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Effect of Supplementation Vitamin E and Selenium to Diet Contains Fats in Productive and Carcass Performance of Broiler

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THIS experiment was conducted at the University of Mosul/College of Agriculture and Forestry in the poultry fields affiliated with the Department of Animal Production. The study period extended 42 days from 11/5/2022 until 12/17/2022. Its aim was to demonstrate the effect of Supplement vitamin E and selenium to a diet containing fats on the productive and carcass performance of broilers. This study used 240 one-day-old, unsexed broiler chicks of the Rose 308 type. The experimental treatments were as follows: The first treatment (control T1) was fed with a standard diet without fat, without oil, and devoid of vitamin E And selenium) as for the second treatment (adding 4% sunflower oil + 250 mg vitamin E/kg feed + 0.4 mg selenium/kg feed) and the third treatment (adding 4% beef tallow + 250 mg vitamin E/kg feed + 0.4 mg selenium/kg feed) either The fourth treatment (a mixture of 2% oil and 2% tallow + 250 mg vitamin E/kg feed + 0.4 mg selenium/kg feed) showed a significant increase in live body weight, weight gain, quantity of feed consumed, speed of feed passage, and percentage of Abdominal fat and Fabricia, and there were no significant differences in the relative percentage of heart, liver, gizzard, or mortality.

Keywords: Broiler, Performance, Vitamin E, Selenium, Tallow and Sunflower oil.

Introduction

Poultry products are considered one of the most important sources of animal protein that is easy to digest and it is considered one of the ingredients of healthy feed for the peoples of the world as a whole. because Meat is an essential food for humans and a vital source of high-nutrient proteins, which are necessary for human development and its different tissues [1]. In comparison to red meat, chicken meat is thought to be healthy for human consumption because it is higher in protein and has lower levels of fat and cholesterol [2]. Given that feed expenses might make up as much as 70% of the entire cost of production[3]. The stages of feeding are essential for optimizing the consumption of feed because they rely on the animal's physiological and biochemical processes to give the bird the right amount of nutrients at the right age and prevent overeating [4] Specialists in nutrition are now focus to the price and need for more energy in feed meals to be able to meet the needs of growing birds. The use of dietary fats are among the preferred ways to accomplish this goal, and several sources of fat have been established into poultry nutrition, including animal fats like beef tallow, lard, and poultry fat as well as vegetable oils like sunflower, soybean, corn, flax and palm oil [5]. Dietary fats offer a reasonable alternative to raise the energy density in the diets of contemporary high-performance broilers

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at relatively low costs because they have a high energy density nearly twice as much as the same amount of carbohydrates and proteins and edible oils are relatively cheap when compared to corn [6]. Considering fats and oils have the largest calorie content of any nutrient, adding fats to a commercial broiler's diet is essential due to their shorter production cycle and high energy requirements [7] In addition to helping to raise feed quality, fats and oils additionally decrease dust created by dry feed ingredients, increasing digestibility. In terms of physiology, fats serve an essential part in the creation of the cell's membrane [8]. The breeding of Poultry birds has received wide attention by many researchers and interested breeders in the development of poultry industry and commercial Hybrids production which characterized by rapid growth and high feed conversion efficiency, but this productive process accompanied by many problems, which resulted from different causes, from these causes are The high prices of some traditional feed materials with a high energy content led us to use energy-dense sources such as beef tallow and vegetable oil to reduce the price of energy units used in broiler feed.

When broiler chicks eat different diets that are high energy, their production increases. Broiler chickens require more energy than cereal grains can offer them, most of the energy required by the birds comes from the carbohydrates in the cereals [9].

The diet includes high energy density lipids to suit the needs of high productivity broiler hens. In poultry diets, animal fats, vegetable oils, and their mixtures are the most common sources of lipids. When administered vegetable oils with higher concentrations of the essential fatty acids linoleic and linolenic, broiler hens have demonstrated improved development [10]. When meat is processed for human consumption, the major animal fat used in animal feed is called beef tallow, which has a high melting point (staying solid at ambient temperature), low moisture content, and free fatty acid content[11].

Selenium is an essential micronutrient required for normal growth and maintenance in poultry. The Selenium requirement for broilers throughout the growth period is 0.15 part per million (ppm) (NRC, 1994). It is one of the essential minerals necessary to survive and productivity in birds . It helps with multiple elements of fertilization, illness prevention, and chicken production. As a necessary component of glutathione peroxidase, selenium functions as an antioxidant and helps in the regulation of lipid and hydrogen peroxide levels. Normal metabolic activity results in the production of these matoblites[12]. As a necessary component of glutathione peroxidase, selenium functions as an antioxidant and helps in the regulation of lipid and hydrogen peroxide levels. Selenium (Se) is one of the necessary trace elements because of its structural makeup and variety of physiological functions, particularly in avian species where it is involved in antioxidation [13]. According to [14] using selenium has enhanced weight gain and growth performance in comparison to other treatments. Normal metabolic activity results in the production of these metabolites . According to [15] using -selenium enhanced protein levels, antioxidant levels (such as glutathione peroxidase and malondialdehyde) , and decreased the liver's oxidation of fat. According to [16] feeding selenium has enhanced feed conversion ratio and live body weight considerably.

Vitamin E is important for the growth of broiler chickens. According to [17] vitamin E enhanced the birds' physiological and productive performance. Vitamin E antioxidants are regarded as effective and dissolved in fat and use for feeding birds, thus reducing oxidation stress [18]. It prevents long-chained unsaturated fatty acids from oxidizing in cell membranes [19]. Free radicals , as a portion of the chains, are distinguished by their ability to initiate a chain, breaking a sequence of interactions that increase their activity and result in the oxidation of unsaturated fatty acids and the destruction of cell components, altering the composition and functions of cell membranes [20].

Material and Methods

This experiment was carried out in the Department of Animal Production of the college of Agriculture and Forestry of the University of Mosul for 1–42 days. The study aimed to show the impact of adding vitamin E and selenium together to the sunflower oil and beef oil and their mixture on the growth performance, carcass traits. The study was used for 240 unsexed birds of one day old of a type (Ross 308). The study was conducted in a room with concrete floors and equally-dimensional rooms distributed on both sides of the room. broiler were growing up with a density of 12 birds/m2, with windows on both sides with air vents to ensure quality ventilation. The floor of the room was brushed with a saw of wood brought from a Local market. The lighting

was operated equally in all rooms. The lighting intensity was 100 watts to ensure that the chicks received homogeneous light throughout the experiment. This room has been equipped with electrical heaters distributed to all rooms to maintain the temperature of the room, which is suitable for birds. The chicks were distributed from the beginning of the first week to four transactions per 3 replicate., with 60 chicks per transaction, 20 chicks per replicate, two periods of feeding starting (1–21 days) and the final period (22-42 days), and the Chicken feed were formed according to the recommendations adopted by the National Research Council. The experimental factors were: The first treatment (control T1) was fed with a standard diet without fat, without oil, and devoid of vitamin E And selenium(as for the second treatment(T2) adding 4% sunflower oil + 250 mg vitamin E/kg feed + 0.4 mg selenium/kg feed) and the third treatment(T3) adding 4% beef tallow + 250 mg vitamin E/kg feed + 0.4 mg selenium/kg feed) either The fourth treatment(T4) (a mixture of 2% oil and 2% tallow + 250 mg vitamin E/kg feed + 0.4 mg selenium/kg feed), as shown in tables (1) and (2), feed and water were freely available for broiler throughout the trial period. Growth parameters: production characteristics, which are represented by the average body weight (g), weekly weight gain (g), feed intake (g/bird), and feed conversion ratio (g feed/g weight gain), were estimated at the end of the trial period. Six birds were selected randomly from each transaction and starved for four hours. The feed was supplemented with red feed dyes purchased from the local market and then waited until the color came out with the bird's waste, after which the speed of feed passage was calculated by minute, which is the period of eating colored feed until the color came out with the waste.

Statistical analysis

Data were taken and statistically analysed by SAS (2003) using the complete random design (CRD) Randomized Design and the multi-range Duncan Analysis (Duncan, 1955) to test averages at the probability level of 5%, which indicates that the averages with the same characters are not morally different from each other, while the averages with different characters indicate moral differences from each other. The standard error value was also found to be consistent with the rate values.

$$YIj=u+Ti+eij$$

Whereas:

Yij = Views Value

u = overall average views

Ti = Transaction Effect

eij = Experimental error effect

Results and Discussion

Table 3 indicates the effect of adding sunflower oil, beef tallow, and their mixture on live body weight, weight gain, and feed consumed. The results of the statistical analysis regarding live body weight at the age of 21 days showed that the second treatment was significantly superior to all experimental treatments and that there were no significant differences between the third and fourth treatments, which were significantly superior to the first treatment. However, at the age of 42 days, the second treatment was significantly superior to all treatments as well. The third treatment was significantly superior to the first and fourth treatments. The fourth treatment was also significantly superior to the first treatment. This increase in body weight may be due to the sunflower oil containing linoleic acid, which is one of the essential fatty acids that is very necessary in poultry nutrition. The oil also contains fatty acid (linolenic acid), as studies have indicated that these acids work to improve productive performance and increase body weight. They also work to improve the composition and structure of the carcass and the taste of meat in broiler chickens [21]. These acids, in turn, lead to increased digestion of fats in the intestines, which leads to increase the benefit from feed [22]. Also The effect of increasing body weight may be due to increased absorption of both fats and soluble vitamins (K-D-A-E) and then emulsification and digestion of oil, which leads to increased benefit from other nutritional elements such as proteins, and this in turn affects performance. Poultry productivity is positive, in addition to the presence of vitamin E in the feed as an important and necessary source of antioxidants. In general, fats work to increase the palatability of the feed and the consistency of its components, and the presence of Se as an important source of antioxidants significantly improves live body weight without increasing the cost of feeding. These results are consistent with [23] [24] and the reason may also be due to the significant improvement in live body weight values when adding beef tallow with vitamin E and Se indicated that tallow led to a reduction in the speed of passage of feed through the digestive system, and this caused an increase

in the efficiency of utilization of digestion and metabolism of the feed elements or components included in the composition of the feed, which led to an increase in the absorption of vitamins and nutrients, in addition to the fact that beef tallow contains essential fatty acids such as linoleic acid. There are also some important vitamins dissolved in it, as they have an important vital role in metabolism and metabolic processes and thus reflect positively on the average living body weight. These results agreed with the findings of [25] [26] . As for the weight gain at 21 and 42 days, a significant superiority is observed for the second, third, and fourth treatments compared to the first treatment, as the addition of oil or beef tallow or their mixture (with vitamin E and selenium) led to improved palatability and increased efficiency of utilization of digested feed materials, and this is the reason for the increase. The results of this study are in agreement with [24][27][28]. As for feed consumption, a significant increase in feed consumption is observed at the age of 21 for the second, third, and fourth treatments compared to the first treatment, while at the age of 42, there is a significant increase in feed consumption for the second and fourth treatments compared to the first and third. In general, the oils work to consolidate the components of the feed and increase its palatability. The way to improve the flavor and increase the attractiveness of birds to eat is because fats have a distinctive taste, which can lead to increased feed consumption because the birds will enjoy the taste of the feed more, and free fatty acids are aromatic compounds that can contribute to the flavor of the feed. These results were consistent with what was reached by [29] [30]. who showed that the oil treatment was significantly superior and the amount of feed consumed increased.

Table 4 indicates the effect of adding sunflower oil, beef tallow, and their mixture on the feed conversion ratio, feed passage speed, abdominal fat percentage, and the fabricia. The results of the statistical analysis on the feed conversion ratio values at 21 days of age showed that there were no significant differences between the experimental treatments at 42 days of age It is noted that there is a significant improvement in the conversion ratio values in favor of the second, third, and fourth parameters compared to the first. The significant improvement in the feed conversion ratio when adding vitamin E and Se may be due to the role of vitamin E in removing the free radicals formed before they enter the reaction chain [31]. which led to an increase in the utilization of feed in a way that was reflected in the feed conversion ratio, in addition to the important role of vitamin E in improving growth and productive performance [32]. Also, adding Se to feed increases the possibility of building and synthesizing proteins in the body. Also, the important role of Se Antioxidant activity must be recorded and accelerating Removing harmful toxic substances and free radicals (resulting from metabolism) and also improving the immune system [23]. Also, the improvement in the feed conversion ratio is due to the treatment to which beef tallow was added, perhaps due to its effect on reducing the speed of feed passage (Table 4: Feed passage speed). This, in turn, affects the improvement of the efficiency of the absorption process of essential fatty acids and the assimilation of other nutrients included in the feed composition and increases their absorption and better use [33]. As for oil, the improvement in the values of the feed conversion ratio for this treatment may be due to the presence of essential fatty acids. (Oleic and linoleic), which in turn activate bile juice and lead to increased digestion of fats in the intestines, which has a positive effect on increasing the efficiency of the utilization of feed components [34].

As for the speed of feed passage, Table 4 shows that the second, third, and fourth treatments (oil, tallow, and their mixture) led to a significant decrease in the speed of feed passage through the digestive system (an increase in the residence time of the feed) compared to the first treatment (control). The reason for this may be attributed to the fact that the digestion and absorption of fats are the most complex when compared to other feed components [35] [36] as this study agreed with the findings of [37] [38] It is also noted from Table 4 that there was a significant increase in the percentage of abdominal fat for the third treatment compared to the rest of the treatments, as well as a significant increase in abdominal fat for the second and fourth treatments compared to the first treatment, as the results of this study were in agreement with [39] Who indicated that the use of vegetable oil or beef tallow led to an increase in the percentage of abdominal fat compared to the control diet. As for the fabricia, the results obtained from the statistical analysis in Table 4 indicate that there are no significant differences between the first and second treatments in the percentage of fabricia, while the fourth treatment was significantly superior to the previous two treatments, and the

third treatment was significantly superior to all treatments. Experimental studies indicate that an increase in the weight of the Fabricia indicates improved production performance and growth [40]. The increase in the weight of the Fabricia also indicates an increase in the birds' ability to resist diseases and an increase in antibodies in the bird's body. These results were consistent with what was reported by [41] [42].

It is noted from Table 5 that there are no significant differences between all experimental treatments in the relative weight carcass yield %This study agreed with [35] [43] [44] who indicated that there were no differences in the relative weight of the eaten internal organs. as well as no significant differences in the mortality rate Although the fourth treatment was the best, as mortality rate was zero, in addition to the fact that the first treatment had the highest mortality rate among the treatments, there is no significant difference, as vitamins E and Se work to increase the viability of broilers by reducing the number of mortality [45] or by increasing immunity in birds [46]. [47] dietary supplementation with Orgainc-Se (Se enriched yeast) improved antioxidant system, and this study was in agreement with [29] [30].

Conclusions

We conclude from the results of this study that the use of sunflower oil and animal tallow (with the addition of vitamin E and selenium) in feeding broiler chickens led to a significant increase in live body weight, weight gain, the amount of feed consumed, the speed of feed passage, the percentage of abdominal fat, and the fabricia gland, and that there were no significant differences in the percentage of heart, liver, gizzard, and mortality.

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Conflicts of interest

There is no conflict of interest.

Funding statement

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TABLE 1. Shows the components of the starter's diet used in the experiment

Feed feedstock	Initiator Diet%			
	Diet control (T1)	Sunflower oil diet (T2)	tallow diet (T3)	Oil & tallow Diet (T4)
Yellow corn	57	15.971	25.971	24
Wheat	2	44	32	34
Soybean meal 44%	38	33	35	34.71
Beef Tallow	-	4	-	2
Sunflower oil	-	-	4	2
Premix*	2.500	2.500	2.500	2.500
Salt	0.250	0.250	0.250	0.250
Limestone	0.250	0.250	0.250	0.250
selenium	0	0.004	0.004	0.004
Vitamin E	0	0.025	0.025	0.025
Total	%100	%100	%100	%100
Chemical analysis %				
Energy represented (kcal/kg)	2911	2920.8	2901.8	2919.03
Crude Protein%	23.0	23.12	23.19	23.17
Ether Extract%	2.55	5.75	5.92	5.88
Crude Fiber %	4.09	3.83	3.91	3.89
Lysine %	1.46	1.38	1.42	1.41
Methionine %	0.60	0.56	0.57	0.57

*Premix: Contains 30.01% crude protein, 2% crude fat, 0.79% crude fiber, 42.95% crude ash. 5.30 Sodium (Na), 6.20% Chloride (CL), 8.19% Lysine, 9.52% Methionine, 0.12% Tryptophan, 2.11% Valine, 0.65% Argenian, 3.05% Threonine, 400.000 IU/kg Vitamin A, 100.000 IU/kg Vitamin D3, 60.000 IU/kg 25-Hydroxyvitamin D3, 3.000 mg/kg Vitamin E, 120 mg/kg Vitamin B1, 320 mg/kg Vitamin B2, 240 mg/kg B6, 1.800 mg/kg Iron (Fe), 2.400 mg/kg Manganese (Mn), 2.800 mg/kg Zinc (Zn).

TABLE 2. Shows the components of the Finisher diet used in the experiment

Feed feedstock	Finisher Diet%			
	Diet control (T1)	Sunflower oil diet (T2)	tallow diet (T3)	Oil & tallow Diet (T4)
Yellow corn	65	21	33.04	30.3
Wheat	2	48	34.331	36.921
Soybean meal 44%	30	23.971	25.7	25.75
Beef Tallow	0	0	4	2
Sunflower oil	0	4	0	2
Premix*	2.500	2.500	2.400	2.500
Salt	0.250	0.250	0.250	0.250
Limestone	0.250	0.250	0.250	0.250
selenium	0	0.004	0.004	0.004
Vitamin E	0	0.025	0.025	0.025
Total	%100	%100	%100	%100
	Chemical analysis %			
Energy represented (kcal/kg)	3007	3003.95	3000.05	3017.10
Crude Protein%	20.20	20.16	20.01	20.20
Ether Extract%	2.79	5.95	6.16	6.10
Crude Fiber %	3.68	3.38	3.44	3.45
Lysine %	1.24	1.15	1.16	1.18
Methionine %	0.56	0.52	0.52	0.53

*Premix: Contains 30.01% crude protein, 2% crude fat, 0.79% crude fiber, 42.95% crude ash. 5.30 Sodium (Na), 6.20% Chloride (CL), 8.19% Lysine, 9.52% Methionine, 0.12% Tryptophan, 2.11% Valine, 0.65% Argenian, 3.05% Threonine, 400.000 IU/kg Vitamin A, 100.000 IU/kg Vitamin D3, 60.000 IU/kg 25-Hydroxyvitamin D3, 3.000 mg/kg Vitamin E, 120 mg/kg Vitamin B1, 320 mg/kg Vitamin B2, 240 mg/kg B6, 1.800 mg/kg Iron (Fe), 2.400 mg/kg Manganese (Mn), 2.800 mg/kg Zinc(Zn).

TABLE 3. Effect of Adding Sunflower oil , Tallow and mixture of both on Live Body weight (g) , Weight Gain (g) and Feed Consumption (g/bird) .At 21 and 42 days old respectively

Treatment	Body weight (gm)		Weight gain (gm)		Feed Consumption (gm \ bird)	
	21 day	42 day	21 day	42 day	21 day	42 day
T1	709.85±9.04 ^{c}	3079.75 ±31.4^{d}	273.09 ±9.41^{b}	3035.75±31.41^{d}	403.33±12.41^{b}	4976.66±29.77^{b}
T2	819.28±10.17 ^{a}	3476.00±21.85^{a}	387.08± 9.82^{a}	3430.00±21.85^{a}	548.67±33.39^{a}	5384.67±48.22^{a}
T3	784.43±8.13 ^{b}	3348 .10±24.86^{b}	373.85±8.09^{a}	3303.10±25.84^{b}	514.00±34.70^{a}	5085.33±26.19^{b}
T4	783.75±8.10 ^{b}	3255.48±29.84^{c}	365.52±8.14^{a}	3210.48±29.84^{c}	535.33±18.52^{a}	5115.33±38.73^{a}

* The different letters within the column indicate the existence of significant differences (P≤0,05).

TABLE 4. Effect of Adding Sunflower oil , Tallow and mixture of both Feed Conversion Ratio (gmFeed\gm gain) Feed Passage speed (min) , Abdominal fat % and Fabrecia %

Treatment	Feed Conversion Ratio (gm Feed\gm gain)			Abdominal fat %	Fabrecia %
	21 day	42 day			
T1	1.47±0.07^{a}	1.63±0.005^{a}	91.67±2.33^{b}	0.431 ±0.013^{c}	0.310 ±0.018^{c}
T2	1.41±0.026^{a}	1.56±0.009^{c}	128.00±2.64^{a}	0.714 ±0.007^{b}	0.305 ±0.023^{c}
T3	1.37±0.012^{a}	1.53±0.006^{d}	131.33±2.96^{a}	0.786 ±0.0096^{a}	0.469 ±0.004^{a}
T4	1.46±0.018^{a}	1.59±0.008^{b}	122.00±3.21^{a}	0.727 ±0.0092^{b}	0.374 ±0.0012^{b}

* The different letters within the column indicate the existence of significant differences (P≤0,05).

TABLE 5. Effect of Adding Sunflower oil , Tallow and mixture of both on Percentage of Heart , Liver , Gizzard and Mortality

Treatment	Heart %	Liver %	Gizzard%	Mortality %
T1	0.709 ± 0.01[a]	2.65 ± 0.05[a]	2.140 ±0.01[a]	5.00±2.88[a]
T2	0.701 ±0.01[a]	2.63 ±0.07[a]	2.074 ±0.03[a]	3.33±1.66[a]
T3	0.644 ± 0.01[a]	2.48 ±0.03[a]	2.070 ±0.03[a]	0.00±0.00[a]
T4	0.708 ±0.01[a]	2.58 ± 0.04[a]	2.180 ± 0.02[a]	1.66±1.66[a]

* The different letters within the column indicate the existence of significant differences (P≤0,05).

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تأثير اضافة فيتامين E والسلينيوم الى العلائق المحتوية على الدهون في الاداء الانتاجي والذبيحة لفروج اللحم

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تم اجراء هذه التجربة في جامعة الموصل / كلية الزراعة والغابات في حقول الطيور الداجنة التابعة الى قسم الانتاج الحيواني وامتدت فترة الدراسة 42 يوماً من 2022/11/5 ولغاية 2022/12/17 وكان الهدف منها لبيان تأثير إضافة فيتامين E والسيلينيوم إلى النظام الغذائي المحتوي على الدهون في الأداء الإنتاجي والاحشاء الداخلية لفروج اللحم استخدم لهذه الدراسة 240 فرخ من افراخ فروج اللحم الغير مجنسة وبعمر يوم واحد من النوع روز 308 وكانت المعاملات التجريبية كالاتي المعاملة الاولى (السيطرة T1) تم تغذيتها بعليقة قياسية بدون شحم وبدون زيت (وخالية من فيتامين E والسيلينيوم) اما المعاملة الثانية (اضافة 4% زيت الطعام 250+ ملغم فيتامين E /كغم علف + 0.4 ملغم سلينيوم/كغم علف) والمعاملة الثالثة (اضافة 4% شحم حيواني 250+ ملغم فيتامينE /كغم علف + 0.4 ملغم سلينيوم/كغم علف) اما المعاملة الرابعة (خليط 2% زيت و2%شحم 250+ ملغم فيتامين E /كغم علف + 0.4 ملغم سلينيوم/كغم علف) حيث اظهرت نتائج التحليل الاحصائي بعمر 42 يوم ارتفاع معنوي في وزن الجسم الحي والزيادة الوزنية وكمية العلف المستهلك وسرعة مرور الغذاء والنسبة المئوية لدهن البطن وغدة فابريشيا ، وعدم وجود فروق معنوية في النسبة المئوية للقلب ، الكبد ، القانصة ونسبة الهلاكات.

الكلمات الدالة: فروج اللحم ، الاداء الانتاجي، فيتامين E ، السلينيوم ، الشحم البقري وزيت عباد الشمس.