EFFECT OF FEEDING LEVEL ON OVARIAN AND OESTROUS CHARACTERISTICS OF LOCAL (RAHMANI) EWE LAMBS AT PRE- AND POST-PUBERTAL AGES

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ABSTRACT

A total of 36 weaned Rahmani ewe lambs (82.25±1.04 days and 14.42±0.4 kg LBW) was used to study the effect of feeding level on ovarian and oestrous characteristics pre- and post-pubertal ages. The experimental animals were fed 60% concentrate feed mixture and 40% berseem hay and divided into two comparable groups, 18 animals in each. Ewe lambs in 1st group (G1) received 100% of the recommended feed allowance by the NRC (1985) and those in 2nd group (G2) were fed orally 85%. During the experimental period (from weaning up to conception), LBW and age were recorded at puberty (1st oestrus), 1st mating and conception. A laparoscopy technique was individually employed to visualize and examine ovarian characteristics in each group at 7 months of age and about 5 days after mating. Weekly progesterone concentration in blood plasma at 5 weeks pre-puberty and every two days from puberty (1st oestrus) up to 2nd oestrus incidence was determined. The results show that LBW at puberty was heavier (P<0.05) in G1 than in G2 (38.3 vs. 40.5 kg). Numbers of small (SF) and large follicles (LF) as well as numbers of corpora lutea (CLs) and corpus albicans (CA) examined at 7 months of age were greater on ovarian surface of ewe lambs in G1 than in G2 (7.46, 1.53, 0.13 and 0.06 vs. 8.6, 1.93, 0.2 and 0.2/ovary), but the differences were not significant. After mating, number of SF and LF was insignificantly greater in G2 (6.6 and 1.93/ovary) than in G1 (4.9 and 1.53/ovary), respectively, while number of CLs was greater (P<0.05) in G1 than in G2 (1.06 vs. 1.46/ovary).and number of CA was the same in both groups (0.20/ovary). Lambing rate and litter size after the 1st mating was higher in G1 than in G2 (50% and 1.0 vs. 66.6% and 1.08/ewe). More pronounced finding was continuously and higher increase in P4 concentration in plasma during three weeks prior to puberty in G1 than in G2. Nearly similar pattern of change in P4 level during oestrous cycle was observed in both groups. Data divided on the base of precocious and late puberty showed that LBW at puberty was heavier (38.2 vs. 39.9 kg, P<0.05), average age at puberty and 1st mating was earlier (314.2 vs. 344.4 days, P<0.05), duration of the 1st oestrus was shorter (15.6 vs. 22.9 h, P<0.05) and number of CA/ovary was greater (0.06 vs. 0.2/ovary, P<0.05) were higher in preco-

cious than in late puberty group. Lambing rate and litter size after the 1st mating was higher in precocious than in late group (47.6 and 1.0 vs. 60.0% and 1.11). Progesterone level was higher in precocious than in late puberty group in particular during three weeks prior to puberty. Nearly similar pattern of change in both groups was observed during oestrous cycle, but ewes in late group showed slightly higher P4 level during luteal phase (8-14 day) than that in precocious group.

The onset of puberty in local sheep (Rahmani ewe lambs) is affected by several factors, such as age, body weight, ovarian characteristics and progesterone profile preincidence of puberty. Advancing the pubertal age through genetic selection has been successful, but the use of high nutritional level (100% of NRC, 1985) is important to be environmental option that producers may exploit to advance pubertal age.

Keywords: Rahmani, ewe lambs, feeding level, puberty, ovarian characteristics, P4.

الملخص العربى

تأثير مستوى التغذية على خصائص التبويض والشبق فى إناث حملان الرحمانى أثنـاء أعمـار ماقبـل وبعـد البلـوغ

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أستخدم فى هذه الدراسة عدد ٣٦ من إناث الحملان (٢٥ر٨٢ ، ١ر٠٤ يوم ، ٤٢ر١٤ يوم، ٤٢ر١٤ + ٤ر٠كجم) لمعرفة تأثير مستوى التغذية على خصائص التبويض والشبق أثناء أعمار ماقبل وبعد البلوغ الجنسى، غذيت حيوانات التجربة على ٦٠٪ مخلوط علف مركز و٤٠٪ دريس برسيم وتم تقسيمها إلى مجموعتين متماثلتين بكل منها ١٨ من إناث الحملان أعطيت حيوانات المجموعة الأولى ١٠٠٪ من مقرراتها الغذائية أما المجموعة الثانية غذيت على ٨٥٪ من مقرراتها الغذائية خلال فترة التغذية من الفطام وحتى الإخصاب تم تسجيل الوزن الحى للجسم والعمر عند البلوغ (أول شياع)، أول تلقيح وعند الإخصاب.

تم إستخدام الفحص المجهرى فى فحص المبايض فى كل المجموعات التجريبية عند عمر سبعة أشهر من عمر الحملان وكذلك عند ٥ أيام بعد التلقيح، إسبوعياً تم تقدير هرمون البروجيستيرون فى بلازما الدم عند ٥ أسابيع قبل البلوغ وكل يومين عند البلوغ (أول شياع) وحتى حدوث الشياع الثانى أظهرت النتائج التالية :

١- إرتفع الوزن الحى للجسم عند البلوغ معنوياً فى المجموعة الأولى مقارنة بالمجموعة الثانية (٥ر٤٠ مقابل ٣ر٣٨كجم).

٢- عند عمر ٧ أشهر : كانت أعداد الحويصلات الصغيرة والكبيرة وأيضاً أعداد الأجسام الصفراء والبيضاء المقدرة على سطح المبيض أكثر فى المجموعة الأولى عن الثانية (٦ر٨، ٩٣ر١، ٢ر٠ و ٢ر٠ مقابل ٤٦ر٧، ٥٣ر١، ١٣ر٠ و ٠٦ر٠ مبيض)، وكانت هذه الفروق غير معنوية.

٣- بعد التلقيح زاد عدد الحويصلات الصغيرة والكبيرة معنوياً فى المجموعة الثانية عن الأولى (٦ر٦، ١ر٩٣ مبيض) و (٤ر٩، ١ر٥٣ مبيض) بينما زاد عدد الأجسام الصفراء معنوياً فى المجموعة الأولى عن الثانية (١ر٠٦ ، ١ر٤٦ مبيض) وكان عدد الأجسام البيضاء فى المجموعتين متساوى (٠ر٢ مبيض)

٤- ارتفع معدل الولادة وحجم الخلفة بعد التلقيح الأول فى المجموعة الأولى عن الثانية (٦ر٦٦٪، ١ر٠٨ مقابل ٥٠٪، ١ر٠) وزاد مستوى هرمون البروجيستيرون فى بلازما الدم خلال ثلاثة أسابيع قبل البلوغ فى المجموعة الأولى مقارنة بالثانية، ولوحظت نفس التغيرات تقريباً فى مستوى الهرمون خلال دورة الشبق فى المجموعتين.

٥- بعد تقسيم البيانات على حسب عمر البلوغ (مبكر ومتأخر البلوغ) بغض النظر عن مستوى التغذية لوحظ أن الوزن كان أكبر والعمر كان أسرع عند البلوغ الجنسى وعند التلقيح عند مستوى معنوية ٠ر٠٥ وكذلك فترة الشياع الأول كانت أقصر عند مستوى ٠ر٠٥ وأعداد الأجسام البيضاء لكل مبيض كانت أكثر فى النعاج المبكرة عن المتأخرة البلوغ الجنسى، معدل الولادة وحجم الخلفة بعد التلقيح الأول كان مرتفعاً فى الحيوانات مبكرة البلوغ عنها فى متأخرة البلوغ (٦٠٪، ١ر١١ مقابل ٦ر٤٧٪ و ١ر٠) مستوى هرمون البروجيستيرون التغيرات خلال دورة الشبق ولكن النعاج متأخرة البلوغ زاد مستوى الهرمون خلال مرحلة الجسم الأصفر (٨-١٤ يوم) عنها فى النعاج المبكرة.

يتأثر حدوث أول بلوغ فى الأغنام المحلية (إناث الحملان الرحمانى) بعدة عوامل مثل العمر، وزن الجسم، خصائص المبيض ومستوى هرمون البروجيستيرون قبل حدوث البلوغ، ويعتبر تفضيل عمر البلوغ خلال الانتخاب الوراثى من العوامل الناجحة ولذا يعتبر إستخدام المقررات الغذائية العالمية من أهم الإمكانيات البيئية التى تمكن المربى من الاستفادة من البلوغ الجنسى المبكر.

INTRODUCTION

Improving the reproduction of local ewe lambs was thought to be the most important way to attain considerable increase in their lamb production. One of the paths, which can be achieved for improving the production of local sheep, is by starting their productive life as early as possible through early puberty, mating, conception and lambing of ewe lambs.

Use of feeding level in lamb development programs is aimed primarily at achieving the breed specific pubertal weight prior to the breeding season. Although a high level of nutrition will advance puberty and even increase ovulation rate in ewe lambs **(Downing, 1980 and Hamra and Bryant, 1982)**, the feeding of high-energy diets prior to breeding may be associated with an increased incidence of barrenness in ewe lambs, possibly due to over fatness **(Stoerger et al., 1976)**. Level and source of nutrition seems to be the most important factor in determining the age and live body weight at puberty **(Dyrmundsson, 1987)**, so nutritional requirements of local ewe lambs need to be more precisely defined.

Brown et al. (2005), in his study on local ewe lambs found that there were no significant differences in age and body weight at puberty and mating of Rahmani ewe lambs fed on 80 or 100% CP level of **NRC (1985)** recommendations

Therefore, the present study aimed to in-

vestigate the effect of two feeding levels (100% and 85% CP of **NRC, 1985** requirements) on LBW and age at puberty as well as reproductive performance at pre- and post pubertal ages of Rahmani ewe lambs born during summer season.

MATERIALS AND METHODS

This work was conducted at the Animal Production Department, Faculty of Agriculture, Tanta University from August 2006 to September 2007.

Animals:

A total of 36 weaned Rahmani ewe lambs having 82.2±1.04 days of age and weighing 14.42±0.4 kg Live body weight (LBW) was used in this experiment. The experimental ewe lambs were divided into two comparable groups according to live body weight and age, 18 ewe lambs in each. Ewe lambs in both groups were fed on a 60% concentrate mixture (containing 16.25% CP and was composed of yellow corn, 45%; soybean meal, 20%; wheat bran, 15%, rice Polish, 12%; molasses, 5%; limestone, 2% and salt, 1%) and 40% Egyptian berseem hay (14% CP, 3rd cut).

Ewe lambs in the first group received only 85% of **NRC (1985)** daily feed allowance based on live body weight, while those in the second group were fed 100% of **NRC (1985)**. Amount of rations were adjusted every two weeks according to LBW changes from weaning up to conception.

Data recorded:

Live body weigh and age:

Live body weight at birth was recorded, and throughout the experimental period, ewe lambs were weighed morning before feeding and watering at the beginning of the experiment (weaning), at puberty and first mating. Also, age at puberty (first oestrus), first mating and conception (bases on lambing rate) was recorded.

Oestrus detection and puberty incidence:

At 7 months of age, teaser ram was daily introduced to the ewe lambs of each group, three times/day at 8:00, 12:00, 16:00 and 18:00 for 20 minutes/occasion, to detect the ewes at the onset of the 1st oestrus. Ewe lambs being receptive for teaser and stood for mounting by the teaser were to be in first oestrus and such trend was used as an indicator for the onset of puberty, then age at puberty was recorded.

Laparoscopic examination:

A laparoscopy technique (Walf/8933/7mm, USA) was individually employed to visualize and examine ovarian characteristics in each group at 7 months of age and about five days after mating. Ewe lambs were fasted for feeds and water for 24h prior to laparoscopic examination. At laparoscopic examination, number of corpora lutea, small ovarian follicles (≤2 mm in diameter) and large ones (≥2 mm in diameter) presented on the ovarian surface were recorded.

Oestrous characteristics and mating:

After puberty incidence, ewe lambs were left to exhibit the second oestrus, and then oestrous duration at the 1st and 2nd oestrus as well as oestrous cycle length was recorded. Natural mating was performed at the second

oestrus of ewe lambs in heat using fertile ram, then age at conception of pregnant ewe lambs was recorded. Lambing rate was calculated based on total number of animals in each group and then on number of mated animals in each group.

Progesterone (P4) assay:

At 8 months of age, blood samples were taken before feeding from Jugular vein of each ewe lamb in each group (at 3-4 day-interval) and at puberty. Also, blood samples were collected every two days from puberty (1st oestrus) up to 2nd oestrus incidence. Blood plasma was separated and stored at -20°C until P4 analysis. Blood plasma samples for 5 weeks prior to puberty and at two day-interval during the oestrus cycle were chosen for determination of P4 concentration. Plasma P4 concentration was determined using radioimmunoassay technique **(RIA, Abraham, 1981)**, using coated tubes methodology (Diagnostic Product Corporation, Los-Angeles, USA), following the procedure outlined by the manufacturer.

Statistical analysis:

Data of each experimental season were analyzed using general linear model of **SAS (1996)** while differences among the treatment means were performed using Duncan Multiple Range Test **(Duncan, 1955)**.

RESULTS AND DISCUSION

Effect of feeding level on:

Live body weight and age at puberty:

Results in Table (1) show that feeding level affected significantly ($P<0.05$) the LBW at puberty, being heavier in the ewe lambs fed the 100% feeding allowance than in those fed 85% of the NRC level (38.3 vs. 40.5 kg). This trend was attributed to that ewe lambs in 100% group attained 1st oestrus at wider rang (35.8-48.3 kg) than those in the 85% did (35.2-42.7 kg). The observed heavier LBW of lambs fed the 100% than was associated with higher nutrient requirements to attained higher average daily gain than those in 85% group. These results agreed with those obtained in ewe lambs fed different level of rations **(Bizelis et al., 1990 and El-Gohary, 2004)**, in buffalo heifers fed different (TDN levels, 80, 100 and 120%) **(Shahin, 2004)** or cow heifers fed different energy levels **(Hall et al., 1995)**.

However, LBW at 1st mating (2nd oestrus) was not affected by feeding level, although there was a tendency of heavier weight (41.04 kg) in those fed the 100% level than in 85% (39.16 kg), which came in line with increased LBW at puberty. In this respect, **Helali et al. (1986)** found that the weight and age at first service, conception and calving in buffalo heifers were affected by feeding level.

Also, age at puberty, 1st mating and conception were not affected by feeding level, despite earlier age at puberty, 1st mating and conception in the ewe lambs fed the 100% level of the **NRC (1985)** allowance (Table 1). The lowest difference was found at conception, being about two days as compared to at puberty and 1st mating (about 24 days). This was associated with conceiving most of ewe lambs of later ages in 85% and early ages in the100% group. Similar trend was reported by **El-Gohary (2004)** on ewe lambs. In accordance with the present results, **Freety and Cundiff**

(1997) reported that heifers fed low feeding level (20% less) tended to reach puberty 5 days later than those fed 100% feeding level. While, **Macdonald et al. (2005)** found that time to reach puberty was negatively associated with level of feeding. Finally, **Fajersson et al. (1991)** reported that dietary protein had no effect on the onset of puberty.

It is of interest to note that the nearly similarity in LBW at birth and weaning with increasing LBW and early age at puberty of ewe lambs in 100% group as compared to those in 85% group was in relation to the rate of increase in growth as affected by feeding level from weaning up to puberty. In this respect, similar results were obtained on ewe lambs fed different feeding levels **(El-Gohary, 2004)**, on buffalo heifers fed different TDN levels **(Shahin, 2004)** and cow heifers fed different dietary energy levels **(Hall et al., 1994)**.

Oestrous characteristics:

Results in Table (2) concerning oestrous characteristics show insignificant differences in oestrous cycle length and oestrous duration at 1st and 2nd oestrus, but they tended to be longer in those fed the 85% of the feeding allawance than in 100% group. Also, no marked differences were found between both groups in distribution of different type of oestrous cycle, being the highest for the normal cycles (17-19 days) and in duration of the 2nd oestrus, being the highest for short type (≤25 h). However, marked differences were observed in duration of the 1st oestrus as affected by feeding level. Among different types of oestrous duration, normal duration of the 1st oestrus was more frequent (50%) in the 85% group versus more frequent (57.5%) of short duration in the 100% group.

These findings are in agreement with those reported by **Brown et al. (2005).** Also, several authors reported that the oestrous cycle length of ewes did not change when they were fed on low or high level of nutrition **(Sabra, 1989; Bizelis et al., 1990 and Gawish et al., 1999)**. Furthermore, **Mukasa et al. (1993)** reported that the pattern of cycles was not significantly affected by the level of nutrition.

Ovarian characteristics:

Results in Table (3) regard to ovarian characteristics reveal that numbers of small (SF) and large follicles (LF) as well as numbers of corpora lutea (CLs) and corpus albicans (CA) examined at 8 months of age were almost greater on ovarian surface of ewe lambs fed the 100% of feeding allowance than those in the 85% group, but the differences were not significant. Similar results were reported by **El-Gohary (2004)** in ewe lambs fed different feeding levels. The laparoscopic examination at mating showed that number of SF and LF was insignificantly greater on ovarian surface of ewe lambs fed the 85% feeding level than in those fed the 100% level. The less number of SF and LF in 100% group was reflected in significantly ($P<0.05$) greater CLs in the 100% than in the 85% group (1.06 vs. 1.46/ovary). However, number of CA was the same in both groups. The greater number of CLs reflected also higher ovulation rate in ewe lambs fed 100% than those fed 85% feeding level. Level of feeding is believed to play an important role in determining the ovulation of goats **(Chaniagom1989). EL-Harairy et al. (2004)** revealed that the beneficial effect of flushing system pre- and during mating season to obtain high

ovulation and conception rates as well as litter size in Zaraibi goats.

Lambing performance:

Results in Table (4) showed that lambing rate and total number of lambs born after the 1st mating was higher for ewe lambs fed 100% than for those fed 85% level (66.67% and 13.0 vs. 50.0% and 1.0). This reflected in slightly higher litter size based on total number of served or lambed ewes in the100%level than in the 85% level. Interestingly to note that the results of lambing rate came in line with the laparoscopic examination of ewe lambs in both groups, especially with number of CLs/ovary (Table 3). Also, **EL-Harairy et al. (2004)** found that lambing rate was always associated with ovarian rate of ewes undergoing flushing system.

The observed increase in lambing rate and litter size in the 100% level of feeding than in the 85% group contrasted the finding of **McKelvey et al. (1988)**, who used reciprocal embryo transfer to separate the effect of pre- and post-mating nutrition on embryo survival and growth of the sheep fetus. They concluded that high-plane feeding during the post-mating period can adversely affect embryo survival. Also, **Wallace et al. (1994)** recorded that a high plane of nutrition after ovulation influences embryo survival.

Progesterone profile:

Progesterone (P4) profile of ewe lambs during 5 weeks prior to puberty was different in both feeding level groups (Fig. 1). More pronounced finding was continuously and higher increase in P4 concentration in plasma during three weeks prior to puberty in ewe lambs fed 100% feeding level than those fed 85% level. This finding is associated with higher ovarian activity (silent ovulation) and presence of CL prior to puberty in 100% than in 85% group **(El-Gohary, 2004)**.

Progesterone (P4) profile of ewe lambs during the 1st oestrous cycle after puberty incidence revealed a nearly similar pattern of change in ewe lambs fed the100 or 85% feeding level. In both ewe lamb groups, progesterone concentration in blood plasma showed a sharp rise from undetectable to 0.01 ng/ml at puberty up to >1.0 ng/ml on day 8 of oestrous cycle, then ranged between 1.2 -1.6 ng/ml at the interval from 8 to 16, and sharply decreased to less than 0.5 ng/ml on the day of the new oestrus (Fig. 2).

These findings indicating normal change in P4 profile during oestrous cycles of ewes in both feeding levels. Feeding level did not affect significantly P4 concentration. However, **McKelvey et al. (1988)** concluded that high-plane feeding during the post-mating period could led to a decline in plasma P4 concentration. Also, **Wallace et al. (1994)** observed a significant reduction in peripheral P4 concentrations, when under-nutrition is severe, and this can be appear to be attributable to inadequacy of corpus luteum function **(Abecia et al., 1994)**.

Characteristics of ewe lambs attained precocious and lat puberty:

Ewe lambs in both feeding level groups were divided into two groups according to incidence of puberty, regardless feeding level, into precocious puberty group (attained 1st oestrus at ≤300 days of age, n=15) and late

puberty group (attained 1st oestrus at >300 days of age, n=21).

Live body weight and age:

Data divided on the base of precocious and late puberty showed that only LBW at puberty was significantly (P<0.05) heavier by about 4.5% in late than in precocious group (38.2 vs. 39.9 kg). However, LBW of ewe lambs at birth, weaning and first mating did not differ significantly between both groups (Fig. 3). On the other hand, average age at puberty and first mating was significantly (P<0.05) earlier in precocious than in late puberty group (314.2 vs. 344.4 days), but age at conception was did not differ significantly between both groups (Fig. 4). This may suggest that the precocious puberty achieved when ewe lambs reached LBW around 40 kg. This was indicated in this study as puberty was attained for most ewe lambs around 38 kg in both groups (lighter weights in 100% and heavier weights in 85% feeding level groups).

Oestrous characteristics:

Results in Table (5) showed that oestrous cycle length did not differ significantly between both groups and frequency distribution was similar in both groups, being almost in normal type. However, duration of the 1st oestrus was significantly (P<0.05) longer in late than in precocious group (15.6 vs. 22.9 h) and most durations was in short type in precocious and in normal type in late group. At the 2nd oestrus, the duration was not affected, but frequency distribution of duration was the highest in normal type for precocious and in short type in late group.

Ovarian characteristics:

Results in Table (6) reveal that the differences in numbers of SF and LF as well as numbers of CLs were not significant at 8 months of age. However, number of CA/ovary was significantly greater on ovarian surface of ewe lambs in precocious than late puberty group. (0.06 vs. 0.2/ovary). Such trend may indicate incidence of greater ovulations in precocious group (all cases were quiet ovulation) than in late group at pre-pubertal ages (before 8 months of age).

At mating, a greater number of SF and CA as well as lesser number of LF and CLs were observed in late than in precocious group, but the differences were not significant (Table 6). Increasing number of CA in late than in precocious group at mating in revisable pattern to that observed at 8 months of age may indicate incidence of silent ovulations at pre- and post -pubertal ages in late than in precocious group.

Lambing performance:

Results in Table (7) show that lambing rate and litter size after the 1st mating was higher for ewe lambs in precocious than in late group (47.6 and 1.0 vs. 60.0% and 1.11). Lambing rates came in line with the laparoscopic examination of ewe lambs in both groups, especially with number of CLs/ovary (Table 6).

It is worthy noting tat lambing rate obtained for precocious group (60%) was lower than 66.7% in 100% feeding level group, which may indicate the impact of feeding level on lambing rate rather than selection of ewe lambs on precocious puberty only.

Progesterone profile:

Progesterone (P4) profile of ewe lambs during 5 weeks prior to puberty was different in both groups, being higher in precocious than in late puberty group in particular during three weeks prior to puberty (Fig. 5). This finding was associated with higher ovarian activity (silent ovulation) and presence of CL prior to puberty in precocious than in late puberty group. Similar results were reported **(El-Gohary, 2004)**.

Concentration of P4 during the 1st oestrous cycle after puberty incidence revealed nearly similar pattern of change in ewe lambs of both groups during oestrous cycle, but ewes in late group showed slightly higher P4 level during luteal phase (8-14 day) than that in precocious group. In both groups, concentration of P4 showed a sharp rise from undetectable to 0.02 ng/ml at puberty up to >2.0 ng/ml on day 10 of oestrous cycle, then ranged between 1.5 -2.0 ng/ml at the interval from 10 to 16, and sharply decreased to less than 0.5 ng/ml on the day of the new oestrus (Fig. (6).

This finding indicate normal change in P4 profile during oestrous cycles of ewes in both feeding levels. Feeding level did not affect significantly P4 concentration. However, **McKelvey et al. (1988)** concluded that high-plane feeding during the post-mating period can led to a decline in plasma P4 concentration. Also, **Wallace et al. (1994)** observed a significant reduction in peripheral P4 concentrations, when under-nutrition is severe, and this can be appear to be attributable to inadequacy of corpus luteum function **(Abecia et al., 1994)**.

Table (1): Live body weight at birth, weaning, puberty and first mating and age at puberty first mating and conception of ewe lambs as affected by feeding level.

Item	Feeding group		±SEM
	100% NRC*	85% NRC	
Live body weight of lambs (kg) at:			
Birth	2.730	2.770	0.14
Weaning	14.26	14.59	0.32
Puberty (1st oestrus)	40.50	38.30	0.89*
First mating (2nd oestrus)	41.04	39.16	1.10
Age of lambs (day) at:			
Puberty (1st oestrus)	291.0	315.0	3.4
First mating (2nd oestrus)	309.3	333.4	5.4
Conception	335.7	337.5	4.2

*** significant group differences at P<0.05.**

***-The ewe lambs were fed at 100% of the nutrient requirements recommended by the NRC(1985)**

Table (2): Oestrous cycle length (/day) and duration of the first and second oestrus of ewe lambs as affected by feeding level.

Item	Feeding group		±SEM
	100% NRC*	85% NRC	
Oestrous cycle length (day)	18.2	18.8	0.64
Frequency distribution of oestrous cycle(%):			
Short (≤16 days)	17	14	-
Normal (17-19 days)	66	72	-
Long (≥17 days)	17	14	-
Duration of the 1st oestrus	22.2	27.8	5.30
Frequency distribution (%):			
Short (≤25 h)	57.5	42.8	-
Normal (25-40 h)	35.5	50.0	-
Long (≥40 h)	7.0	7.2	-
Duration of the 2nd oestrus	27.3	34.3	6.40
Frequency distribution (%):			
Short (≤25 h)	44.5	42.8	-
Normal (25-40 h)	35.0	28.5	-
Long (≥40 h)	20.5	28.5	-

***-The ewe lambs were fed at 100% of the nutrient requirements recommended by the NRC(1985)**

Table (3): Number of small and large follicles and corpora lutea and corpus albicanc per ovary in ewe lambs at 8 months of age and at mating as affected by feeding level.

Item	Feeding group		±SEM
	100% NRC*	85% NRC	
Number of ovarian structures/ovary at 7months of age:			
Small follicles (≤2mm diameter)	8.60	7.46	1.20
Large follicles (≥2 mm diameter)	1.93	1.53	0.34
Corpus luteum (CL)	0.20	0.13	0.01
Corpus albicans (CA)	0.20	0.06	0.01
Number of ovarian structures/ovary at mating:			
Small follicles (≤2 mm diameter)	4.90	6.60	0.24
Large follicles (≥2 mm diameter)	1.53	1.93	0.15
Corpus luteum (CL)	1.46	1.06	0.01*
Corpus albicans (CA)	0.20	0.20	0.01

*** Significant group differences at P<0.05.**

***-The ewe lambs were fed at 100% of the nutrient requirements recommended by the NRC(1985)**

Table (4): Lambing rate and litter size of ewe lambs as affected by feeding level.

Item	Feeding group	
	100% NRC	85% NRC
Number of served ewes	18	18
Number of lambed ewes	12	9
Lambing rate (%)	66.67	50.0
Total number of lambs	13	9
Litter size (1)	0.72	0.50
Litter size (2)	1.08	1.00

(1): Based on total number of ewes in each group

(2): Based on number of conceived ewes in each group

Table (5): Oestrous cycle length (day) and duration of the 1st and 2nd oestrus of ewe lambs in precocious and late puberty group.

Item	Precocious group	Late group	±SEM
Oestrous cycle length (day):	18.6	19.0	0.27
Frequency distribution of oestrous cycle (%):			
Short	8	18	-
Normal	67	64	-
Long	25	18	-
Duration of the 1st oestrus	15.6 (6-36)	22.9 (6-54)	5.2*
Frequency distribution (%) of the 1st duration:			
Short	66.6	43.3	-
Normal	33.4	47	-
Long	0.0	9.7	-
Duration of the 2nd oestrus	26 (6-78)	32 (15-42)	7.1
Frequency distribution (%) of the 2nd duration:			
Short	33.4	52.9	-
Normal	41.6	23.6	-
Long	25	23.5	-

- **Significant group differences at P<0.05.**

Table (6): Number of small and large follicles as well as corpora lutea and corpus albicanc per ovary in ewe lambs at 8 months of age and at mating in precocious and late puberty groups.

Item	Precocious group		Late group		±SEM
	Mean	Rang	Mean	Rang	
Number of ovarian structures/ovary at 7 months of age:					
Small follicles (SF)	7.47	3-14	8.41	3-18	0.34
Large follicles (LF)	1.29	1-4	1.52	0-5	0.01
Corpus luteum (CLs)	0.17	0-1	0.17	0-2	0.24
Corpus albicans (CA)	0.20	0-1	0.05	0-1	0.01*
Number of ovarian structures/ovary at mating:					
Small follicles (SF)	5.76	0-13	5.94	3-11	0.15
Large follicles (LF)	1.88	0-4	1.58	0-5	0.01
Corpus luteum (CL)	1.28	1-3	1.22	1-2	0.02
Corpus albicans CA)	0.28	0-1	0.33	0-1	0.01

- **Significant group differences at P<0.05.**

Table (7): Conception rate and litter size of ewe lambs in precocious and late puberty groups.

Item	Precocious group	Late group
Number of served ewes	15	21
Number of lambed ewes	9	10
Lambing rate (%)	60.0	47.6
Total number of lambs	10	10
Litter size (1)	0.66	0.48
Litter size (2)	1.11	1.00

(1): Based on total number of ewes in each group

(2): Based on number of conceived ewes in each group

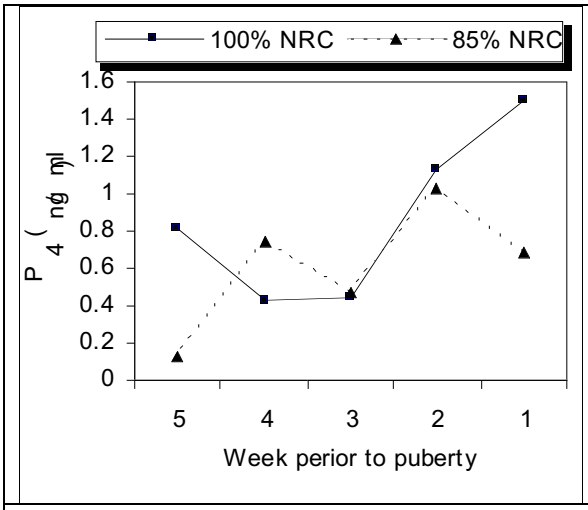

Fig (1): Changes in plasma progesterone concentration (ng/ml) of ewe lambs at different weeks prior to puberty.

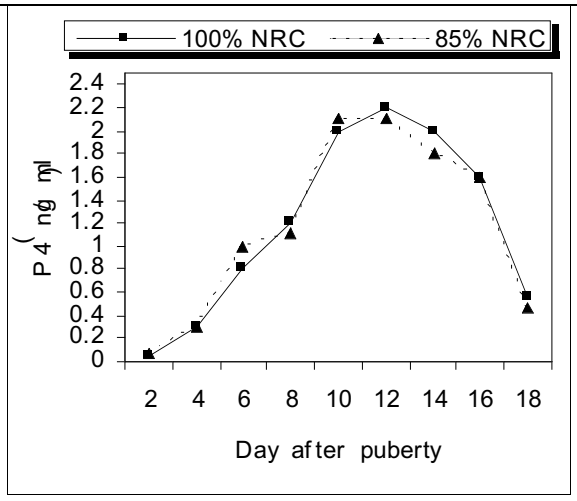

Fig. (2): Progesterone profile during the 1st oestrous cycle of ewe lambs in 100 and 85% feeding level groups.

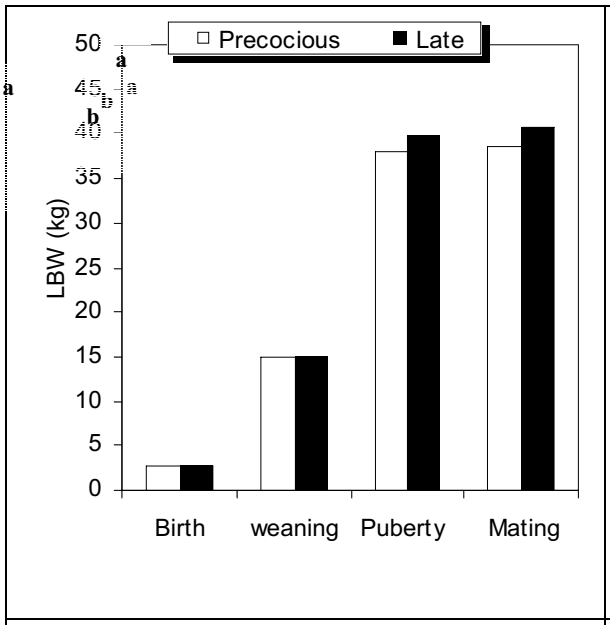

Fig. (3): Average LBW at birth, weaning, puberty and 1st mating in precocious and late puberty groups.

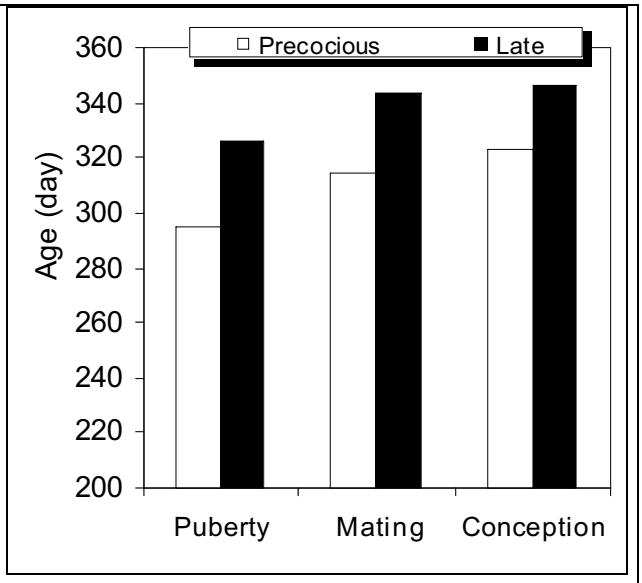

Fig. (4): Average age at puberty, mating and conception in precocious and late puberty groups.

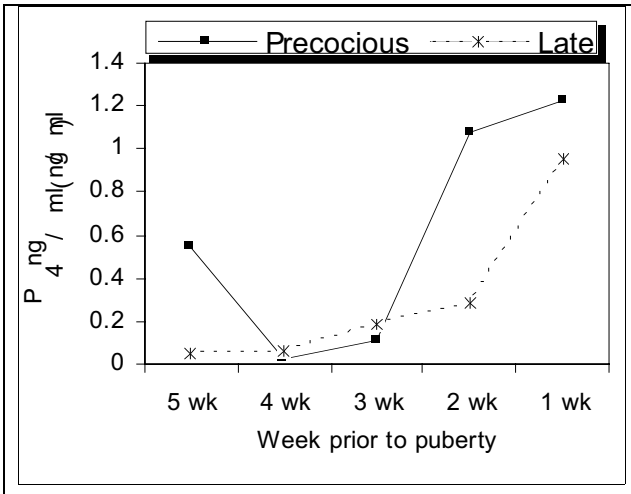

Fig (5): Changes in plasma progesterone concentration (ng/ml) of ewe lambs at different weeks prior to puberty.

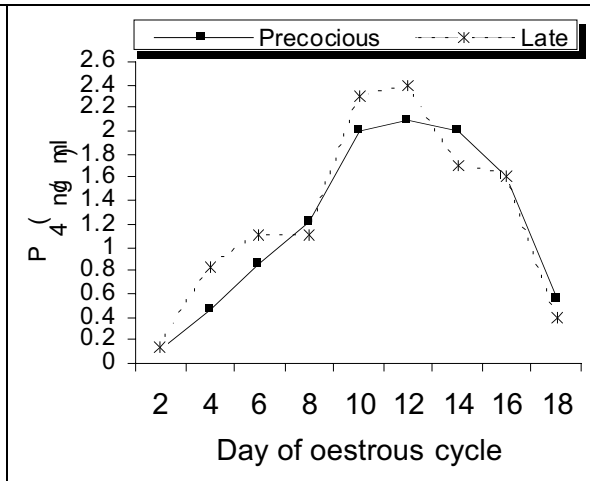

Fig. (6): Progesterone profile during the 1st oestrous cycle of ewe lambs in precocious and lat puberty groups.

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