

## Evaluating the Impact of Fenugreek Seed Meal in Poultry Diets on productive Performance and carcass traits

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### Abstract

The study aimed to evaluate the impact of using different levels of Fenugreek seed meal on growth performance and carcass traits of broiler chicks, 144 unsexed broiler chicks (ROSS) were distributed into four groups, each with 36 chicks, at random distribution in four replicates 9 chicks each. The first group designated as a control group and received a standard diet. While groups 2, 3, and 4 (T1, T2, and T3) received 5%, 10%, and 20% Fenugreek seed meal, respectively. The experimental period lasted for five weeks. The main results demonstrated significant differences in the parameters assessed included live body weight (LBW), body weight gain (BWG), feed intake (FI), feed conversion ratio (FCR), performance index (PI), and the European productive efficiency factor (EPEF) between treatments at five weeks of age. The percentage of carcass weight was significantly lighter in birds (T1, T2, and T3) treatments than in the control. All slaughter parameters were significantly affected by the different dietary treatments except heart and neck percentages.

**Keywords:** Fenugreek seed meal; Broiler; productive performance; carcass characteristics.

### Introduction

One of the important agriculture sources of income poultry farming, which is distinguished by its high intensity and quick expansion. The production and consumption of poultry have risen significantly over the past 40 to 50 years. With this trend expected to continue, especially in emerging economies, chicken meat will become the world's most important source of meat protein to feed the growing population. Chicken meat is widely consumed since it is affordable, has excellent nutritional and flavor characteristics, is easy to prepare, and is not prohibited by religion [1].

One of the biggest obstacles to the production of chickens feed costs are thought to be the primary expense of raising chickens, accounting for 65–75% of total costs [2], consequently, many studies aim to reduce feed costs to the lowest possible levels. In support of sustainable poultry production, these efforts involve substituting lower-cost, more abundant by-products for expensive feed ingredients. In broiler diets, soybean meal (SBM) commonly serves as the primary plant protein source. However, to optimize costs, alternative protein sources are sometimes included at competitive prices [3].

Since 2005, the supply of plant-based protein sources used in the poultry industry, particularly soybean meal (SBM), has been limited. As a result, there is an increasing need to incorporate alternative protein sources at higher inclusion levels to maintain optimal production [4]. It is suggested that fenugreek can be utilized as substitutes for soybean meal in poultry feed, offering various benefits [5].

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Received November 22, 2024, received in revised form, January 05, 2025, accepted January 05, 2025.

(ASWJST 2021/ printed ISSN: 2735-3087 and on-line ISSN: 2735-3095)

<https://journals.aswu.edu.eg/stjournal>

Fenugreek has been identified as a promising alternative in poultry production due to its numerous physiological benefits, including antibacterial, anticancer, antiulcer, anthelmintic, hypocholesterolemic, hypoglycemic, antioxidant, and antidiabetic properties. Additionally, fenugreek supports improved digestion and nutrient absorption. It is also rich in protein, fats, total carbohydrates, and essential minerals such as calcium, phosphorus, iron, zinc, and magnesium [6].

Fenugreek seed meal is the result of manually extracting fenugreek oil from fenugreek seeds. Therefore, the study's goal is to evaluate how various dosages of fenugreek seed meal, an alternative feed, affect broiler productivity and carcass weights.

## Materials and methods

### Experimental design and birds

A hundred and forty-four unsexed one day old (ROSS) broiler chicks were divided into four groups with 36 chicks in each treatment group, which are divided into four replicates 9 chicks each. Three periodical diets were used: starter (0-14 days), grower (15-28 days) and finisher (29-35 days). **Table (1)** describes the composition and calculated analysis of the experimental diets. The experimental groups were followed: control groups birds fed on (basal diets) and (T1, T2, and T3) received diets containing fenugreek seed meal at varying levels 5%, 10%, and 20%, respectively.

### Birds managements

Feed was provided adlibitum in stainless steel feeders in the form of pellets for grower and finisher feed and mash for starter feed, all based on experimental diets. Nipple drinkers that work automatically have access to fresh water at all times. Excreta were removed daily to ensure keeping all birds in the same environmental, sanitary, and managerial circumstances throughout the entire experimental period. Every bird received a drinking water-based Newcastle immunization at the age of 7 days, against Gumboro disease at 14 days, and both at 18 and 28 days, against Lasota. All vaccines were obtained from the Egypt-based Veterinary Serum and Vaccine Research Institute (VSVRI) for animal health. The study was conducted from October to November 2023 at Aswan University, Department of Animal and Poultry Production, Faculty of Agriculture and Natural Resources.

### Measurements and procedures

1. Productive performance: At the end of every stage of the birds age; feed consumption (g) (FC), live body weight (LBW) (g), body weight gain (g) (BWG), and mortality rate were recorded and feed conversion ratio (g feed/g gain) (FCR), in addition to European Productive Efficiency Factor and index of performance were calculated. The performance index (PI) = (final LBW [kg] / FCR) as stated by [7] and European productive factor of efficiency (EPEF) = (final LBW [kg] \* survival rate%) / (FCR \* rearing periods [days]) as described by [8]
2. Carcass characteristics and some organs weight

At 35 days of age, four chicks were randomly selected from each treatment group. Weighed, and slaughtered by severing the carotid arteries and jugular veins. After complete bleeding, the chicks were scalded and de-feathered. The head, along with the neck and shanks, was removed and the carcasses were cleaned and weighed for evaluation dressed carcass weight

and percentage. Giblets including liver, heart, and empty gizzard were also individually weighed. The relative weights of these organs were calculated in relation to live body weight.

3. Statistical analysis: The linear model in SAS software was used to statistically examine the data through the analysis of variance procedure. SAS USER'S GUIDE (1994), derived from the model that follows:

If  $Y_{ij}$  is any observation, then  $Y_{ij} = \mu + T_i + e_{ij}$ . Where  $\mu$  is the overall mean.  $T_i$  is the treatment's effect ( $i = 1-4$ ), while  $e_{ij}$  is the random error. The mean values of each experimental group and the control group were compared using Duncan's multiple range test [9].

**Table 1. The composition and calculated analysis of starter, grower, and finisher phases.**

phases	Starter (0-14 days.)				Grower (15-28 days.)				Finisher (29-35 days.)			
Ingredients %	Control	T1	T2	T3	Control	T1	T2	T3	Control	T1	T2	T3
Yellow corn	52.96	50.84	48.11	41.79	55.96	54.22	51.34	46.61	61.77	59.50	56.54	52.76
Soybean meal (46%)	33.00	33.40	33.00	34.00	32.10	31.00	31.00	29.50	28.00	28.00	28.00	24.00
Corn gluten meal (60%)	7.00	5.00	3.80	0.00	5.00	4.00	2.30	0.00	4.20	2.50	0.85	0.20
Fenugreek seed meal	0.00	5.00	10.00	20.00	0.00	5.00	10.00	20.00	0.00	5.00	10.00	20.00
Soybean oil	2.40	1.55	1.00	0.30	2.80	2.00	1.50	0.00	2.80	2.10	1.65	0.00
Monocalcium phosphate	2.50	1.64	1.60	1.45	2.18	1.45	1.40	1.23	1.75	1.10	1.10	1.00
Limestone	0.96	1.35	1.33	1.30	0.88	1.25	1.20	1.22	0.55	0.82	0.80	0.80
HCl- Lysine	0.28	0.30	0.21	0.18	0.21	0.20	0.27	0.34	0.12	0.13	0.16	0.28
DL- Methionine	0.30	0.32	0.35	0.38	0.27	0.28	0.39	0.50	0.21	0.25	0.30	0.36
NaCl	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Premix*	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Price LE/(ton)***	22218	20535	19404	17216	21424	19857	18945	16688	20242	18786	17781	15568
<b>Calculated chemical analysis</b>												
Metabolizable energy Kcal/kg)	3017.5	3003.8	3002.8	3004.0	3050.3	3052.7	3053.3	3040.4	3105.0	3101.1	3100.2	3106.8
Crude protein (%)	23.07	23.06	23.05	23.02	21.57	21.50	21.53	21.56	19.54	19.53	19.52	19.53
Crude fiber (%)	2.53	2.85	3.13	3.73	2.53	2.80	3.09	3.63	2.46	2.76	3.04	3.52
Calcium (%)	0.965	0.969	0.968	0.963	0.871	0.887	0.874	0.876	0.651	0.647	0.655	0.655
Available phosphorus (%)	0.486	0.478	0.484	0.482	0.437	0.433	0.437	0.428	0.366	0.354	0.369	0.371
Lysine (%)	1.403	1.467	1.404	1.456	1.293	1.295	1.294	1.296	1.089	1.078	1.085	1.076
Methionine %)	0.666	0.689	0.727	0.764	0.608	0.626	0.678	0.741	0.521	0.535	0.558	0.579
Methionine + cystine (%)	1.088	1.072	1.081	1.088	0.990	0.990	0.995	0.998	0.870	0.859	0.860	0.857

The premix contains 15000000 I.U. Vit A and 3000000 I.U. VIT D in 50g portions for every 3 kg. VIT E, 3000 mg K3. VIT, 3000 mg VIT. B1, 8,000 mg. VIT B2, 4000 mg. Vit B6, 20 mg, pantothenic acid, 15000 mg, niacin, 60000 mg, folic acid, 1500 mg, biotin, 200000 mg, and VIT B6 VIT C 700 g of choline chloride, 80 g of manganese, 80 g of zinc, 60 g of iron, 10 g of copper oxide, 1 g of iodine, and 0.2 g of millennium; 3 kg of premix per ton of feed was the inclusion rate, with CaCo3 being used as a carrier up to 3 kg. \*\* The experimental diets were formulated according to Brazilian feed stuffs (2017). \*\*\* Data Cost 2023.

## Results and Discussion

### **Growth Performance:**

Data presented in Table (2) show the effects of using various levels of Fenugreek seed meal (FGSM) compared to a basal diet (control group) on live body weight, body weight gain, feed consumption, feed conversion ratio, performance index (PI), European productive efficiency factor (EPEF), and mortality rate.

### **Live body weight (LBW)**

The data show no significant differences in chicks' weight at one day old. Results recorded a significant decrease between treatments at the age of 14, 28 and 35 days and control group. At the age of 14 days, the highest value found in the control group (420.28g) compared with another treatments (FGSM1-3), corresponding values ranged between 310.83, 302.22 and 260.14 g respectively, as well in the same order at the age of 28 days, the data recorded that the highest levels seen in birds fed the control group (1474.46g) compared with all other the treatments (FGSM1-3), corresponding values ranged between 938.06, 713.83 and 586.39g respectively. While, in the five weeks of age, the results showed that a significant difference between treatments, where it was found T3 (the lowest in LBW) 914.17g groups while control groups (highest in LBW) 1996.39 g. The highest results in which fed the levels of the (FGSM) treatments were T1, followed by T2, corresponding values ranged between 1330.77 and 1084.17g respectively. These results agreed with [10] reported that higher levels of Fenugreek Seeds (FS) inclusion had an adverse effect on the growth performance of broilers. On the other hand, [11] stated that including fenugreek seeds in the diet resulted in an increase in the body weight of broiler chickens.

### **Body weight gain (BWG)**

The results shown in Table (2) indicate that birds fed FGSM had a significant less body weight gain compared with control birds among all ages. The data recorded that the highest levels seen in birds fed the control diet. In the first stage (0-14 days) showed that (FGSM1-3) values had a significant difference among all experimental treatments in comparison to the control group, and the values ranged between 374.03g in the control group and 264.23, 258.02 and 215.64 in the other treatments, respectively while during grower phase (15-28 days) the values ranged between 1054.18g in the control group and 627.22, 411.61 and 326.25g in the other treatments, respectively. There is an inverse relationship between increasing the level of FGSM and BWG. Also, in the period from 29 to 35 days. In the same order, the findings also revealed indicated that the greatest levels have been observed in birds provided with on the control group, also (521.93g) compared with other treatments (FGSM1-3) corresponding values ranged between 392.72, 370.33 and 327.78g respectively. While during the five-week fattening period (0-35 days), there was a significant difference among treatments. Chicks fed FGSM 20% T3 (869.67g), was significant gained less weight than control group 1950.14g. These results agreed with [12] who demonstrated that body weight and breast weight were reduced following treatment with Fenugreek Seed Powder resulted in lower values compared to the control group.

### **Feed Consumption (FC)**

Feed consumption showed significant variations among chicks receiving different dietary treatments during the starter phase (0-14 days), grower phase (15-28 days), and finisher phase (29-

35 days), during starter phase and grower phase and Finisher phase chicks fed diets with FGSM (T1, T2, and T3) consumed significantly less feed than those fed control diet. In addition to that data indicated that lowest feed consumption found in birds fed diets with FGSM 20% (T3) (442.5 and 716.25 g) in during starter phase (0-14 days) and the growing phase (14-28 days), respectively, followed by the birds fed diets with FGSM 10% (T2) (440.0 and 1005.0 g), respectively. Finally, results showed that the lowest feed consumption was observed in birds fed 20% of the fenugreek seed meal (T3) in comparison to the other treatments and the control group. The corresponding values for feed consumption during all experimental periods (0–35 days) ranged (T1, T2, and T3) between 2433.75, 2346.25, and 1931.25 with significant differences compared to the control group, 2921.25g. These results agreed with, [12] who stated that, chicks fed a diet containing 5% fenugreek seed powder consumed significantly less feed than those in the control group. Also, the study carried out by [13] who demonstrated that, the reduction in feed consumption values observed in chicks fed increasing levels of fenugreek seed in their diet may be attributed due to the bitter taste and strong odor inherent in fenugreek seeds. On the other hand, [10] demonstrated that no significant effect was observed on feed intake (FI) when feeding broiler on fenugreek compared to the control diet.

### Feed Conversion Ratio (FCR)

The data in **Table (2)** show that feed conversion ratio values differed significantly among chicks fed various dietary treatments during the starter phase (0-14 days), grower phase (14-28 days), and finisher phase (29-35 days).

**Table (2): Impact of dietary treatments on the productive performance of broiler chicks.**

a, b and c mean in the same raw with different superscripts are significantly ( $p < 0.05$ ) different, SEM: standard error of

Items	Treatments				SEM	Sig.
	Control	T1	T2	T3		
live Body weight (g)						
0 days	45.25	45.40	44.70	45.30	0.11	NS
14 days	420.28 <sup>a</sup>	310.83 <sup>b</sup>	302.22 <sup>b</sup>	260.14 <sup>c</sup>	15.41	*
28 days	1474.46 <sup>a</sup>	938.06 <sup>b</sup>	713.83 <sup>c</sup>	586.39 <sup>d</sup>	89.20	*
35 days	1996.39 <sup>a</sup>	1330.77 <sup>b</sup>	1084.17 <sup>c</sup>	914.17 <sup>d</sup>	107.34	*
Body weight gain (g /day)						
0-14 days	374.03 <sup>a</sup>	264.23 <sup>b</sup>	258.02 <sup>b</sup>	215.64 <sup>c</sup>	15.36	*
15-28 days	1054.18 <sup>a</sup>	627.22 <sup>b</sup>	411.61 <sup>c</sup>	326.25 <sup>c</sup>	27.12	*
29-35 days	521.93 <sup>a</sup>	392.72 <sup>b</sup>	370.33 <sup>ab</sup>	327.78 <sup>c</sup>	20.52	*
0-35 days	1950.14 <sup>a</sup>	1284.17 <sup>b</sup>	1039.97 <sup>c</sup>	869.67 <sup>d</sup>	107.25	*
Feed consumption (g/ feed)						
0-14 days	463.75 <sup>a</sup>	461.25 <sup>a</sup>	440 <sup>b</sup>	442.5 <sup>b</sup>	3.47	*
15-28 days	1355 <sup>a</sup>	1060 <sup>b</sup>	1005 <sup>c</sup>	716.25 <sup>d</sup>	59.01	*
29-35 days	1102.5 <sup>a</sup>	912.5 <sup>b</sup>	901.25 <sup>b</sup>	772.5 <sup>c</sup>	33.17	*
0-35 days	2921.25 <sup>a</sup>	2433.75 <sup>b</sup>	2346.25 <sup>b</sup>	1931.25 <sup>c</sup>	91.89	*
Feed conversion ratio (g feed/g gain)						
0-14 days	1.24 <sup>c</sup>	1.75 <sup>b</sup>	1.71 <sup>b</sup>	2.05 <sup>a</sup>	0.07	*
15-28 days	1.29 <sup>c</sup>	1.71 <sup>bc</sup>	2.58 <sup>a</sup>	2.24 <sup>ab</sup>	0.16	*
29-35 days	2.12 <sup>b</sup>	2.33 <sup>ab</sup>	2.45 <sup>a</sup>	2.36 <sup>a</sup>	0.04	*
0-35 days	1.50 <sup>c</sup>	1.90 <sup>b</sup>	2.27 <sup>a</sup>	2.23 <sup>a</sup>	0.09	*
Mortality rate (MR)	0\36	0\36	0\36	0\36		

means. Control: basal diets, T1: 5% FGSM, T2: 10% FGSM, T3: 20% FGSM.

The best values were found in control group (1.24, 1.29 and 2.12) respectively. While the results showed that significant differences between treatments in FCR values during 0-35 day of age although, there was a non-significant difference between birds fed FGSM (T2-3) and the values ranged from 2.27 to 2.23 but, these treatments differ significantly than control group and T1 therefore, the best feed conversion ratio recorded in control group (1.50) followed by T1 group. Conversely, [14] found that body weight and feed conversion ratio were significantly greater in the group receiving fenugreek-supplemented feed compared to the control group.

### **Mortality rate (MR)**

Although the productive performance of birds fed with FGSM-supplemented feed was affected negatively, the chicks remained healthy throughout the study. The total mortality rate was 0.00% over the entire experimental period (0–35 days), with no significant differences observed between the experimental treatments and the control group.

Performance index (PI), European productive efficiency factor (EPEF), Protein conversion ratio (PCR) and calorie conversion ratio (CCR) of broilers chicks.

The data presented in Table (3) revealed a significant difference in PI and EPEF across treatments applied during the study period. (0-35 days). The chicks fed the control diet showed the highest values of PI and EPEF compared to the other treatments.

The respective values for PI ranged from 133.37 to 41.28 and for EPEF from 381.04, to 117.93. The variations among treatments were significant. Chicks fed FGSM (T2-3) showed the lowest figures of PI or EPEF comparison to birds fed the control diet. In contrast, [13] found that the enhancement in economic and relative economic efficiency from adding fenugreek seed powder to the broiler diet results from the increased in final body weight, while total feed consumption was reduced, leading to lower feed costs and increased overall revenue. [15] who stated that supplementing the broiler diet with fenugreek seed powder resulted in economic benefits. Also [15] showed a profit for broilers fed diets that included with 1% FGS. Also, [13] observed that broiler chicks fed a diet with 1.0% fenugreek seed powder achieved the highest values for total revenue, net revenue, economic efficiency, and relative economic efficiency compared to other dietary treatments. Furthermore, broiler chicks on the 1% fenugreek seed diet generated the highest profit when compared to the control group ,while [16] found that incorporating fenugreek seeds into broiler diets led to an increase in average daily gain.

The data presented in Table (3) for PCR and CCR showed a significant impact on PCR and CCR during the (1–35 days) periods. However, throughout the entire experimental period (1–35 days), significant differences were observed between the control group and the dietary treatments (T1, 2, and 3). However, the best CCR was in the control (4.56). Also, the best PCR in the control (0.31). showed that these differences were due to improvements related to various concentrations of protein and amino acids. The associated values for CCR ranged between 4.56 and 6.77, while PCR values ranged between 0.31 and 0.47.



**Table (3): Effect of dietary treatments on the performance index, European productive efficiency factor, calories conversion ratio and protein conversion ratio of broiler chicks.**

Items	Treatments				SEM	Sig
	Control	T1	T2	T3		
Protein conversion ratio (PCR)	0.31 <sup>c</sup>	0.40 <sup>b</sup>	0.48 <sup>a</sup>	0.47 <sup>a</sup>	0.02	*
Calories conversion ratio (CCR)	4.56 <sup>d</sup>	5.78 <sup>c</sup>	6.88 <sup>a</sup>	6.77 <sup>b</sup>	0.26	*
Performance index (PI)	133.37 <sup>a</sup>	70.48 <sup>b</sup>	48.39 <sup>c</sup>	41.28 <sup>c</sup>	9.84	*
European productive efficiency factor (EPFF)	381.04 <sup>a</sup>	201.38 <sup>b</sup>	138.25 <sup>c</sup>	117.93 <sup>c</sup>	27.10	*

a, b and c mean in the same raw with different superscripts are significantly ( $p>0.05$ ) different, SEM: standard error of means. Control: basal diets, T1: 5% FGSM, T2: 10% FGSM, T3: 20% FGSM.

### ***Carcass characteristics***

**Table (4)** summarized the average values of carcass weights (carcass, Neck, Giblets part, Total edible Part, Liver, Gizzard, Heart and Abdominal fat%).

The findings indicated that there was a significant effect on all parameters impacted by the different dietary treatments except in heart and neck percentage.

**Table (4): Effect of dietary treatment on the percentages of carcass parts at 35 days.**

Items	Treatments				SEM	Sig.
	Control	T1	T2	T3		
Carcass	70.45 <sup>a</sup>	70.24 <sup>ab</sup>	69.49 <sup>bc</sup>	66.92 <sup>c</sup>	0.68	*
Neck	5.81	6.50	6.05	6.20	0.28	N. S
Giblets	3.24 <sup>c</sup>	4.09 <sup>b</sup>	4.44 <sup>ab</sup>	4.75 <sup>a</sup>	0.14	*
Total edible Part	73.69 <sup>a</sup>	74.33 <sup>a</sup>	73.93 <sup>a</sup>	71.67 <sup>b</sup>	0.27	*
Liver	1.62 <sup>b</sup>	1.96 <sup>ab</sup>	2.16 <sup>a</sup>	2.31 <sup>a</sup>	0.08	*
Gizzard	1.27 <sup>c</sup>	1.53 <sup>bc</sup>	1.77 <sup>ab</sup>	1.90 <sup>a</sup>	0.09	*
Heart	0.50	0.52	0.50	0.55	0.02	N. S
Abdominal fat	1.41 <sup>a</sup>	0.78 <sup>b</sup>	0.28 <sup>c</sup>	0.03s <sup>c</sup>	0.15	*

a,b,c and d means in the same raw with different superscripts in the same raw are significantly ( $p>0.05$ ) different, N.S.: non-significant. Control: basal diet, T1: 5% FGSM, T2: 10% FGSM, T3: 20% FGSM.

**Table (5)** summarized the average values of carcass weights (Drumstick, Thigh, Breast and Wing %). The data showed that none of A significant effect was observed on the parameters impacted by the different dietary treatments.

**Table (5): Effect of dietary treatment on carcass parts at the age of 35 days**

Items	Treatments				SEM	Sig.
	Control	T1	T2	T3		
Drumstick	4.77	5.15	6.06	4.71	0.17	N. S
Thigh	8.20	8.95	10.16	7.71	0.16	N. S
Breast	13.33	14.11	13.87	11.96	0.53	N. S
Wing	3.54	3.63	4.60	4.10	0.18	N. S

a, b and c mean in the same raw with different superscripts are significantly ( $p>0.05$ ) different, SEM: standard error of means. Control: basal diets, T1: 5% FGSM, T2: 10% FGSM, T3: 20% FGSM.

## Conclusion:

It is concluded that Fenugreek seed meal (FGSM) at all levels used in the present study (20%, 10%, or 5%) had negative effect on productive performance when used as alternative sources of protein in broiler diets, but further research is required.

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## تقييم تأثير إضافة بذور الحلبة في علائق الدواجن على الأداء الإنتاجي وصفات الذبيحة

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### الملخص

أُجريت الدراسة التجريبية خلال شهرى أكتوبر ونوفمبر بكلية الزراعة والموارد الطبيعية – جامعة أسوان لتقييم المستويات المختلفة من كسب بذور الحلبة كمصدر للبروتين في علائق دجاج التسمين حيث تم استخدام 144 كتكوت عمر يوم وتوزيعهم عشوائياً في 4 معاملات وكانت كل معاملة مقسمة لأربع تكرارات وكل تكرار احتوى على 9 كتاكيت.

وكانت العلاجات التجريبية الأربعة على النحو التالي :

- 1- طيور غُذيت علي عليقة الكنترول بدون اضافات (معاملة الكنترول) .
- 2- طيور غُذيت علي عليقة تحتوي علي 5% كسب بذور الحلبة (المعاملة الأولى).
- 3- طيور غُذيت علي عليقة تحتوي علي 10 % كسب بذور الحلبة (المعاملة الثانية).
- 4- طيور غُذيت علي عليقة تحتوي علي 20% كسب بذور الحلبة (المعاملة الثالثة).

وقد أظهرت النتائج ما يلي :

- النسبة لمعدلات الوزن الحي ووزن الجسم المكتسب ومعدلات استهلاك العلف: أدت جميع المعاملات المستخدمة الى انخفاض معنوي في كل هذه المعدلات مقارنة بمعاملة (الكنترول) كما أدت الى تدهور في معامل التحويل الغذائي مقارنة بمعاملة (الكنترول) ولم يوجد أى نفوق خلال فترة التجربة .

- كما تأثرت بعض صفات الذبيحة معنويًا لجميع المعاملات مقارنة بمعاملة (الكنترول) لكلا من وزن الذبيحة والكبد والقانصة ودهون البطن واخيرا الأجزاء الصالحة للأكل بينما لم يتأثر البعض الآخر لصفات الذبيحة للمعاملات الغذائية مقارنة بمعاملة الكنترول للصدر و الفخذ وايضا الجناح مع وجود تدهور واضح في أوزان الذبيحة لجميع المعاملات الغذائية مقارنة بمعاملة (الكنترول).

- نسبة تحويل السعرات الحرارية ونسبة تحويل البروتين : كان هناك اختلافات معنوية بين المعاملات الغذائية المختلفة ومجموعة الكنترول .

- مؤشر الأداء وعامل كفاءة الإنتاج الاربوي :انخفضا بشكل ملحوظ مع زيادة مستويات وجبة بذور الحلبة في المجموعات الغذائية المختلفة مقارنة بمجموعة الكنترول .

ومن نتائج هذه الدراسة يمكن التوصية بعدم استخدام كسبة بذور الحلبة بمستوى 20%، 10%، أو 5% لتأثيرها السلبي على الأداء الإنتاجي بصفة عامة في علائق دجاج التسمين.