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REGULAR ARTICLE

EFFECT OF USING SECTOR OF FAT ON SOME CHEMICAL CARCASSE PARAMETERS

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ABSTRACT

This experiment was conducted in the Nawroz broiler's field in Asky-Kalak Mosul-Iraq. The effects of added dietary fat types and levels on broiler strain (Cobb500) of carcass performance were evaluated in three treatments. Treatment one (T1) supplied with 5% vegetable fat (VF) traditional fat used in most farms of Iraq (palm oil) treat by hydrogenation industry. Treatment two (T2) is mixing from 2.5% VF hydrogenation (palm oil) with 2.5% sunflower oil (SUN). Treatment three (T3) included 5% sunflower oil. Six repetitions were used from day one age to four marketing ages (42-45-48-51 days). The highest value for mosture in breast and thigh musle was in T3 (73.5%, 72.7%) respectivaly, high value for protein proportion in breast musle was in T2 (23.66%). Best value for thigh protein percentage was in T3 (22.89%). High value for fat proprotion in breast and thigh musles was in T1 (5.5%, 7.3%) respectivaly. Ash proprotion was high value in T2 for breast and thigh musles (1.3%, 1.2%) respectivaly, cholestrol was high value for both musles in T1

(59.1mg.100g^{-1} , 71.1mg.100g^{-1}). Treatments and marketing ages were highly differences significant (P<0.01).

Key words: broiler carcass**,** nutrition, vegetable fat, sunflower oil

INTRODUCTION

Over the past 20 years, many studies and clinical investigations have been carried out on the metabolism of polyunsaturated fatty acids (PUFA) in general and on n-3 fatty acids in particular. Today we know that n-3 fatty acids are essential for normal growth and development and may play an important role in the prevention and treatment of coronary artery disease, hypertension, diabetes, arthritis, and other inflammatory autoimmune disorders and cancer (**Simopoulos *et al.,* 1986; Simopoulos A. P., 1989; Simopoulos A. P., 1991; Galli *et al.,* 1994a,b; Salem *et al.,* 1996**). Research has been done with animal models, in tissue cultures, and on humans. The original observational studies have given way to controlled clinical trials. Great progress in our knowledge on the physiologic and molecular mechanisms of the various fatty acids in growth and development and in health and disease. Specifically, their beneficial effects have been shown in the prevention and management of coronary heart disease (**Burr *et al.,* 1989; de Lorgeril *et al.,* 1994, 1996, 1999),** Cases of high blood pressure (**hypertension) (Appel *et al.,* 1993, 1994; Morris *et al.,* 1993**), type 2 diabetes (**Connor *et al.,* 1993; Raheja *et al.,* 1993**), renal disease (**De Caterina *et al.,* 1993**; **Donadio, *et al.,* 1994**), rheumatoid arthritis (**Kremer, 1996**), ulcerative colitis (**Stenson *et al.,* 1992), Crohn's disease (Belluzzi *et al.,* 1996**), and chronic obstructive pulmonary disease (**Shahar *et al.,* 1994**). Poultry feeding is one of the most important aspects of poultry production. Therefore, for profitable poultry rearing, provision of economical and balanced feed is must. Among the constituents of poultry feed, fats supply a concentrated form of energy (2.25 times more energy than carbohydrates and proteins). However, their inclusion as true fat or oil in the rations is limited because of the high risk of rancidity of prolonged exposure to air, heat, sunlight and poor storage conditions (**Linfield *et al.,* 1985; Ali *et al.,* 2000**).

The goal of this study to find the effect of utilization sectors of fats in diet of broiler (Cobb500) on chemical of main carcass parts which reflect on human consumer's health.

MATERIAL AND METHODS

The experiment was realized at the Erbil city /Iraq in Nawroz broiler's field. The animals were 360 Broiler of strain type (Cobb-500) from one day age to four marketing ages (42, 45, 48 and 51) days in cages, in order to be able to control feed intake and weight gain. Each cage contained 20 birds and each experimental group in cooperated 6 cages (6 replicates), so that 120 birds were allotted to each treatment. The cages were 100 cm in length, 50 cm high and 55 cm deep. The group of birds fed the diet supplemented with vegetable fat was considered to be the control group, which was compared against the others.

The Feed Formulation and Feeding Periods

Three different types of diets (Table 1) which were similar according to crude protein (isonitrogenic) and at the same energy (isocaloric) were supplied, also balanced for vitamins and minerals. The feed stuff was prepared in the local feed factory.

Table 1 Nutrient Composition of the Experiments

Treatments Ingredients %	Starter (1-28 days age)			Finisher (29-42 days age)		
	T1	T2	T3	T1	T2	T3
Wheat	52.43	52.43	52.43	64.82	64.82	64.82
Soya bean meal	38.60	38.60	38.60	25.46	25.46	25.46
Palm oil hydrogenise	5	2.5	------	5	2.5	-------
Sunflower oil	-------	2.5	5	-------	2.5	5
Ground lime stone	0.80	0.80	0.80	0.910	0.910	0.910
DiCali-pho	0.40	0.40	0.40	0.33	0.33	0.33
Sodium bicarbonate	0.17	0.17	0.17	0.17	0.17	0.17
Lysine	0.013	0.013	0.013	0.013	0.013	0.013
Methionine	0.005	0.005	0.005	0.005	0.005	0.005
Methionine+Cystine	0.009	0.009	0.009	0.009	0.009	0.009
Premix* 2.5%	1	1	1	1	1	1
Analysed composition (g.kg)**						
Crud protein (C.P)	230.0	230.0	230.0	190.01	190.01	190.01
Fiber	30.18	30.18	30.18	28.19	28.19	28.19
Crud fat	40.23	40.23	40.23	30.70	30.70	30.70
Ca	10	10	10	10	10	10
P	4.5	4.5	4.5	4.2	4.2	4.2
Linolicacid	30.26	30.26	30.26	30.23	30.23	30.23
MEN (MJ.kg)	12.31	12.34	12.34	12.76	12.76	12.74

*active substances per kilogram of premixVitamin and Mineral Premix at 2.50% of the diet supplies the following per kg of the diet : Vit A 1000 IU ;Vit D3 3000 IU;Vit E 20 mg; VitK3 3mg ;Vit B12 mg ;Vit B2 6mg;Vit B 65mg ; Vit B 12 20 mg ; Niacin 66 mg ; Pantothenic acid 10 mg ;Folic acid 1 mg ;Biotin 0.5mg ; Cholin Chlorid ,500mg ; Mn ,100mg;Cu,8 mg ; Fe,100 Zn, 75 mg ;Co,10 mg and Se ,10mg .**According to NRC, 1994.

Estimation of Iodine Number and Rancidity

For the purpose ascertaining the content of fat and oil users in the experiment, two types of fatty acids saturated and unsaturated consider adjectives on ioden numbers and rancdity together **(Plummer, 1971).**

Biochemical Parameters for Meat

The chemical analysis of meat samples taken from the breast and thigh parts at four ages and by different marketing models for each sample of each treatment in every ages, The marketing unit that includes all the analysis used, was as following steps:-

Estimation of Moisture and Ash

Dry matter (DM) by the thermal method (105^{o}C) acc. To **AL-Aswade (2000**) method. Total Ash was determined by application of **ISO 5984 (2002)** standard method

Crud Protein

We used scientific method **AOAC, 1990** for estimation of with the macro-Kjeldahl method according to application of **AL-Aswade (2000)** to find the quarterly ratios of total nitrogen in samples of meat.

Estimation of Crud Fat

Crude fat (CF) by the Soxhlet method. To **AL-Aswade (2000)** method, then transferred quantitatively "to the test tubes and Jugs of 25 ml capacity for easy transfer to a laboratory examination of cholesterol. Enzymatic colorimetric method using for estimation of total

cholesterol was achieved by using gas Liquid Chromatography (GLC) method (SYRBO) Company for determination cholesterol, spectrophotometer device on 500nm (nm= nanometer(s) (1 nm = 10^{-9} m).

Statistical Analysis:

Data were analyzed with the help of General Linear Model procedure (GLM) of in **SAS-1996** software. The following model was used.

Y ij=μ+Ti+eij, Where

μ = overall means.

T =effect of treatment.

E i = Random error.

Data were analyzed on three stages:

1- between experimental diets (3 treatments).

2- between fat levels (3 treatments).

3-between interaction fat level and four ages (3 treatments).

RESULTS AND DISCUSSION

Chemical Composition for the main Carcass parts (Breast and Thigh)

The quality of the meat generally measured by their chemical composition in terms of containment of the moisture, protein, fat and mineral elements (**AL-Aswad, 2000**). Which this adds to the poultry meat is a concession in palatability and ease of digestion. In order to identify these qualities we have studied the chemical composition of breast and thigh for being the main parts in the sacrifice of chickens and more willingness by the consumer.

Breast Moisture

The results of laboratory analysis and statistical as shown in table 2. The presence of highly significant differences ($P<0.01$) between T1 compared to T3 and T2 there were insignificant differences between both. Probably this attribute due to the increase of the proportion of saturated fat in T1 versus T2 and T3. On other hand there were an inverse relationship between the proportion of fat and moisture, protein which depending on the type

of fat used in the fodder. (**Naji and Al-Fayade,1989**), foundes there were highly significant differences (P<0.01) for the periods of marketing age (42, 45 and 51days) while we did not find these differences in periods 45, 48 days and 48, 51days. It must be mentioned that at age of 51 days inT3 had a superior moisture level marks amount 72.77%, while T1 70.1% and T2 72.2 %. This makes the increase in the tendrness proportion that make the recipe palatability high for the T3 and less so for the T2 and the least for the T1.

Breast Protein

Table 2 illustrat compatible with the relationship between fat and moisture, protein, where there were differences significant (P <0.01) between the T3 and T1. The most saturated fats did not appear btween T2 and T3, with regard to the periods of the ages of marketing there were insignificant differences (P>0.01). It should be noted that the highest protein percentage in T2 was 24.2% at the 45 days age and for the same period for T3 was 23.6%, while T1 at 42 days age amounted to 22.8%.

Breast Fat

Consideration to the different nature of the chemical composition of fat sources used in the diets of three birds, treatments reflected were present the chemical composition of the bird's bodies. Table (2) shows the results of laboratory and statistical analysis existence of significants diffrences (P <0.01) three times the percentage of the fat between the third treatment and each of he first and second treatments , comparing the percentage of fat in the pectoral muscle for the sacrifices of different ages, where the steady increase in old age as well as differences significant between all periods marketing ages were present.

These results agree with the results (**Popescue and Criste, 2003**) and **Mossab *et al.* (2000**). They found a gradual increase in this ratio with marketing age, and this was interpreted as a bone halt growth and the resulting increase of weight is due to the accumulation of fat between the muscles and internal organs and dependent on the fat‘s type which was used in the fodder . **Manilla *et al.*** (**1999**) explained that there are positive correlations between chemical composition of each fat‘s or oil’s forage with carcasses fats content.

Breast Ash

Ash is an indicator containing the fabric deducted from the muscular site of mineral elements. Table2 indicates a high difference significant (P<0.01) for the first treatment versus third and second treatments also, between periods of ages (42, 51 days) . We did not find differences significant with (45, 48 and 51 days) , however we found them between (42, 45, and 48 days). This is due to the different composition of muscle in terms of protein and fat.

Breast Cholesterol Content

From numerous derived studies that the recipe for the chicken being one of white meat with low cholesterol compared to the red meat, studies have pointed to that in general they were 60 mg.100g^{-1} percentag. (**Naji and Al- Fayade, 1989**). According to the installation fat diets used in the study that reflected the proportion of fat in the meat which in turn is reflected on the amount of cholesterol in the site is taken from. Results which highlight the existence of significant diffrences (P<0.01) between the first treatment, due to the fact that high proportions of saturated fat were obsorved while the third treatment unsaturated fats.We did not find these differences between first and second treatments because both contained saturated fats. Table2 illustrated the existence diffrences in diffrente periods. These results were in agreement with which obtained by (**Osman *et al.*, 1999**). The existence of significant differences at the level (P<0.01) in the rate of cholesterol in the types of fats and oils which including sunflower oil and results of (**Horbanczuk *et al.*, 1999**) correrspond to proportion of cholesterol in the pectoral muscle in poultry amount 49 mg.100g^{-1} of diets with unsaturated fats, this ratio increased in birds fed on saturated fats to 70-65 mg.100g^{-1} of pectoral muscle.

Table 2 Means±S.E for effecting treatments and marketing ages with interaction between percent some breast chemical parameters.

Treatments	Attributes				
	% Moisture	%Protein	%Fat	Ash	Cholestrol mg.100g^{-1}
T1 5% V.F	71.73 ± 0.27b	21.67 ± 0.25b	5.46 ± 0.47a	1.12 ± 0.01b	59.13 ± 1.32b
T2 2.5%V.F +2.5%S.F.O	73.24 ± 0.26a	23.66 ± 0.22a	1.79 ± 0.18b	1.26 ± 0.02a	58.82 ±0.78b
T3 5% S.F.O	73.50 ± 0.30a	23.335 ± 0.20a	1.91 ± 0.19b	1.25 ± 0.02a	38.04 ± 0.87a
LSD for Treatment	0.740	0.770	0.680	0.060	1.660
Age 1(42 Days)	74.11 ± 0.28a	22.10 ± 0.22	1.63 ± 0.24a	1.26 ±0.02	45.13 ± 2.39

Age 2(45 Days)	73.15± 0.23b	23.15 ± 0.32	2.50 ± 0.43b	1.18 ±0.02b	49.94 ± 2.31
Age 3(48 Days)	72.38±0.29bc	22.86 ± 0.30	3.55 ± 0.47c	1.19 ± 0.02	53.33 ± 2.57
Age 4(51 Days)	71.65 ± 0.35c	22.55 ± 0.45	4.55 ± 0.68d	1.21 ±0.02ab	57.28 ± 2.63d
for Marketing ages LSD	0.850	0.890	0.780	0.070	1.920
Collection to characterize the effecting factors					
T1*AGE 1	73.07±0.246	22.80 ± 0.24	2.97 ±0.24	1.14 ± 0.02	52.20 ± 1.06
T1*AGE 2	72.51±0.234	21.62 ±0.27	4.76 ± 0.47	1.10 ± 0.01	55.50 ± 1.15
T1*AGE3	71.24±0.302	21.80 ± 0.58	5.83 ± 0.69	1.12 ± 0.03	60.83 ± 1.70
T1*AGE 4	70.11±0.320	20.44 ± 0.31	8.28 ± 0.63	1.14 ± 0.01	66.83 ± 1.62
T2*AGE1	74.43±0.391	23.13 ± 0.38	1.08 ± 0.01	1.34 ± 0.20	53.75 ± 1.22
T2AGE2	73.42±0.389	24.22 ± 0.39	1.12 ± 0.03	1.22 ± 0.04	57.33 ± 1.23
T2AGE3	72.95±0.251	23.40 ± 0.37	2.38 ± 0.29	1.22 ± 0.04	60.17 ± 0.79
T2AGE4	72.17±0.452	23.96 ± 0.57	2.61 ±0.29	1.24 ± 0.02	62.33 ± 0.67
T3*AGE1	74.82±0.520	23.05 ± 0.52	0.83 ± 0.06	1.29 ±0.02	33.50 ± 0.92
T3AGE2	73.53± .441	23.61 ± 0.23	1.62 ±0.28	1.23 ± 0.04	37.00 ± 0.97
T3AGE3	72.95±0.533	23.38 ± 0.33	2.43 ± 0.31	1.23 ± 0.04	39.00 ± 1.44
T3AGE4	72.67±0.466	23.30 ± 0.52	2.76 ± 0.25	1.25 ± 0.05	42.67 ± 1.17
LSD*	1.480	23.296	1.350	0.120	3.320

Values within the columns with different superscripts differ significantly (P<0.01)

*L.S.D. Test/used for comparative between treatments means under probability (P<0.01).

Thigh Moisture

Table 3 shows there were a significant diffrences (P<0.01) among all treatments for the thigh moisture percentage also there are diffrences significant (P<0.01) between periods (age 42 days) and 45,48,51days. At the same time we did not find these differences between each periods alone (45, 48 days - 48, 51days). This attributed for the relationship between percentages of fat versus moisture and protein (**AL- Aswade , 2000**).

Thigh Protein

The results of chemical and statistical analysis (Table 3) observed the existence of highly significant differences among the three treatments and there is a propotional advantage for sacrifices of the third treatment versus first and second treatments, while we did not observe any significant differences between the age periods for the protein proportion. The best period was 42 days of age for the first treatment when the rate of protein 21.0% It is also the best period of treatment two, where the percentage of protein 23.2 % and the best period of the third treatment was 45 days where the percentage of protein was 23.2 %. This is due to the difference in the proportion of fat.

Thigh Fat

Table 3 indicates that there are signifcant differences (P <0.01) between the treatments and compatible with the humidity. We found differences for age periods, this logical consequence points to significant where differences (P <0.01) among periods (42, 45 and 51days). We did not find differences niether between (45, 48 days) nor (48, 51 days).

Thigh Ash

The results showed clearly that there were significant differences (P <0.01) between T2 and T1. Table3 points to the age periods (42, 45 days) individual on one hand and (48, 51days) on other hand.They are attributed natural to their composition of proporation of protein and fat in meat.

Thigh Cholesterol Content

As a result of the marked composition of fat proportion in thigh muscle this is generaly reflected to the cholesterol proportion with different qualities of the diets. It has been observed from the results that is significant diffrences (P<0.01) among treatments as well as between all ages periods. Table 3 is in agreement with age for increasing deposition of fat accumulation for the thigh did occur. This is will reflected on the content of cholesterol which minimum in 51 days for the first treatment amount (79.2 $mg.100g^{-1}$) compared with

third treatment (46.7 $mg.100g^{-1}$) and the second treatment (70.50 $mg.100g^{-1}$). These results are agree with **Horbanczuk et al., 1999** while their examination of cholesterol in the thigh muscle reported that reach to 65 mg $.100g^{-1}$ percentage of the cholestero when fed with content oils diets versus fed on diets which contained saturated fats. The cholesterol amount was 80 $mg.100g^{-1}$. These results do not agree with results of **Ahn (2004)**. This is may be due to sex selection of birds used and the strain and the nature of breeding.

Table 3 Means±S.E for effecting treatments and marketing ages with interaction between percent some thigh chemical parameters

Treatments	Attributes				
	% Moisture	%Protein	%Fat	Ash	Cholestrol mg.100g^{-1}
T1 5% V.F	69.79±0.26c	20.36±0.15c	7.27± 0.28a	1.15± 0.01b	71.00±1.36c
T22.5%V.F+2.5%S.F.O	71.78± 0.26b	22.03±0.21b	4.87±0.31c	1.21 ± 0.02a	65.00±1.17b
T3 5% S.F.O	72.74± 0.26a	22.89±0.30a	3.00± 0.19b	1.19±0.02ab	42.46±0.86a
LSD for Treatment	0.750	0.830	0.650	0.050	2.070
Age 1(42 Days)	72.55± 0.36a	22.28 ± 0.33	3.67± 0.46a	1.13 ± 0.02a	53.94±2.67a
Age 2(45 Days)	71.67± 0.34b	21.75 ± 0.38	4.87± 0.47b	1.13 ± 0.02a	57.39±3.02b
Age 3(48 Days)	71.10±0.36bc	21.52 ± 0.36	5.56±0.48bc	1.19± 0.02b	61.17±3.21c
Age 4(51 Days)	70.43 ± 0.42c	21.50 ± 0.37	6.80 ± 0.49	1.28 ± 0.02	65.44±3.45d
LSD Marketing ages	0.870	0.960	0.750	0.060	2.390
Collection to characterize the effecting factors					
T1*AGE 1	70.97 ± 0.44	20.96 ± 0.26	5.95 ± 0.58	1.10 ± 0.02	63.67 ±1.26
T1*AGE 2	70.31 ± 0.36	20.16 ± 0.27	6.85 ± 0.50	1.10 ±0.02	68.33 ± 1.23
T1*AGE3	69.41 ± 0.28	20.19 ± 0.25	7.83 ± 0.24	1.15 ± 0.01	72.83 ± 1.25
T1*AGE 4	68.48 ±.0.36	20.14 ± 0.36	8.45 ± 0.24	1.24 ± 0.01	79.17 ± 1.83
T2*AGE1	73.02±0.33	23.24±0.22	2.59 ± 0.36	1.13 ± 0.03	59.17 ± 1.01
T2AGE2	71.87 ± 0.37	21.86 ± 0.25	5.06 ± 0.23	1.15 ± 0.03	63.17 ± 1.80
T2AGE3	71.43 ± 0.37	21.46 ± 0.39	5.73 ± 0.20	1.23 ± 0.05	67.17 ± 1.87
T2AGE4	70.79 ± 0.45	21.55 ± 0.41	6.90 ± 0.18	1.33 ± 0.04	70.50 ± 1.77
T3*AGE1	73.67± 0.44	22.63 ± 0.68	2.47 ± 0.39	1.16 ± 0.02	39.00 ± 0.89
T3AGE2	72.83 ± 0.49	23.23 ± 0.62	2.70 ± 0.41	1.14± 0.03	40.67 ± 1.20
T3AGE3	72.45 ± 0.43	22.90 ± 0.61	3.14 ± 0.24	1.20 ± 0.03	43.50 ± 1.69
T3AGE4	72.01 ± 0.44	22.81 ± 0.62	3.70 ± 0.35	1.28 ± 0.03	46.67 ± 1.28
LSD*	1.510	1.670	1.310	0.110	4.130

Values within the columns with different superscripts differ significantly (P<0.01)

*L.S.D.Test/used for comparative between treatments means under probability (P<0.01)

CONCLUSIONS

From present results we conclude that. There were oposite relationship between proprotion of fat versus moisture and protein in each main parts musles. Treatment which include of saturated fat had more percentage of fat and cholestrol which this reflect on human health. Treatment which include unsaturated fat had mor percentage of moisture and protein which reflect on their flavorite for example tendernes and abilaty for digestive human system. Even treatment had more of protein reflect on their Ash content which mean more of mineral content, that can be benifite by human as a coenzyme.

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