| Cadmium(Cd) | 6.3 ppm |
| Zinc (Zn) | 22.8 ppm |
| Lead (pb) | 1.4 ppm |
| Copper (Cu) | 21.22 ppm |
| Cobalt (CCo) | 1.0 ppm |
| Magnesium (Mg) | 4937 ppm |
| Selenium(Se) | Rearly |
| Manganese(Mn) | 116.1 ppm |
| Calcium(Ca) | 140.5 ppm |

**Table 2 :** Anti-nutritional factors in water hyacinth meal.

| Anti-nutritional factors | Composition % | Recommended Critical Limit* |
|---|---|---|
| Alkaloids | 1.7% | ND |
| Tannin | 12.5% | 31.20 |
| Saponin | 22.7% | 7.02 |
| Flavanoids | 0.53% | ND |

*Kumar *et al*. (2001).

Medicate M160 scales: gizzard (without digesta), liver, (without gallbladder), heart. Next, the percentage of these organs to pre slaughter body weight was determined.

**Statistical analysis**

Statistical analysis were conducted using SAS (Version 6, SAS Institute, Cary, NC, USA) (SAS, 2001). Data collected were subjected to analysis of variance (ANOVA) by means of the General Linear Models (GLM) procedure ,based on the Randomized Completely Block. Means were compared using the Duncan's Multiple Range Test (Duncan, 1955).

## Results and Discussion

Table 7 showed the weight gain, feed consumption, feed conversion ratio of the control and the dietary treated groups. The average weight was not significantly different between the control (without WHM) and the dietary treatment (T3) with 5% WHM+5% wheat, which recorded weight gain 740.6,741.4 g/bird respectively at starting periods (0-21d), but significant ($p \leq 0.05$) compromise with all treatment which weight gain were 683.8, 669.0, 710.05 g/bird at T5, T4, T2 respectively. However, there was no significance differences between

**Table 3 :** Amino acids in Water Hyacinth Meal.

| A.A | Alanine | Arginine | Aspartic acid | Cystine | Glutamic acid | Glycine | Histidine | Isoleucine | Leucine |
|---|---|---|---|---|---|---|---|---|---|
| D.M% | 3.1 | 4.1 | 7.6 | 0.6 | 8.7 | 3.4 | 6.6 | 4.3 | 6.2 |
| A.A | Lysine | Methionine | Phenylalanine | Proline | Serine | Threonine | Tyrosine | Valine | Tyrosine |
| D.M% | 1.9 | 1.1 | 2.6 | 2.9 | 2.8 | 2.0 | 3.4 | 3.1 | 3.4 |

**Table 4 :** Approximate chemical analysis for ingredients.

| Ingredient | DM% | CP % | EE% | CF% | Ash% | NFE% | ME (Kcal/kg)** |
|---|---|---|---|---|---|---|---|
| WHM | 95.0 | 20.5 | 4.3 | 18.0 | 0.7 | 51.5 | 2000.0* |
| Wheat | 89.0 | 13.6 | 2.1 | 3.2 | 1.0 | 69.1 | 3105.0 |
| Corn | 90.0 | 7.5 | 3.5 | 2.3 | 2.6 | 74.1 | 3353.0 |
| Soybean meal | 92.0 | 47.0 | 2.3 | 6.1 | 10.8 | 25.8 | 2232.0 |

*ME for Water Hyacinth Determined according to Lodhi (1976).
**ME for corn, wheat, soybean determined according to NRC (1994).

(six from each treatment) were randomly selected slaughtered and dissected manually, plucked and eviscerated. Chickens heads and legs were removed and then internal organs (liver, gizzard and heart) were removed, weighted and calculated as percentage of carcass weight. The dressed carcass was divided into breast, thigh, drumstick, back, wings, neck, cuts which were weighed and calculated as percentage of dressed carcass weight. The length of the esophagus and crop, small intestine, both caeca and large intestine was tape-measured. In addition, the following internal organs were separated and weighed to the nearest 0.001 g on a

the last three treatments. During finishing period (4-6) weeks age, T2 recorded significant ($p \leq 0.05$) higher weight gain compared to the other treatments, 1868.5 g/bird versus the lowers average 1593.0g/bird in T5 and during the all period of study (0-6wk). Also the second treatment the higher weight gain (2569.6g/bird) at probability ($p \leq 0.05$) than the other treatments. It seemed to ours generally decreasing in weight gain with increasing water hyacinth meal more than 5% instead of wheat, this may be due to the high level of tannin content in WHM (12.5%) in our study and which causes decreasing in the digestibility of nutrients in diets, by making chelating

**Picture 1 :** Collection water Hyacinth from river.

**Picture 2 :** shows complete plant (water Hyacinth) samples.

**Table 5 :** Composition of Starter diets for all treatments.

| | | Treatments | | | | |
|---|---|---|---|---|---|---|
| **No** | **Ingredients** | **T1** | **T2** | **T3** | **T4** | **T5** |
| **1** | Corn | 44.90 | 44.68 | 44.53 | 44.18 | 44.10 |
| **2** | Soybean meal(47% C.P) | 38.00 | 37.72 | 37.42 | 37.22 | 36.80 |
| **3** | Locally Wheat | 10.00 | 7.50 | 5.00 | 2.50 | 0.00 |
| **4** | Water Hyacinth Meal(WHM) | 0.00 | 2.50 | 5.00 | 7.50 | 10.00 |
| **5** | Premixes | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| **6** | Corn oil | 3.00 | 3.50 | 3.95 | 4.50 | 5.00 |
| **7** | DiCalcium Phosphate** | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| **8** | L-lysine*** | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| **9** | DL-Methionine**** | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| **Total** | | 100 | 100 | 100 | 100 | 100 |
| **10** | ME Kcal/Kg | 3020.0 | 3020.0 | 3020.0 | 3020.0 | 3020.0 |
| **11** | Crude Protein% | 23.92 | 23.96 | 23.97 | 23.97 | 23.93 |
| **12** | Crude Fiber% | 3.67 | 4.02 | 4.37 | 4.72 | 5.05 |
| **13** | Total Calcium | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **14** | Available Phosphorus% | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 |
| **15** | Lysine% | 1.43 | 1.43 | 1.43 | 1.43 | 1.43 |
| **16** | Meth.+Cyst. | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 |
| **17** | Calorie/Protein ration | 126.25 | 126.04 | 126.00 | 126.00 | 126.20 |

*Premixe(Turkish, BIRMIX M-25) contain per Kg: V.A 400.000 I.U; V.D3 16.000I.U;V.E 1.600I.U;V.K 80mg;V.B1 80mg;V.B2 240mg; Calcium Pantothenate 5.200mg; Niacine 1.400mg; Biotin 2mg; Follice acide 40mg; V.B120.4mg; DiCalcium Phosphate 120.000mg; phytase 4.000mg; oil20.000mg; CaCO3122.000mg; Choline 20.000mg; Protein 20%; ME 3000Kcal/kg; Dig.Lysine 5.71%; Dig. Meth. 8.2%; Salt 5.92%.

**DiCalcium Phosphate (Turkish) Contain: 22% Inorganic Calcium, 18% Inorganic Phosphorus.

***Lysine-HCl: Hydrochloride Lysine, Purity percentage 98.5%.

****DL-Methionine (Turkish) Purity percentage 99.0%.

compound with important minerals required for metabolism inside the body and conformed double stress in sequence of operation on metabolism lead to retarded growth rate and decreasing weight gain (Rajab *et al.*, 2015). This may be due to high level of fiber in WHM (18%), which is agreement with Malik *et al*. (2016), who found that the decreasing of growing chicken fed on water hayicinth meal because of high content of fiber, which lead to inhibition of growing chicks by slowing metabolism operation. The same table showed the average of feed

**Table 6 :** Finisher diets for all treatments.

| | | Treatments | | | | |
|---|---|---|---|---|---|---|
| **No** | **Ingredients** | **T1** | **T2** | **T3** | **T4** | **T5** |
| **1** | Corn | 49.47 | 50.72 | 50.80 | 50.70 | 50.10 |
| **2** | Soybean meal(47% C.P) | 31.70 | 30.40 | 29.92 | 29.52 | 29.52 |
| **3** | Locally Wheat | 10.00 | 7.50 | 5.00 | 2.50 | 0.00 |
| **4** | Water Hyacinth Meal(WHM) | 0.00 | 2.50 | 5.00 | 7.50 | 10.00 |
| **5** | Premixes* | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| **6** | Corn oil | 4.80 | 5.10 | 5.50 | 6.00 | 6.60 |
| **7** | DiCalcium Phosphate** | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| **8** | L-lysine*** | — | — | — | — | — |
| **9** | DL-Methionine**** | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| | **Total** | 100 | 100 | 100 | 100 | 100 |
| **10** | ME Kcal/Kg | 3204.5 | 3205.0 | 3202.0 | 3202.0 | 3205.0 |
| **11** | Crude Protein% | 20.94 | 20.89 | 20.83 | 20.81 | 20.93 |
| **12** | Crude Fiber% | 3.27 | 3.64 | 3.97 | 4.32 | 4.65 |
| **13** | Total Calcium | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **14** | Available Phosphorus% | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 |
| **15** | Lysine% | 1.43 | 1.43 | 1.43 | 1.43 | 1.43 |
| **16** | Meth. Cyst. | 1.07 | 1.07 | 1.07 | 1.07 | 1.07 |
| **17** | Calorie/Protein ration | 126.25 | 126.04 | 126.00 | 126.00 | 126.20 |

*Premixe (Turkish, BIRMIX M-25) contain per Kg: V.A 400.000 I.U; V.D3 16.000I.U; V.E 1.600I.U; V.K 80mg;V.B1 80mg; V.B2 240mg; Calcium Pantothenate 5.200mg; Niacine 1.400mg; Biotin 2mg; Follice acide 40mg; V.B 120.4mg; DiCalcium Phosphate 120.000mg; phytase 4.000mg; oil 20.000mg; CaCO3122.000mg; Choline 20.000mg; Protein20%; ME3000Kcal/kg; Dig. Lysine 5.71%; Dig. Meth.8.2%; Salt 5.92%.

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**DiCalcium Phosphate (Turkish) Contain : 22% Inorganic Calcium, 18% Inorganic Phosphorus.

***Lysine-HCl: Hydrochloride Lysine, Purity percentage 98.5%.

****DL-Methionine (Turkish) Purity percentage 99.0%.

**Table 7 :** Means of some productive traits of broiler at(0-3),(4-6)and(0-6) weeks of age.

| | **Means± SE** | | | | |
|---|---|---|---|---|---|
| | **Treatment** | | | | |
| **Traits** | **T1: Control 10% wheat without WHM** | **T22.5%WHM +7.5% wheat** | **T35.0%WHM +5.0% wheat** | **T47.5% WHM +2.5% wheat** | **T510%WHM +0.0% wheat** |
| Initial BWg/bird (1 d) | 41.70 | 40.75 | 42.60 | 41.85 | 42.15 |
| Weight gain (0-3 wk) | a740.6±30.05 | b710.05 ±13.0 | a741.4 ±17.1 | b669.0± 8.8 | b683.8± 10.7 |
| Weight gain (4-6 wk) | c643.9±30.05 | a1868.5±35.1 | b1757.0±28.8 | b1703.0 ±21.1 | c1593.0±24.2 |
| Weight gain (0-6 wk) | b2384.5±18.9 | a2569.6±20.2 | a2498.4±23.1 | b2371.8±19.3 | c2277.2±15.6 |
| Feed Cons.g/bird (0-3wk) | c1125.6±21.1 | d1032.0±22.5 | b1188.5±24.1 | c1136.1±19.6 | a1239.2±18.4 |
| Feed Cons.g/bird (4-6wk) | d3076.5±19.3 | c3360.1±24.4 | c3348.9±23.7 | b3529.5±20.0 | a3647.7±25.1 |
| Feed Cons.g/bird (0-6wk) | e4202.1±23.7 | d4392.1±26.1 | c4537.4±19.7 | b4665.6±27.1 | a4886.9±30.2 |
| Feed Conv. ratio (0-3wk) | d1.51±0.02 | d1.47±0.03 | c1.60±0.01 | b1.69±0.01 | a1.81±0.02 |
| Feed Conv. ratio (4-6wk) | c1.87±0.06 | d1.79±0.04 | c1.90±0.03 | b2.07±0.04 | a2.28±0.02 |
| Feed Conv. ratio (0-6wk) | c1.76±0.01 | d1.70±0.02 | c1.81±0.02 | b1.96±0.01 | a2.14±0.03 |
| Mortality % | 0% | 0% | 0% | 0% | 0% |
| Significant | * | * | * | * | * |

*Means in the same rows with different superscripts were significantly ($p<0.05$) different.

**Table 8 :** Dressing percentage without edibles and edibles weight for all treatments.

| Means±SE | | | | | |
|---|---|---|---|---|---|
| Treatments | | | | | |
| **Traits** | **T1** | **T2** | **T3** | **T4** | **T5** |
| Final bodyweight(g) bird pre slaughtering | b**2391.0±25.4 | a2465.0±31.4 | a2497.0±30.6 | a2450.0±27.5 | c2281.0±22.3 |
| Hot carcass weight (g without edibles) | c1838.4±13.8 | a1908.3±20.6 | a1929.8±18.5 | b1881.7±14.7 | d1743.5±12.9 |
| Dressing percentage without edibles | b73.59±4.12 | a74.19± 3.7 | a73.99±3.8 | cd73.49±2.9 | c73.10± 4.4 |
| Heart weight (g) | b10.0±1.3 | a14.0±2.5 | ab12.0±0.9 | b11.0±1.1 | ab13.0±2.0 |
| Heart as% of live body weight | c0.42±0.01 | a0.57±0.01 | b0.48±0.02 | b0.49±0.02 | a0.57±0.01 |
| Liver weight (g) | b55.0±3.6 | a66.0±3.8 | b59.0±2.5 | b58.0±2.3 | ab61.0±3.3 |
| Liver weight as% of live body weight | b2.30±0.10 | a2.68±0.18 | ab2.36±0.14 | ab2.37±0.17 | a2.67±0.18 |
| Gizzard weight (g) | d40.0±0.03 | a54.0±0.05 | b51.0±0.01 | c47.0±0.01 | d42.0±0.02 |
| Gizzard as% of live body weight | b1.67±0.2 | a2.20±0.3 | ab2.04±0.3 | ab1.92±0.2 | ab1.84±0.1 |
| Significant | * | * | * | * | * |

*means significant differences (P≤0.05) among treatments.
**means the same letters in every row indicated no significant differences and the different letters mean there were significant differences.

**Table 9 :** Carcass cuts percentage of birds slaughtered at 6 weeks of age.

| Means±SE | | | | | |
|---|---|---|---|---|---|
| Percentage of carcass cuts% | | | | | |
| **Traits** | **T1** | **T2** | **T3** | **T4** | **T5** |
| Breast% | 30.1±3.5 | 30.7±4.1 | 31.0±4.7 | 29.6±3.7 | 30.8±4.3 |
| Thighs% | 31.7±3.1 | 31.6±2.5 | 30.5±1.9 | 30.8±2.7 | 29.5±1.4 |
| Back% | 21.2±2.0 | 20.0±1.8 | 20.3±3.1 | 22.5±2.9 | 22.8±2.2 |
| Neck % | 5.7±0.7 | 6.0±0.3 | 6.1±0.3 | 5.6±0.5 | 5.7±0.4 |
| Wings % | 11.2±1.7 | 11.6±0.9 | 11.8±2.0 | 11.2±1.5 | 11.1±0.8 |
| Significant | NS | NS | NS | NS | NS |

NS:means Non Significant differences among treatments

consumption, so we noticed that there was decreasing in feed consumption with increasing the level of WHM instead of wheat and the highest value at 42 d age in the T5 (10% WHM + 0% wheat) 4886.9 g/bird, while the lowest value in the T1 (Control group, 10% wheat) 4202.1g/bird. This result may be related to determined metabolisable energy (2000kcal/kg for WHM) highly which more than the actual energy, or may be due to high percent of NSPs in water hyacinth meal (Malik *et al*., 2016) indicated to high content of cellulose and lignin in water hyacinth 12.86, 26.08, 24.86% from the total fiber content in water hyacinth. Also, reflected the same trends on feed conversion ratio, the table shows the best value in FCR in T2, which recorded 1.7 feed/gain ration and best significantly (p≤0.05) than control group and the rest treatments. This result may be due to occur more balance in the second treatments to produce ration with more digestibility and available for more absorption at intestinal birds.

Table 8 showed carcass traits, where there significant differences (p≤0.05) between all treatments. The highest percentage recorded in the T2, T3, 74.19, 73.99% respectively, while the lowest values found in the T4, T5 (73.49, 73.10% respectively). This result was in agreement with Laloviæ and Pandureviæ (2014), who found that high positive correlation between weight before slaughtering and dressing percentage and the value r=0.7.

## Conclusion and Recommendations

Body weight gain was significantly (p≤0.05) higher for birds fed 5% WHM with 5% wheat diets than for those fed diets without WHM. FCR. There were no significant (p≤0.05) differences in mortality between all treatments. A noxious weed that requires millions of dollars for its eradication and control can now be as an

important and valuable feed resource for poultry. It is available in a good quantities throughout the year and can be regarded as a valuable raw material vital to the Iraqi feed milling industry for the formulation of balanced and quality feed for growing pullets at reduced cost.

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