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EFFECT OF BREED, TYPE OF BIRTH AND WEANING SYSTEM ON DEVELOPMENT OF TESTIS AND BODY WEIGHT IN GROWING CHIOS AND RAHMANI RAM LAMBS

(With 3 Tables)

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تأثير السلالة ونوع الولادة ونظم الفطام على تطور الخصية ووزن الجسم في ذكور الحملان الكيوس والرحمان النامية

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استخدم في هذه التجربة ٢٢ من ذكور الحملان (٩ كيوس و ١٣ رحمانى) لدراسة تاثير السلالة ونوع الولادة ونظم الفطام على تطور الخصية ووزن الجسم. قسمت الحملان عند الميلاد عشوائيا الى ٣ مجموعات ١- فطام مبكر (عند عمر ٨ أسابيع)، ٢- فطام عادى (عند عمر ١٢ أسبوع) ، ٣- فطام متأخر (عند عمر ١٦ أسبوع) وأظهرت النتائج انه لا يوجد فروق معنوية بين السلالتين على الوزن عند الميلاد ولكن عند عمر ٩٠، ١٨٠، ٣٦٠ يوم كانت الحملان الكيوس أثقل وزنا من الحملان الرحمانى. الحملان الكيوس مبكرة البلوغ الجنسي وأثقل وزنا عن الحملان الرحمانى. الحملان التي فطمت مبكرا عند عمر أسابيع وصلت إلى البلوغ الجنسي في عمر اقل من الحملان المفطومة عند عمر ١٢ أسبوع أو عند عمر ١٦ أسبوع. كانت هناك فروق معنوية فى مقاييس الخصية بين السلالتين. نوع الولادة لم يكن له تأثير معنوي على مقاييس الخصية او وزن الجسم. وجد أن هناك علاقة ارتباط موجبة ما بين مقاييس الخصية ووزن الجسم.

SUMMARY

A total number of twenty two male lambs, nine of Chios and thirteen of Rahmani ram lambs, were used to investigate the effects of body weight of lambs, type of birth, weight at birth, weaning system and age at puberty on the development of the six testicular parameters from weaning 8-16 weeks of age in both Chios and Rahmani ram lambs Lambs were assigned randomly at birth to three groups: 1) Lambs were

weaned at 8 weeks of age (early weaning); or 2) Lambs were weaned at 12 weeks of age (normal weaning); or 3) Lambs were weaned at 16 weeks of age (late weaning). Results revealed that, no significant differences were observed between breed on birth body weight of lambs. However, at 90,180 and 360 days of age, Chios lambs were significantly ($P<0.01$) heavier than Rahmani lambs. Weaning weight was reduced at 90 days, but there was a quick recovery to similar weight by yearling age. Age at puberty in ram lambs was significantly affected ($P < 0.01$) by weaning system. Puberty occurred earlier in early weaning (8 weeks) (279 d) and normal weaning (12 weeks) (255 d) compared with late weaning (16 weeks) (313 d). Breed was significantly differences of testicular measurements. Types of birth were not significantly affected the development of testicular parameters. Increasing of testicular parameters were relatively similar to the development of body weight. In general, sexual development of ram lamb appears to be more closely associated with body growth. Measurement of testis were positively correlated with body weight ($r= 0.60 - 0.85$, $P<0.01$) and each other testicular parameters ($r= 0.50 - 0.69$, $P <0.05$, $P<0.01$).

***Key words**: Ram lambs, Rahmani, Chios, testis, puberty, Weaning*

INTRODUCTION

The sheep is one of the species most widely distributed throughout the world. The efficiency of sheep production depends highly on reproductive performance. Most reproductive efficiency research in sheep focuses on females, while less attention to males (kridli *et al*, 2006). Testicular size can be used within one breed as an accurate predicator of the onset of puberty. Scrotal circumference was also used as important measurements in determining sexual maturity and spermatozoa function of a ram (Yarney *et al*., 1990 and Chemineau *et al*., 1991). Shrestha *et al* (1983) pointed out that testis length, testis diameter and body weight significantly increased from 6 to 8 months of age. Also, Mukosa and Ezaz (1992) reported that scrotal circumference of a ram has increased gradually and correlated with age, body weight wither height and him girth, respectively ($r= 0.83- 0.85$, $P< 0.001$). Reports of puberty in rams, defined as age at first ejaculate, vary from 132 days for Tabasco lambs on the high plateau in Mexico (Valencia *et al.*, 1978) to as old as 738 days for 3/4 Rambouillet 1/4 Malpora lambs in Rajasthan, India (Tiwari and Sahni 1981)

The biometric analysis of testicular development is of great importance since it is significantly correlated with reproductive activity (El-Wishy and El-Sawaf, 1971). Because information on post weaning testicular development of Chios and Rahmani is limited. The present study was conducted to measure development of several testicular parameters and factors influencing them. The relationship of testicular parameters to body growth in growing ram lambs and the effects of type of birth and breed were also the target of studies under Upper Egypt conditions.

MATERIALS and METHODS

The present study was conducted in the experimental farm of Animal Production Department, Faculty of Agriculture, AL-Azhar University, Assiut, Egypt. A total of twenty two male lambs, nine of Chios and thirteen of Rahmani were used. Lambs were assigned randomly at birth to three groups: 1); lambs were weaned at 8 week of age (early weaning) 2); lambs were weaned at 12 week of age (normal weaning) 3); lambs were weaned at 16 week of age (late weaning). Lambs were received 500 g of concentrates containing 40% wheat bran, 32% maize, 25% undecorticated cotton seed meal, 2% limestone and 1% sodium chloride. The animals were allowed to graze on a good quality pasture, consisting of Egyptian clover (Berseem). Water and wheat straw were provided *ad libitum*. At 90, 120, 180 and 360 days old, length, width, scrotal circumference, and volume of the testes and body weight were measured. Each testis was brought into the distal part of the scrotum and its circumference was measured with a flexible cloth tape. The length and the width of each testis were measured with a caliper after forcing each testis against the scrotum. The volume of the testis was evaluated from the volume of water they replaced according to Salhab, *et al*. (2001).

Puberty performance of male lambs born in the lambing season of February /March 2006 starting from four months of age. Puberty was defined as the first observed mounting with ejaculation.

Statistical Analysis: Data were statistically analyzed using general linear model (GLM) procedure of SAS (1996). The following model was used:

$$Y_{ijkl} = \mu + B_i + T_j + W_k + E_{ijkl}$$

Where, Y_{ijkl} = the observation, μ = general mean; B_i = effect of the $_I^{th}$ breed; T_j = effect of the j^{th} type of birth; W_k = effect of the k^{th} weaning system; E_{ijkl} = experimental error.

RESULTS

Table 1: Effect of breed, rearing type, and weaning system on body weight, from birth to yearling age of Rahmani and Chios ram lambs.

Items	Breed			Type of birth			Weaning system			
	Rahmani	**Chios**		**Single**	**Twins**		**Early**	**Normal**	**Late**	
Body weight (kg)										
Birth weight	3.6 ± 0.05	3.57 ± 0.05	ns	3.65 ± 0.037	3.53 ± 0.07	ns	3.61 ± 0.06	3.5 ± 0.057	3.65 ± 0.06	ns
90 days	16.6 ± 0.2 ^{b}	17.0± 0.2 ^{a}	ns	17.04 ± 0.2	16.6 ± 0.27	ns	15.0 ± 0.27 ^{a}	17.33 ± 0.26 ^{b}	18.1± 0.23 ^{c}	**
120 days	23.4 ± 0.6	24.3 ± 0.6	ns	23.82 ± 0.61	23.85± 0.62	ns	25.13± 0.7 ^{a}	24.15 ± 0.78 ^{a}	22.2 ± 0.18 ^{b}	*
180 days	28.6 ± 0.9 ^{b}	32.9 ± 0.9 ^{a}	**	30.76 ± 0.87	30.76 ± 1.1	ns	32.9 ± 1.01 ^{a}	30.6 ± 1.1 ^{b}	28.8 ± 1.1 ^{b}	*
360 days	35.2 ± 1.0 ^{b}	40.8 ± 1.0 ^{a}	**	37.47 ± 0.99 ^{a}	38.5 ± 1.33 ^{b}	ns	41.34± 1.1 ^{a}	36.57± 1.2 ^{b}	36.1 ± 1.3 ^{b}	**
Age at puberty (day)	306.6 ± 7.6	300 ± 7.6	ns	294.4 ± 5.78	294.8 ± 7.76	ns	279.3 ± 6.65 ^{b}	291.6 ± 7.37 ^{b}	313 ± 7.74 ^{a}	*

ns= not significant; *= significant (P<0.05); **= (P<0.01)

$^{a, b, c}$ Means in the same column with different superscripts differ at (P<0.05)

Table 2: Effect of breed, type of birth, and weaning system on testis development, from 90 to 360 days of age in ram lambs

	Rahmani	Chios	Single	Twins	Early	Normal	(Late
Right length							
90 days	3.43 ± 0.13	3.24 ± 0.13	3.35 ± 0.13	3.33 ± 0.18	3.4 ± 0.15	3.52 ± 0.17	3.1 ± 0.18
120 days	6.53 ± 0.23 a	5.79 ± 0.23 b	6.31 ± 0.23 a	6.0 ± 0.31 b *	6.5 ± 0.26	6.55 ± 0.29	5.44 ± 0.31
180 days	7.8 ± 0.33 b	9.0 ± 0.34 a *	8.4 ± 0.33	8.41 ± 0.45	8.87 ± 0.38	8.49 ± 0.43	7.82 ± 0.45
360 days	8.74 ± 0.35 a	9.93 ± 0.35 b *	9.23 ± 0.35	9.43 ± 0.46	10.6 ± 0.4	9.05 ± 0.44	8.36 ± 0.46
Right width							
90 days	1.63 ± 0.07	1.54 ± 0.07	1.64 ± 0.72	1.52 ± 0.09	1.64 ± 0.08	1.64 ± 0.09	1.46 ± 0.1
120 days	3.26 ± 0.11	3.03 ± 0.11	3 .21± 0.11	3.08 ± 0.15	3.36 ± 0.13	3.30 ± 0.14	2.8 ± 0.15
180 days	3.97 ± 0.2	3.8 ± 0.2	3.9 ± 0.19	3.88 ± 0.26	4.27 ± 0.22	3.92 ± 0.25	3.5 ± 0.26
360 days	4.33 ± 0.18	4.20 ± 0.18	4.01 ± 0.18 b	4.5 ± 0.24 a	4.7 ± 0.21	4.14 ± 0.23	3.9 ± 0.24
Left length							
90 days	3.69 ± 0.11 a	3.24 ± 0.12 b *	3.42 ± 0.11	3.52 ± 0.15	3.54 ±0.13	3.6 ±0.15	3.25 ± 0.15
120 days	6.88 ± 0.26 a	5.64 ± 0.26 b **	6.37 ± 0.26 a	6.15 ± 0.26 b	6.61 ± 0.3	6.7 ± 0.33	5.48 ± 0.35
180 days	8.35 ± 0.37	9.03 ± 0.37	8.48 ± 0.37 a	8.9 ± 0.5 b	9.15 ± 0.42	8.76 ± 0.47	8.15 ± 0.49
360 days	10.24 ± 0.39 a	9.04 ± 0.38 b *	9.32 ± 0.38 a	9.96 ± 0.52 b	10.85 ± 0.44	9.22 ± 0.49	8.86 ± 0.51
Left width							
90 days	1.84 ± 0.07 a	1.59 ± 0.07 b *	1.7 ± 0.072	1.73 ± 0.09	1.74 ± 0.08	1.76 ± 0.09	1.63 ±0.09
120 days	3.49 ± 0.14 a	2.97 ± 0.14 b *	3.21 ± 0.14 a	3.25 ± 0.19 b	3.4 ± 0.16	3.4 ± 0.18	2.86 ± 0.19
180 days	4.1 ± 0.17	3.94 ± 0.17	4.0 ± 0.17	4.03 ±0.23	4.37 ± 0.2	3.99 ± 0.22	3.68 ±0.23
360 days	4.50 ± 0.21	4.24 ± 0.21	4.28 ± 0.21	4.45 ± 0.28	4.72 ± 0.24	4.35 ± 0.27	4.04 ± 0.28
Scrotal circumference (cm)							
90 days	17.14±0.46 a	15.16 ± 0.46 b **	15.6 ± 0.46	16.7 ± 0.62	16.43 ± 0.53	16.56 ± 0.58	15.45 ± 0.61
120 days	17.86 ± 0.34	17.06 ± 0.34	17.56 ± 0.34	17.36 ± 0.34	17.7 ± 0.38	18.2 ± 0.43	16.5 ± 0.45
180 days	23.5 ± 0.73	23.7 ± 0.73	23.02 ± 0.72	24.16 ± 0.97	24.31 ± 0.83	22.81 ± 0.92	23.7 ± 0.97
360 days	27.9 ± 1.13	25.6 ± 1.12	25.8 ± 1.11	27.71 ± 1.49	28.44 ± 1.28	25.76 ± 1.42	26.06 ± 149
Testicular volume (ml)							
90 days	65.2 ± 3.2 b	77.4 ± 3.5 a *	68.3 ± 3.4	74.4 ± 4.65	68.13 ± 3.99	78.15 ± 4.4	67.67 ± 4.64
120 days	158.6 ± 7.25	163.8 ± 7.3	150.1 ± 7.21	172.3 ± 7.3	164.8 ± 8.3	161.3 ± 9.2	157.5 ± 9.6
180 days	413.6 ± 22.7	410.1 ± 22.8	402.7 ± 22.5	421 ± 30.2	436.8± 25.9	415.3 ± 28.7	383.5 ± 30.1
360 days	480.0 ± 14.1 a	448.1 ± 13.9 b *	444.6 ± 13.9	483.5 ± 18.6	495 ± 15.9	420 ± 17.7	477 ±18.6

*= significant (P<0.05); **= (P<0.01)

a, b, c, Means in the same column with different superscripts differ at (P<0.05)

Table 3: Coefficients of Correlation among testicular measurements and body Weight in growing lambs.

Items	RL	RW	LL	LW	SC	TV(ml
Body weight	0.847 **	0.698 **	0.855 **	0.600 *	0.697 **	0.803 **
Right Length		0.895 **	0.961 **	0.813 **	0.786 **	0.710 **
Right width			0.877 **	0.895 **	0.653 **	0.632 **
Left length				0.754 **	0.874 **	0.753 **
Left width					0.560 *	0.503 *
Scrotal circumference						0.739 **
Testicular Volume (ml)						

*= significant (P<0.05); **= (P<0.01)

DISCUSSION

Body weight and age at puberty. Means and standard error of body weight and age at puberty over the time of experimental period are shown in (Table 1). The effect of breed on birth weight of lambs were not significant, however at 90, 180 and 360 days of age Chios lambs were significantly ($P < 0.05$) heavier than Rahmani lambs. Body weight was lower in Rahmani rams than in Chois rams throughout the experimental period. Our results were in agreement with those reported by Emsen (2005) who found that body weight was higher in Redkaraman than in Awassi at 90 and 180 days of age. Also, Abd Allah (2005) indicated that body weight of F1 cross (1/2 Chios x 1/2 Rahmani) were heavier than Rahmani lambs at 3, 6 and 12 months of age.

In the current work, weaning weight was low at 90 days but there was a quick recovery to similar weights by yearling age (Table 1). The similarity of body weight between the groups weaned at 56 and 84 days could be attributed to reduced milk production which was observed in this breed from the 8th week of lactation (Combellas 1980).In the current study, age at puberty in Chios ram lambs was 35 days earlier than that (334.9 days of age) as reported by Mousa (1991). Also, Salem (1997). found that the average age at puberty of Saidi ram lambs were 369.4 day. In the present study, Chios ram lambs performed their first ejaculation at a slightly older age and the weight was heavier than Rahmani ram lambs. These results were disagreement with those reported by Lysandrides, (1981) who reported that Chios ram lambs seem to be adversely affected by the environment in Upper Egypt, resulting in slower growth rates than those reported in their home country. Similar results were found on sheep where Hassan *et al.* (2002) found that Chios x Ossimi and Chios x Awassi crossbred ram lambs performed their first

ejaculation at a slightly older age and heavier weight than their Awassi and Ossimi parents (P<0.05).

Lambs were weaned at 8 weeks of age attained puberty significantly (P<0.01) earlier than those weaned at 12 or 16 weeks of age (279.3 vs 291.6 or 313 days respectively). These finding were similar to those recorded by Roux *et al.* (1978) who found that early weaning of lambs was not increased the age at puberty, when lambs weaned at 4, 6, 8 and 12 weeks of age.

Testicular measurements developments: The development of testicular length, width, scrotal circumference and volume are presented in Table (2). Chios lambs were significantly larger (P<0.05) right length (RL) than Rahmani lambs at the end of the experimental period (180 and 360 days of age). Whereas, there was no significant difference in right width (RW) among genotypes. Rahmani lambs were significantly larger (P<0.05) left length (LL), left width (LW) and scrotal circumference (SC) than Chios lambs at the beginning of experiment (90 and 120 days of age). Also testicular volume (TV) was relatively heavier in Rahmain lambs than in Chois lambs at one year of age. These data were suggested that from 3 to 6 months of age, lambs were rapid development as determined by increasing in testicular size. The results obtained from data were similar to those reported by Emsen (2005) in Awassi male lambs, who illustrated that crossbred lambs (Awassi x Redkarman) were significantly greater (P<0.05) SC, and relatively larger in TV than purebred lambs. Salem (1997) found that testis length was increased gradually until rams reached puberty in almost one year of age, following this period testis length fluctuated from month to another.

Effect of birth type on the development of testicular length, width, scrotal circumference, and volume relative to body weight are presented in Table (2). No significant differences were observed between means of RL, LW, SC and TV of single–born vs twin-born lambs during the investigated period, except at 189 days of RL and at 360 days of RW. There was a gradual and linear increase in TV from 90 to 360 days of age. However, as a result of loss body weight during twin-born lambs (when animals were 90 and 360 days of age) a slight decrease in all testicular parameters was noticed. A rapid increase in body weight at 180 and 360 days of age compensated for the previous decline in weight and testicular measurements responded accordingly. Increased of testicular length, width and circumference between 90 and 360 days of age were relatively similar to the development of body weight. These results were in agreement with those reported by Salhab

et al. (2001) who reported that type of birth were no significant differences between measurements of the left and right testis, the highest increased in testicular parameters were occurred between 7 and 10 months of age.

Coefficients of correlation among testicular measurements and body weight in growing lambs are presented in Table (3). Live body weight of growing lambs were positively correlated with other testicular parameters (r=0.60-0.85, P<0.01). The highest correlation coefficients calculated were observed between body weight and right length (r= 0.85, P<0.01) as well as left length (r=0.85). Similarly, Foster *et al.* (1989) and Alkass *et al.* (1987) reported high significant correlations, but with lower values, between body weight and testicular parameters. Also, Salhab *et al.* (2002) reported that high significant correlations, between body weight and testicular parameters in Awassi ram lambs.

As shown in Table (3) testicular measurements were positively correlated with each other (r=0.50 - 0.89, P<0.05, P<0.01). However, testicular parameters could provide a useful estimate of testicular growth since its correlations with the other testicular measurements were the highest. Body weight at 180 and 360 days of age was more correlated with testicular measurements than other age (90 and 120 days of age).

These results were in agreement with that reported by Celis *et al.* (1987) and Foster *et al.* (1989) who reported that scrotal circumference could provide a useful estimate of testicular growth since its correlations with other testicular measurements were the highest.

In conclusion, the present study indicated that, Chios lambs were heavier than Rahmani lambs. lambs weaned at 8 week reached puberty earlier 12.3 and 33.7 days than lambs weaned at 12 or 16 weeks, respectively. Birth type had no influence on body weight and testicular measurements. Live body weight of growing lambs were positively correlated with other testicular parameters.

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