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EFFECT OF USING EGYPTIAN LEEK LEAVES POWDER (*Allium porrum* L.) AS UNCONVENTIONAL FEED ON GROWTH PERFORMANCE, CARCASS QUALITY AND SOME SERUM BIOCHEMICAL ANALYSIS IN BROILER CHICKENS

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ABSTRACT

This experiment was conducted to investigate the effect of partial substituting diets constituents by Egyptian leek (*Allium porrum* L.) as unconventional feedstuff in the diets of broiler chickens and its effect on the growth performance, carcass characteristics, and some serum biochemical parameters. A total of 144 unsexed one day old (Cobb 500) broiler chickens were randomly divided into six equal triplicate groups (each replicate contained 8 chicks). A basal control diet was formulated to fulfil the nutrients requirement of broiler chickens according to NRC. In the experimental diets constituents were partially substituted by Egyptian leek (*Allium porrum* L.) at rate of 2, 4, 6, 8 and 10%. Results revealed that the dietary treatments (4, 6, 8 and 10%) levels of leek had a significant effect ($P<0.05$) on growth performance parameters than those fed the control diet and other groups. The broilers fed diet contained 8% leek had a significant heavier final body weight, body gain, and best feed conversion ratio as compared to broiler chickens fed other dietary treatments. Percentages weight of liver, heart, stomach and spleen had insignificantly ($P>0.05$) affected by broilers fed on different levels of leek, while there was a significant ($P<0.05$) increase in the percentage weight of dressing as compared to those fed control group. Some serum biochemical parameters were significantly ($P<0.05$) improved due to substitution of the diets constituents with leek as decrease (total cholesterol, triglyceride, low density lipoprotein (LDL) and glucose or increase high density lipoprotein (HDL). It could be concluded that leek could replace up to 8% in broiler diets constituents without any adverse effects on growth parameters, carcass quality and serum biochemical parameters.

Key words: Leek powder, broilers; lipids, performance, carcass traits.

INTRODUCTION

The use of antibiotics as growth promoters is restrict due to drug resistance in bacteria and the drug residues in meat (CAFA, 1997). To overcome these serious criticism and poor performance, attempts were made to find, use and utilize other growth promoters of natural origin such as fruits and vegetables (Iji *et al.*, 2001).

Leeks (*Allium porrum* L.) are the most commercially produced vegetables in the world. Along with onions and garlic, leeks belong to the Alliumgenus (family Alliaceae). Allium genus such as garlic (*A. sativum*), onion (*A. cepa*) and leek (*A. porrum*) are widely known vegetables, cultivated and consumed as flavors and foods throughout the world. Fresh leeks are a good source of nitrates, flavonoids, polysaccharides and glucosinolates in addition to numerous organosulfur components contributing to their rich flavor (Mondy *et al.*, 2002 ; Lanzotti, 2006). The leeks have antifungal (Yin and Tsao, 1999), reduces risks of atherosclerosis (Fattorusso *et al.*, 2001), prostate, colorectal, stomach and breast cancer (Hsing *et al.*, 2002). Leeks are perishable and

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must either be consumed rapidly or preserved by various methods, such as drying, freezing or cold storage (Magra *et al.*, 2006). The process of drying is one of the oldest methods for food preservation, and drying is a complex process involving heat and mass transfer phenomena, which occurs frequently in most of the food processing industries (Vega-Gálvez *et al.*, 2009).

Improvement of broilers performance and carcass merits can be achieved by supplementation of diets with leek (Amagase *et al.*, 2001; Demir *et al.*, 2003). It was reported that feeding leek at levels of 1.5, 3 and 4.5% had a significant reduction serum and liver cholesterol in broiler (Konjufca *et al.*, 1997) or in layer (Lewis *et al.*, 2003); inhibit bacterial growth, inhibit platelet growth and reduce oxidative stress (Cavallito *et al.*, 1994). Using leek in broiler's diet wasn't affected triglyceride but influenced meat quality and carcass yield positively (Horton *et al.*, 1991). However, leek effects on broilers performance, carcass characteristics and blood lipids are debatable. So, the present study aimed to investigate the growth performance, carcass traits, and some serum biochemical parameters of broiler chickens fed on leek contained diets.

MATERIALS AND METHODS

Sample Preparation

Egyptian Leek (*Allium porrum* L.) was collected from a local market in (Egypt). The purchased leek was fresh without any physical defect; then the sample was sliced into chips and dried in an oven at a temperature of 40°C for 72 hours. After drying the chips were ground into fine powder by using a commercial blender. The powdered sample was stored into an air tight bottle in freeze (about 4°C) until further analysis.

Experimental Birds and Management

One hundred and forty four, one day old chicks of a commercial meat type (Cobb) obtained from a local hatchery were used in this study. On arrival they were weighed and randomly allocated to equal six treatment groups. Each containing twenty four chicks. Birds were reared in a naturally ventilated open house with saw dust as litter and at a density 10 birds/m^2. Continuous lighting was provided throughout the experiment. The starting temperature was 33°C then decreased gradually 2°C each week until reach 21°C at the 6^{th} week.

Experimental Design

One hundred and forty four, one day old chicks were randomly equally divided into six groups as shown in Table 1.

The proximate chemical analyses of the used feedstuffs and the experimental diets were carried out according to the standard procedures of the AOAC (2002).

The Experimental Diets

Isocaloric, isonitrogenous starter stage (3200 kcal/ kg ME; 23.20% CP) and grower-finisher stage (3200 kcal/kg ME; 19.50% CP) diets were formulated (Tables 2 and 3) to meet the nutrient requirements of broiler chickens as set by NRC (1994). The feed and water were provided ad-libitum.

Chemical Analyses

Fresh leek used in the experiment was obtained from a market from a commercial brand with the purity of 100%. It was analyzed for moisture, crude protein, total fats, crude fiber and ash, were analyzed according to the methods of the Association of Official Analytical Chemists AOAC (2002). Moisture was determined by drying at 105˚C until constant weight. Nitrogen was determined by Kjeldahl method (crude protein = N (%) × 6.25). Amino acids composition hydrolyses was determined by amino acid analyzer Eppendorf using Acid hydrolysis. Hydrolysis was carried out according to the method of Block *et al.* (1958). Minerals were determined in *Allium porrum* L. using the atomic absorption spectrophotometric technique. The different mineral elements were determined by the method of Nation and Robinson (1971).

Growth Performance Parameters

Body weight was determined through the period of starter and finisher. Feed intake was recorded for the corresponding periods. Body weight gain (BWG) and feed conversion ratio (FCR) were calculated according to (Wagner *et al.*,1983)

Table 1. The experimental design of the study

Group	dietary treatment	No. of the birds
1	Control diet	24
2	Diet containing 2% Egyptian leek	24
3	Diet containing 4% Egyptian leek	24
4	Diet containing 6% Egyptian leek	24
5	Diet containing 8% Egyptian leek	24
6	Diet containing 10% Egyptian leek	24

Table 2. Physical and chemical composition (%) of the experimental diets used in experimental starter stages

Ingredient	Experimental starter diet					
		Leek leaves				
	Control	2%	4%	6%	8%	10%
Yellow corn	59.70	57.40	55.20	52.90	50.75	48.70
Leek leaves	-	2	4	6	8	10
Soybean meal, 48%CP	24.30	24.25	24.00	24.00	23.50	22.65
Corn gluten, 60% CP	6	6	6	6	6	6
Fish meal, 65%CP	2.75	2.20	1.80	1.30	1	1
Soybean oil	3.50	4.40	5.25	6.05	7	7.90
Calcium carbonate	1.20	1.20	1.20	1.20	1.20	1.20
Calcium dibasic phosphate	1.50	1.50	1.50	1.50	1.50	1.50
Common salt	0.30	0.30	0.30	0.30	0.30	0.30
Premix[1]	0.30	0.30	0.30	0.30	0.30	0.30
DL- Methionine, 98% CP	0.20	0.20	0.20	0.20	0.20	0.20
Lysine,Hcl, 78%CP	0.15	0.15	0.15	0.15	0.15	0.15
Toxenil	0.10	0.10	0.10	0.10	0.10	0.10
Calculated composition						
ME, Kcal/Kg	3218.35	3217.27	3214.06	3206.71	3210.35	3212.02
CP (%)	23.20	23.20	23.20	23.19	23.19	23.19
EE (%)	8.01	7.93	7.85	7.77	7.70	7.64
CF (%)	2.58	2.58	2.57	2.56	2.54	2.52
Ca (%)	1.10	1.00	1.00	1.00	1.00	1.00
Available phosphorus (%)	0.46	0.45	0.45	0.44	0.44	0.44
Lysine (%)	1.22	1.19	1.15	1.12	1.10	1.05
Methionine (%)	0.62	0.61	0.60	0.58	0.57	0.56

[1]Muvco premix: Each 2.5kg contain vit. A (10, 000000 IU), vit. D3 (2, 000000 IU), vit. E (10 g), vit.k3 (1000 mg), vit. B1 (1000 mg), vit. B2 (5 g), vit.B6 (1.5 g), pantothenic acid (10 g), vit. B12 (10 mg), niacin (30 g), folic acid (1000 mg), biotin(50 g), fe (30 g), Mn (60 g), Cu (4 g), I (300 mg), Co (100 mg), Se (100 mg) and Zn (50 g).

(ME=Metabolizable energy, CP=Crude protein, EE=Ether extract, CF=Crude fiber)

Table 3. Physical and chemical composition (%) of the experimental diets used in experimental finisher stages

Ingredient	Experimental finisher diet					
		Leek leaves				
	Control	2%	4%	6%	8%	10%
Yellow corn	68.20	66.20	64.00	61.80	59.60	57.60
Leek leaves	-	2	4	6	8	10
Soybean meal, 48%CP	19	18.90	18.80	18.50	17.90	17.00
Corn gluten, 60%CP	3.50	3.50	3.50	3.50	3.50	3.50
Fish meal, 65%CP	2.5	2.00	1.50	1.10	1.00	1.00
Soybean oil	2.8	3.70	4.50	5.40	6.30	7.20
Calcium carbonate	1.20	1.20	1.20	1.20	1.20	1.20
Calcium dibasic phosphate	1.50	1.50	1.50	1.50	1.50	1.50
Common salt	0.30	0.30	0.30	0.30	0.30	0.30
Premix[1]	0.30	0.30	0.30	0.30	0.30	0.30
DL- Methionine, 98%CP	0.12	0.12	0.12	0.12	0.12	0.12
Lysine, Hcl, 78%CP	0.18	0.18	0.18	0.18	0.18	0.18
Toxenil	0.10	0.10	0.10	0.10	0.10	0.10
Calculated composition						
ME, Kcal/Kg	3218.67	3217.64	3211.16	3211.11	3211.36	3213.46
CP (%)	19.55	19.57	19.53	19.52	19.57	19.55
EE (%)	8.20	8.11	8.04	7.96	7.90	7.84
CF (%)	2.48	2.47	2.47	2.45	2.43	2.41
Ca (%)	1.07	1.04	1.02	1.00	0.99	0.99
Available phosphorus (%)	0.44	0.43	0.42	0.41	0.41	0.40
Lysine (%)	1.02	0.98	0.95	0.92	0.89	0.85
Methionine (%)	0.54	0.52	0.51	0.49	0.48	0.47

[1]Muvco premix: Each 2.5kg contain vit. A (10, 000000 IU), vit. D3 (2, 000000 IU), vit. E (10 g), vit.k3 (1000 mg), vit. B1 (1000 mg), vit. B2 (5 g), vit.B6 (1.5 g), pantothenic acid (10 g), vit. B12 (10 mg), niacin(30 g), folic acid (1000 mg), biotin(50 g), fe (30 g), Mn (60 g), Cu (4 g), I (300 mg), Co (100 mg), Se (100 mg) and Zn (50 g).

(ME=Metabolizable energy, CP=Crude protein, EE=Ether extract, CF=Crude fiber)

Carcass Traits

At the end of the experimental period (42 days), four birds from each group were selected, fasted overnight, weighed then slaughtered by sharp knife to complete bleeding, followed by plucking the feather, evisceration and finally weighed to estimate the dressing percentage. The liver, heart, stomach, intestine, and spleen were selected, weighed and expressed as (%) of live body weight.

Biochemical Analyses

At the end of experiment (42 days), four birds were randomly selected from each group and slaughtered for collection of blood samples. Each blood sample was collected into clean centrifuge tube without anticoagulant for separation of serum and the serum obtained were stored at -20°C until used for biochemical analyses. Serum total protein (Henry,1974); albumin (Doumas and Pinkas, 1971), while globulin was calculated by difference. Serum total cholesterol (Natio and Kaplan, 1984), triglyceride (Wahlefed, 1974), blood urea nitrogen, creatinine and uric acids (Patton and Crouch, 1977). Serum aspartate-aminotransferase (AST) and alanine-aminotransferase (ALT) were determined as described by Reitman and Frankel (1957).

Statistical Analysis

The obtained data in this study were statistically analyzed for variance ANOVA, LSD (Least significant difference) according to (Snedecor and Cochran, 1982). Differences among treatment means were compared using Duncan's multiple range tests (Duncan, 1995). Data were presented as mean ± SE and significance was declared at ($P < 0.05$).

RESULTS AND DISCUSSION

Chemical Composition of Egyptian Leek

The results of the chemical composition and energy value of the Egyptian leek are shown in Tables 4, 5 and 6. The protein content was (24.70%), while the fat was 3.62% and fiber 11.98%. Also, ash was 18.10%, while the total calory 3535.18 (k.cal/kg). The values presented here fall within the range reported for most Egyptian leek (Souzan and Abd El-All, 2007). High concentration of protein suggests that it could be used in food for animals. Also, carbohydrates and high fiber are very useful in the formation of the diets for the animals and that's what led us to the use of this plant.

The leek was found to contain variable amounts of minerals, the most predominant minerals found in the leek were potassium, calcium, sodium, iron and phosphorus with values; of 58737, 21602, 21006, 2098 and 3667 ppm, respectively. Zinc, manganese and selenium were generally low with values;of 55.4, 143.65 and 6.23 ppm, respectively. Mineral composition showed the leek to be a good source of potassium and selenium. These findings were in agreement with those of (Souzan and Abd El-All, 2007).

The nutraceutical analysis of Egyptian Kurrat (leek) was done to elucidate its essential and nonessential amino acids (Table 6). The analysis revealed 8 essential amino acids namely leucine > lysine > valine > phenylalanine > threonine > isoleucine > tyrosine > methionine in decreasing order of abundance. The most abundant amino acid glutamic acid with an average value of 3.20% and the lowest levels were those of cysteine (0.49%) and methionine (0.25%). The high concentration of the acidic amino acids like glutamic acid may be because of their use as precursors from which the backbone of other amino acid is formed . Previous studies have reported glutamic acid as an active participant in metabolism and synthesis of nucleotide and some amino acid. It also reported to play a role in brain functioning nerve system and participates in the detoxification of ammonia in liver, muscle and brain (Souzan and Abd El-All, 2007).

Growth Performance

Growth performance of broiler chickens fed the experimental diets is shown in Table 7. The results revealed that the broiler fed diets contained (4%, 6%, 8% and 10%) level of leek were significantly ($P<0.05$) different in total final BW, body weight gain, total feed intake and feed conversion ratio, than those fed the control diets. However, the chickens were fed the diet contained 2% level of leek had no significant ($P>0.05$) effect on the final body weight, body weight gain and total feed intake, while it had a significant improvement on feed conversion ratio. Broiler fed on diet contained

Table 4. The proximate compositions of studied Egyptian leek on DM basis

Parameter (%)	Leek
Moisture	86.00 ± 0.05
Crude Protein	24.70 ± 0.30
Crude lipid	3.62 ± 0.06
Crude Fiber	11.98 ± 0.07
Total Carbohydrates	41.60 ± 0.30
Ash	18.10 ± 0.50
Total calory (k.cal/kg)	3535.18

Table 5. Mineral composition (ppm) of studied Egyptian leek

Parameter (ppm)	Leek
Potassium (K)	58737.00 ± 0.10
Magnesium (Mg)	2862.00 ± 0.03
Calcium (Ca)	21602.00± 0.20
Phosphorus (P)	3667.00± 0.30
Sodium (Na)	21006.00± 0.50
Iron (Fe)	2098.80± 0.10
Zinc (Zn)	55.40± 0.02
Manganese (Mn)	143.65± 0.02
Selenium (Se)	6.23 ± 0.02
Copper (Cu)	0.04 mg± 0.01
Ca/P	5.6
Na/K	0.35

Table 6. Amino acid (%) as dry weight profile of studied Egyptian leek

Amino acid	Results (%)
Aspartic	1.95
Therionine	0.90
Serine	0.73
Glutamic	3.20
Glycine	0.87
Alanine	0.70
Valine	1.06
Isoleucine	0.86
Leucine	1.45
Tyrosine	0.72
Phenylalanine	1.05
Histidine	0.51
Lysine	1.14
Arginine	0.98
Proline	0.80
Cysteine	0.49
methionine	0.25

Table 7. Effect of substituting diets constituents by Egyptian leek (kurrat) on the overall performance of broiler chicks (means ± SE)

Trait studied	Experimental diets					
	Control	**2% leek**	**4% leek**	**6% leek**	**8% leek**	**10% leek**
Initial body weight, g	40.54 ±0.29^{a}	40.42 ±0.11^{a}	40.29 ±0.18^{a}	40.08 ±0.15^{a}	40.17 ±0.23^{a}	40.13 ±0.26^{a}
Final body weight, g	1516.36 ±28.64^{e}	1581.25 ±26.34^{e}	1750 ±10.82^{d}	1875 ±9.54^{c}	2250 ±9.54^{a}	2087.5 ±7.21^{b}
Absolute weight gain, g	1475.82 ±28.35^{e}	1540.83 ±61.41^{e}	1709.71 ±10.89^{d}	1834.92 ±9.56^{c}	2209.83 ±9.58^{a}	2047.37 ±6.96^{b}
Total feed intake , g	3033.16 ±35.84^{e}	3103.83 ±43.86^{e}	3281.75 ±15.68^{d}	3448.37 ±4.70^{c}	3997.92 ±4.96^{a}	3877.42 ±0.80^{b}
Feed conversion ratio	2.05 ±0.05^{a}	2.01 ±0.05^{ab}	1.92 ±0.01^{bc}	1.87 ±0.008^{cd}	1.81 ±0.005^{d}	1.89 ±0.008^{cd}

^{abcde} Means within the same row carrying different superscripts are significantly different at ($P \leq 0.05$).

8% leek achieved the highest final average body weight followed by broiler groups fed on diet contained 10%, 6, and 4% leek, while the lowest values were obtained in broiler groups fed on diets contained 2% leek and control group. Concerning the body gain, FI and FCR followed a similar trend.

Treatment effect on the final body weight, body weight gain, total feed intake and feed conversion ratio were significant (P<0.05). These results are in agreement with those reported by (El-Tazi *et al*., 2014) who reported that the inclusion of garlic powder at level 3% in the experimental diets improved the broiler performance. Similar results were obtained by (Soliman, 2000) who mentioned that addition of dried garlic to diet at level 3% improved significantly the productive performance of broiler chicks. Studies have been conducted on the effects of dietary garlic powder on growth of broiler were studied in various studies (Tolba and Hassan, 2003; Al-Homidan, 2005 ; Fayed *et al*., 2011). Also, reproductive performance of broiler chicks was improved by adding fresh or dry onion or garlic to their diets (El-Nahla, 2011; El-Nawawy, 2012). The above results may be explained due to leek contents of sulfur components that are considered as active anti-microbial agents.

Serum Biochemical

Data of some serum biochemical parameters of broiler chicken are presented in Table 8. No significant (P>0.05) differences were detected in total protein, albumin, globulin, liver enzymes (ALT, AST), creatinine and urea for boilers fed the experimental diets compared with the control group. However, it showed a significant (P<0.05) decrease in total cholesterol, triglyceride and LDL (low density lipoprotein) in groups fed diet contained (4%, 6%, 8% and 10%) levels of leek powder as compared to other group and control group. The lower level of total cholesterol, triglyceride and LDL for broilers fed diets contained 8% level of leek powder was showed the best result. Statistical analysis of data revealed a significant (P<0.05) increase in serum HDL for broiler chicken fed on diets contained (2%, 4%, 6%, 8% and 10%) levels of leek powder in comparison to the control group. The results show the significant (P<0.05) decrease in the concentration of glucose in treatment group with leek powder as compared to the control group.

There were positive differences between treatment groups and control group,so mortality go lower by leek powder addition to the diets. Broiler chickens receiving 80g|kg leek powder had a significantly higher HDL and lower total cholesterol, triglyceride and LDL concentrations as compared to other groups and control group. These results agreed with (Prasad *et al*., 2009; Kamal and Abo Omar, 2012) who reported similar finding that total cholesterol, triglyceride, LDL and VLDL were significantly decreased, while HDL was significantly increased by garlic supplementation in chickens up to 8 weeks of age in comparison to control group. Reduced serum cholesterol in their experiments by using of onion as compared to control group (Sebastain *et al*., 1979 and Al- Homidan, 2005). Also results of the study showed that leek powder significantly decreased the concentration of glucose compared to control group. Glucose concentration was significantly decreased by onion supplementation in chickens if compared with the control group (Goodarzi *et al*., 2013). The effect of leek on blood metabolites may be due to the possible mechanism of hypocholestrolaemic and hypolipidemic action of leek or its containing sulfur organic compounds including S-Methylcysteine sulfoxide (SMCS) is related to decreasing of blood lipid and glucose (Sebastin *et al*., 1979).

These results showed no significant influence of experimental diets with leek powder on total protein, globulin, AST, ALT, creatinine and urea. These results are in agreement with those obtained by (An *et al*., 2015) who reported that there were no significant differences in the activities of AST and ALT by onion supplementation in white mini broilers. (Ghalehkandi *et al*., 2014) who reported similar findings that supplementation of the different levels of sole fresh onion juice in the rats had no significant (P>0.05) effects on serum urea, uric acid and creatinine levels.

Carcass Traits

Data of carcass traits are presented in Table 9. The results show that the Percentages weight of liver, heart, stomach and spleen did

Table 8. Effect of substituting diets constituents by Egyptian leek (kurrat) on some serum biochemical parameters of broiler chickens (means ± SE)

Parameter	Experimental diet					
	Control	2% leek	4% leek	6% leek	8% leek	10% leek
Total protein, g/dl	3.15 ±0.30[a]	3.45 ±0.65[a]	3.36 ±0.08[a]	2.98 ±0.17[a]	2.95 ±0.25[a]	3.10 ±0.23[a]
Albumin, g/dl	1.46 ±0.12[a]	1.56 ±0.26[a]	1.53 ±0.10[a]	1.60 ±0.11[a]	1.41 ±0.08[a]	1.60 ±0.10[a]
Globulin, g/dl	1.69 ±0.19[a]	1.89 ±0.38[a]	1.83 ±0.01[a]	1.38 ±0.13[a]	1.54 ±0.17[a]	1.50 ±0.13[a]
AST, IU/ dl	32.86 ±3.73[a]	37.33 ±1.14[a]	33.60 ±3.48[a]	31.50 ±4.02[a]	31.31 ±3.47[a]	28.73 ±2.36[a]
ALT, IU/ dl	6.86 ±0.17[a]	5.52 ±0.70[a]	6.38 ±0.32[a]	7.33 ±1.83[a]	6.95 ±0.92[a]	6.40 ±0.38[a]
Creatinine, mg/ dl	0.31 ±0.04[a]	0.23 ±0.06[a]	0.30 ±0.03[a]	0.36 ±0.04[a]	0.23 ±0.04[a]	0.21 ±0.04[a]
Urea, mg/ dl	2.50 ±0.28[a]	2.43 ±0.23[a]	2.76 ±0.12[a]	2.60 ±0.15[a]	2.63 ±0.08[a]	2.83 ±0.17[a]
Uric acid, mg/ dl	5.91 ±0.80[a]	4.68 ±0.75[a]	4.00 ±0.68[a]	3.93 ±0.02[a]	5.41 ±0.87[a]	4.17 ±0.24[a]
Cholesterol, mg/ dl	94.76 ±0.93[a]	90.56 ±0.40[a]	83.10 ±1.44[b]	81.56 ±3.21[b]	74.00 ±1.21[c]	70.30 ±1.02[c]
Triglyceride, g/dl	210.50 ±0.86[a]	193.67 ±0.66[b]	185.00 ±1.73[c]	174.00 ±2.08[d]	165.67 ±0.88[e]	164.33 ±1.85[e]
HDL,mg/dl	70.30 ±1.02[c]	74.00 ±1.21[c]	81.56 ±3.12[b]	83.10 ±1.44[b]	90.56 ±0.40[a]	94.76 ±0.93[a]
LDL, mg/ dl	153.03 ±1.82[a]	138.53 ±1.49[b]	121.17 ±2.31[c]	104.67 ±3.46[d]	93.76 ±0.81[e]	97.13 ±0.92[e]
Glucose, mg/ dl	101.73 ±4.38[a]	86.63 ±2.89[a]	77.26 ±0.95[a]	69.33 ±0.44[b]	63.73 ±2.30[d]	67.66 ±1.01[c]

[abce] Means within the same row carrying different superscripts are significantly different at ($P \leq 0.05$).

Table 9. Effect of substituting diets constituents by Egyptian leek (kurrat) on carcass traits relative to the live weight of broiler chickens (means ± SE)

Parameter	Experimental diet					
	Control	2% leek	4% leek	6% leek	8% leek	10% leek
Live BW, g	1159.3 ±117.15[b]	1339.3 ±69.31[b]	1739.4 ±36.49[a]	1850.3 ±24.96[a]	1811.1 ±30.22[a]	1738.3 ±31.70[a]
Dressing %	68.33 ±0.33[c]	72.33 ±0.33[b]	73.33 ±0.88[b]	73.66 ±0.88[b]	76.66 ±0.33[a]	76.33 ±0.33[a]
Liver %	2.95 ±0.25[a]	2.86 ±0.16[a]	3.07 ±0.14[a]	2.88 ±0.21[a]	3.18 ±0.12[a]	3.22 ±0.05[a]
Heart %	0.44 ±0.03[a]	0.68 ±0.32[a]	0.53 ±0.13[a]	0.55 ±0.01[a]	0.55 ±0.02[a]	0.72 ±0.08[a]
Stomach %	4.48 ±0.24[a]	4.50 ±0.28[a]	4.40 ±0.24[a]	4.45 ±0.07[a]	4.54 ±0.05[a]	4.62 ±0.05[a]
Intestine %	6.44 ±0.59[ab]	7.79 ±0.46[a]	6.03 ±0.07[b]	6.48 ±0.12[ab]	6.45 ±0.51[ab]	6.99 ±0.40[ab]
Spleen %	0.26 ±0.024[a]	0.30 ±0.015[a]	0.28 ±0.006[a]	0.27 ±0.005[a]	0.27 ±0.006[a]	0.28 ±0.006[a]

[ab] Means within the same row carrying different superscripts are significantly different at ($P \leq 0.05$).

not significantly (P>0.05) affected by broilers fed on different levels of leek, while there was a significant (P<0.05) increase in the percentage weight of dressing as compared to those fed control group. These results are consistent with the results reported by (Aji *et al*., 2011) who found no significant difference in the carcass yield obtained from broilers fed garlic and onion. An *et al*. (2015) reported that, the carcass yield and the relative weights of edible parts weren't affected by supplementation dietary treatment of onion as compared to control group.

Conclusions

Supplementation of Egyptian leek (kurrat) in broiler diets as unconventional feedstuff, had significantly additive benefit in growth performance and immune status of broiler compared with the control. It could be concluded that leek could replace up to 8% of broiler diets consistuents in broiler diets without any adverse effects on growth parameters, serum biochemical parameters and carcass quality.

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تأثير استخدام مسحوق أوراق الكراث المصري كمادة علف غير تقليدية في علائق بدارى التسمين على معدلات النمو وصفات الذبيحة وبعض التحاليل البيوكيميائية فى الدم

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يهدف هذا البحث إلى دراسة تأثير استبدال جزئى من مكونات العليقة بمسحوق أوراق الكراث المصرى لاستخدامه كماده علف غير تقليديه كجزء من علائق بدارى التسمين وتأثير ذلك على أداء النمو، خصائص وصفات الذبيحة وبعض التحاليل البيوكيميائية فى الدم، حيث تم استخدام عدد ١٤٤ كتكوت عمر يوم من سلالة (كب) تم تقسيمهم عشوائيا إلى ست مجموعات متساوية احتوت كل منها على ثلاث مكررات وبكل مكررة عدد ٨ كتاكيت، تم تكوين عليقه أساسيه لتلبيه الاحتياجات الغذائية لبدارى التسمين طبقا إلى المجلس القومي للبحوث الزراعية (NRC)، وفى العلائق التجريبية تم استبدال جزء من الذرة الصفراء بمسحوق أوراق الكراث المصري بنسبة ٢%- ٤%- ٦%- ٨%-١٠%، وأوضحت التجربة الأتي: حققت طيور المجموعة الخامسة المحتوية على ٨% من مسحوق أوراق الكراث أعلى وزن جسم نهائي وأعلى معدل زيادة فى وزن الجسم النهائي وأعلى معدل من استهلاك العلف وأفضل كفاءة تحويل غذائى (أكبر معنوياً) بالمقارنة مع المجموعة الضابطة والمجموعات الأخرى، حققت طيور المجموعة الخامسة اقل نسبة نفوق من طيور المجموعات الأخرى حيث لم تسجل أي وفيات في الطيور، كما لم يلاحظ أى تأثيرات معنوية على بعض التحاليل البيوكيميائية لسيرم طيور كل مجموعات المعاملات مثل نسبة كل من الإنزيمات الكبدية والالبيومين والبروتين الكلى والجلوبيولين والكرياتينين واليوريا وحمض اليوريك، أظهرت النتائج أيضاً أن هناك تأثير معنوي بإضافة مسحوق الكراث الى العليقة حيث انخفضت نسبة كلا من الكوليسترول والدهون الثلاثية والكوليسترول منخفض الكثافة والجلوكوز فى الدم وزادت نسبة الكوليسترول عالي الكثافة، ٥- لم يلاحظ أى تأثيرات معنوية على وزن أعضاء الطيور مثل الكبد والطحال والقلب والمعدة بينما زادت نسب التصافي لمجموعات المعاملات بالمقارنة مع المجموعة الضابطة، وخلصت نتائج التجربة إلى أن مسحوق أوراق الكراث يمكن أن تحل محل جزء من مكونات العليقة بنسبه قد تصل إلى ٨% فى علائق بدارى التسمين دون أي أثار سلبية على معدلات النمو وصفات الذبيحة وبعض التحاليل البيوكيميائية فى الدم.

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