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IMPACT OF USING SUNFLOWER SEED MEAL IN BROILER MALE DIETS ON PERFORMANCE TRAITS AND CARCASS CHARACTERISTICS

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Abstract

This study was conducted to determine the impact of using three levels of sunflower seed meal (SFSM) (0%, 10%, and 20%) to evaluate the growth performance, carcass traits in 270 male broiler (Ross 308), reared for 42 days distributed in a completely randomized design, with 3 treatments five replicates with 18 chicks per each for 42 days. T1: Control treatment (Basal diet containing zero SFSM), T2: Basal diet containing 10% SFSM and T3: Basal diet containing 20% SFSM. The inclusion of various levels of sunflower seed meal was observed alter the productive performance of the birds. The inclusion of 20 % sunflower seed meal (SFSM) had significant differences ($p \leq 0.05$) in overall body weight (LBW), body weight gain (BWG), while %10 SFSM had a significant impact on feed intake (FI), feed conversion ratio (FCR). The inclusion of sunflower seed meal from 10%, 20% had effect on carcass characteristic cut yield of broilers. They were slaughter weight, carcass weight, dressing percentage, breast, joint wings, and legs. Slaughter weight, carcass weight, breast weight, leg weight, wing weight, were influenced by high level of (SFSM) which had a significant effect ($p \leq 0.05$) between treatments. This study was concluded that male broiler performance traits carcass characteristics improved by inclusion high level of (SFSM).

Keywords: Karadi Sunflower Seed Meal, Broiler, Performance, Carcass Characteristics.

تأثير استخدام مسحوق بذور زهرة الشمس في علائق ذكور فروج اللحم على الأداء الأنتاجي وخصائص الذبيحة

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الخلاصة

أجريت هذه الدراسة لتحديد تأثير استخدام ثلاثة مستويات من كسبة بذور زهرة الشمس (SFSM) (0٪، 10٪ و20٪) لتقييم الأداء الانتاجي وصفات الذبيحة، استخدم 270 من ذكور افراخ فروج اللحم (Rose 308)، تمت تربيتها لمدة 42 يومًا موزعة في تصميم عشوائي كامل، مع 3 معاملات، وخمسة مكررات لكل معاملة و18 فرخة لكل مكرر. تضمنت المعاملات: T1: (معاملة المقارنة) العليقة الاساسية بدون اضافة SFSM. T2: العليقة الاساسية بإضافة 10% من SFSM و3T: العليقة الاساسية بإضافة 20% SFSM. لوحظ أن اضافة مستويات مختلفة من كسبة بذور دوار الشمس يغير الأداء الإنتاجي للطيور. كان لإدراج 20٪ من كسبة بذور زهرة الشمس (SFSM) قد ادت الى اختلافات معنوية ($p\leq0.05$) في الوزن الكلي للجسم (LBW)، والزيادة الوزنية للجسم (BWG)، وكمية العلف المستهلك (FI)، وكفاءة تحويل العلف (FCR) مقارنة مع المعاملات الأخرى. ان اضافة كسبة بذور زهرة الشمس من 10٪ و20٪ كان له تأثير على صفات الذبيحة للطيور. تأثر وزن الذبيحة، وزن الصدر ووزن الفخذ، ووزن الاجنحة بارتفاع مستوى (SFSM) الذي كان له تأثير معنوي ($p\leq0.05$) بين المعاملات. خلصت هذه الدراسة إلى أن صفات الأداء الانتاجي لذكور دجاج فروج اللحم قد تحسنت بإضافة كسبة زهر الشمس.

كلمات مفتاحية: كسبة بذور زهرة الشمس، ذكور دجاج فروج اللحم، الأداء الانتاجي، صفات الذبيحة.

Introduction

Sunflower seed meal (*Helianthus annuus*) is a by-product of sunflower meal, the oil extraction industry for human consumption. Poultry feed prices are consistently increasing because of dependence on imported soybean meal. Hence, it is essential to find sustainable alternative protein sources. Sunflowers are thought to be one of the first plants cultivated in the Americas, and (*Helianthus annuus*) was developed in North America by Indian tribes and first commercialized in Russia (3). It is used as an alternative source of protein in broiler diets it is economically important due to a very large quantity of source of protein. The chemical composition of Sunflower seed

meal is comparable with soybean meal; it is higher than those in cottonseed or rapeseed meals. Sunflower seed meal decorticated contains 45.4% crude protein 2,320 Kcal/kg. Metabolizable energy (2). Even it has a low level of lysine content of 1.70 % but it is well balanced with its amino acid composition. The synthetic lysine can be supplemented in the diet to complete the nutrient requirement of broilers (15). It is essential to improve the efficiency of conversion of proteins from feed to meat. The only apparent disadvantage of this feedstuff is that it contains relatively high level of fiber and low level of metabolizable energy and lysine compared to soybean meal Amino acids are the building blocks of proteins. As lysine is the first limiting amino acid in sunflower meal, the growth of chicks substantially depends on its concentration in broiler diets. The strong lysine deficiency in sunflower meal must be balanced by L-lysine HCl to obtain satisfactory performance (8).

Broiler production in certain countries often suffers from an inadequate supply of local high-quality protein. Increased production of sunflower seeds (*Helianthus annuus L.*) for oil can provide more meal that can provide protein and offset the need for soybean meal, which is often unavailable due to cost (3). Presently, due to adaptive capabilities in various climatic soil conditions, sunflower seeds are grown worldwide. (The non-availability of SBM at economical prices supports a need to search for alternate protein sources in least cost formulations for poultry in certain countries (7 and 12). However, investigators reported that SFSM can replace up to two thirds of the soybean meal protein in the starter finisher diets of broilers. Addition of L-lysine HCl allows more flexibility in feed formulation, allowing high inclusion rates of sunflower meal. The amino acid digestibility is reported to be 86%, 88% and 89% respectively for sunflower meal with 32%, 35%, and 37% crude protein. Similarly, protein digestibility is higher in high protein sunflower meal (12). Another characteristic of SFSM is that it does not have anti-nutritional factors such as those found in soybean, cottonseed and rapeseed meals. Enzyme supplementation to SFSM-based diets in different types of poultry species need further study. The ingredient can successfully be included in layer, broiler and waterfowl diets to replace 50-100% of soybean meal, depending on the type of diet and the nature of the other ingredients (16).

Materials and Methods

Husbandry, experimental design diets: This experiment was carried out at the poultry farm of Animal Science Department/ College of Agricultural Engineering Sciences/ University of Sulaimani. Two hundred and seventy male chicks (Ross 308) were used to evaluate their performance with three levels of sunflower seed meal 0, 10 and 20. The two first weeks was for adapting the chicks together. At 14^{th} days the male chicks were distributed in 3 treatments each treatment has 5 replications with 18 chicks per each pen. From the second week to the end of the experiment the experimental diets were presented, feed and water were given (*ad libitum)*. The birds had free access to feed and water at all time. The chicks were fed two different levels of protein diet as grower from 15-28 days old was (%21 crude protein) and (3100

kcal/kg), from 28-42 days old was (%20 crude protein) and (3070kcal/kg) for the control (3150 Kcal/kg) for the other treatments.

T1: Control treatment (Basal diet containing zero SFSM).

T2: Basal diet containing 10% SFSM.

T3: Basal diet containing 20% SFSM.

Ingredient's composition of the grower and finisher diets and its analysis are shown in tables 1:

Table 1 Composition of the grower diet 15-28 days of age.

Ingredients	Sunflower Seed Meal		
	0	10%	20%
Sunflower Seed Meal	0	50	100
Corn	462	408	336
Soybean Meal (%46)	304	278	280
Wheat	200	200	200
Wheat bran	0	30	50
Premix*	25	25	25
Soybean Oil	0	0	0
Mono-Calcium	5	5	5
Toxin Binder	4	4	4
L-Lysine (%)	1.35	1.35	1.35
Methionine (%)	0.65	0.65	0.65
Calcium (%)	1	1	1
Av. phosphorus (%)	0.45	0.45	0.45
Methionine + cystine (%)	1	1	1
Calculated Analysis			
Crude protein	21	21	21
Metabolizable energy kcal/kg	3100	3100	3100

Table 2 Ingredients Composition of the finisher 29-42 days of age.

Ingredients	Sunflower Seed Meal		
	0%	**10%**	**20%**
Sunflower Seed Meal	0	100	200
Corn	431	357	246
Soybean Meal (%46)	288	525	203
Wheat	250	250	250
Wheat bran	0	0	60
Premix*	25	25	25
Soybean Oil	0	0	0
Mono-Calcium	0	0	0
Toxin Binder	4	4	4
Limestone	0	10	10
L-Lysine (%)	1.3	1.3	1.3
Methionine (%)	0.6	0.6	0.6
Calcium (%)	0.9	0.9	0.9
Av. phosphorus (%)	0.4	0.4	0.4
Methionine + cystine (%)	0.95	0.95	0.95
Calculated Analysis			
Crude protein	**20**	**20**	**20**
Metabolizable energy kcal/kg	**3070**	**3150**	**3150**

Performance Traits Measured: The following parameters (performance traits) were evaluated: live body weight, body weight gain, feed intake, and feed conversion ratio

and carcass traits. The birds were weighed individually and feed consumption recorded at weekly intervals.

Statistical analysis: The data from this experiment were analyzed according to analysis of variance (ANOVA) using the General Linear Model (GLM) within the statistical program Complete Randomized Design (CRD) procedures of XLSTAT. (Addinsoft, version.5.03, 2016) in one-way ANOVA, its significance was verified at the level of 5% using Duncan's multiple range test program (4) to determine the effect of different treatments.

Results and Discussion

Table 3 shows the live body weight (LBW) at different age periods in each treatment. The highest LBW in the 15 days of age was in T3 which was 445.85 g, the lowest was in T1(control) which was 416.80 g. There were significant differences ($p \leq 0.05$) between T1 and T3, no significant differences ($p > 0.05$) were obtained between T1 and T2. Also, in the second age period 21 days the T2 was the highest weight 837.60 g, the lowest was T1 (control) which was 810.400 g. There were no significant differences ($p > 0.05$) between the treatments in live body weight in 21, 35 and 42 days except 28 days of age. There were significant differences ($p \leq 0.05$) between T1, T2 and T3 and the highest LBW was in T3 1389.80 g. In 35 days of the highest LBW was T3 which was 2109.80 g and the lowest one was T1 (control) which was 1986.200. At the last period 42 days age T1 (control) was obtained the lowest LBW was 2665.400 g while T3 gained the highest LBW 2775.20 g. Live body weight was significantly affected by addition of SFM during periods which is in treatments.

Table 3 Impact of using sunflower seed meal in broiler diet on live body weight (g) in different ages.

Treatments	Age (days)				
	15	21	28	35	42
T1	416.80^{b} ± 10.27	810.40^{a} ± 11.52	1340.60^{b} ± 20.80	1986.20^{a} ± 26.82	2665.40^{a} ± 20.23
T2	432.80^{ab} ± 7.36	837.60^{a} ± 22.10	1273.40^{b} ± 27.30	1995.20^{a} ± 63.29	2688.20^{a} ± 78.90
T3	445.85^{a} ± 2.53	828.00^{a} ± 10.27	1389.80^{a} ± 20.25	2109.80^{a} ± 45.68	2775.20^{a} ± 20.50

^{ab} Values (means ± SEM) in rows with different superscripts differ significantly ($p \leq 0.05$)

Similar results recorded by (6) growth rate of birds fed the SFM diets was significantly affected ($P < 0.001$). These results are in in contrast with (14) that in study indicated that the rate of live weight gain, were insignificantly affected by the level of SSM in the diet. However, the main effect of A-V fat on weight gain was significant (P<.01). Chicks fed diets containing 6% A-V fat 10 or 20% SFM gained more weight than did those fed 10 or 20% SFSM diets containing no A-V fat 18). (9) in a study indicated that increasing the sunflower seed meal level to 250 g kg- i supplemented with lysine and methionine, supported growth equal to or better than the control diet.

Results in table 4 show the effect of the diet on the BWG in different treatments and different age periods, there were no significant difference ($p>0.05$) between treatments in different periods of ages. Chickens in T1 have got the highest BWG in age period 15-21 days which was 393.600 g and the lowest one was T3 which was 349.800 g. In period 22-28 days, highest BWG was in T3 which was 577.400 g according to the other treatments and the lowest one was T2 were gained 448.200 g. In age period 29-35 days the highest BWG was T2 which was 721 g and T1(control) was the lowest BWG which was 637.40 g.

Table 4 Impact of using sunflower seed meal in broiler diet on live body weight gain (g) in different age periods.

Treatments	Age periods (days)				
	(15-21)	(22-28)	(29-35)	(36-42)	Overall
T1	393.60[a] ± 12.47	529.40[a] ± 14.32	637.40[a] ± 12.49	679.20[a] ± 31.24	2248.60[a] ± 27.12
T2	392.20[a] ± 14.65	448.20[b] ± 15.60	721.00[a] ± 37.22	693.00[a] ± 39.48	2255.40[a] ± 74.81
T3	349.80[a] ± 17.11	577.40[a] ± 28.40	719.00[a] ± 40.81	665.40[a] ±56.76	2329.35[a] ± 21.22

[a] Values (means ± SEM) in rows with different superscripts not differ significantly ($p\leq0.05$)

Also, in the last age period and overall there were no significant differences ($p>0.05$) between treatments.in 36-42 days the highest BWG obtained by T2 693 g while in overall T3 gained 2329.35 g which was the highest. (10) in a study observed that BWG responded quadratically ($P<0.01$) with increasing levels of dietary SFM. Since the performance of the broiler chicks receiving the highest BWG which have highest level of SFM This finding con- firm that in the present study, the magnitude of response in weight gain to higher levels of sunflower seed meal was significantly greater (9). Pelleting diet induced a greater increase in BWG of chicks fed on diets containing 10 or 20% SFSM than in those fed on diets containing 0% SFSM (18). Also (12) recorded not similar result in a study that BWG was not affected by total replacement of SBM with SFM at 42 d of age.

The effect of using different levels of SFSM on feed intake FI was shown Table 5. There were no significant differences ($p>0.05$) between the treatments in all periods of ages, while in period 15-21 days the highest feed intake was recorded in T1(control) which was 454.200 and the lowest was T3 which was 415.400 g. In period 22-28 days highest FI was in T1 (control) which was 675.80 g and in lowest was in T2 which was 603.80 g. while in period 29-35 and last period 36-42 days and overall showed that T2 consumed the highest amount of F I. resulted in food intake has similar result as (10) The feed intake increased quadratically with increasing levels of dietary SFSM during the experiment 22- to 42-d periods as well as overall. Results were not similar with (14), who announced that feed intake were not significantly affected by the levels of inclusion rates of SFSM However, birds fed on diets supplemented with SSM consumed substantially more feed than the control group. (12) in study indicated feed intake was significantly higher in SFM-based diets than in the SBM reference diet at 21 and 42 d of age, except in groups given SFM100

at 21 d of age. In the latter group, the food intake was similar to that on the SBM reference diet.

Table 5 Impact of using sunflower seed meal in broiler diet on feed intake (g) in different age periods.

Treatments	Age periods (days)				
	(15-21)	(22-28)	(29-35)	(36-42)	Overall, FI
T1	454.20[a] ± 8.13	675.80[a] ± 19.46	1077.20[a] ± 29.49	1091.80[a] ± 48.18	3299.00[a] ± 65.87
T2	437.40[a] ± 13.19	603.80[a] ±41.34	1097.60[a] ± 81.97	1193.80[a] ± 117.83	3332.60[a] ± 178.15
T3	415.40[a] ± 15.35	631.40[a] ± 53.26	1057.80[a] ± 28.15	1156.20[a] ± 25.10	3260.80[a] ± 92.32

[a] Values (means ± SEM) in rows with different superscripts not differ significantly (p≤0.05)

The effects of using SFSM supplement and soybean oil to the diets on feed conversion ratio (FCR) are shown in table 6. The results did not indicate significant differences (p>0.05) between periods 15-21, 22-28, 29-35, 36-42 and overall. The maximum FCR in age period 15-21 days was in T3 1.204 and the minimum one in T2 1.120. While in age period 22-28 days birds in T2 recorded the highest 1.344 FCR T3 recorded the lowest 1.123. In age period 29-35days the maximum mean was T1 (control) 1.693 and the minimum mean was T3 1.485. In age period 36-42 days the highest FCR was in T3 1.778 and lowest FCR was in T1 (control) which was 1.617. While in overall T2 obtained 1.478 which was the highest FCR and (T3) gained lowest FCR 1.400. Similar observations have been obtained by (14) FCR were not significantly affected by the levels of inclusion rates of SSM. (9) recorded at 15 and 20% of the diet, feed conversion ratio was equal to the control (soya bean meal). In experiment (10) observed , the effects of various levels of SFM (0, 70, 140, and 210 g/kg) on chick performance and FCR were improved ($P < 0.05$) when up to 140 g of SFM was used.

Table 6 Impact of using sunflower seed meal in broiler diet on feed conversion ratio (g feed intake/g live body weight) in different age periods.

Treatments	Age periods (days)				
	(15-21)	(22-28)	(29-35)	(36-42)	Overall FCR
T1	454.20[ab] ± 8.13	675.80[a] ± 19.46	1077.20[a] ± 29.49	1091.80[a] ± 48.18	3299.00[a] ± 65.87
T2	437.40[ab] ± 13.19	603.80[a] ± 41.34	1097.60[a] ± 81.97	1193.80[a] ± 117.83	3332.60[a] ± 178.15
T3	415.40[bc] ± 15.35	631.40[a] ± 53.26	1057.80[a] ± 28.15	1156.20[a] ± 25.10	3260.80[a] ± 92.32

[a] Values (means ± SEM) in rows with different superscripts not differ significantly (p≤0.05)

According to the data in table 7, some carcass traits were influenced by dietary treatments. According to slaughter weight There were no significant differences (p>0.05) between treatments T1 and (T2, T3), Slaughter weight in T3 gained the highest weight it was 2230 g while T2 gained the lowest slaughter weight which was 2800 g. There were no significant differences (p>0.05) between treatments in carcass

weight T3 obtained the highest which was 2230 g the lowest carcass weight was T2which was 2141 g. Breast weight, leg weight and wing showed that there were no significant differences ($p>0.05$) between treatments T1(control) was gained the highest breast weight 853.1 g while T2 was 838.5 g. Maximum leg weight obtained by T3 657.7 g minimum leg weight was in T2 616.2.

While in wing weight the highest was T3 248.8 g and T2 was gained the lowest 231.5 g. In dressing percentage there was no significant differences between treatments, T2 gained the highest dressing percentage 76.298 and lowest dressing percentage was T3 which was 75.378[a]. dressing percentage were not significantly affected by the levels of inclusion rates of SFSM (14). The differences in the weights of the various carcass parts reflected the differences in the final weight consequently, in the carcass weight: if calculated as a percentage of carcass weight, no significant differences were found between groups for any of the carcass slices (19).

Table 7 Impact of using sunflower seed meal in broiler diet on Carcass traits (g).

Treatments	Slaughter weight	Carcass weight	Breast weight	Leg weight	Wing weight	Dressing percentage
T1	2898[a] ± 65.15	2200[a] ± 57.19	853.10[a] ± 26.44	624.6[a] ± 20.25	237.30[a] ± 7.12	75.88[a] ± 0.67
T2	2800[a] ± 78.88	2141[a] ± 87.03	838.50[a] ± 37.78	616.20[a] ± 21.89	231.50[a] ± 7.29	76.30[a] ± 1.50
T3	2958[a] ± 70.20	2230[a] ± 58.82	843.10[a] ± 27.23	657.70[a] ± 20.29	248.80[a] ± 5.72	75.38[a] ± 0.73

[a] Values (means ± SEM) in rows with different superscripts not differ significantly ($p\leq0.05$)

(5) indicated that there were no significant differences in various characteristics of the subjective quality traits of breast meat.(1) observed that carcass results are a consequence of the decrease in weight gain and function of the increase of SFSM in the diet. These results differ from those by (11 and 17), who did not verify any influence on carcass parameters up to the levels of 25.0% and30.0% inclusion SFSM, respectively.

Conclusion: The inclusion of sunflower seed meal (SFSM) in the diets at level of 0%, 10% and 20%. Using %20 of SFSM in diet had significant impact on the productive performance traits of broilers in terms of live body weight, body weight gain also on carcass weight and slaughter weight as well. while feed intake, feed conversion ratio and resulted in the best dressing percentage Influenced by including %10 of SFSM.

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