GROWTH PERFORMANCE OF RAHMANI AND OSSIMI LAMB BREEDS FROM BIRTH TO 12 MONTH OF AGE

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SUMMARY

The aim of this study was to describe the growth performance of Rahmani and Ossimi lamb breeds through their 1ˢᵗ year of age. Ten newborn male lambs of each breed were allowed to suckle their dams for four months before being fed their regular ration. Lambs were fed on concentrate feed mixture in addition to Egyptian clover or its hay according to their live body weight (BW). Mineral blocks and clean water were made available throughout the daytime. Lambs were kept loose in semi shaded open yards and weighed monthly throughout the experimental period (360 day). Simultaneously to body weighing, blood samples were collected to determine IGF1 concentration in the peripheral blood plasma. Growth curve, relative growth rate (RGR) and average daily gain (ADG) were calculated as growth performance measurements. At days 270 and 360 of age four lambs from each breed were slaughtered to measure carcass characteristics.

Breed had no effect (P>0.05) on the monthly BW and ADG within the experimental period, thus the growth curve was similar in Rahmani and Ossimi sheep. The growth curve had a concave shape up to day 240 of age, before changing to a liner shape through the rest of the experiment. Except the 1ˢᵗ phase of growth curve (birth – day 120) no significant (P< 0.01) difference in ADG was observed between the two breeds in the 2ⁿᵈ (day 120 – 240) and 3ʳᵈ (day 240-360) phases of growth curve. GR showed an opposite trend to the growth curve, with no significant difference between the two studied breeds. Age had a significant effect on slaughter and carcass weights. Slaughter weight increased (P< 0.0003) from 31.1 ± 2.1 kg at day 270 of age to 49.3 ± 2.5 kg at day 360 of age, while carcass weight increased (P > 0.05) by 63.8 % during the same period averaging 15.2 ± 1.4 and 24.9± 1.7 kg for 270 and 360 day of age, respectively. Differences due to age and breed in dressing percentage and separable fat were insignificant. IGF1 concentration was < 500 ng / ml from birth up to day 210 of age in both breeds, afterward IGF1 concentration increased to >500 ng / ml with relative higher concentration in Rahmani than Ossimi.

Keywords: Sheep, daily gain, growth curve, growth rate, carcass characteristics

INTRODUCTION

Sheep population in Egypt is reported to be 5.04 million head contributing in 17 % of local demand of red meat (Ministry of Agriculture Census, 2004). Mutton meat

comes mainly from Rahmani and Ossimi breeds, which represent the majority of local sheep breeds in Egypt. Sheep are usually marketed and slaughtered around 12 months of age in the occasion of religious feasts.

Sex (Aboul-Naga *et al.*, 1980), genotype (Aboul-Naga *et al.*, 1980 and Hassan, 1993), age (Swidan *et al.*, 1979), twining rate (Swidan *et al.*, 1979), level of feeding (Hassan & El-Feel, 1991 and Awadalla *et al.*, 1997), and castration (Darwish *et al.*, 1973) affect the growth patterns and sheep measurements of sheep.

Growth is a complicated process influenced by the balance between cellular growth (hyperplasia and hypertrophy) and fat deposition. Growth hormone is the main hormone affecting muscle fiber development (proliferation and differentiation), however its effect is mediated via insulin like growth factor 1 (IGF1) (Gatford *et al.*, 1996), which controls protein synthesis and protein degradation (Oksbjerg *et al.*, 2004). Several studies were conducted to determine the concentration of IGF1 in growing lambs (up to weaning) (Medrano and Bradford, 1991; Gatford *et al.*, 1996; Gatford *et al.*, 1997, and Whisnant *et al.*, 1997) to provide a physiological interpretation of growth feature.

Many trials were conducted to describe the growth features of Egyptian native sheep breeds in relation to age, with an emphasis on the period of early weaning (from birth to 6-8 weeks of age) (Swidan *et al.*, 1979; and Aboul-Naga *et al.*, 1980) or around the fatting period (from 6-12 months of age) (Hassan & El-Feel, 1991 and Awadalla *et al.*, 1997). Few studies based on record analysis were conducted to draw the growth curve of Barki sheep (Mokhtar *et al.*, 2004 and Salwa Kinawy, 2004) and Rahmani - Romanov crossbred (Elshennawy *et al.*, 2004).

No data are available concerning the description of growth feature and related phenomena of Rahmani and Ossimi sheep breeds within their first 12 months of age in relation to IGF1 concentration, which were the objectives of this study.

MATERIALS AND METHODS

Animals and Management

The present study was carried out in the experimental farm of the Faculty of Agriculture, Cairo University during the period from October 2004 to February 2006. Twenty newborn male lambs of Rahmani and Ossimi (n=10 of each) sheep breeds were used to study the growth performance and its related phenomena during the 1st year of age. Lambs were kept with their dams for four months post-lambing (suckling period) and then after were kept loose in semi-shaded open yards. Lambs were fed according to their group average of live body weight (NRC, 1985) on concentrate feed mixture (55% yellow corn, 20% wheat bran, 10% cottonseed cake, 10% soybean cake, 2% lime stone, 1.5% common salt, 1% minerals mixture, 0.4% sodium bicarbonate and 0.1% AD$_3$E vitamins) in addition to the Egyptian clover (*Trifolium alexandrinum*) during winter and spring or its hay during summer and autumn. Water and mineral blocks were made available all the daytime.

Experimental Procedure

Body weight (BW) was recorded monthly (±3d) starting at one month of age. Lambs were prevented to suckle their dams or fasted for 12 hrs before weighing. Blood samples (5 ml) were collected (in heparinized tubes) once monthly from the

jugular vein after body weighing for determination of insulin like growth factor 1 (IGFl) in peripheral blood plasma. Within 30 min plasma was separated by centrifugation at 3000 rpm. The harvested plasma was kept at - 20° C till the time of assay. At day 270 and 360 of age, three lambs per breed were selected randomly for slaughtering to compare the carcass characteristics of the two studied breeds.

Slaughtering procedure

Lambs were fasted 18 hrs before slaughtering, which was proceeded by the Islamic conventional method. In this method the lambs were slaughtered without stunning and the jugular vines were cut by a sharp knife for complete bleeding. After complete bleeding, carcasses were skinned and eviscerated after removing head and feet. Carcasses were sectioned down through the vertebral column to right and left sides. Carcass length (cm) and Thighbone length (cm) were recorded as indicators of growth. Slaughter wt. (kg), carcass wt (kg), loss (%) due to slaughtering, edible offal (%), non-edible offal (%) and separable fat (%) were recorded as carcass quality measurements.

Insulin Like Growth Factor 1 (IGFl) Determination

The concentration of IGF-1 in blood plasma was assessed by radioimmunoassay (Breier *et al.,* 1991) technique using ready-coated kite (BioSource Europe, Nivelles, Belgium). The standard curve ranged from 0.0 to 5000 ng /ml. Cross reaction of the IGFl antibody was reported to be 100% for IGF-1, 0.7 % for IGF-II, and less than 0.1 % with Insulin and Growth hormones. The intra assay coefficient of variability was 9.2 %.

Experimental Measurements

$$1\text{- Average daily gain (ADG) (g)} = \frac{W_2 - W_1}{30}$$

$$2\text{- Relative growth rate (RGR)} = \frac{W_2 - W_1}{0.5\,(W_2 + W_1)}$$

Where W_1 is the BW at (x) month and W_2 is the weight at the next month

$$3\text{- Dressing (\%)} = \frac{\text{Hot carcass weight (not including fat tail or kidney fat)}}{\text{Live body weight}} \times 100$$

4. Growth curve: The growth curve was drawn using the monthly BW against age (day). The growth period was divided into three phases. Phase 1 (infantile phase) is defined as the period from birth to weaning (day 120 of age), while phase 2 (the exponential phase) is defined as the period from weaning to the expected age of puberty (day 240 of age, Karam, 1957) and phase 3 which is defined as the period from puberty to day 360 of age.

5. Carcass length (cm): the distance between the 1st thoracic vertebra and the 1st caudal vertebra.

Statistical Analysis

Data of growth characteristics were analyzed by the General Linear Model (GLM) procedure using SAS statistical package (SAS, 2000). Duncan's Multiple Range Test was used to compare among means (Duncans, 1955). The following model was used:

$$Yij = \mu + x_i + b\,(w_{ij} - w) + e_{ij} \qquad\qquad (Model\ 1)$$

where:

Y_{ij} = Experimental observation,

μ = Overall mean,

x_i = Effect of breed (i, 1= Rahmani, 2= Ossimi)

b_j = Regression of body weight on birth weight,

w_{ij} = The continuous independent variable for the corresponding Y_{ij} observation

w = Average of birth weight and

e_{ijk} = Random error

Traits of carcass characteristics were analyzed using the following model:

$$Y_{ijk} = \mu + x_i + a_j + (xa)_{ij} + b\,(w_{ij} - w) + e_{ijk} \qquad\qquad (Model\ 2)$$

where:

Y_{ij} = Experimental observation,

μ = Overall mean,

x_i = Effect of breed (i, 1= Rahmani, 2= Ossimi),

a_j = Age at slaughter (j, 1= 270 day , 2= 360 day),

$(xa)_{ij}$ = Interaction effects,

b_j = Regression of body weight on birth weight,

w_{ij} = The continuous independent variable for the corresponding Y_{ij} observation,

w = Average of birth weight and

e_{ijk} = Random error

Regression coefficient was used to smooth the curves of growth curve and growth rate. Liner, logarithmic, polynomial, power, and exponential functions were tested to draw the curves. The growth curve of Rahmani and Ossimi sheep breeds was drawn using the exponential function, while growth rate curve was drawn using power function, since they resulted in the highest accuracy.

RESULTS AND DISCUSSION

1. Growth Performance

1.1. Growth curve

The growth curve, of Rahmani and Ossimi lambs, which had a curvilinear shape, was almost similar in both breeds (Figure 1). The growth curve during the 1st and 2nd phases (up to day 240 of age) had a concave shape, before having a linear shape up to day 360 of age. The obtained accuracy (r^2) of the drawn growth curves of Rahmani and Ossimi lambs were 0.91 and 0.90, respectively.

The obtained growth curve is in consistence with the findings of Elshennawy *et al.* (2004); Mokhtar *et al.* (2004) and Salwa Kenawy (2004) on Barki and Rahmani-Romanov crossbred. They reported that up to 12 months of age the growth curve showed concave shape when Brodey's function was applied.

1.2. Relative growth rate (RGR)

Growth rate curve showed a descending trend during the experimental period, (opposite to growth curve) with no significant difference between the two studied breeds (Table 1 and Figure 2). The predicted curves of the RGR (Figure 2) had an accuracy of 0.74 for the two studied breeds.
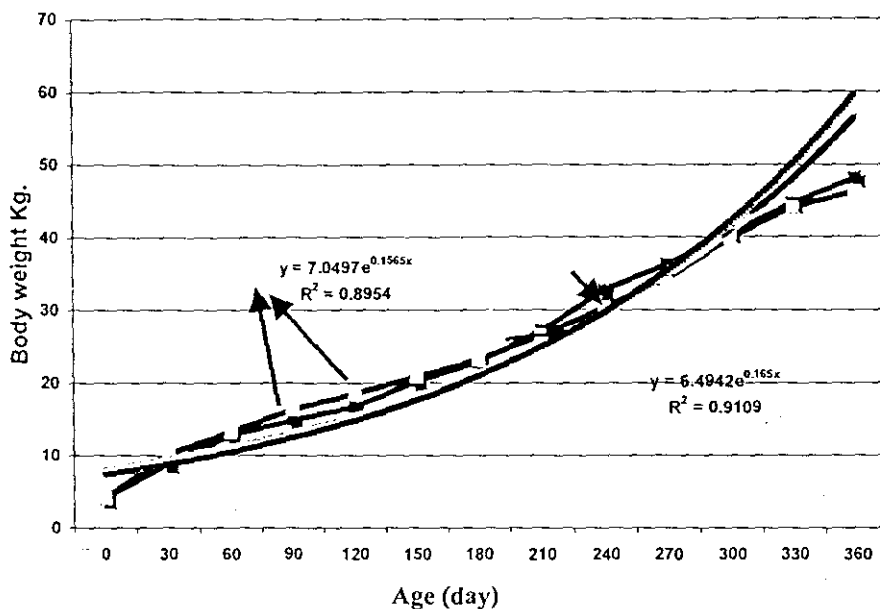

Fig. 1. The actual and predicted growth curve of Rahmani and Ossimi sheep during the first year of age

Table 1. Relative growth rate (LSM ± SE) of Rahmani and Ossimi sheep breeds as affected by age (day)

Age	Sheep Breeds		
	Rahmani	Ossimi	P Value
0 – 30	0. 720 ± 0.047	0.829 ± 0.053	0.15
30 – 60	0.345 ± 0.029	0.261 ± 0.032	0.07
60 – 90	0.159 ± 0.037	0.194 ± 0.037	0.51
90 – 120	0.113 ± 0.018	0.129 ± 0.018	0.53
120 – 150	0.190 ± 0.013	0.116 ± 0.013	0.001
150 – 180	0.120 ± 0.014	0.103 ± 0.014	0.39
180 – 210	0.181 ± 0.026	0.148 ± 0.026	0.38
210 – 240	0.188 ± 0.027	0.144 ± 0.027	0.26
240 – 270	0.097 ± 0.020	0.082 ± 0.021	0.62
270 – 300	0.099 ± 0.026	0.117 ± 0.026	0.63
300 – 330	0.097 ± 0.026	0.111 ± 0.026	0.70
330 - 360	0.087 ± 0.019	0.097 ± 0.021	0.75

Within the 1st phase of growth period (day 0.0-120), the RGR reached its highest value at its end. It obviously clear that at the beginning of the 2nd (day 121-240) and 3rd (day 241-360) phases RGR showed relative increase compared to that of the previous month (Figure 3).

$$y=0.8352x^{-0.909}$$
$$R^2 = 0.7374$$

$$y=0.8824x^{-0.908}$$
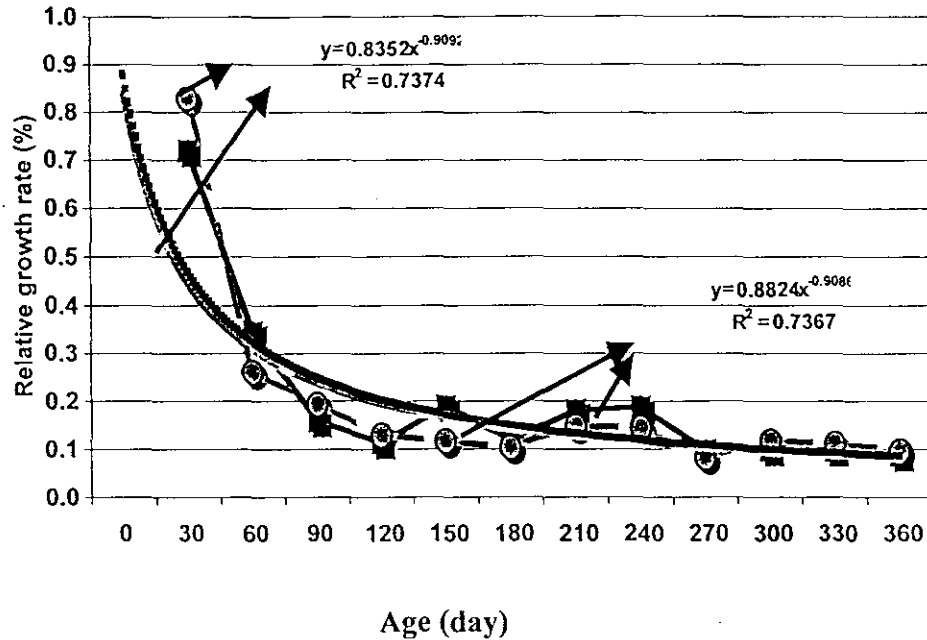$$R^2 = 0.7367$$

Age (day)

Fig. 2. The actual and predicted relative growth rate of Rahmani and Ossimi lambs during the first year of age
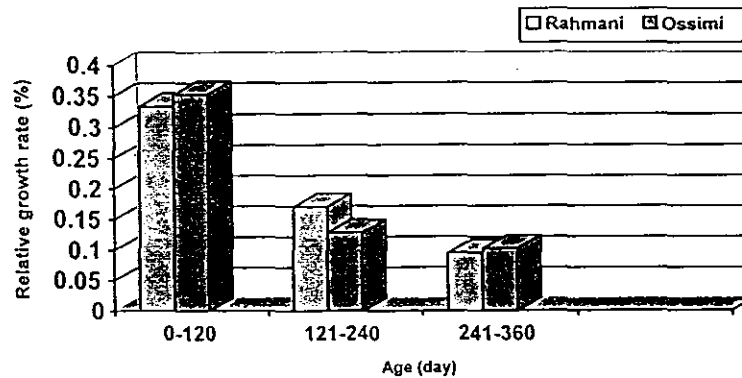
Fig. 3. Average of relative growth rate of Rahmani and Ossimi lambs as affected by age (Phases of growth curve)

The drastic decrease in the relative RGR from 0.720 in the 1st month (30 d) to 0.113 in the 4th (120 d) may be attributed to change from abomasal digestion of milk to ruminal fermentation of roughage (Lawrence and Fowler, 1998). The semi constant RGR during the 2nd phase of the growth curve of the two studied breeds (Table 1) comes in agreement with Lawrence and Fowler (1998) reporting that the period from weaning to puberty is the period of greatest absolute growth rate.

1.3. Body weight (BW)

Up to day 360 of age no significant difference was observed between the two breeds concerning the monthly BW, however, within the first 180 days of age Ossimi lambs showed relatively heavier BW compared to Rahmani. Day 210 of age was the break-even point where the two breeds reached almost the same BW. During the rest of the experimental period (day 240-360) a reverse trend was observed since Rahmani lambs showed higher BW relative to Ossimi ones (Table 2).

Table 2. Average (LSM ± SE) body weight (Kg) of Rahmani and Ossimi sheep breeds as affected by age (day)

Age	Breeds		
	Rahmani	Ossimi	P Value
0	4.13 ± 0.18	4.21 ± 0.18	0.77
30	8.88 ± 0.60	10.31 ± 0.67	0.13
60	12.63 ± 1.03	13.41 ± 1.03	0.59
90	14.76 ± 1.33	16.57 ± 1.33	0.35
120	16.59 ± 1.42	18.69 ± 1.42	0.31
150	20.11 ± 1.76	21.13 ± 1.76	0.69
180	22.69 ± 1.97	23.40 ± 1.97	0.80
210	26.99 ± 1.94	26.76 ± 1.94	0.93
240	32.48 ± 1.84	30.55 ± 1.84	0.47
270	35.92 ± 2.57	34.55 ± 2.72	0.72
300	40.13 ± 3.51	40.12 ± 3.51	0.99
330	44.38 ± 3.51	44. 41 ± 3.51	0.99
360	48.26 ± 3.29	46.16 ± 3.61	0.68

The obtained BW of yearling Ossimi males (46.16 kg) is higher than that reported by Hassan (1993) (40.0 kg). The obtained BW of Rahmani at 360 day of age (47.26 kg) is close to that reported by Awadella *et al.* (1997) (44.8 kg).

1.4. Average daily gain (ADG)

Breed had no effect on the ADG during the experimental period except within the period from day 120 and 150 of age (P < 0.05). ADG showed a descending trend from birth to day 120 of age and afterward within each growth curve phases it showed almost an ascending trend (Table 3).

ADG during the 1st phase of growth curve was higher (P < 0.01) than that of the 2nd and 3rd phases of the growth curve averaging 0.105, 0.133 and 0.130 kg/day for Rahmani and 0.120, 0.098 and 0.134 kg/d for Ossimi, respectively. ADG during the 1st phase was four folds of the ADG during the two rest phases. The overall mean of

ADG within the experimental period was close in the two breeds averaging 0.122 and 0.117 for Rahmani and Ossimi, respectively. The obtained lowest ADG (0.061 and 0.071 kg /day) was recorded during the age of 60-90 day in Rahmani and Ossimi, respectively, while the highest (0.183 kg/d) was during the age of day 210-240 in Rahmani and 0.146 kg / day at the age of day 330-360 in Ossimi.

Table 3. Average (LSM ± SE) daily gain (Kg) of Rahmani and Ossimi sheep breeds as affected by age (day)

Age	Rahmani	Ossimi	P Value
0 – 30	0.159 ± 0.016	0.203 ± 0.018	0.99
30 – 60	0.127 ± 0.015	0.111 ± 0.017	0.51
60 – 90	0.072 ± 0.021	0.104 ± 0.021	0.28
90 – 120	0.061 ± 0.001	0.071 ± 0.001	0.48
120 – 150	0.120 ± 0.012	0.083 ± 0.012	0.05
150 – 180	0.094 ± 0.010	0.078 ± 0.010	0.28
180 – 210	0.134 ± 0.017	0.107 ± 0.017	0.26
210 – 240	0.183 ± 0.020	0.126 ± 0.020	0.07
240 – 270	0.111 ± 0.024	0.100 ± 0.025	0.75
270 – 300	0.124 ± 0.028	0.137 ± 0.026	0.76
300 – 330	0.140 ± 0.032	0.144 ± 0.032	0.76
330 – 360	0.130 ± 0.027	0.146 ± 0.030	0.69
Overall mean	0.122 ± 0.010	0.117 ± 0.010	0.71

In Rahmani, the ADG during suckling period (105 g/ d) is less than that reported by Abbas (1978) (134 g/d) and Swidan et al. (1979) (189 g/d), who applied early weaning regime. The obtained ADG during 2nd half of the experiment (130 - 133 g/day) is also less than that reported by Hassan and El-Feel (1991) (142.2 g/d) and Awadalla et al. (1997) (152.4 g/day).

2. Carcass Characteristics

Age at slaughtering had a significant effect on the most of carcass traits (Table 4). Slaughter and carcass weights were increased by 58 % and 63.8 % when the slaughter age was postponed from 270 to 360 day of age. This increase was accompanied by 10 % increase (P < 0.01) in carcass length and 9.4 % increase in bone length, however the difference was not significant. Except the percentage of loss due to slaughtering (P< 0.05), dressing percentage, edible offal (%), non-edible offal (%) and separable fat (%) the difference between two ages was not significant. Breed has no significant effect on all the studied traits of carcass (Table 4). Moreover, the interaction between age and breed was also insignificant.

The increase in carcass weight by 63.8% when slaughtering was made at day 360 instead of 270 is higher than that reported by Hassan and El-Feel (1991) (8.1%) (Between 10-12 months of age).

Carcass weight at 270 day of age (15.2 kg) is higher than that reported by Darwish et al. (1973) (11.69 kg) and less than that of Hassan and El- Feel (1991) (19.34 kg, at 10 months of age). The reported carcass weight of the Rahmani at 12 months of age by Awadella et al. (1997) (24.5 kg) is close to the finding of the

present study (24.9 kg), which meanwhile, higher than that reported by Hassan and El-Feel (1991) (20.91 kg) on Ossimi breed. Hassan and El-Feel (1991) reported higher increase in dressing percentage (6.7 %) compared to the present finding (2.3%).

Table 4. Carcass characteristics (LSM ± SE) of Rahmani and Ossimi sheep as affected by age (day) and breed

Trait	Age (day)			Breed		
	270	360	P Value	Rahmani	Ossimi	P Value
Carcass length (cm)	65.6± 1.4	72.4± 1.6	0.01	71.3± 1.5	66.7± 1.5	0.06
Thighbone length (cm)	36.2± 1.1	39.6± 1.3	0.07	37.1± 1.2	38.7± 1.2	0.36
Slaughter wt. (kg)	31.1± 2.1	49.3± 2.5	0.0003	42.6± 2.3	37.9± 2.3	0.18
Carcass wt. (kg)	15.2± 1.4	24.9± 1.7	0.002	21.0± 1.6	19.1± 1.6	0.40
Dressing (%)	48.9± 0.9	50.0± 1.1	0.42	49.1± 1.0	49.8± 1.0	0.62
Loss (%) [1]	18.7± 0.8	21.4± 0.9	0.05	20.6± 0.8	19.6± 0.8	0.42
Edible offal (%)	22.7± 0.5	22.3± 0.6	0.61	22.6± 0.6	22.3± 0.6	0.7
Non-edible offal (%)[2]	14.1± 0.3	12.9± 0.4	0.04	13.2± 0.3	13.9± 0.3	0.17
Separable fat[3] (%)	4.7± 0.6	7.3± 0.7	0.03	5.9± 0.7	6.2± 0.9	0.8

[1] Loss due to slaughtering =Blood wt (kg)+Digestive tract content (kg)/Slaughter wt (kg)X100
[2] Weight of pelt + four feet/slaughter wt.X100, [3] Included fat of heart, kidney, menesitric& tail.

3. Concentration of Insulin Like Growth Factor 1 (IGF1)

Insulin Like Growth Factor 1 concentration in the peripheral blood plasma was almost similar in both studied breeds throughout the experimental period (Figure 4). During the 1st and 2nd phases of the growth curve, IGF1 concentration showed fluctuation trend with concentration < 500 ng / ml. With the beginning of the 3rd phase, IGF1 concentration increased to > 500 ng / ml before decreasing again to concentration of < 500 ng/ ml in Rahmani. IGF1 concentration in Rahmani showed relative higher concentration compared to Ossimi. The concentration of IGF1 was > 500 ng / ml from day 270 up to the end of the experimental period (day 360).

No data are available to compare the obtained concentration of IGF1 in relation to age for the Egyptian sheep breeds. The obtained range of IGF1 during the first 4 months of age (105-300 ng/ml) is close to that reported by Medrano and Bradford (1991) (171-206 ng/ ml) measured on randomly selected sheep breed. In general the obtained concentration of IGFI during the 3rd phase of growth curve age of Rahmani and Ossimi breeds is in accordance with Jones and Clemmons (1995) and Oksbjerg et al. (2004) reporting that IGFI increases during adulthood and thereafter till one year old.
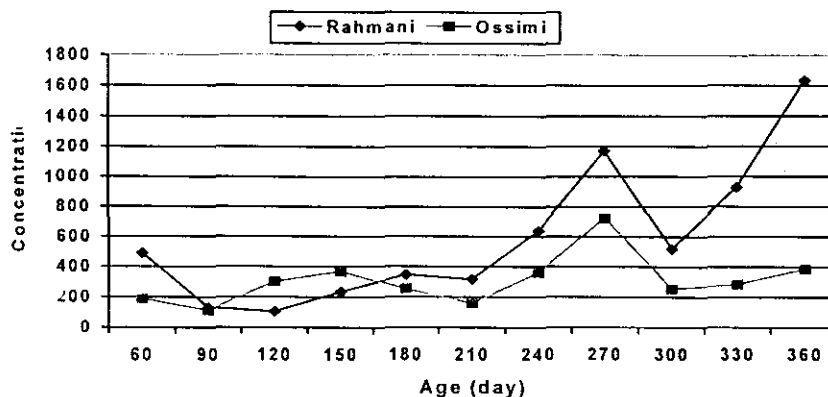
Fig. 4. Concentration (ng/ml) of insulin like growth factor 1 (IGF1) in the peripheral blood plasma of Rahmani and Ossimi sheep breeds as affected by age

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سمات النمو لحملان الرحماني والأوسيمي من الميلاد وحتى عمر 12 شهر

آمال كمال العشيري[1]، ياسين محمد حافظ[1]، محمد عبد العزيز إبراهيم[1]، مرتضى محمد علي[2]، أشرف هشام برقاوي[1]

1- قسم الإنتاج الحيواني، كلية الزراعة، جامعة القاهرة، الجيزة، 2- أكاديمية البحث العلمي والتكنولوجيا، ج. م.ع.

تهدف الدراسة إلى توصيف مظاهر النمو في حملان الأوسيمي والرحماني خلال العام الأول من العمر. تم اختيار عشرة حملان حديثة الولادة من كل نوع وتركت الصغار لترضع أمهاتها طبيعياً لمدة أربعة شهور (عمر الفطام) ، عقب ذلك ربيت الحملان في حظائر شبه مفتوحة وغذيت على مخلوط علف مركز بالإضافة إلى البرسيم المصري أو الدريس على أساس وزن الجسم الحي، أما ماء الشرب والأملاح المعدنية فكانت متاحة على مدار اليوم. تم وزن الحيوانات مرة كل 30 يوم خلال فترة التجربة التي امتدت لمدة عام (360 يوما). تم جمع عينات دم في نفس توقيت الوزن لتقدير تركيز هرمون IGF1 في بلازما الدم المحيطي . تم رسم منحنى النمو ، وحساب معدل النمو النسبي ، ومتوسط الزيادة اليومية في وزن الجسم كمؤشرات للنمو . عند اليوم 270 (حوالي 9 أشهر) ، 360 (حوالي عام) تم ذبح أربع حملان من كل نوع لتقدير مقاييس الذبيحة.

أظهرت النتائج أن النوع لم يكن له تأثير معنوي سواء بالنسبة للأوزان الشهرية أو معدل الزيادة اليومية خلال فترة التجربة. وكان شكل منحنى النمو متشابهاً في كلا النوعين ، وقد اتخذ منحنى النمو الشكل المقعر حتى عمر 240 يوم قبل أن يتغير إلى الشكل الخطي خلال الفترة المتبقية من التجربة. و باستثناء المرحلة الأولى من منحنى النمو (من الميلاد حتى 120 يوم) (P<0.01) لم توجد أي إختلافات معنوية بالنسبة لمقدار الزيادة اليومية خلال الفترة الثانية (من 120 وحتى 240 يوم) أو الفترة الثالثة (من 240 وحتى 360 يوم) من منحنى النمو وذلك في كلا النوعين. أظهر معدل النمو اتجاهاً معاكساً لشكل منحنى النمو ولم تكن الاختلافات معنوية بين النوعين.

كان لعمر الذبح تأثير معنوي على كلٍ من وزن الذبح (P<0.0003) ووزن الذبيحة (P<0.05). زاد وزن الجسم عند الذبح من 31.1± 2.1 كجم على عمر 270 يوم إلى 49.3 ±2.5 كجم على عمر 360 يوم، وكانت الاختلافات معنوية على مستوى أقل من 1 %. أما بالنسبة لوزن الذبيحة فقد ارتفع بمقدار 63.8 % خلال نفس الفترة (من 15.2±1.4 كجم على عمر 270 يوم إلى 24.9±1.7 كجم على عمر 360 يوم).

كانت الاختلافات في نسب التصافي والدهن غير معنوية. أما بالنسبة لتركيز هرمون IGF فقد كان أقل من 500 نانوجرام/ سم[3] من الميلاد وحتى عمر 210 يوم في كلا النوعين ، ثم ارتفع مستواه إلى أعلى من 500 نانوجرام / سم[3] بعد هذا العمر مع زيادة ملحوظة في تركيزه في حملان الرحماني مقارنة بالأوسيمي.