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REGULAR ARTICLE

EFFECT OF USING DIFFERENT LIPIDS TYPE ON SECOUNDARY AND EDIBLESCARCASSES PARTS OF BROILER (COOB-500)

Hasan Abdullah Mohammed[1], Dara Omer Miran[2], Sardar Yasine A.L. Sardary[3]*

Address * : M.Sc. Hasan Mohammed, [1]Slovak University of Agriculture, Faculty of Agrobiology and Food Resources, Department of Animal Nutrition, Trieda Andreja Hlinku 1200/38 Nitra, Slovak republic, email (mohammedhassan335@gmail.com) Tel.+421944337624.

[2]Medical University Erbil, Physiological Department. Shoresh Street 100, Erbil, Iraq.

[3]College of Agriculture - Salah Al-Deen University, Department of Animal Resources, Adala Street 60, Erbil, Iraq.

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 secondary and edibles carcasses parts 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 and 51 days). There were significant differences ($P<0.05$) among all treatments at all periods marketing ages for carcass weight. The high values were in T2 (1721g, 2140g, 2487g and 2763g) at 42, 45, 48 and 51 days respectively.Insignificant differences ($P>0.05$) for neck weight at 42 days and 48days ages observed for wing weight, at 45 days and 51 days there were significance ($P<0.05$) High value found in T2 (175.5g and 248.3g) at 45 days and 51 days respectively. Back weight, liver weight, pad fat weight, total digestive system weight, intestine weight, bile salt weight and heart weight were insignificant differences at 42 days age. High values for back weight at 45day was in C (376.2g) and at 48days,51 days were in T2 (407.2g, 440.4g) respectively. Liver was just significance (P<0.05) at 48 days and high value was in T2 (58.9g). Pad fat weight were significant (P<0.05) at 45 days and 51 days and high values were (41.03g, 71.6g) for T2 and T1 respectively. Head weight just at 42 days significant (P<0.05)and higher value was in T1 (45.7g). Total digestive system values was at C group at 45 days (229.5g) and at 48, 51days were in T2(339.1g, 286.0g) respectively. Feather and blood were significant (P<0.05) at 42, 45 days higher values were in T1 (389.9g, 575.8g) respectively, but at 48, 51 days were highest values in T2 (541.2g, 488.3g) respectively. High value for intestine was in 45days at C (147.8g), and higher value at 48, 51 days were in T2 (175.5g, 183.6g) respectively. Bile salt insignificant (P<0.05) at 48, 51 days and higher value were (3.07g 3.45g) respectively, gizzared and heart were high value in T2.

Keywords: broiler carcass, secondary and edible carcass parts, different marketing ages

INTRODUCTION

It is widely accepted that dietary manipulation, especially dietary lipid modifications, can alter lipid composition of different tissues of animals (**Mourot and Hermier, 2001)**. The chicken has been considered an appropriate model in lipid nutrition studies, since it is quite sensitive to dietary modifications and many of the studies done with chickens deal with the degree of saturation of the dietary added fat and how does it influence the fatty acid profile of the animal **(Rymerand Givens, 2005)**. It has been also observed that the consumption by chickens of diets with different fatty acid composition not only changes the degree of saturation but also modifies the amount of fat deposited in chicken tissues. In particular, the intake of polyunsaturated fatty acids (PUFA) compared to the intake of saturated fatty acids (SFA) causes a lower fat deposition in the animal **(Villaverde *et al.,* 2005)**.

Unsaturatedfatty acids are particularly susceptible to oxidativeprocesses which involve the generation of fatty acidfree radicals, which may then react with moleculamoxygen to produce peroxide free radicals and lipidper oxidation (**Sherwin, 1978**) and undesirable products with offensive odour and toxic properties (**Cheeke, 1991**). During oxidative process secondary products including ketones, malonaldehyde and acids areproduced (**Lin *et al.*, 1989a**).

The nutritive value of suchrancid fats or feeds results in nutritional and economiclosses (**Cheeke, 1991**). Dietary fat quality not only affects animal growth performance and health (**Lin *et al*., 1989b; Engberg *et al*., 1996**) but also influences the quality of broiler meat and meat products (**Lin *et al*., 1989b; Asghar *et al*., 1989**). Moreover, the influence ofoxidized fat on animal performance depends on thedegree of oxidation. **Lewis and Wiseman (1977**)reported a significant fall in digestibility while the freefatty acid reached 50%. **Hussein and Kratzer (1982)** reported that rancidity had no effect on the energy content. **Godber *et al*. (1993)** showed that rancidity deteriorated the palatability and feed intake. Chicks showed poor growth performance when dietary ricebran was rancid.

Chicken's meat is a great consumption factor in our society, not only the amount but also the quality of its body fat is of great importance for the producers and the consumers. For this reason, the industry currently tries to produce chickens with a lower accumulated abdominal fat, and the ability of the animals to modify and to deposit the fatty acids that are received through the diet is being studied (**Popescu, 2003**).

The objective of this study was to determine the influence of the consumption of diets with different fatty acids profile from vegetable oils (varying in their degree of saturation and chain length) on secondary and edibles carcasses parts.

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 (42-45-48-51) 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

	Starter (1-28 days age)			Finisher (29-42 days age)		
Treatments	T1	T2	T3	T1	T2	T3
Ingredients %						
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
VF hydrogenation (palm oil)	5	2.5	-----	5	2.5	-------
Sunflower oil	------	2.5	5	------	2.5	5
Ground lime stone	0.80	0.80	0.80	0.91	0.91	0.91
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.g)**						
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
ME_n (MJ.g)	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 g of the diet : Vit A 1000 IU ;Vit D3 3000 IU;Vit E 20 mg; VitK3 3mg ;Vit B12 mg ;Vit B2 6 mg;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 as certaining 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)**.

Slaughter outputs

The heart, liver and bilesalt were immediately removed from hot carcasses and weighting for each slaughter periods, and the abdominal padfat (from the proventriculus surrounding the gizzard down to the cloaca) was removed and weighed (**Cahaner and Nitsa 1985).** At the end of the experimental period (42, 45, 48 and 51 days old), one chicken from each replicate of treatments group (similar body weight) was slaughtered to determine the relative weight of the following parts. A. The hot carcass weight. B. wings C. Necks. D. Backs. E.Heads. F. Total digestive system. G.Blood and feather were calculated by subtracted from all other parts.

Statistical analyses

For the statistical design and data analyses, complete random design an experiment with 3 treatments was determined. Data in all experiments were subjected to ANOVA procedures appropriate for a completely randomized design and the significance of differences between the means estimated using Duncan test (Duncan's new multiple range test). Probability level of $P<0.05$ was considered for Significance in all comparisons. Values in percentage were subjected to transformation of Arc sin v100. All statistical analyses were performed using the software SPSS 11.5 for Windows® (**SPSS Inc., Chicago, IL**).

RESULTS AND DISCUSSION

Effect of diets on hot or fresh carcass

The composition of the broiler carcass is now receiving considerable attention with the poultry industry's major trust in further processing. Today the trend is towards specialized carcass types and composition to meet specific demands for cut-up, deboning, and subsequent new product manufacture. **Leeson and summers (1997),** reportedthat the carcass composition can, to a large extent, be modified through diet choice. Obtained data on slaughter outputs are presented in tables 2 and 3. Hot or fresh carcass weight values of trial groups are present in table 2 observed there were significant differences ($P<0.05$) among all treatment at marketing ages 42 and 45 days for carcass weight higher value was in T2 (1721g and 2140g) respectively, followed by C and T1. At ages 48 and 51 days also significant differences ($P<0.05$), the best value for carcass weight fix in T2 (2487g and 2763g)respectively,this is due to of the type of fat which used in this group is unsaturated fat (USF) as a 5% of sunflower oil (SUN). This type of fat can be absorption easer in digestive system because content double bond in their chemical structure of fatty acids.Values obtained in this research for average carcass are in accordance with results of some trial groups of **Moharerry (2005)** in which they used different level of soya bean oil mixing with tallow. This result agree with the results reported by **Kermanshahi *et al.* (2005)**, when they fed diets supplemented with commercial feed additives depending on a blend essential oils source, for 42 days old. Same results were found in the experiment performed by **Zhang *et al.* (2005)**. In which used sunflower oil in broiler diets they mentioned that at advantage age after grower period till end of trial at 42 days the growth of digestive system will better and more increase of secretion of lipase enzyme.

Table 2 Means± SD between treatments of carcass weight with secondary and edible parts at ages 42 and 45 days

Treatments		C		T1		T2	
Attributes \ Age	Unite	42 days	45 days	42 days	45 days	42 days	45 days
Carcass weight	g	1712±8.47[b]	2001±1.51[ab]	1477±1.12[a]	1763±3.04[a]	1721±1.35[b]	2140±1.97[b]
Wing weight		186.6±1.64	240.2±6.20[b]	185.3±1.81	186.8±1.96[a]	193.2±1.92	223.1±3.25[ab]
Neck weight		162.4±1.97	156.2±3.025[ab]	148.6±1.72	127.3±3.07[a]	146.7±8.03	175.5±7.08[b]
Back weight		291.9±2.98	376.2±3.79[b]	262.4±2.62	290.1±4.30[a]	295.5±4.24	329.7±2.18[a]
Liver weight		47.2±1.03	46.6±0.002	44.4±4.34	41.15±5.44	41.5±1.12	44.8±3.45
Pad fat weight		34.9±6.36	36.90±5.89[a]	34.07±12.05	30.38±9.98[a]	32.25±5.30	41.03±4.89[b]
Head weight		41.0±4.7[b]	46.68±4.90	45.7±1.78[b]	45.1±2.41	36.9±2.95[a]	44.4±3.38
Total digestive system weight		204.3±11.67	229.5±10.23[b]	201.4±11.46	201.7±5.73[a]	209.5±18.93	207.7±14.40 [a]
Blood and feather weight		299.2±7.57[ab]	436.7±5.05[a]	389.9±8.65[b]	575.8±7.45[b]	292.6±5.90[a]	452.7±1.60[ab]
Intestine weight		123.8±5.27	147.8±12.41[b]	120.6±6.75	124.7±10.07[a]	126.0±4.18	122.8±12.93[a]
Bile salt weight		1.90±0.587	2.43±0.388	1.82±0.75	2.62±0.34	1.83±0.56	2.53±0.36
Gizzard weight		31.97±4.27[a]	33.53±4.93	34.52±4.86[ab]	33.22±2.78	40.26±7.25[b]	37.50±4.51
Heart weight		16.70±3.86	13.40±0.41[a]	12.90±3.18	12.82±2.21[a]	16.73±2.24	19.08±3.67[b]

[a,b] means with different superscript within row are significantly different (P< 0.05) and values will increase from a to c value .Values are $\overline{x}$ ± Std. Deviation of 120 birds

Effect of diets on the back,wings and neck weight

The back and wings weight values of trial groups are present in tables 2 at ages 42 and 45 days In regard the data on the back weight of thechicken at 42 days was an insignificant differences (P>0.05), but significant differences (P<0.05) were registered at 45 day old, values were not differ so much except between C, T2 and T1. At 48 and 51 days old treatments natural result has higher values in back weight at T2 (407.2g,440.4g) respectively than in both T1 and C. This is could be attributed to the influence of these additives on the bone creation by affecting hormones responsible on the mineral or type of vitamin soluble in type of fat metabolism and reflect of carcass weight at these periods.

In regard the data on wings percentage, there were a slight insignificant (P>0.05) differences observed between groups at 42 days old. During the overall rearing remain periods values of wings weights in trial groups there were significant differences (P<0.05) tended to be lower than group T2 expect at 45 days the high value was for C group (240.2g), even the differences were statistically insignificant (P>0.05) with T1 and T2groups. Wings weight of birds consumed diets containing mixing SUN and VFequal showed slightly decrease compared to the T2 and C groups. While **Mala *et al.* (2004)** found that wing percentage (on the base of dressed carcass), in groups consumed diets contain a group of essential oils, was higher than the control insignificantly (P>0.01). This finding agrees with **Popescu and Criste (2003)**.Table 2 and 3 observed that there were insignificant differences (P>0.05) at 42 and 48 days ages for neck weight but there were significant differences at 45 and 51 days period. The high values were at 45 and 51 days in T2 (175.5g and 248.3g) this is due to reflect of carcass weight and accumulation of fat with advantage age.

Effect of diets on liver weight

The liver is closely associated with digestive tract, as the organ responsible for metabolism and synthesis from absorbed nutrients (**Shane, 2006**). Liver weight values of trial groups are present in table 2 and 3. Weight of liver was higher in groups consumed diets containing SUN in T2 at 48 days ages was (58.9g) and different significant (P<0.05).In allremain periods there were insignificant differences (P>0.05) among all groups a low value was (41.15g, 51.1g) in T1 groups at 45 and 51 days respectively. **Saleh *et al.* (2003)** explain this state due to that tri-charboxied cycle in liver for SFA make more of ATP this lead to increase of fat deposes in liver.

Table 3 Means± SD between treatments of carcass weight with secondary and edible parts atages 48 and 51 days

Age / Attributes	Unite	48 days	51 days	48 days	51 days	48 days	51 days
Carcass weight	g	2088±1.33[a]	2185±0.97[a]	2002±1.57[a]	2179±1.71[a]	2487±2.66[b]	2763±4.03[b]
Wing weight		207.7±1.56[a]	212.9±1.92[a]	231.5±1.71[ab]	224.4±3.11[a]	297.3±1.07[b]	262.1±2.49[b]
Neck weight		165.3±2.20	170.7±1.34[a]	168.5±1.57	149.1±1.74[a]	168.5±1.32	248.3±6.30[b]
Back weight		343.4±3.71[a]	358.6±1.81[a]	290.2±4.30[a]	359.7±2.50[a]	407.2±2.42[b]	440.4±7.41[b]
Liver weight		51.6±2.56[a]	57.8±2.74	51.1±4.48[a]	57.2±8.39	58.9±6.85[b]	55.9±2.95
Pad fat weight		59.6±12.21	54.4±9.38[ab]	59.6±8.42	71.6±9.41[b]	60.3±8.91	51.0±11.25[a]
Head weight		47.8±3.39	55.9±3.89	49.9±8.48	55.8±9.28	49.1±2.67	62.7±4.53
Total digestive system weight		246.0±1.83[a]	282.5±4.65[b]	254.1±2.06[a]	239.6±3.18[a]	339.1±9.29[b]	286.0±3.17[b]
Blood and feather weight		501.0±1.10[a]	537±8.97[b]	464.7±1.11[a]	482.2±2.15[a]	541.2±1.72[b]	488.3±1.87[c]
Intestine weight		158.6±1.42[a]	176.4±4.05[b]	163.4±1.42[ab]	141.0±1.96[a]	175.5±4.39[b]	183.6±0.98[b]
Bile salt weight		2.32±0.32[a]	3.03±0.12[b]	2.15±0.29[a]	1.95±0.27[a]	3.07±0.33[b]	3.45±0.26[b]
Gizzard weight		33.42±6.20[a]	45.32±5.33	37.47±5.14[ab]	39.50±8.187	41.37±5.55[b]	43.02±5.30
Heart weight		16.92±1.45[a]	16.92±1.45[a]	14.25±3.00[a]	14.25±3.01[a]	21.25±4.58[b]	21.25±4.58[b]

[a,b] means with different superscript within row are significantly different (P< 0.05) and values will increase from a to c value .Values are $\overline{x}$ ± Std. Deviation of 120 birds

Effect of diets on abdominal fat percentage

Body fat deposition depends on the net balance among absorbed fat, endogenous fat synthesis and fat catabolism. Abdominal fat percentage values of trial groups are present in table 3. An insignificant (P>0.05) differences were found among males groups for abdominal fat. Lowest values found in groupT3 contained mixing different type of fat with different proportion as showed in material and methods. This means that the fat metabolism was shifted by the photochemical included in the beta metabolism of fat cycle **(Al-Dalaly, 1993),** to be more available for the energy supply than precipitating in the abdomen. And sex male has no effect on fat accumulation in the abdomen. These results agree with result of **Collins *et al.* (1999)** and **Sanz et al. (1999)**,while they used mixing of USFA with SFA, they found significant differences (P<0.05) on abdominal fat. Results obtained in present study are in agreement to those obtained by Vila and EsteveGarcia,(1996) who found that abdominal fat deposition increased with increasing fat inclusionlevel in birds fed tallow, whereas it remained constant in birds fed sunflower. **Sanz *et al.* (1999)** suggest that dietary fatty acid profile could affect abdominal fat deposition. **Crespo and Esteve, (2001)** reported that in male's abdominal fat increased withincreased fat concentration. Similar results obtained by Deaton et al, 1981, but these results is incontrast with the results of **Fuller and Rendon, (1977)** and **Sizemore and Siegel, (1993)** who didnot find any effect of dietary fat concentration when the energy to protein ratio remained constant. **Badawy (1997)** found that supplementing of quail growing ratio with either sunflower or palm athigh (10%) or low (5%) slightly reduce abdominal fat.

Effect of diets on head weight

Head and sometimes foots of the chicks are utilized by the poor people in some countries such as in South African countries; they have some traditional food and cook these things as they have low income.Data from tables 2 and 3 shows there were in significant differences (P>0.05) among all periods and treatment expect 42 days period was significant differences (P<0.05) between T2 (36.9g)with T1and C group while they are insignificant differences between them. This result agree with result of **Mossab *et al.* (2000)** when they used USF mixed with SF in young turkeys chickens diet.

Effect of diets on total digestive system

Total bowel or total digestive systemweight values of trial groups are present in tables 2 and 3. At 42 days old insignificant differences (P>0.05) were observed among trial groups. Digestive system weight at 45 days old were higher in group C (229.5g) while the lowest value is in group T1 (201.7g) on the other hand for 48 and 51 days old there were significant differences (P<0.05) among groups. Digestive system weight were higher in groups T2 at 48 and 51 days old(339.1g and 286.0g) respectively. This could be attributed to the growth promoter effects of type fat when fed to the birds during starter period as indicated by higher feed consumption during starter and later in finisher phase of feeding. Increasing the digestion system volume is important to increase the capacity of consuming more diet further that may be affect type of sex.

Mala*et al.* (2004) found that with different mixing of fat in broiler diet the bowel weight decreased insignificantly (P>0.05) compared to control. Same results were found in the experiment performed by **Taraz *et al.* (2006)** in which used replacement of soybean meal with rapeseed oil in broiler diets. **Anonymous (1997)** disagree with our result, may be due to type of strain broiler.

Effect of diets on blood and plumage weight

Feather and blood in some country they get benefit from these items as a source of protein in feed stuff, weight values of trial for all age'sgroups periods are present in tables 2 and 3. During both age periods insignificant (P>0.01) values were recorded. Values in groups T1 (389.9g, 575.8g) at 42 and 45 ages respectively, contain high level of SF and USF tends to increase the feather creation. This is could be attributed to the influence of these additives on the pituitary hormone prolactin which is responsible indirectly on the feather production. Prolactin appears to influence reproductive function by a direct action on the central nervous system (**Buntin, 1993),** or might be due the effect on sulfuric amino acids availability by increasing the feed consumption in groups which consumed diets supplied by both type of fat.Subsequently at ages 48days and 51 days the higher value were in group T2 (54.21g , 488.3g) for 48 days and 51 days respectively this due to increase of blood weight on the other hand these weight is related by arithmetic calculate depend on others parts weights.

Effect of diets on intestine weight

Intestine of the chicks are also used in preparing the threads used in surgery in many countries **(Urbanowicz et al., 2005)**. Intestine is one of important part of digestive system and more heaver than other parts because most of fat absorption will do inthis part **(Lesson and Zubair, 2005)**.

Data from table 2 pointed that there were insignificant differences (P>0.05) for weight of intestine at 42 days old, this is may be due to improving of digestive system and this reason explain or reflect on total digestive system weight also insignificant at this age old. Same table shows that at 45 days old there were significant differences (P<0.05) and the higher value was in group C (147.8g) this can be attribute to the type of SF use in diet. At advantage age the higher values were in T2 (0.176 g, 0.184g) because of more secretion of lipase enzyme in duodenum to make emulation for fatty acids and easy for absorption, this is due to using of USF and easy to emulsification by lipase enzyme. On the other hand reflect on value of total digestive system were high values at these ages old also.

Effect of diets on bile salt weight

Bile salt has a big role for digestive fat by secretion lipase and ester cholesterol to analyze fat to fatty acids and esters cholesterols this will convert by emulsification to fatty acids, monoglyceride and glycerol (Lesson and Zubair, 2005). This secretion will increase when abundance of USF at advantage age so we note insignificant differences (P>0.05) for weight of bile salt at 42 days and 45 days old. On other hand in table 3 pointed that T2 which content diet USF were higher values at 48 days and 51 days old (3.07g ,3.45g) respectively.

Effect of diets on gizzard weight

Gizzard weight values of trial groups are present in tables 2 and 3. At 45 and 51 days old insignificant differences (P>0.05) were observed between trial groups. Gizzard weightwere higher in groups T2 at 42 days old (table2) and in same group at 48 days age (table 3) comparing to other groups. This could be attributed to the growth promoter effects of USF when fed to the birds during starter at young age and finisher at semi advantage age period as indicated by higher feed consumption during starter and later in finisher phase of feeding. Increasing the digestion system volume is important to increase the capacity of consuming more diet.

Our results are agree with some results of Osman et al. (1999), when they use USF in broiler diet and affected on the product performance.

Effect of diets on heart weight

Heart weight values of trial groups are present in tables 2 and 3. During young phase the heart weight not affected by including SF and USF in the diet, which decreased insignificantly (P>0.05), comparing to all groups at advantage ages old. A similar result was registered for values group T2 (19.08g, 21.25g and 21.25g) for ages old 45, 48 and 51 days respectively. These results confirm the previous results from **Lee *et al.* (2003).**

CONCLUSION

From present results we conclude that. Best values where found for carcass weight and most parts reflect in treatment which include USF (SUN) in T2. At advantage ages it will increase the pad abnormal fat and more accumulation of fat reflect on total carcass weight and secondary parts with edibles. This point may be commercial for farmer but it is very bad for human health due to gradually proportion of fat positively relation with advantage age.

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