Effect of adding vitamin e to diet contain fats in productive performance and the internal organs of broiler

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ABSTRACT

This study was conducted at the University of Mosul - College of Agriculture and Forestry - Department of Animal Production - Poultry Field. 300 broiler Chicks, type Rose 308, one day old, unsexed, were used in this experiment. They were divided into 5 treatments (each treatment had 3 replicates). The experimental treatments were as follows: First treatment: control diet (without additives). The second treatment: adding 4% sunflower oil. The third treatment: adding 4% sunflower oil + 250 mg vitamin E/kg feed. Fourth treatment: Adding 4% animal fat. Fifth treatment: Adding 4% animal fat + 250 mg vitamin E/kg feed. The results at 42 days of age showed a significant increase in the characteristics of the body weight of the animal, its weight gain, and the amount of feed consumed for the experimental treatments, and a significant improvement in the feed conversion factor for the third and fifth treatments. As for the carcass cuts, the percentage of dressings, and the edible offal, there were no differences between all the experimental treatments.

Keywords: Broiler, Performance, Vitamin E, tallow & sunflower oil.

INTRODUCTION

Poultry products are considered an important source of animal protein that is easy to digest and provides high-nutrient proteins necessary for human development and tissue growth. Poultry meat, such as chicken and turkey, is perceived to be healthier and of better quality due to its low fat, cholesterol, and sodium content compared to red meat [1] [2]. Regular consumption of poultry meat has health benefits, including preventing overweight, diabetes, cardiovascular diseases, and different types of cancers [3]. Poultry meat is also recommended for anti-aging, muscle and bone development, improving the immune system, and increasing brain function [4]. The poultry industry focuses on maintaining the quality and safety of meat throughout the production and processing route to meet consumer demands and address societal and environmental challenges [5] . The increased demand for poultry meat has led to genetic improvement and progress in nutrition and management to enhance growth rates and feed efficiency . Compared to red meat, chicken is considered healthier for human consumption because of its higher protein content and lower fat and cholesterol levels. [6] Given that feed costs can account for up to 70% of total production [7]. Feeding phases are critical for optimizing feed consumption as they rely on the animal's physiological and biochemical processes to provide the birds with the right amount of feed to provide nutrients at the appropriate age and prevent overeating. [8] Nutrition experts are now concerned about prices and the need for more energy in feed to meet the growth needs of birds. The use of dietary fats is one of the preferred ways to achieve this, and a variety of fat sources have been established in poultry nutrition, including animal fats such as tallow, lard, and poultry fat, and vegetable oils such as sunflower oil, soybean oil, Corn oil, linseed

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oil and palm oil[9], Dietary fats provide a useful alternative to increase the energy density in modern high-performance chicken diets at relatively low cost, as they are nearly twice as energy dense as equivalent amounts of carbohydrates and protein and are comparable to corn In comparison, edible oils are relatively cheap [10]. Given that fats and oils have the highest caloric content of all nutrients, the inclusion of fats in commercial broiler diets is critical due to their shorter production cycles and higher energy requirements. [11] Fats and oils not only help improve feed quality but also reduce dust from dry feed ingredients, thereby improving digestibility. From a physiological perspective, fat plays a vital role in the structure of cell membranes[12]. With the development of the poultry industry and the commercial production of hybrids characterized by fast growth and high feed conversion efficiency, the breeding of poultry has attracted great attention from many researchers and interested breeders. However, this production process has Many problems arise arising from different reasons, due to which the high price of some traditional feeds with high energy content leads us to use high energy sources such as beef tallow and vegetable oils to reduce the price of energy units used in broiler feeds.

When broiler chickens eat different, energy-rich foods, their production increases. Broiler chickens require energy beyond what grains can provide; most of the energy required by birds comes from the carbohydrates in grains [13]. Vitamin E is important for the growth of broiler chickens. According to [14], vitamin E can improve the physiological and production performance of poultry. Vitamin E antioxidant is thought to be potent and can be dissolved in fat and used to feed birds, thereby reducing oxidative stress [15]. It prevents the oxidation of long-chain unsaturated fatty acids in cell membranes [16]. Free radicals, as part of a chain, are characterized by their ability to initiate the chain and disrupt a series of interactions, thereby increasing their activity and leading to the oxidation of unsaturated fatty acids and the destruction of cellular components, thus changing the composition and function of cell membranes [17].

MATERIALS AND METHODS

The chicks were distributed from the beginning of the first week to five transactions per 3 replicate., with 60 chicks per Treatment, 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 treatments were as follows: First treatment: control diet (without additives). Second treatment: Adding 4% sunflower oil. Third treatment: Adding 4% sunflower oil + 250 mg Vitamin E/kg feed. Fourth treatment: Adding 4% tallow. Fifth treatment: Adding 4%tallow +250 mg Vitamin E/kg feed. as shown in tables (1) and (2), feed and water were freely available for broiler throughout the trial period Weekly production characteristic data represented by mean body weight (g), weekly weight gain (g), feed intake (g/chick) and feed conversion ratio (g feed/g gain) were estimated at the end of the experimental period. From each transaction, six chick were randomly selected and starved for four hours. Red food dye purchased from a local market is added to the food and then the dye is excreted in the bird's droppings. Then calculate the rate of feed passing through per minute, which is H. The time to eat colored food until the color is passed out with feces.

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

Ingredients	Initiator Diet%				
	Diet control (T1)	Sunflower oil diet (T2)	Sunflower oil diet + vit E (T3)	Tallow diet (T4)	tallow diet + vit E (T5)
Yellow corn	57	16	15.971	26	25.971
Wheat	2	44	44	32	32
Soybean meal 44%	38	33	33	35	35
Beef Tallow	-	-	-	4	4
Sunflower oil	-	4	4	-	-
Premix*	2.500	2.500	2.500	2.500	2.500
Salt	0.250	0.250	0.250	0.250	0.250
Limestone	0.250	0.250	0.250	0.250	0.250
250_{mg} Vitamin E	-	-	0.025	-	0.025
Total	%100	%100	%100	%100	%100
Chemical analysis %					
Energy represented (kcal/kg)	2911	2921.8	2920.9	2903	2901.8
Crude Protein%	23.0	23.13	23.13	23.20	23.19
Ether Extract%	2.55	5.75	5.75	5.92	5.92
Crude Fiber %	4.09	3.83	3.83	3.91	3.91
Lysine %	1.46	1.38	1.38	1.42	1.42
Methionine %	0.60	0.56	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).

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

Ingredients	Finisher Diet%				
	Diet control (T1)	Sunflower oil diet (T2)	Sunflower oil diet + vit E (T3)	Tallow diet (T4)	tallow diet + vit E (T5)
Yellow corn	65	21	20.975	33.30	33.275
Wheat	2	48	48	34	34
Soybean meal 44%	30	24	24	25.7	25.7
Beef Tallow	-	-	-	4	4
Sunflower oil	-	4	4	-	-
Premix*	2.500	2.500	2.500	2.500	2.500
Salt	0.250	0.250	0.250	0.250	0.250
Limestone	0.250	0.250	0.250	0.250	0.250
250_{mg} Vitamin E	-	-	0.025	-	0.025
Total	%100	%100	%100	%100	%100
Chemical analysis %					
Energy represented (kcal/kg)	3007.00	3004.60	3003.74	3001.80	3000.94
Crude Protein%	20.20	20.17	20.17	20.03	20.03
Ether Extract%	2.798	5.952	5.951	6.167	6.166
Crude Fiber %	3.688	3.386	3.385	3.444	3.443
Lysine %	1.248	1.150	1.150	1.174	1.173
Methionine %	0.567	0.527	0.527	0.536	0.536

*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).

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 of Duacans Multiple Range Test [18] to test averages at the probability level of 5%.

RESULTS AND DISCUSSION

Table (3) shows a significant increase in live body weight for the second, third, fourth, and fifth experimental treatments compared to the first treatment, The significant increase in body weight for Sunflower oil treatment compared to control treatment may be due to the presence of linoleic acid and linolenic acid in the oil, which are essential fatty acids that improve production performance and increase body weight in poultry. These acids also enhance the composition and structure of the carcass and improve the taste of meat in meat chickens [19] [20]. These acids, in turn, lead

to increased digestion of fats in the intestines, leading to increased food utilization [21]. The effect of increased body weight may be due to increased absorption of both fats and vitamins dissolved in it (K-D-A-E) and then emulsification and digestion of oil, which leads to increased Benefits from other nutritional elements such as proteins, which in turn affects the productive performance of poultry positively, in addition to the presence of vitamin E in the feed as an important and necessary source of antioxidant, and in general, fats work to increase the palatability of the feed and the consistency of its components, These results are consistent with his findings[22] [23] . Regarding the addition of beef, the reason for the significant improvement in body weight values when adding beef alone or with vitamin E may be caused beef led to a reduction in the speed of food passing through the digestive system, and this caused an increase in the efficiency of benefiting from digestion and metabolism of the nutritional elements or components included in the food. 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, as well as some important vitamins dissolved in it, as they have an important vital role in metabolism and metabolic processes and thus reflected positively on the average live body weight, and these results agreed with the findings of [24] [25].

Table 3 shows that there is a significant increase in the weight gain of the experimental treatment (the second, third, fourth, and fifth) compared to the first. The reason may be due to the weight gain being affected by the average living body weight, Adding oil or beef also improved palatability and increased the efficiency of utilizing digested feed materials. This is the reason for the increase in the average weight gain values for the oil or beef addition treatments, as the results of this study agreed with [24] [25] [26].

Table 3 shows that there is a significant increase in the amount of feed consumed for the experimental treatments second, third, fourth, and fifth compared to the first treatment. In general, oils and fats work to cohesion the feed components and increase their palatability by improving the flavor and increasing the attractiveness of birds to eat because fats have a distinctive taste and this can lead to increased feed consumption because the birds will enjoy the taste of the feed more. Also, free fatty acids are aromatic compounds that can contribute to the flavor of the diet. Research [27] has proven that adding vitamin E to the diet of broilers leads to significant improvements in the rate of feed consumption. These results were consistent with the findings of [22].

Table 3 shows a significant improvement in the values of the food conversion coefficient for the third and fifth treatments compared to the first, second, and fourth treatments. The significant improvement in the food conversion factor when adding vitamin E is due to its role in removing free radicals formed before they enter the reaction chain [28]. which led to an increase in the benefit of food in a way that was reflected in the food conversion factor, in addition to the important role of vitamin E in improving Growth and productive performance [29]. Also, the improvement in the feed conversion coefficient is due to the treatment to which animal fat was added, perhaps due to its effect on reducing the speed of food passage, and this in turn affects the improvement of the efficiency of the

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absorption process of essential fatty acids and the assimilation of other nutrients included in the feed composition and increasing their absorption and better use [30]. As for oil, the improvement in the feed conversion factor values for this treatment may be due to the presence of essential fatty acids (oleic and linoleic), which in turn activate bile and lead to increased digestion of fats in the intestines, which has a positive effect on increasing the efficiency of utilization of feed ingredients [31] Also, this high fat absorption rate led to increased absorption of vitamins (A-E-D-K), which in turn improved and increased the ability to benefit from other nutrients, such as proteins, for example.

Table 3. Effect of adding sunflower oil & tallow , on live body weight (g) , weight gain (g), feed consumption (g/bird) & feed conversion ratio (gmfeed\gm gain).

treatment	Body weight (g)	Weight Gain (g)	Feed Consumption (g/bird)	Feed Conversion Ratio (gmFeed\gm gain)
T1	2800 b 23.30 ±	2756.0 b 44.90 ±	4536 b 27.97±	1.645 a 0.05±
T2	3199 a 40.18 ±	3157.0 a 48.30 ±	5150 a 48.30±	1.631 a 0.011±
T3	3249 a 19.30 ±	3205.5 a 60.34 ±	5106 a 57.11±	1.592 b 0.07±
T4	3194 a 48.22 ±	3151.5 a 53.26 ±	5149 a 22.46±	1.633 a 0.019±
T5	3265 a 37.40 ±	3222.0 a 63.67 ±	5120 a 46.77±	1.589 b 0.024±

* The different letters within the column indicate the existence of significant differences (P≤0.05).

Tables (4 and 5) show that there are no significant differences between all experimental treatments in the characteristics: dressing percentage, the relative weight of the heart, the liver, and the gizzard, and mortality rate, and the relative weight of the parts (Breast, thighs, back, wings, and neck). The results of this study agreed with [32] [33] [34].

Table 4. Effect of adding sunflower oil, tallow on dressing percentage & percentage of heart , liver, gizzard & mortality .

treatments	dressing Percentage	Heart %	Liver %	Gizzard%	Mortality %
T1	79.36 0.22±	0.678 0.03 ±	2.44 0.09 ±	2.08 0.11±	0.00 0.00 ±
T2	79.80 0.50±	0.712 0.01±	2.41 0.07±	2.19 0.05±	0.00 0.00 ±
T3	79.88 0.49 ±	0.705 0.02 ±	2.38 0.05±	2.16 0.09±	0.00 0.00 ±
T4	79.71 0.33 ±	0.642 0.01±	2.38 0.07 ±	2.20 0.07 ±	0.00 0.00 ±
T5	80.03 0.21 ±	0.708 0.04±	2.36 0.06 ±	2.07 0.12 ±	0.00 0.00 ±

* The different letters within the column indicate the existence of significant differences (P≤0.05).

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TABLE 5. Effect of adding sunflower oil , tallow on relative weight for breast, thighs , back , wings and neck.

treatment	Breast %	Thighs %	Back %	Wings %	Neck %
T1	38.56 0.33±	26.76 0.37 ±	18.61 0.13 ±	10.74 0.15±	5.32 0.20 ±
T2	39.65 0.27±	25.91 0.42±	17.88 0.30±	10.89 0.18±	5.67 0.30 ±
T3	39.42 0.26 ±	26.49 0.29 ±	17.92 0.19±	10.78 0.27±	5.38 0.21 ±
T4	39.34 0.41 ±	26.38 0.38 ±	18.48 0.23 ±	10.36 0.26 ±	5.43 0.17 ±
T5	39.61 0.34 ±	26.45 0.35 ±	17.98 0.16 ±	10.53 0.16 ±	5.42 0.15 ±

* The different letters within the column indicate the existence of significant differences (P≤0.05).

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