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PRODUCTIVE PERFORMANCE AND SOME CARCASS CHARACTERISTICS OF AWASSI LAMBS FED ON DIFFERENT LEVELS OF FAT FROM POULTRY SLAUGHTERHOUSES

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Abstract:

The study aimed to follow up the treatments added to the fat of poultry slaughterhouse and their impact on improving some productive performance and some meat characteristics in male Awassi lambs, the weight of the animals was recorded weekly for the duration of the study (120 days), all lambs were slaughtered, skinned and hollowed until the end of the study period and the results were as follows: where the treatments T3 and T4 outperformed a high significant superiority (P<0.01) in the final weight characteristic of the animals over the rest of the experiment treatments, as well as the presence of a high superiority P<0.01)) for the T4 treatment in the characteristic of daily and total weight gain compared to the rest of the trial treatments, as for the quality of food conversion efficiency, where T4 recorded the highest percentage of food conversion efficiency than the rest of the treatments. As for the proportions of the weights of the main carcass pieces, as T3 recorded the highest weight of the shoulder and rib pieces, the highest weight of the cotton piece was in favor of T3 and T4, and the highest weight of the thigh piece was T4 compared to the rest of the experiment treatments, as for the percentages of the weights of the secondary carcass pieces, where T1 and high significance (P<0.01)) exceeded the percentage of weight of the neck piece compared to the rest of the experiment treatments, and T1 and T2 recorded the highest weight of the chest piece and T3 recorded the highest weight of the loin piece compared to the rest of the experiment treatments.

Keywords: fat poultry slaughterhouse, lamb growth, Rumen fermentation and Carcass Characteristics.

INTRODUCTION

The lack of fodder materials and their high prices, especially in the dry seasons, is one of the most important difficulties facing ruminant breeders (Mui and Ledin, 2005), cattle have the ability to respond to different feed additives that lead to improving their general performance by improving the efficiency of utilization of different nutrients and reducing the risk of developing metabolic diseases (Nian et al., 2017), as there are a number of non-food additives such as antibiotics, but although they improve animal performance, they have a number of side effects due to their toxicity to animals and rumen microorganisms, in addition to their deposition within living tissue cells and the transmission of some of them with animal products such as (milk or meat) to the consumer with resistance of some types of bacteria to it (Szumacher and Cieslak, 2010) this led to search for sources of natural food additives such as vegetable oils, animal fats, or fat from slaughterhouses, which are rich in fatty acids (Cowan, 1999), which makes it a possible natural alternative to antibiotics to treat microbial activity in the rumen. Therefore, they are considered a good source of energy in ruminant diets, and thus these are non-traditional additives to improve the speed of growth in lamb (Steel, 1985), increasing the production of meat and milk in lamb (Hassan, 2008) and increasing the amount of milk fat used in various food industries (Palmquist and

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Jenkins, 1980), as fats contain more thermal energy than proteins and carbohydrates because of their chemical composition because they contain carbon and hydrogen at a higher rate than oxygen, fat can be added at a rate of 6-7% of the dry matter in ruminant diets (Doreau and Chilliard, 1997 and Cooper, 2000), fat from animal poultry waste is added because it is relatively cheap in most countries of the world in feeding milk cows, especially in the first stage of milk production (Onetti et al., 2001), the use of animal fats resulting from slaughterhouses in feeding ruminants leads to an increase in calories, a reduction in dust from concentrated feed, and an improvement in feeding efficiency (NRC, 1996). In order to find out the extent of its effect on feeding ruminants, the idea of this study was born in the use of fat leftover from poultry slaughterhouses in feeding Awassi lamb, as the objectives of the study centered on the following points:

1- Using different levels of fat from poultry slaughterhouse to determine the best level and its effect on the efficiency of meat production.
2- Studying the weight gain achieved by the use of fat from poultry slaughterhouses waste.
3- Studying some quantitative characteristics of carcasses.

MATERIALS AND METHODS OF WORK

1. Trial plan: This trial was conducted in the sheep field of the Department of Animal Production / College of Agriculture - University of Tikrit for the period from 5/2/2022 to 20/6/2022, including an introductory period that lasted for 15 days, this is to study the effect of adding different levels of poultry slaughterhouses fat at a rate of 0, 2, 4 and 6% to the concentrated feed on productive performance and some characteristics of Awassi lamb meat carcasses.

2. Trial diets: Raw materials for trial diets were purchased from local markets and crushed in the feed factory of the Department of Animal Production / College of Agriculture - University of Tikrit, poultry slaughterhouse fat was added at a rate of 2, 4 and 6% for the second, third and fourth treatments (T2, T3 and T4), as for the first treatment (control), it was without addition, as shown in Table 1, the mixing of poultry slaughterhouse fat with concentrated feed is done daily by melting these fats on a heat source and converting them into a liquid state, then mixing them with the concentrated feed, concentrated fodder was provided to the four treatments at a rate of 3% of the live body weight, according to the method (NRC, 2007), with coarse fodder provided freely to lambs, table 2 shows the chemical composition of the diets (Alfalfa hay) used in the trial.

Table 1. Percentages of trial diet components from raw materials (%).

Materials / Diets	Control T1%	Diet T2%	Diet T3%	Diet T4%
Black barley	48	48	48	48
Wheat bran	30	32	34	36
Yellow corn	12	8	4	-
Soybean meal	8	8	8	8
Fat poultry slaughterhouses	0	2	4	6
Vitamins and salts	2	2	2	2
Total	100	100	100	100

T2: a diet with 2% added fat from poultry slaughterhouses, T3: a diet with 4% added fat from slaughterhouses, T4: a diet with 6% added fat from slaughterhouses.

Table 2. The chemical composition of the components of the trial diet and Alfalfa hay (%).

Chemical composition / Feed materials	Dry material %	Organic material %	Ash %	Crude protein %	Crude fibre %	Ether extract %	The nitrogen-free extract %	* Metabolic energy (megajoules/kg dry material)
Feed barley	90.52	81.16	9.36	12.38	6.68	3.35	58.75	11.08

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Yellow corn	91.22	82.93	8.29	10.97	3.58	5.79	62.59	12.05
Soybean meal	90.47	84.02	6.45	43.74	5.11	3.66	31.51	11.05
Wheat bran	90.34	83.48	6.86	15.08	7.45	2.85	58.1	11.19
Concentrated feed	92.44	81.87	10.57	13.67	10.52	6.53	51.15	11.35
Alfalfa hay	91 75	84.86	6.89	17.34	19.46	1.62	46.44	10.05

* Metabolite energy (MJ / kg dry matter) = 0.012 x crude protein + 0.031 x ether extract + 0.005 x crude fiber + 0.014 x nitrogen-free extract (MAFF), (1975)

3. Preparing barns and their supplies: Trial animals were distributed in 4 group misleading cages with dimensions of 4.5 x 4.5 m, in which the feeding system was used according to each treatment of the experiment, each cage was equipped with a trough in which concentrated feed was placed, and another trough in which coarse fodder was put (Alfalfa hay) with a plastic bowl to provide water throughout the experiment period.

4. Duration of the experiment, conducting the slaughter process and taking measurements: The experiment period lasted 120 days, then the animals were slaughtered after fasting them for 12 hours, as mentioned previously, and their final weights were recorded just before slaughter, and after the carcasses were skinned (removing the skin), hollowed out, and cleaned, they were cooled in a cool room at a temperature of 4 m for a period of 24 hours, after the slaughter and cooling process, some qualitative and quantitative measurements of the carcasses were taken.

4. The first trial (growth trial)

This trial included studying the following characteristics:

4-1: Average daily weight gain (g/day) (total weight gain/number of days of the experiment).

4-2: Total weight gain rate of lambs (kg) (final weight - initial weight).

4-3: Feed conversion efficiency (the amount of feed consumed daily / daily weight gain).

5. The second trial (slaughter trial): All trial animals were slaughtered after the end of the trial period, and their feed was cut off for a period of (12) hours, while water was available in front of them, record the weight of the live animal before slaughtering, and after the completion of the slaughtering process, record the weight of: head weight, limbs weight, skin, spleen, testicles, liver, heart, lungs and bronchi, digestive system full, digestive system empty, kidneys, kidneys fat, fat Intestines, heart fat, rumen fat. The following measurements were also taken:

5-1: Cutting the carcass

After cooling, the carcass was divided into two equal halves, left and right, using an electric saw, where the left half of the carcass was cut into eight pieces according to what was stated by Forrest et al. (1975), four of them were major, namely the thigh, shoulder, ribs, and loin, and four were secondary, namely the neck, ulna, breast, and loin. Edible and non-edible parts such as skin, head, limbs, liver, heart, spleen, testes, and contents of the alimentary canal were also weighed.

6. Statistical analysis: The data was analyzed statistically by adopting a factorial experiment in a completely randomized design (CRD) in order to find out the effect of fat from poultry slaughterhouses waste and its effect on the weights and quantitative and qualitative characteristics of carcasses based on the following mathematical model:

Yij=μ+Ti+Eij

Where:

Yij= value observed (j) in the diet (i).

μ= the general average value of all observations.

Ti= effect of treatments, and this represents the effect of adding fat from poultry slaughterhouses

Eij= the value of the random trial error of the trial unit, which is distributed normally and independently with a general mean equal to zero and a variance equal to 2δ e.

The general linear model (GLM) was used within the statistical analysis system SAS (2018) in analyzing the data, and the Multiple Range Test Duncan (Duncan 1955) was used to determine the significant differences between the means of the studied characteristics at the probability level of 0.01.

RESULTS AND DISCUSSION

1- Growth trial

1-1 primary weight, final weight, daily and total weights, and food conversion efficiency: The results of the study and shown in schedule 3 showed that there are no significant differences between treatments in the primary weight of the Awassi lambs, in addition to adding of poultry slaughterhouse fat at 0, 2, 4 and 6 %, while it had a significant impact

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on the final weight of the lambs, as the treatment contained on the fat of the waste of poultry massacres is registered significant (p <0.01) the highest final weight of the lambs, whose average reached 39,598 kg for the treatment containing 6 % of the waste of poultry slaughterhouse fat and 38,416 kg for the treatment containing on 4 % poultry waste fat, while the treatment contained 2 % of the waste of poultry massacres, a high significant decrease (P <0.01), as a rate of 37,519 kg compared to the treatment free from the addition (control), which amounted to 36.704 kg, respectively, this is not consistent with the results of Carmichael and others (2012) from adding different proportions of the waste of poultry massacres 3 and 15% to the diets of male Saanen goats, as significant differences did not appear in the description of the final weight of the goats. The reason for this may be to prepare all treatments with fat or oil, that is, by diversifying energy sources in the diets, which led to an improvement in the activity of microorganism with rumen, which was positively reflected on the concentrations of volatile fatty acids and their hydrogenity with the rumen (2015).

The results of the same table (3) also showed the effect of adding to the poultry slaughterhouse fat by 0, 2, 4 and 6 % to the diets in the daily and total weight of the lambs of Al -Awasia and the efficiency of food conversion, it is noted that there are significant differences between treatments, as the treatments containing 6% outpaced the waste of poultry massacres, and in a high significant manner (p <0.01) in the daily and total weight increase, which reached 143 g and 17.160 kg, respectively, while the treatments containing 4 and 2% were recorded of the poultry slaughterhouse fat, a high significant decrease p <0.01)) in the weight and total increase, as their rates amounted to 134 g and 16.080 kg, 129 g and 15.480 kg respectively compared to the fat -free treatment (control) that was recorded, the slightest daily increase and a college for Al -Awasi pregnancy, with a rate of 122 g and 14,640 kg, respectively, these results were not similar to what happened to H.M.Saleh and others (2002) that there are no significant differences in the daily and total weight increases, he has the addition of fat poultry massacres waste by 0,14 and 17% to the diets of Kabash Al -Rahmani, while these results agreed with what the researcher Hutchison and others (2006) found the presence of significant differences in the daily and total weights he had an addition when adding the fat of the poultry massacres waste to 4 % of the Angus calves, these results are near to the extent to which Boucqud and others indicated (1990) that the weight increase did not change the level of lipids in the diet. Perhaps the contrast is due to the characteristic of improvement in the daily and total weight increase, due to the variation in the containment of the diet from the lipids, which reflects its content of fatty acids with the bid with eating and digesting them with rumen as a result of the high rate of consumption of different nutrients, especially in concentrated feed, which has a positive role in increasing the activity of different microscopic neighborhoods in the rumen and thus increasing the efficiency of the formation of microbial protein and providing the rest of the digestive system to the extent sufficiently from the animal and turning the surplus from the administration to the growth of the various physical tissues that cause the daily and total weight increase that will cause an increase in Live body weight (Al -Kaabi, 1987).

As for the characteristic of feed conversion efficiency, the results of the statistical analysis shown in Table 3 showed that the treatment free of additives led to a highly significant decrease (P<0.01) in the efficiency of feed conversion, which averaged 9.845 compared with treatments 2, 4 and 6% of poultry waste fat, the averages were 8.262, 8.699 and 8.185, respectively. These results were not similar to what happened in Ahmed et al. (2015) and Santra and Karim (2000), as the results showed that there were significant differences in favor of the treatment in which lipids were added at a rate of 2% in the characteristic of food conversion efficiency, and at the same time indicated (Mc Donald et al., 2002).

The addition of fats to the diet in high proportions affects the effectiveness of microorganisms in the rumen, and then reduces the coefficient of digestion of various nutrients, the reason for the difference in the results with other researchers may be due to the difference in the percentage or type of sinter added to the diet, or the difference in the type of animal and the different environmental conditions, in addition, the addition of lipids in moderate proportions to ruminant diets improves digestion coefficient and nutritional value, it may be due to the effect of the high energy of the lipids, which are transformed into pure energy with the presence of a source of nitrogen in the diet, which leads to reducing the negative effect of fat on rumen bacteria, which was reflected positively in increasing the process of absorption and metabolism of the various elements present in the diet (Guerrero, 2016) from the cells of the body, and thus leads to improving the efficiency of food conversion for lambs.

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Table 3. Effect of adding different percentages (0, 2, 4 and 6%) of poultry slaughterhouse fat on daily weight gain (g/day), total (kg/day) and feed conversion efficiency (average ± standard error)

Studied trial / Treatments	Primary weight kg	Final weight kg	Daily weight gain day/gm	Total weight gain in kg	Feed conversion efficiency
T1	22.021±0.30 A	36.704±0.18 C	122±0.76 C	14.640±0.09 C	9.845±0.67 A
T2	21.780±0.48 A	37.519±0.51 B	129±1.55 B	15.480±0.14 B	8.262±0.08 B
T3	22.242±0.27 A	38.416±0.57 A	134±0.50 B	16.080±0.30 B	8.699±0.15 B
T4	21.751±0.63 A	39.568±0.37 A	143±2.19 A	17.160±0.26 A	8.185±0.14 C
significant level	N.S	**	**	**	**

T1: control diet (free from additives), T2: diet with the addition of 2% fat from poultry slaughterhouses, T3: diet with the addition of 4% fat from poultry slaughterhouses, T4: diet with the addition of 6% fat from poultry slaughterhouses.

2- Slaughter trial

2-1 Carcass cuts

2-1-1 The main parts of the carcass

The proportions of carcasses were calculated on the basis of the weight of the cold carcass, the results of the statistical analysis shown in Table 4 indicate that there are significant differences between the main pieces of carcasses and for all treatments of fat from poultry slaughterhouses fat of 0, 2, 4 and 6% in this study, highly significant differences were found between poultry slaughterhouse fat treatments in the percentage of the main pieces of carcasses (shoulder, ribs, cotton and thigh) at the level ($p<0.01$), where the treatment containing 4% fat from poultry slaughterhouses recorded the highest percentage of shoulder weight 6.531%, the highest percentage of ribs weight 3.764%, and the highest percentage of thigh weight 13.412%, respectively, compared to the control treatment and the treatment containing 6% fat from poultry slaughterhouses, their rates in those percentages were 5.949, 6.006, 2.764, 2.828, 11.889, and 11.238%, respectively, while there were arithmetic differences that did not reach significant in relation to the percentage of weight of shoulder pieces, ribs and thigh in the treatment containing 2% fat from poultry slaughterhouses, as these percentages reached 6.227, 3.224 and 12.614%, respectively, in the same context, the treatments containing 2 and 6% recorded the highest percentage of cotton weight ($p<0.01$), reaching 3.749 and 3.605%, respectively, compared to the treatment containing 4% fat from poultry slaughterhouses, where the percentage of cotton weight was 2.583%, while there were arithmetic differences that did not reach significant in relation to the weight of the piece of cotton in the control treatment, as that percentage reached 3.274%, the results of this study differed from what the researcher Erico et al. (2016) concluded, when the addition of 3.13% of animal fats to the diets of local calves of the Nellore type did not lead to significant differences in the proportions of the main parts of the carcasses of Nellore calves, in the same context, Nelson and others (2008) confirmed that the addition of 6% of animal fats to the diets of local calves did not lead to significant differences in the proportions of the main parts of the carcasses of those calves.

We conclude from this that the proportions of the weights of the main pieces in the carcasses of lambs containing palm oil were of good weights, this may be attributed to the rapid growth of Awassi lambs that were fattened on diets containing palm oil, which had a positive effect on rumen microorganisms by maintaining the pH in improving carcass characteristics, in light of the increase in the meat content in increasing the efficiency of the food conversion process, which was represented by increasing the availability of nutrients in the light of increasing the efficiency of the metabolism of nutrients, which facilitates the process of absorption, this indicates a positive effect on improving digestion and absorption processes (Allen and Mert, 1988) and increasing the efficiency of utilization of the consumed diet.

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Table 4. The effect of adding different percentages (0, 2, 4 and 6%) of poultry slaughterhouse fat on the weight percentages of the main pieces (shoulder, ribs, cotton and thigh) of Awassi lamb carcasses (%) (average ± standard error).

Studied trial / Treatments	Cold carcass weight (kg)	Shoulder (%)	Ribs (%)	Cotton (%)	Thigh (%)
T1	17.549±0.15 B	5.949±0.55 B	2.764±0.59 B	3.274±0.90 AB	11.889±1.85 AB
T2	17.800±0.38 B	6.227±0.80 AB	3.224±0.47 AB	3.749±0.88 A	12.614±0.96 AB
T3	18.800±0.31 AB	6.531±0.37 A	3.764±1.31 A	2.583±0.58 B	13.412±0.79 A
T4	19.522±0.58 A	6.006±0.09 B	2.828±0.07 B	3.605±0.42 A	11.238±0.99 B
significant level	**	**	**	**	**

T1: control diet (free from additives), T2: diet with 2% fat from poultry slaughterhouses added, T3: diet with 4% fat from poultry slaughterhouses added, T4: diet with 6% fat from poultry slaughterhouses added.
** The different letters within the same column indicate that there are significant differences between the averages at a significant level (P < 0.01).

2-1-2 Secondary carcass cuts

The results of Table 5 indicate that the effect of adding different percentages (0, 2, 4 and 6%) of fat from poultry slaughterhouses to the diets of Awassi lambs in Awassi on the percentage of the weight of the four secondary pieces of Awassi lamb carcasses (neck, breast, ulna and loin), the fat-free treatment recorded in a highly significant manner (P<0.01) the highest percentage of neck weight (4.162%), compared to the treatment containing 6% fat from poultry slaughterhouses, which averaged 3.538% in that percentage, while there were arithmetic differences that did not reach significance in treatments containing 2 and 4% fat from poultry slaughterhouses in the percentage of neck weight of Awassi lamb carcasses, as their rates reached 3.884 and 3.759%, respectively, in the same regard, the treatment free of addition and the treatment containing 2% recorded a highly significant increase (P<0.01) in the percentage of breast weight of Awassi lamb carcasses among the treatments of fat leftover from poultry slaughterhouses, as their rates for this percentage reached 5.561 and 5.544%, respectively, compared to the treatment containing on 6% of the fat left over from poultry slaughterhouses, the rate of which was 4.856%, while there were no significant differences in the treatment containing 4% of fat from poultry slaughterhouses in the percentage of breast weight of Awassi lamb carcasses, as for the ulna, it had arithmetic differences that did not reach significant in all treatments containing fat from poultry slaughterhouses, from Table (5), we note that the loin piece recorded the highest percentage of it in the treatment containing 4% of the fat from poultry slaughterhouse waste, as the rate of that percentage was 2.260% compared to the treatment free of addition and with the treatments containing 2 and 6% fat from poultry slaughterhouse waste, their rates in that ratio were 1.396 and 1.643% among the proportions of the components of the by-products in the carcasses of Awassi lambs. The results of this current study differed from what the researcher Guerrero and others (2016) concluded, when adding 4% of animal fats to the diets of calves of Friesian cattle did not lead to significant differences in the proportions of the by-products of the carcasses of those calves.

We conclude from this that the percentages of the weights of the by-products in the lamb carcasses containing lipids (fats or oils) were of good weights, as the effectiveness of rumen microorganisms is affected when lipids are added, thus affecting the fermentation process inside the rumen, this harmful effect of fatty acids on rumen microbiota depends on the type of lipid added and the composition of the diet (Palmguist and Mattos, 2006), there are fixed chemical mechanisms that are responsible for controlling the intake of dry matter used in this study, which is considered as an energy source, which provides the diet with energy, essential fatty acids, and fat-soluble vitamins (Steele, 1985), which had a positive effect on improving carcass characteristics in light of the increase in meat content in the carcass, which came as a result of differences in the percentage of pesticides added to the concentrated

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feed, which led to an increase in the efficiency of the food conversion process, which was represented by an increase in the availability of nutrients in light of the increase in the efficiency of the metabolism of nutrients (Geay, 1976), thus, it increases the growth rate by increasing the growth of muscles and bones, and thus leads to an increase in the basic metabolic rate in the body (Sturkie, 1986).

Table 5. The effect of adding different percentages (0, 2, 4 and 6%) of poultry slaughterhouse fat on the weight percentages of the secondary pieces (neck, breast, ulna and loin) of Awassi lamb carcasses (%) (average ± standard error).

Studied trial / Treatmens	Cold carcass weight (kg)	Neck (%)	Breast (%)	Ulna (%)	Loin (%)
T1	17.549±0.15 B	4.162±0.60 A	5.561±0.09 A	3.566±2.33 A	1.374±2.27 B
T2	17.800±0.38 B	3.884±0.43 AB	5.544±0.07 A	3.357±2.21 A	1.396±1.28 B
T3	18.800±0.31 AB	3.759±0.24 AB	5.103±0.06 AB	3.566±2.65 A	2.260±1.94 A
T4	19.522±0.58 A	3.538±0.50 B	4.856±0.03 B	3.454±2.27 A	1.643±1.27 AB
significant level	**	**	**	N.S	**

T1: control diet (free from additives), T2: diet with the addition of 2% fat from poultry slaughterhouses, T3: diet with the addition of 4% fat from poultry slaughterhouses, T4: diet with the addition of 6% fat from poultry slaughterhouses. ** The different letters within one column indicate that there are significant differences between the averages at a significant level ($P < 0.01$) N.S means that there are no significant differences at the probability level ($P < 0.01$).

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