

## REPRODUCTIVE DEVELOPMENT OF FARAFRA AND CHIOS LAMBS IN SOUTHERN EGYPT

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### SUMMARY

*Fifty-five pre-puberty Farafra and Chios ewe lambs four months old and weighing (15.7±2.7kg), and thirty Farafra ram lambs 4 months of age and weighing 20.6±1.09 kg were studied. Age and weight at puberty were 269, and 294 days and 30.6 and 34.1 kg for Farafra and Chios ewe lambs, respectively. Ewe lambs born in February reached puberty earlier ( $P < 0.01$ ) by 40days than those born in October. Ewe lambs born in February reached puberty at slightly heavier than October born ones (32.7 vs.32.1 kg). Single and twin ewe lambs exhibited their first oestrus at an average age of 282 and 281 days and body weight 32.6 and 32.1 kg, respectively. First peak of plasma progesterone concentration in Farafra and Chios ewe lambs were at age 244 and 252 days with a body weight of 30.3 and 33.0kg, while in October and February they had 267 and 237 days of age and had 30.7 and 31.50 kg body weight, respectively. Age and weight of Farafra ram lambs at first mounting without erection, at first mounting with erection and at first ejaculation with spermatozoa (puberty) were (216 days & 28.8 kg), (274days & 34.8 kg) and (329 days & 36.2 kg), respectively. Testicular measurements increased gradually from 4 to 16 months of age. Age and body weight of Farafra ram lambs were positively and significantly ( $P < 0.01$ ) correlated with right testis length, left testis length, scrotal circumference and testicular volume ( $r = 0.57$  to  $0.83$ ,  $P < 0.01$ ). Testosterone concentration correlated with Scrotal circumference and age ( $P < 0.05$ ). Also, all semen characteristics were improved as age advanced.*

**Keywords:** *Farafra, Chios, puberty, progesterone, testosterone, semen*

### INTRODUCTION

Puberty can be defined as the age and live weight at which animals are able to reproduce in other words, that they are able either to fertilize a female after mating (male puberty) or to be fertilized during estrous behavior and conduct a pregnancy until term (female puberty). In both sexes puberty is generally preceded by a period of a few weeks, called pre-puberal period, during which an external cue is able induce the appearance of puberty. The onset of puberty is generally dependent on both age and live weight (Chemineau *et al.*, 1991). The objective of the present study was to determine age and weight at puberty for Farafra and Chios ewe lambs and Farafra ram lambs under research station conditions Upper (Southern) Egypt.

## MATERIALS AND METHODS

The present study was carried out at Mallawi Animal Production Research Station south of Cairo Animal Production Research Institute (APRI). Chios flock was imported from Greece by the Ministry of Agriculture in 1986. Chios sheep are dual-purpose animals characterized by early sexual maturity, high prolificacy, high fertility and good milk production (Hatziminaoglou *et al.*, 1996). Farafra flock was introduced to Mallawi Research Station in 1992. Farafra is a local sheep dominant in El-Farafra Oasis of the Egyptian western desert, New Valley. Hamdon (1996) and Galal *et al.* (2002) give description of this breed.

Fifty-five pre-pubertal Farafra and Chios ewe lambs born in October 2002 and February 2003 were included in this study. The experiment was initiated as ewe lambs reached four months of age and weighing  $15.56 \pm 2.71$  kg. They were fed concentrate mixture and wheat straw throughout the experimental period according to APRI (2000) recommendations. Lambs were weighed every two weeks. Blood samples were collected from jugular vein puncture into heparinized 5 ml evacuated tubes of 15 (10 Farafra & 5 Chios) before offering feed or water twice weekly. Samples were centrifuged for 15 minutes at 3000 rpm for plasma separation and stored at  $-20^{\circ}\text{C}$  for hormone determination. Quantitative determination of progesterone in plasma samples was carried out using progesterone radioimmunoassay (RIA) kit. The concentration of plasma progesterone was used to detect the onset of puberty (first ovulation) as described by Fitzgerald *et al.* (1982).

A young active teaser ram was introduced for 30 minutes twice daily (8 am and 4 pm) to detect heat signs, the ewe lamb that still stood and allowed the teaser to mount her is considered to be in heat. At the first estrus the ewe lamb is considered at puberty, age and body weight were recorded. At 11 months of age, the ewe lambs were joined by one fertile ram of each breed. Ewe reproductive performance and the lamb production traits were recorded at first lambing.

Thirty Farafra ram lambs averaged ( $20.56 \pm 1.09$ ) kg initial live body weight and 4 months till 16 months of final age were used. All animals were subjected to observation in order to detect changes in sexual behavior daily between 8–9 am from the beginning of the experiment till the occurrence of puberty (1<sup>st</sup> successful ejaculation with motile sperm).

Libido test for each animal was measured by introducing ram lambs to a randomly selected teaser ewe. Ewe was restrained in collection crate in a  $3\text{m} \times 5\text{m}$  indoor pen. All ram lambs were allowed to go out the collection area without restraint to observe the sexual activity toward the ewe and considering the following criteria: first mounting, first mounting with erection (first penile protrusion) and puberty (age at first collected ejaculate containing motile sperm). Following first mounting with erection, ram lambs were trained for semen collection using an artificial vagina. During semen collection, the ram lamb was stimulated sexually either by running it from its pen to the collection area or by allowing it to mount the ewe.

Body weight and testis measurements (scrotal circumference, testis length and volume of water they replaced, Salhab, *et al.*, 2001) were recorded monthly during the course of the study.

### *Semen collection and analysis*

During semen collection, the ram lambs were sexually stimulated, by running from their pens to the collection area or by allowing them to mount the ewe. After puberty or the stage at which ram lamb ejaculation had motile sperm, semen was collected by an artificial vagina once every two weeks. Immediately after ejaculation, semen samples were placed in water bath at 37°C. Semen was evaluated (volume-mass movement, PH, sperm concentration, live and dead sperm and abnormal spermatozoa).

Blood samples were monthly collected at age from 4-16 months, at first mounting, first mounting with erection and puberty. Direct radioimmunoassay technique was conducted for plasma testosterone level determination using testosterone RIA, DSL- 4000 KIT, UK. Data were analyzed statistically using the General Linear Model (GLM) procedure, Least-Squares Means Method (LSM), (SAS, 1995) and Duncan's multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

The onset of puberty in ewe lambs is influenced by genetic and environmental factors such as breed, time of birth and the nutritional planes (Jainudeen and Hafez, 1993).

### *1. Puberty of ewe lambs*

**1.1. Breed effects:** Least-squares means of age and weight at puberty were 269 day and 30.6 kg, in Farafra ewe lambs, while they were 294 days and 34.1 kg, in Chios ewe lambs (Table, 1). Breed has significant effect ( $P<0.05$ ) on age at puberty, but a highly significant effect ( $P<0.01$ ) on body weight at puberty. Farafra ewe lambs reached puberty at average of 24.4 days younger and 3.3 kg lighter body weight than Chios. Results also showed the Farafra ewe lambs reached puberty earlier and had lighter body weight at puberty than other Egyptian breeds of sheep, where age and body weight at puberty were in both Ossimi (356.1 days and 34.2 kg) and Saidi ewe lambs (385 days and 34.7 kg) according to El-Hommosi and Abd El-Hafiz (1982). In addition, Mousa (1991) recorded that age and body weight at puberty, were 288.2 days and 33.3 kg in Ossimi.

**Table 1. Least-squares means ( $\pm$ SE) of age and body weight at puberty in Farafra and Chios ewe lambs**

Items	No.	LSM $\pm$ SE	
		Age (day)	Body weight (kg)
Overall mean	55	279 $\pm$ 34.54	31.4 $\pm$ 3.97
Breed		*	**
Farafra	44	269 $\pm$ 6.19	30.6 $\pm$ 0.71
Chios	11	294 $\pm$ 10.99	34.1 $\pm$ 1.26
Season of birth		**	
October	34	302 $\pm$ 7.79	32.1 $\pm$ 0.89
February	21	261 $\pm$ 8.75	32.7 $\pm$ 1.01
Type of birth			
Single	41	282 $\pm$ 6.31	32.6 $\pm$ 0.72
Twins	14	281 $\pm$ 10.29	32.1 $\pm$ 1.18

\* Significant ( $p<0.05$ ), \*\* Significant ( $p<0.01$ )

The first peak of plasma progesterone hormone levels was at 244.10 and 252.20 days of age for Farafra and Chios ewe lambs, respectively (Table 2). The differences between age at puberty estimated by observed estrus signs (269.30 and 293.67 days, Table, 1) and the rise in plasma progesterone hormone levels were 25.2 and 41.47 days for Farafra and Chios ewe lambs, respectively. Chemineau *et al.* (1991) attributed such differences to the ewe lamb's initial silent ovulation (i.e. an ovulation without associated oestrous behavior), followed by a short lifespan corpus luteum (CL). Initial oestrous behavior is observed only when the associated ovulation is preceded by a luteal phase of normal duration.

**Table 2. Means ( $\pm$ SE) of plasma progesterone concentrations (ng/ml), age (days) and body weight (kg) at first progesterone peak in Farafra and Chios ewe lambs**

Items	Mean concentration	First peak concentration	Range	Age (days)	Body weight (Kg)
Breed					
Farafra	1.183 $\pm$ 0.10	3.12 $\pm$ 0.64	0.064 - 8.759	244.10 $\pm$ 9.33	30.33 $\pm$ 0.82
Chios	1.051 $\pm$ 0.13	3.01 $\pm$ 1.08	0.056 - 9.214	252.20 $\pm$ 4.14	33.00 $\pm$ 1.24
<b>Season of birth</b>					
October	0.818 $\pm$ 0.12	3.08 $\pm$ 0.74	0.069 - 8.611	266.80 $\pm$ 11.39	30.66 $\pm$ 1.47
February	1.299 $\pm$ 0.10	3.08 $\pm$ 0.74	0.056 - 9.214	236.80 $\pm$ 5.58	31.50 $\pm$ 0.88

**1.2. Season of birth:** Ewe lambs born in February reached puberty earlier by 40.37 days than those born in October ( $P < 0.01$ ). Ewe lambs born in February were slightly heavier at puberty than October born ones (32.66 vs. 32.10 kg), but the difference was not significant (Table, 1). Aboul-Naga *et al.* (1982) found that ewe lambs born in spring reached puberty earlier than those born in autumn, as well as, spring born ewe lambs were heavier at puberty than autumn born ones, but the difference was not significant. The earlier puberal age of February born lambs may be due to climatic conditions (temperature and photoperiodicity) and nutritional differences from season to another. Also, Fitzgerald (1981) reported that puberty in ewe lambs may be delayed by the indirect effect of high temperature on the endocrine balance.

**1.3. Type of birth:** Singles and twins ewe lambs exhibited their first oestrous at an average age of 282.08 and 280.86 days. However, body weight at puberty was 32.64 and 32.12 kg for single and twin ewe lambs, respectively. Type of birth had no significant effect on both age and weight at puberty (Table, 1). This could be attributed to little variation in body weight between single and twin ewe lambs during experimental period. These observations are in agreement with the findings of Mousa (1991) that it had no significant effect on both pubertal age and weight. However, Younis *et al.* (1978) found a significant difference between singles and twins in age and body weight at puberty in Awassi ewes.

## **2. Reproductive performance of ram lambs**

**2.1. Sexual behavior development:** The average age and weight (Table, 3) of Farafra ram lambs at first mounting without erection, at first mounting with erection and at first ejaculation with spermatozoa (puberty) were (215.80 days & 28.76 kg), (274.35 days & 34.76 kg) and (329.17 days & 36.19 kg), respectively. Mohamed

1998) found that average age and weight of Ossimi ram lambs at first mounting without erection, at first mounting with erection and at first ejaculation with spermatozoa (puberty) were (242 days & 29.5 kg), (289 days & 33.2 kg) and (330 days & 38 kg), respectively. When, age and weight at puberty of Farafra ram lambs are compared with other Egyptian breeds or with Chios breed, Mousa (1991) reported that the average age at puberty for Ossimi and Chios were 296.8 and 334.9 days, respectively. This indicates that Farafra ram lambs are earlier (329.17days) in reaching puberty than Chios. Also, Salem (1997) found that the average of age and weight of Saidi ram lambs at puberty were 369.43 days and 38.30kg, respectively. This indicates that Farafra ram lambs are earlier at puberty age than Saidi by 40.26 days and reached puberty by 2.11kg lighter body weight.

**Table 3. Mean ( $\pm$ SE) of pre-pubertal characters of reproductive traits of Farafra ram lambs**

Measurements	1 <sup>st</sup> mounting	1 <sup>st</sup> mounting with erection	1 <sup>st</sup> ejaculation (puberty)
Age, days	215.80 $\pm$ 8.47 <sup>c</sup>	274.35 $\pm$ 7.86 <sup>b</sup>	329.17 $\pm$ 5.86 <sup>a</sup>
Body weight, kg	28.76 $\pm$ 1.58 <sup>b</sup>	34.76 $\pm$ 1.77 <sup>a</sup>	36.19 $\pm$ 1.12 <sup>a</sup>
Right testis length, cm	7.20 $\pm$ 0.56 <sup>a</sup>	7.35 $\pm$ 0.23 <sup>a</sup>	7.51 $\pm$ 0.17 <sup>a</sup>
Left testis length, cm	7.10 $\pm$ 0.56 <sup>b</sup>	8.26 $\pm$ 0.29 <sup>a</sup>	8.09 $\pm$ 0.17 <sup>a</sup>
Scrotal circumference, cm	21.12 $\pm$ 1.24 <sup>b</sup>	23.76 $\pm$ 0.76 <sup>a</sup>	25.40 $\pm$ 0.44 <sup>a</sup>
Testicular volume, ml	174.50 $\pm$ 16.80 <sup>b</sup>	196.41 $\pm$ 21.43 <sup>ab</sup>	232.83 $\pm$ 13.99 <sup>a</sup>
Testosterone Conc., ng/ml	1.77 $\pm$ 0.60 <sup>b</sup>	1.85 $\pm$ 0.74 <sup>b</sup>	5.83 $\pm$ 0.98 <sup>a</sup>

a, b, c means with different letters on the same row different at ( $p < 0.05$ )

**2.2. Testicular measurements development:** Table (3) indicates that the maximum values of right testis length, left testis length, scrotal circumferences and testicular volume were obtained at first mounting without erection. These values were higher than those recorded by Ali and El-Saidy (2003) who indicated that the averages of scrotal circumference of  $\frac{1}{2}$  Rahmani x  $\frac{1}{2}$  Romanove ram lambs increased from 12.6 cm at first mounting to 14.00 cm at first mounting with erection to 19.4 cm at first ejaculation (puberty). Also, Salem (1997) found that, when Saidi ram lambs reached puberty testis length range was 11.2-11.6 cm for right testis and was 11.0-11.5 cm for left testis and scrotal circumference was 32.9 cm during puberty.

Data in Table (4) show that body weight and testis length increased gradually from 4 to 16 months of age. Values that recorded were 3.58 cm for right testis and 4.35 cm for left testis at fourth month of age, and were 8.91 cm for right testis and 9.46 cm for left testis at 16 month of age. When Farafra ram lambs reached puberty at age 329.17 days with average body weight 36.19 kg, right testis length was 7.51 cm and left testis length was 8.09 cm (Table, 3). Hence, puberty could be predicted as testis length ranged from 7.00-8.00 cm. On the other hand, left testis length was slightly longer than right testis throughout the course of the study. Also, Salem (1997) found that testis length increased gradually until rams reached puberty in almost one year of age, following this period testis length fluctuated from month to another.

Data in Tables (3 & 4) show that the scrotal circumference increased gradually from the beginning of the study until reached 25.40 cm (at puberty). Following this

period, the scrotal circumference fluctuated from month to another until reached 28.93 cm at 16 month of age. So, scrotal circumference can be utilized also for detecting puberty in Farafra ram lambs.

Results in this study agreement with Mukasa and Ezaz (1992) that scrotal circumference of a ram has increased gradually with advancing age and body weight. They indicated also that scrotal circumference at puberty of rams reached  $21.5 \pm 0.3$  cm. Also, Salem (1997) reported that scrotal circumference of Egyptian Saidi rams increased moderately from month to another until reached  $32.90 \pm 0.67$  cm (during puberty). Following this period, the scrotal circumference fluctuated from month to another until reached 39.23 – 39.85 cm, but the overall mean of scrotal circumference values throughout the course of the study was 26.49 cm. Recently, Ozturk *et al.* (2002) studied the biometry of testicular growth and live body weight of Konya Merino (KM), Akkaraman (AK) and Awassi (AW) ram lambs for each month from 3 to 14 months of age. They recorded that live body weights and scrotal circumferences were (17.95-48.08 kg) and (9.7-27.92 cm) for KM, (17.88-42.23 kg) and (9.38- 26.60 cm) for AK and (19.00-48.21 kg) and (10.22-29.49 cm) for AW, at third and 14<sup>th</sup> month of age, respectively.

**Table 4. Means  $\pm$ SE of testicular measurements, testosterone hormone level and body weight of Farafra ram lambs from 4 to 16 months**

Age, mo.	Mean $\pm$ SE					
	BW, kg	RTL, cm	LTL, cm	SC, cm	TV, ml	TES, ng/ml
4	20.56 $\pm$ 1.09	3.58 $\pm$ 0.15	4.35 $\pm$ 0.35	15.36 $\pm$ 1.57	71.84 $\pm$ 8.32	0.61 $\pm$ 0.20
5	23.60 $\pm$ 0.32	5.44 $\pm$ 0.29	5.71 $\pm$ 0.30	15.61 $\pm$ 0.55	91.43 $\pm$ 6.95	2.02 $\pm$ 0.55
6	27.19 $\pm$ 1.07	5.86 $\pm$ 0.25	6.42 $\pm$ 0.28	16.31 $\pm$ 1.02	127.63 $\pm$ 12.28	2.05 $\pm$ 0.73
7	26.40 $\pm$ 0.92	6.47 $\pm$ 0.35	6.46 $\pm$ 0.36	17.21 $\pm$ 0.71	100.07 $\pm$ 6.15	2.42 $\pm$ 0.62
8	29.21 $\pm$ 1.03	6.88 $\pm$ 0.24	6.90 $\pm$ 0.20	21.14 $\pm$ 0.54	117.33 $\pm$ 11.06	2.74 $\pm$ 0.56
9	32.08 $\pm$ 1.09	6.79 $\pm$ 0.19	7.33 $\pm$ 0.21	22.78 $\pm$ 0.49	148.67 $\pm$ 14.50	3.31 $\pm$ 0.69
10	36.99 $\pm$ 1.15	7.51 $\pm$ 0.20	8.10 $\pm$ 0.17	25.30 $\pm$ 0.43	218.83 $\pm$ 10.08	2.19 $\pm$ 0.66
11	35.13 $\pm$ 1.06	7.73 $\pm$ 0.17	8.03 $\pm$ 0.16	25.67 $\pm$ 0.42	224.83 $\pm$ 16.40	7.05 $\pm$ 2.07
12	39.47 $\pm$ 1.13	8.10 $\pm$ 0.14	8.54 $\pm$ 0.13	26.02 $\pm$ 0.34	243.17 $\pm$ 11.51	2.13 $\pm$ 0.81
13	43.28 $\pm$ 1.21	8.18 $\pm$ 0.15	8.63 $\pm$ 0.18	25.88 $\pm$ 0.34	216.00 $\pm$ 14.79	2.33 $\pm$ 1.04
14	44.05 $\pm$ 1.27	8.15 $\pm$ 0.17	8.82 $\pm$ 0.14	26.47 $\pm$ 0.35	250.17 $\pm$ 16.71	2.41 $\pm$ 1.12
15	49.16 $\pm$ 1.46	8.61 $\pm$ 0.15	9.06 $\pm$ 0.13	27.73 $\pm$ 0.38	244.17 $\pm$ 13.63	5.02 $\pm$ 1.46
16	50.18 $\pm$ 1.59	8.91 $\pm$ 0.19	9.46 $\pm$ 0.14	28.93 $\pm$ 0.41	278.17 $\pm$ 15.74	2.40 $\pm$ 0.57

BW = Body weight, RTL= Right testis length, LTL= Left testis length, SC = Scrotal circumference,

TV= Testicular volume, TES= Testosterone conc.

The development of testicular volume had a gradual and linear increase from 4 to 16 months of age and relatively related to body weight. After reaching puberty, the testicular volume fluctuated from month to another until reached 278.17 ml at 16<sup>th</sup> month (Table, 4). Testicular volume was 232 ml at first ejaculation (puberty) in Farafra ram lambs (Table, 3). In the present study, testicular volume values were lower than those reported by Salhab *et al.* (2001) that the development of testicular

volume was of a gradual and linear increase from 3 to 17 month of age in growing Awassi ram lambs.

Table (5) shows that, age and body weight of Farafra ram lambs were positively and significantly ( $P < 0.01$ ) correlated with RTL, LTL, SC and TV ( $r = 0.57$  to  $0.83$ ,  $P < 0.01$ ). Moreover, body weight of Farafra ram lambs was more correlated with the various testicular measurements than did the age ( $r = 0.65 - 0.83$  vs.  $0.57-0.78$ ). So, SC could provide a useful estimate of testicular growth since its correlation coefficient with the other testicular measurements were the highest. These results were in agreement with finding of Salhab *et al.* (2001). On the other hand, there were nonsignificant positive correlation coefficients between testosterone hormone level and BW, RTL, LTL and TV, but positively and significantly ( $P < 0.05$ ) correlated with age and scrotal circumference ( $r = 0.24-0.25$ ,  $P < 0.05$ ). In this respect, Salhab *et al.* (2001) found that age and body weight of Awassi ram lambs were positively and significantly ( $P < 0.01$ ) correlated with testicular circumference, testicular length and testicular volume ( $r = 0.51-0.91$ ).

**Table 5. Correlation coefficients (r) of body weight, age, testosterone concentration and testicular measurements of Farafra ram lambs**

Items	Age	RTL	LTL	SC	TV	TES
BW	0.822**	0.646**	0.665**	0.826**	0.758**	0.127
Age		0.571**	0.609**	0.781**	0.675**	0.244*
RTL			0.905**	0.625**	0.520**	0.156
LTL				0.699**	0.535**	0.224
SC					0.673**	0.249*
TV						0.126

\* Significant at ( $p < 0.05$ ), \*\* Significant at ( $p < 0.01$ )

BW = Body weight, kg - RTL= Right testis length, cm - LTL= Left testis length, cm - SC = Scrotal circumference, cm - TV= Testicular volume, ml - TES= Testosterone conc., ng/ml

However, body weight was more highly correlated with testicular measurements than age. Also, Mahmoud (2002) found that correlation between Bw and RTL, LTL and SC were highly significant ( $P < 0.01$ ) and low correlations coefficients ( $r = 0.34-0.54$ ) between BW and testis measurements. On the other hand, Ozturk *et al.* (2002) noticed that age and live weight were positively correlated with testicular measurements ( $P < 0.01$ ) and high correlation coefficients were found ( $r = 0.941-0.981$ ) between live weight and testis measurements.

**2.3. Testosterone hormone level:** Tables (3 & 4) showed that the means of most values of plasma testosterone hormone level of Farafra ram lambs increased gradually with advancing age until attaining puberty (5.83 ng/ml), then after reaching puberty, plasma testosterone hormone level decreased and fluctuated from month to another. Testosterone hormone level trend was similar to those results obtained by Miller *et al.* (1989) that serum testosterone levels increased gradually in ram lambs at 24-30 weeks of age. They also indicated that average testosterone concentration determined in 12, 18, 24 and 30 weeks of age were 1.46, 2.56, 5.31 and 7.44 ng/ml in

blood serum, respectively. Salem (1997) reported that testosterone levels increased in amplitude and frequency with advancing age until reached 3.48 ng/ml blood serum at 375 days of age (puberty). He added that after puberty, blood serum testosterone increased and fluctuated in the range between 1.12 and 2.48 ng/ml blood serum until reached 3.65 ng/ml blood serum.

Table (3) indicates that testosterone hormone level was significantly different ( $P < 0.05$ ) among puberty stage and each of 1<sup>st</sup> mounting and 1<sup>st</sup> mounting with reaction stages. Testosterone hormone level may be used in the prediction of pubertal age Miller *et al.* (1989). The hormone level was 5.23 ng/ml blood plasma in Farafra ram lambs at puberty. Moreover, Table (5) shows that there were significant positive correlation coefficients between testosterone hormone level and either age or scrotal circumference. These results attributed to the anatomical development of the organs, age and testis size are directly dependent on the testosterone secretion released from the testis.

**2.4. Semen Physical Characteristics:** Semen physical properties at puberty were studied at first ejaculation and every two weeks post-puberty. Data of the semen physical properties are presented in Table (6). All semen characteristics were improved as age advanced. These findings are in agreement with El-Shamaa (2002) and Ali and El-Saidy (2003). Generally, the high semen quality is mainly related to the increase in age, body weight and consequently in testicular size and function, in addition to the complete development of hypothalam-hypophysial testicular axis as well as the other endocrine glands which may directly or indirectly influence male reproductive functions (Mousa, 1991).

**Table 6. Mean  $\pm$ SE of semen physical characteristics at puberty and every two weeks post-pubertal**

Characteristics	Ejaculate Volume (ml)	pH	Mass motility	Sperm conc. ( $\times 10^9$ /ml)	Total sperm ( $\times 10^9$ /ejaculate)	Live sperm (%)	Abnormal sperm (%)
At puberty	0.46 $\pm$ 0.04	7.33 $\pm$ 0.11	2.52 $\pm$ 0.12	0.78 $\pm$ 0.06	0.34 $\pm$ 0.03	33.52 $\pm$ 2.32	18.83 $\pm$ 1.59
2-wks	0.62 $\pm$ 0.05	7.37 $\pm$ 0.08	3.09 $\pm$ 0.18	1.58 $\pm$ 0.15	0.98 $\pm$ 0.13	43.18 $\pm$ 3.07	14.09 $\pm$ 1.73
4-wks	0.64 $\pm$ 0.05	7.30 $\pm$ 0.11	3.68 $\pm$ 0.15	2.39 $\pm$ 0.21	1.59 $\pm$ 0.24	52.00 $\pm$ 2.57	10.50 $\pm$ 0.50
6-wks	0.70 $\pm$ 0.05	7.25 $\pm$ 0.09	3.82 $\pm$ 0.17	2.95 $\pm$ 0.19	2.10 $\pm$ 0.21	58.40 $\pm$ 2.30	10.80 $\pm$ 1.23
8-wks	0.74 $\pm$ 0.06	7.17 $\pm$ 0.08	3.81 $\pm$ 0.15	3.04 $\pm$ 0.25	2.28 $\pm$ 0.25	65.10 $\pm$ 1.51	10.20 $\pm$ 0.47
10-wks	0.84 $\pm$ 0.09	7.17 $\pm$ 0.09	3.67 $\pm$ 0.13	2.94 $\pm$ 0.14	2.39 $\pm$ 0.29	67.60 $\pm$ 1.62	10.40 $\pm$ 1.38
12-wks	0.70 $\pm$ 0.05	6.80 $\pm$ 0.11	3.65 $\pm$ 0.13	3.19 $\pm$ 0.23	2.20 $\pm$ 0.21	75.00 $\pm$ 1.59	9.60 $\pm$ 1.36
14-wks	0.77 $\pm$ 0.06	6.61 $\pm$ 0.05	4.32 $\pm$ 0.15	3.55 $\pm$ 0.20	2.83 $\pm$ 0.31	73.70 $\pm$ 1.41	8.70 $\pm$ 1.23
16-wks	0.89 $\pm$ 0.07	6.53 $\pm$ 0.03	4.53 $\pm$ 0.17	3.59 $\pm$ 0.15	3.15 $\pm$ 0.20	77.10 $\pm$ 0.99	8.30 $\pm$ 0.95
Overall mean	0.70 $\pm$ 0.26	7.08 $\pm$ 0.41	3.63 $\pm$ 0.70	2.61 $\pm$ 0.82	1.92 $\pm$ 0.99	57.07 $\pm$ 7.38	12.24 $\pm$ 4.99

Thus, Farafra ewe lambs can be housed separately and bred early with Farafra male lambs to have a prolonged production and reproduction periods. Since, Farafra ewe lambs are characterized by reaching puberty earlier by one month than Chios ones and lighter 3 kg. So, they can be bred at 9 months with weight of 30 kg. Also, they are earlier than other studied Egyptian local ones such as Ossimi (Mousa, 1991) Saidi (El-Hommosi and Abdel Hafez, 1982) Rahmani (Aboul-Naga, 1982) and ½ Chios X ½ Ossimi (Hayder, 2004). Also, Farafra ram lambs exhibited puberty at 329 days weighing 36 Kg and reached 39 Kg at 12 months, therefore, they can breed ewes. While, Chios ram lambs (Mousa, 1991), under the same station conditions, were similar in age and weight as Farafra. But, Farafra ram lambs are earlier than studied



Saidi in reaching puberty (El-Tawel, 1980 and Salem, 1997) and Ossimi (Mohamed, 1998)

Also, plasma progesterone concentration can be used to detect the onset of puberty (Fitzgerald *et al*, 1982). Testicular measurements (SC) can be also applied for Farafra ram lambs to help in detecting puberty.

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## التطور التناسلي لحملان الفرافرة و الكيوس فى مصر العليا

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أجريت هذه الدراسة فى محطة بحوث الإنتاج الحيوانى بملوى التابعة لمعهد بحوث الإنتاج الحيوانى. تم استخدام عدد 55 حولية فرافرة و كيوس عمر 4 شهور و وزن  $15.6 \pm 2.71$  كجم، و 30 حولى فرافرة عمر (4 شهور)، و وزن  $20.6 \pm 1.09$  كجم. كان عمر و وزن البلوغ الجنسى لحوليات الفرافرة (269 يوم - 30.6 كجم) أقل من حوليات الكيوس (294 يوم - 34.1 كجم) وكانت الفروق بين حوليات الفرافرة و الكيوس عالية المعنوية (0.01) فى عمر و وزن البلوغ الجنسى. بلغت الحوليات المولودة فى موسم فبراير مكرراً 40 يوم عن الحوليات المولودة فى موسم أكتوبر ، أيضاً الحوليات المولودة فى موسم فبراير كانت أثقل وزناً (32.7 كجم) عن الحوليات المولودة فى موسم أكتوبر (32.1 كجم). لم تُظهر الحوليات المولودة مفردة فروقا معنوية عن الحوليات المولودة توائم فى عمر و وزن البلوغ الجنسى، وكان أول ارتفاع فى تركيز هرمون البروجيسترون عند 244 و 252 يوماً و وزن الجسم 30.3 و 33.0 كجم فى الفرافره والكيوس على الترتيب . بينما فى أكتوبر وفبراير كانت عند 266 و 237 يوماً ووزن الجسم 30.7 و 31.5 كجم. كان متوسط عمر و وزن حوالى الفرافرة عند أول وثبة بدون انتصاب القضيب ، أول وثبة مع انتصاب القضيب و أول قذفه بها حيوانات منوية حية (البلوغ) كانت (216يوم - 28.8 كجم) ، (274 يوم - 34.8 كجم) ، (329 يوم- 36.2 كجم) على التوالي. وزادت مقاييس الخصية تدريجياً من عمر 4 - 16 شهراً، متوسط طول الخصية اليمنى و اليسرى و محيط كيس الصفن و حجم الخصية يزداد تدريجياً بتقدم العمر ، و تصل هذه المقاييس عند أول قذفه بها حيوانات منوية حية (البلوغ الجنسى) الى 7.71 سم ، 8.09 سم ، 25.40 سم ، 23.2 مل على التوالي. إزداد تركيز متوسط مستوى هرمون التستستيرون فى البلازما تدريجياً بتقدم العمر ، و يصل تركيزه عند البلوغ الجنسى الى (5.83 نانوجرام/مل).