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Effect of Testosterone Enanthate Injection on Some Carcass Traits and Chemical Characteristics of Castrated Karadi Lambs Meat

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Abstract: This study was conducted to investigate the effect of testosterone enanthate injection on some carcass traits and chemical characteristics of Karadi castrated lambs meat. Twenty seven male Karadi lambs (3-4 months of age) with an average live weight of (28.7±3.8 kg) were reared in sheep farm, research station, Faculty of Agriculture Sciences, University of Sulaimania and allocated randomly by weight to three groups (treatments) by the dosage of testosterone enanthate (6 lambs for each treatment): G1 were not injected (control), G2 were injected by 200 mg and G3 were injected by 400 mg (IM weekly). All groups animals were fed with the same concentrate diet (3% of body weight), barley straw provided *ad libitum* and water was free, all group lambs were castrated by rubber band two weeks before experiment begins. There were three periods of slaughter: 60 days from the beginning of the experiment, 90 days and 120 days, at the end of each period three lambs from each treatment were randomly chosen and weighted, then humanly slaughtered. Many measurements were taken such as hot and cold carcass weight, carcass length, carcass thorax circumference, rib eye area and fat thickness ,carcass cuts weight, non-carcass adipose tissue weight, edible organs and offal weight, also the chemical composition of Longissimus Dorsi muscle meat. From the results, it could be concluded that there were positive effects of testosterone enanthate injection, which was increasing of living body weight reflecting on hot and cold carcass weight increase with increasing age and period of treating with enanthate, that increase in carcass weight was related with increasing in weight of whole carcass cuts which was clearly noticed on second and third slaughtering period, and also that increase can be correlated with rib eye area which increase during the same periods , that means the gain in weight is a result of body lean gain due to testosterone enanthate injection. In addition, fat tail weight decrease may be explain as body energy turned to producing or synthesis lean instead of fat.

Key words: Karadi Lambs, Meat, Testosterone Enanthate Injection, castration.

Introduction

The sheep is considered the most important farm animals, and it has a great economic payoff (Juma and Al-Kass, 2000). The demand for lamb's meat in Iraq and regional countries exceeds the amount produced locally several times (Mohammed *et al*., 2009). The European Economic Community (EEC) banned the use of anabolic compounds as growth accelerators in animals feed, while the United States Food and Drug Administration (USFDA) permitted the limited use of some hormones of natural origins (such as estradiol and testosterone)and some synthetic hormones (such as Zeranol and trenbolone) in animal husbandry (MacVinishand Galbraith, 1988; Sadek*et al*., 1998).

Growth promoting hormones are used widely in the United States and in other meat exporting countries in large commercial feedlots. Livestock producers use hormones because it accelerate growth rates and produce a leaner carcass that more compatible with consumer preferences for diets and reduced fat and cholesterol. Growth-promoting hormones (manufactured in the form of implants to be placed behind the animal's ear) approved for use in the United States, which are found to be naturally occur in an animal's body or mimic naturally occurring compounds. Nazli *et al.* (2005) referred that in recent years, hormones and hormone-like compounds have been frequently used in livestock production to obtain a high yield performance in a shorter period of time. As a result, many countries restrict or prohibit the use of anabolic compounds in livestock production. Anabolic-androgenic steroids have two different, but overlapping, types of effects: anabolic, means that it promote anabolism (cell growth), and androgenic means that it affect the development and maintenance of masculine characteristics. Some examples of the anabolic effects of these hormones are increasing protein synthesis from amino acids, increased appetite, increased bone remodeling and growth, and stimulation of bone marrow. Through a number of mechanisms anabolic steroids stimulate the formation of muscle cells and hence cause an increase in size of skeletal muscles, leading to increased strength (Giorgi*et al*., 1999; Schroeder *et al*., 2005; Grunfeld*et al*., 2006).

The aim of this study was to use testosterone injection (enanthate analog) with castrated Karadi lambs and determine their effect on some carcass traits and chemical characteristics of meat.

Materials and methods

This study was conducted in sheep farm, research station, Faculty of Agriculture Sciences, University of Sulaimani. Twenty seven males ofKaradi lambs (3-4 months of age) with an average live weight of (28.7±3.8 kg) were allocated randomly by weight to three groups (treatments) by the dosage of testosterone enanthate (6 for each treatment): G1 were not injected (control), G2 were injected by 200 mg and G3 were injected by400 mg (IM weekly). All groups animals were feed with the same concentrate diet (table1) and barley straw provided *ad libitum* and water was free, diet provided once a day with 3% of body weight for each lamb which housed in a separate pin. All group lambs were castrated by rubber band two weeks before experiment begins. There were three periods of slaughter: 60 days from the begin of the experiment, 90 days and 120 days, at the end of each period three lambs from each treatment were randomly chosen and weighted then humanly slaughtered. Many measurements were taken such as hot and cold carcass weight, carcass length, carcass thorax circumference, rib eye area and fat thickness, breast, fore shank, loin, neck, ribs, leg and shoulder weight (Forrest *et al*., 1975), heart fat, fat tail, intestine fat, kidney and pelvic fat weight, empty intestine, empty rumen, heart, kidney, liver, spleen, lung with esophagus, feet, wool with skin and head weight, also the chemical composition of Longissimus Dorsi muscle meat (A.O.A.C., 1990). Statistical analysis program SAS (2004) with 3x3 factorial Completely Randomized Design (CRD) was used to study the effect of three levels of testosterone enanthate and three periods of slaughtering age. Duncan (1955) multiple range tests were

used to determine the significance differences between means.

Table (1) The ingredients and composition of experimental diet.

ingredient	%
Barley grain	49
Yellow corn	93
Soybean meal	10
salt	1
Min. and vit. mixture	1
Chemical composition / kg dry matter	
Dry matter	94
Organic matter	91
Total nitrogen	21.3
Crude fibers	50.8
Ether extract	34
Nitrogen free extract	700
Metabolisable energy MJ/Kg	12.7
* (7)	

Results and discussion

Table (2) showed the effect of testosterone enanthate injection on live weight and carcass characteristics. As it could be seen that there were significant differences in live body weight, hot carcass weight and cooled carcass weight in second and third periods (90 and 120 days) between 3 treatments, it could be noticed that there were significant (P≤0.05) superiority of injected treatments when compared with control treatment, while there was no effect of treatments on each carcass length and carcass thorax circum in different slaughtering age. Table (3) showed the effect of testosterone enanthate injection on carcass cuts weight, fat tail, rib eye area and fat thickness. There were significant effects for different treatments on carcass cuts weight, where there was superiority (P≤0.05) for injection treatments comparing with control treatment on most main and second cuts weight and for all three periods, while we can see the opposite with fat tail where there was superiority (P≤0.05) for control treatment comparing with injection treatments for all three periods also. In rib eye area data, we can see that the significant effects were limited to the second and third periods, where there was superiority (P≤0.05) for injection treatments comparing with control treatment.

Table (4) showed the effect of testosterone enanthate injection on non-carcass adipose tissue. It could be noticed that there were no significant effects of injection treatments on different non carcass adipose tissue sites. Table (5) showed the effect of testosterone enanthate injection on offal weight. It could be observed that there were no significant effects of injection treatments on offal weight.

Table (6) showed the effect of testosterone enanthate injection on edible organs weight. It could be observed that there were no significant effects of injection treatments on edible organs except with liver where there was a significant (P≤0.05) superiority of injection treatments comparing with control treatment in third period (120 days). Table (7) showed the effect of testosterone enanthate injection on chemical composition of meat. It could be noticed that there were no significant effects of injection treatments on chemical composition. From the results tables we can said that we have positive effects of testosterone enanthate injection, which is increased in live body weight that reflected on increase hot and cold carcass weight with increasing age and period of treating with enanthate, that increase in carcass weight was related with increasing in weight of whole carcass cuts which was clearly noticed on second and third slaughtering period, and also that increase can be correlated with rib eye area which increase during the same periods, that means the gain in weight is a result of body lean gain due to testosterone enanthate injection.

In addition, fat tail weight decrease may explain as a body energy turn into producing or synthesis lean instead of fat. Increase in liver weight for injection treatments in third period may refer to the enhancement of body basic nutritional materials metabolism by the effect of the hormone which led to increase liver activity and weight and reflect on enhance meat synthesis and body weight gain. The results were agreed with Nazli *et al*. (2005) who referred to the positive effect of that kind of hormones on livestock production

Table (2): Effect of testosterone enanthate injection on live weight and carcass characteristics (Different letters within raw refer to significant differences (P≤0.05) between means).

Characteristics	treatments								
	60 days			90 days			120 days		
	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate
Live weight	37.74 ±1.45a	38.96 ±4.30a	38.91 ±4.40a	41.34 ±0.38b	47.90 ±0.20a	46.21 ±0.46a	44.76 ±2.60b	48.84 ±1.90a	48.30 ±1.20a
Hot carcass weight (kg)	20.41 ±0.50a	20.84 ±1.25a	21.31 ±2.50a	25.94 ±0.22b	28.55 ±0.72a	27.24 ±0.83a	26.86 ±0.57b	30.97 ±0.82a	27.96 ±1.75a
Cooled carcass weight	20.11 ±0.49a	20.43 ±1.22a	20.75 ±2.45a	25.32 ±0.98b	28.1 ±2.62a	26.62 ±1.84a	26.34 ±0.56b	30.51 ±0.80a	27.62 ±1.71a
Carcass length (cm)	78.5 ±2.5a	77.5 ±3.5a	75.5 ±5.5a	79.5 ±1.38a	89.0 ±1.36a	89.0 ±2.0a	82.0 ±3.0a	81.0 ±3.0a	86.5 ±7.5a
Carcass thorax circum (cm)	37.5 ±0.5a	38.5 ±0.9a	41.0 ±2.0a	39.5 ±1.5a	38.0 ±2.95a	38.0 ±4.31a	44.0 ±1.0a	43.0 ±1.0a	41.0 ±3.0a

Table (3): Effect of testosterone enanthate injection on carcass cuts weight, fat tail, rib eye area and fat thickness (Different letters within raw refer to significant differences (P≤0.05) between means).

Characteristics	treatments								
	60 days			90 days			120 days		
	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate
Neck (gm)	461.5 ±3.5b	474.0 ±7.5b	552.5 ±6.0a	639.0 ±11.0b	745.0 ±5.0ab	778.0 ±10.0a	586.5 ±1.5b	764.0 ±1.0a	700.0 ±45.0a
Shoulder (gm)	1725.0 ±55.0b	1947.5 ±57.0ab	2120.0 ±1.5a	1925.0 ±35.0b	2615.0 ±5.0a	2625.0 ±55.0a	2050.0 ±5.0b	2697.5 ±42.5a	2647.5 ±82.5a
Breast (gm)	635.0 ±10.0a	625.0 ±10.0a	665.0 ±31.0a	782.5 ±77.5b	1155.0 ±55.0a	887.5 ±62.5b	1005.0 ±65.0a	1070.0 ±85.0a	1075.0 ±85.0a
Rib (gm)	765.0 ±35.0b	905.0 ±10.5ab	1005.0 ±16.5a	980.0 ±55.0b	1215.0 ±35.0a	1165.0 ±30.0a	1082.5 ±32.5b	1330.0 ±10.0a	1170.0 ±22.0ab
Fore shank (gm)	415.0 ±40.0a	447.5 ±17.5a	347.5 ±107.5a	500.0 ±10.0b	647.5 ±7.5a	567.5 ±7.5ab	532.5 ±27.5a	652.5 ±7.5a	552.5 ±10.5a
Flank (gm)	220.0 ±35.0a	227.5 ±2.5a	322.5 ±27.5a	360.0 ±80.0a	462.5 ±7.5a	435.0 ±115.5a	370.0 ±30.0b	435.0 ±15.0a	410.0 ±5.0ab
Loin (gm)	452.5 ±17.5b	622.5 ±2.5a	720.0 ±60.0a	650.0 ±5.0a	700.0 ±30.0a	645.0 ±50.0a	635.0 ±20.0b	680.0 ±32.5b	812.5 ±40.0a
Leg (kg)	2.903 ±0.023b	3.063 ±0.443a	3.195 ±0.495a	3.645 ±0.010b	4.245 ±0.055a	4.088 ±0.092a	3.645 ±0.030b	4.495 ±0.190a	3.648 ±0.738a
Fat tail (kg)	2.335 ±0.205a	1.735 ±0.105b	1.584 ±0.159b	3.168 ±0.118a	2.208 ±0.370b	1.978 ±0.248b	3.099 ±0.161a	2.869 ±0.076ab	2.510 ±0.280b
Ribeye area (cm3)	35.0 ±0.5a	38.5 ±7.5a	35.5 ±5.5a	42.5 ±2.5b	51.0 ±3.0a	51.0 ±3.0a	46.0 ±4.0b	52.0 ±5.0a	53.0 ±3.0a

Fat Thickness(mm)	0.9 ±0.0a	0.5 ±0.2a	1.6 ±0.4a	1.5 ±0.4a	1.6 ±0.2a	1.8 ±0.2a	1.7 ±0.5a	1.6 ±0.2a

Table (4): Effect of testosterone enanthate injection on non-carcass adipose tissue.

Characteristics	Treatments								
	60 days			90 days			120 days		
	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate
Intestine fat (gm)	207.5 ±12.5a	197.5 ±7.5a	205.0 ±2.5a	202.5 ±2.5a	200.0 ±5.5a	415.0 ±13.0a	460.0 ±18.0a	545.0 ±18.5a	420.0 ±10.0a
Omental fat (gm)	312.5 ±52.5a	226.5 ±56.5a	281.0 ±1.0a	450.0 ±40.0a	730.0 ±21.5a	807.5 ±127.5 a	833.5 ±121.5 a	947.5 ±72.5a	1132.5 ±77.5a
Heart fat (gm)	48.5 ±7.5a	34.5 ±11.5a	53.0 ±4.0a	76.5 ±19.5a	62.0 ±3.0a	58.0 ±23.0a	47.5 ±15.5a	72.0 ±47.0a	68.5 ±12.5a
Kidney and pelvic fat (gm)	5.631 ±21.0a	.5321 ±8.5a	.5461 ±29.5a	.0321 ±19.0a	.0219 ±46.0a	.0376 ±35.0a	0.245 ±31.5a	.0468 ±134.0 a	.5393 ±57.5a

Table (5): Effect of testosterone enanthate injection on offal weight.

Characteristics	treatments								
	60 days			90 days			120 days		
	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate
Feet (kg)	1.008 ±0.02a	1.043 ±0.15a	1.050 ±0.10a	1.125 ±0.2a	1.345 ±0.03a	1.208 ±0.8a	1.083 ±0.14a	1.280 ±0.05a	1.020 ±0.18a
Head (kg)	2.158 ±0.017 a	2.345 ±0.235 a	2.443 ±0.043 a	2.283 ±0.8a	2.918 ±0.53a	2.658 ±0.26a	2.385 ±0.290 a	2.920 ±0.065 a	1.993 ±0.818 a
Wool with skin weight(kg)	5.873 ±0.193 a	5.935 ±0.545 a	5.435 ±0.205 a	6.165 ±0.085 a	7.853 ±0.908 a	5.758 ±0.063 a	5.863 ±0.208 a	5.040 ±0.055 a	5.920 ±0.700 a
Empty rumen(kg)	1.485 ±0.065 a	1.648 ±0.328 a	1.533 ±0.203 a	1.373 ±0.073 a	2.235 ±0.305 a	1.798 ±0.003 a	1.530 ±0.130 a	1.635 ±0.10a	1.730 ±0.215 a
Empty intestine (kg)	1.113 ±0.098 a	1.293 ±0.083 a	1.180 ±0.200 a	0.805 ±0.095 a	1.383 ±0.043 a	1.135 ±0.010 a	0.808 ±0.163 a	0.943 ±0.113 a	0.698 ±0.068 a

Table (6): Effect of testosterone enanthate injection on edible organs weight (Different letters within raw refer to significant differences (P≤0.05) between means).

Characteristics	treatments								
	60 days			90 days			120 days		
	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate
Heart (gm)	170.5 ±14.5a	185.5 ±0.5a	207.5 ±24.5a	175.0 ±8.0a	234.5 ±11.5a	213.0 ±38.0a	183.5 ±13.5a	230.0 ±32.0a	180.0 ±32.0a
Kidney (gm)	101.5 ±11.5a	119.0 ±19.0a	135.5 ±3.5a	106.0 ±4.0a	149.0 ±17.0a	137.5 ±5.5a	110.5 ±9.5a	120.5 ±6.5a	115.5 ±23.5a
liver (gm)	678.0 ±32.0a	860.0 ±86.0a	719.5 ±106.5 a	600.0 ±73.0a	882.0 ±92.0a	843.0 ±18.0a	628.0 ±39.0b	926.0 ±23.0a	976.5 ±74.5a
Lunge(gm)	475.0 ±20.0a	731.5 ±59.5a	424.5 ±24.5a	479.5 ±17.5a	624.5 ±18.5a	366.0 ±84.0a	504.0 ±12.0a	598.0 ±46.0a	485.5 ±65.5a
Spleen (gm)	132.0 ±49.0a	124.0 ±55.0a	80.5 ±9.5a	70.5 ±4.5a	76.5 ±0.5a	102.5 ±33.5a	75.5 ±7.5a	98.0 ±9.0a	94.5 ±34.5a

Table (7): Effect of testosterone enanthateinjection on chemical composition of meat.

Characteristics	treatments								
	60 days			90 days			120 days		
	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate	not injected (control)	(200) mg enanthate	(400) mg enanthate
Moisture (%)	74.44 ±0.06a	74.29 ±0.13a	74.11 ±0.11a	73.74 ±0.38a	74.03 ±0.11a	74.41 ±0.01a	74.04 ±0.31a	74.22 ±0.05a	73.86 ±0.22a
Protein (%)	20.11 ±0.01a	20.07 ±a0.03	20.03 ±0.03a	19.92 ±0.10a	20.01 ±0.03a	20.07 ±0.04a	20.01 ±0.08a	20.05 ±0.15a	19.96 ±0.06a
Fat (%)	2.445 ±0.075 a	2.630 ±0.170 a	2.915 ±0.205 a	3.835 ±0.276 a	2.960 ±0.369 a	2.495 ±0.065 a	2.950 ±0.400 a	2.725 ±0.065 a	3.175 ±0.285 a
Ash (%)	1.585 ±0.085 a	1.635 ±0.085 a	1.610 ±0.200 a	1.245 ±0.055 a	1.575 ±0.085 a	1.620 ±0.160 a	1.070 ±0.165 a	1.535 ±0.240 a	1.560 ±0.130 a

which obtain a high yield performance in a shorter period of time, it agree also with Schroeder *et al*. (2005), who indicated that group which given androgen hormone may be increased in size of muscle, also agreed with Giorgi*et al*. (1999) who illustrated that moderate doses of testosterone enanthate can result in significant changes in body strength and composition, and with Roeber *et al*. (2000) who conclude that the use of implants resulted in heavier hot carcass weights and larger rib eyes. It also compatibles with Dunshea *et al*. (2005), consequences who showed that anabolic implants increase lean tissue deposition while decreasing fat deposition in animal tissues, and with each of Perry *et al*. (1991), Bartle *et al*. (1992) and Duckett and Andrae (2001), they documented positive effects of the seandrogenic hormones.

Conclusions

Testosterone enanthate injection increasing each of live body weight, hot and cold carcass weights, whole carcass cuts weight and rib eye area, that could be a result of body lean gain due to the treatments. On the other hand injection treatments decreasing fat tail weight which may be explain as body energy turn to producing lean instead of fat.

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