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Seasonal Variation in The Fertility of Crossbred Ewes

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SEVENTY one adult crossbred Merino and Barki ewes of mixed ages were used in this experiment to examine seasonal variation not related to nutritional differences in ovulation, conception and embryonic survival rates. Ewes were divided at random within age into 3 groups, one was joined with fertile rams in October while the second and third were joined with the same rams during February and June, respectively. Oestrus was observed and recorded daily. Feeding regime was standerised for all experimental groups. Almost half the number of ewes in each season were slaughtered on the 3rd day after mating while the rest were slaughtered at 34th day post coitum. The presence of corpus luteum was taken as an indication for ovulation. Ewes mated in October scord the highest ovulation rate (137.5%) followed by those mated in February (104.3%) and then by June mated ones (100.0%). Embryonic survival rate ranged from 76.5 to 88.9% among different seasons, with differences being not significant. Considering both ovulation and embryonic survival rates observed in the present study October season ranks the first, followed by June and February in descending order. Such differences however, were not significant.

Seasonal variation in ewes fertility are not related to nutritional differences and may be due to changes in climatic conditions, possibly photoperiod and / or ambient temperature.

It is concluded that breeding in different seasons is possible providing that optimum management of feeding is insured.

Keywords : Merino Barki Crossbred, Season, Ovulation rate and embryonic survival rate.

Rebreedng is considered one of the most practical and efficient methods to intensify lamb production in continuous breeders under local conditions. This is because local ewes exhibit oestrus all year around (El - Fouly *et al* ., 1977, Younis, 1977 and Aboul - Naga and Aboul - Ela, 1985).

A system of 3 lambings per 2 years was suggested by Younis (1977) and put in practice on a large scale by Aboul - Naga (1983) and Mokhtar *et al* ., (1991). To obtain 3 lambings per 2 years the months of February, June and October were selected for breeding (Mokhtar *et al* ., 1991). Though total productivity increases as a result of applying such system, seasonal differences in fertility were observed. Aboul - Naga (1983) found that there was a significant variation in the breeding activity at different mating seasons. Previous work in this laboratory (Mokhtar *et al* ., 1991) showed that ewes mated in October had a higher conception rate compared to those mated in either June or February. Reasons behind such differences are not yet fully understood or investigated. However, these differences may be due to nutritional and / or other climatic factors. This paper examines seasonal variation not related to nutritional differences in certain physiological parameters, mainly ovulation and embryonic survival rates.

Materials and Methods

Experimental animals.

Seventy one adult crossbred Merino and Barki ewes of mixed ages with an average livebody weight of 52.1 kg were used in this experiment. These ewes were part of the main flock raised at Maryout Experimental Station which belongs to the Desert Institute, Located some 35 km south west of Alexandria.

Treatments

Before starting the experiment ewes were divided at random within age into 3 groups, the first one comprised 24 ewes. During October these ewes were joined with 2 fertile rams in a separate mating pen for 34 days, while the second one (23 ewes) was joined with the same two rams for the same length of mating period during February. The same procedure was adopted with the third group (24 ewes) during June.

During mating periods rams were colour painted on their briskets every day and oestrus was observed and recorded daily for each individual ewe throughout the 34 day mating period in October, February and June.

Feeding regime was standerised for all experimental groups according to their average livebody weight to avoid any nutritional - climatic confounding effect on their fertility. Animals were fed in each treatment group on a diet which consisted of a concentrate mixture (cottonseed cake 50%, wheat bran 18%, yellow maize 15% rice polish 11%, molasses 3%, Limestone 2% and common salt 1%) at the rate of 1/2 kg / head / day plus 1/2 kg / head / day Berseem (*Trifolium alexandrinum*) hay. Fresh water was available twice daily for all experimental groups.

Observations recorded

Slaughter data

One of the main objectives of the present study was to investigate the effect of sea-

son of breeding on ovulation and embryonic survival rates. Therefore almost half the number of ewes in each season were slaughtered, on the 3rd day after mating. Soon after slaughter each genitalia was removed and both ovaries were examined for the presence of Corpora lutea. The presence of corpus luteum was taken as an indication for ovulation. The rest of the ewes, from each treatment group were also slaughtered on the 34th day after mating. Soon after slaughter each genitalia was removed and examined for embryo survival.

Weights of the whole genitalia as well as the weight of each separate part was obtained and recorded to the nearest gram.

Statistical analysis

Chi - square test was performed for ovulation, conception and embryonic survival rates to detect differences among different seasons. However, an analysis of Covariance was carried out for all weights of genitalia as to remove any effect due to changes in livebody weight of animals just before slaughter (Snedecor and Cochran, 1970).

Results and Discussion

Ovulation and conception rates

Ewes mated in October and slaughtered on 3rd day post coitum scord the highest ovulation rate (123.1%) followed by those mated in February (115.4%) and then by June mated ones (100.0%) (Table, 1). Ewes slaughtered on 34th day post coitum showed almost the same pattern for ovulation rate with values of 154.5, 90.0 and 100% for October, February and June, respectively. Thus, the overall ovulation rate for ewes slaughtered on both occasions was found to be 137.5, 104.3 and 100.0 for October, February and June, respectively, with differences being not significant. These results may explain the high twinning rate observed for local ewes bred in September - October period reported by previous authors (Aboul Naga and Aboul - Ela, 1985) which is a direct result to the high ovulation rate occurs during such period. It is of significance as well to note that ewes bred in the conventional breeding season of June to have a low ovulation rate and consequently will be expected to give a low twinning rate. However, part of the differences among seasons in ovulation rate may be due to differences in livebody weight of ewes. In the present study October mated ewes were, on the average, higher than June mated ones in their body weight by almost 10 kg (Table 1). Edey (1968) investigated the relationship between body weight at the time of ovulation and ovulation rate in mature Merino ewes, and found that body weight below 35.0 - 37.5 kg was associated with an ovulation rate of approximately, 105% and varied a little with body weight above this level. For each increase of 2.5 kg in body weight there was at least a 5% increase in ovulation rate up to 53.5 kg, and at least a 10% increase per 2.5 kg within the range of 40.4 - 48.0 kg.

TABLE 1. Results of slaughter data of different experimental groups classified by season

Trial	Season		
	October	February	June
Total number of ewes	24.0	23.0	24.0
Average livebody weight (kg)	56.4	53.7	46.2
No. of ewes slaughtered on 3rd day Post - Coitum	13.0	13.0	11.0
No. of ewes with corpora lutea	12.0	13.0	10.0
No. of corpora lutea (C.L.)	16.0	15.0	11.0
Ovulation rate for ewes slaughtered on 3rd day post coitum (%)	123.1	115.4	100.0
No. of ewes slaughtered on 34th day post - coitum	11.0	10.0	13.0
No. of ewes with corpora lutea	11.0	7.0	13.0
Conception rate	100.0	70.0	100.0*
No. of corpora lutea	17.0	9.0	13.0
ovulation rate for ewes slaughtered on 34th day post coitum	154.5	90.0	100.0
Overall ovulation rate for all ewes	137.5	104.3	100.0
No. of ewes with embryos	9.0	6.0	11.0
No. of viable embryos	13.0	8.0	11.0
% of survived embryos	76.5	88.9	84.6
Expected lambing rate	118.2	80.0	-

$$\text{Ovaluation rate} = \frac{\text{No. of corpora lutea}}{\text{No. of ewes slaughtered}} \times 100$$

$$\text{\% of survived embryos} = \frac{\text{No. of viable embryos}}{\text{No. of corpora lutea}} \times 100$$

Expected lambing rate = overall ovulation rate X embryonic survival rate *P<0.05

Coop (1966), reported that twinning was increased by 6% for each 10.1 bs (4.5 kg) increase in liveweight at mating. Conception rate was found to be inferior (70%) for ewes mated in February than their counterparts mated in either October or June (100%), differences being significant ($x^2 = 6.5$).

Embryonic survival rate

Embryonic survival rate ranged from 76.5 to 88.9% among different seasons (Table 1), differences, however, were not significant ($x^2 = 0.71$). Embryonic survival rate had almost an inverse relationship with ovulation rate (Table 1). Ewes bred in October, though had the highest ovulation rate, they showed the lowest embryonic survival rate. This low embryonic survival rate for October bred group masked a part of its superiority in ovulation rate. The relationship between ovulation rate and embryonic survival rate were investigated by different authors (Edey, 1966) and there is almost a general agree-

ment that embryonic mortality rate increase with the increase in the ovulation rate. This may be a mechanism by which adapted animals keep it's equalibrium under a certain set of environment.

Results of the present study indicate that differences among seasons in fertility are mainly due to differences in ovulation, conception and embryonic survival rates. Such differences in ovulation, conception and embryonic survival rates are not related to any nutritional differences since feeding regime was standerized for animals bred in all seasons. Accordingly these differences reflects merely seasonal differences possibly due to changes in photoperiod and / or ambient temperature. Mokhtar *et al* . (1991) found that ewes mated in October had a higher conception rate compared to those mated in either June or February. Aboul - Naga *et al* . (1991) found as well that there was a significant variation in the breeding activity of ewes at different mating seasons.

Considering both ovulation and embryonic survival rates observed in the present study October season ranks the first in the expected lambing rate, followed by June and February in a descending order. These results supported finding of previous authors (Aboul - Naga *et al* ., 1991 and Mokhtar *et al* ., 1991) in that September - October breeding season is considered the best in the overall fertility of ewes under local conditions.

Genitalia

As previously mentioned genitalia of ewes slaughtered on both 3rd and 34th days post coitum were examined. Weight of genitalia ranged from 128.3 in June to 193.8 g in October at three days post Coitum, differences being significant ($P<0.05$). Corresponding values on 34th day post coitum were 272.3 and 304.5 g with no significant difference. These differences may indicate the presence of more active genitalia in October season since the effect of livebody weight on the weight of genitalia was removed by analysis of covariance.

Weight of right ovary was found to be 1.1, 1.2 and 1.2 g on the third day post coitum for June, October and February bred ewes with corresponding values of 1.3, 1.3 and 1.2 g for left ovary, differences were not significant. However, on 34th days Post Coitum October bred ewes had significantly higher values for right ovaries (1.9 g) compared to either June (1.7 g) or February (1.3 g) bred ewes. Weight of left ovaries on 34th day Post Coitum did not differ significantly among seasons being 1.0, 1.5 and 1.8 g for June, October and February bred ewes.

Apart from that no significant differences were observed due to season among different parts of genitalia on the 3rd day Post Coitum. However, on 34th Post Coitum October bred ewes significantly ($P<0.01$) exceeded their counterparts in the weight of oviduct being 0.8, 1.3 and 1.1 g for June October and February bred ewes. On the other hand February bred ewes exceeded significantly ($P<0.05$) their counterparts in the width of left ovary being 1.3, 1.2 and 1.4 cm for June, October and February bred ewes, respectively. Similarly February bred ewes had significantly ($P<0.05$) higher values for

the volume of the left ovary being 1.0, 1.5 and 1.6 cm^3 for June, October and February bred ewes.

February bred ewes exceeded June and October ones in most embryonic traits (Table 2), though differences were not significant.

TABLE 2. Average values for genitalia and different embryonic traits classified by season (mean ± SE)

Item	Season		
	October	February	June
Weight of genitalia (g)			
on 3rd day post - coitum	193.8 ± 7.38	136.1 ± 8.04	128.3 ± 7.39*
on 34th day post coitum	304.5 ± 29.68	289.6 ± 58.49	272.3 ± 17.82
Weight of rightovary (g)			
on 3rd day post - coitum	1.2 ± 0.12	1.2 ± 0.05	1.1 ±0.12
on 34th day post coitum	1.9 ± 0.21	1.3 ± 0.15	1.7 ± 0.16*
Weight of left ovary (g)			
on 3rd day post - coitum	1.3 ± 0.12	1.2 ± 0.06	1.3 ± 1.70
on 34th day post coitum	1.5 ± 0.15	1.8 ± 0.27	1.0 ± 0.07**
Weight of oviduct (g)			
on 3rd day post - coitum	1.3 ± 0.13	1.2 ± 0.07	1.1 ± 0.05
on 34th day post coitum	1.3 ± 0.12	1.1 ± 0.07	0.8 ± 0.07**
Width of left ovary (cm)			
on 3rd day post - coitum	1.3 ± 0.06	1.4 ± 0.10	1.3 ± 0.06
on 34th day post coitum	1.2 ± 0.07	1.4 ± 0.10	1.3 ± 0.05
Volum of left ovary (cm^3)			
on 3rd day post - coitum	1.1 ± 0.12	1.6 ± 0.22	1.1 ± 0.14
on 34th day post coitum	1.3 ± 0.17	1.6 ± 0.22	1.0 ± 0.06*
Weight of chorionic vesicle (g)	81.2 ± 12.6	119.5 ± 38.66	93.5 ± 0.86
Weight of amniotic sac + embryo (g)	10.0 ± 0.89	15.5 ± 1.97	11.5 ± 1.96
Weight of amnion (g)	6.3 ± 0.87	11.7 ± 1.88	8.8 ± 1.72
Weight of embryo (g)	1.9 ± 0.12	2.7 ± 0.19	1.8 ± 0.22
Crown rump length CRL (cm)	2.6 ± 0.08	2.8 ± 0.13	2.7 ± 0.14
No. of Cotyledons in right horn	29.8 ± 3.05	37.3 ± 2.11	46.5 ± 3.27
No. of Cotyledons in left horn	28.1 ± 4.03	38.3 ± 3.42	42.0 ± 2.92

* $P<0.05$ ** $P<0.01$

In conclusion, Seasonal variation in ewes fertility are not related to nutritional differences and may be due to changes in climatic conditions, Possibily photoperiod and / or ambient temperature. So, breeding in different seasons is possible providing that optimum management of feeding is insured.

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الاختلافات الموسمية فى خصوبة النعاج الخليطة

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استعمل فى هذا البحث ٧١ نعجة خليط (مرينو – برقى) بمتوسط وزن ١ر٥٢ كيلو جرام قسمت عشوائيا داخل كل عمر الى ثلاث مجاميع (٢٤ ، ٢٣ ، ٢٤) . غذيت كل نعاج المجاميع الثلاث على نفس المستوى الغذائى (نصف كيلو جرام عليقة مركزة + نصف كيلو جرام دريس برسيم / رأس يوميا) لقحت هذه النعاج فى ثلاث مواسم تربية (أكتوبر – فبراير – يونيه) واستعمل فى تلقيح المجاميع الثلاثة كبشين مختبرين . تم ذبح نصف عدد النعاج تقريبا داخل كل مجموعة فى اليوم الثالث بعد التلقيح بينما ذبح النصف الآخر فى اليوم الـ ٣٤ بعد التلقيح . تم فحص الجهاز التناسلى لكل نعجة بعد الذبح مباشرة واخذ وجود الجسم الاصفر كدليل لحدوث التبويض بينما فحصت الاجنة فى اليوم الـ ٣٤ لمعرفة معدل نفوق الأجنة .

وجد من الدراسة أن معدل التبويض ٥ر١٣٧ ، ٣ر١٠٤ ، ١٠٠ للنعاج التى لقحت فى اكتوبر ، فبراير ويونيه على التوالى بينما كانت نسبة الأجنة الحية هى ٥ر٧٦ ، ٩ر٨٨ ، ٦ر٨٤ لنفس المواسم على التوالى . وعليه فان نسبة الولادات المتوقعة فى كل من اكتوبر ويونيه وفبراير هى ٢ر١١٨ ، ٦ر٨٤ و ٨٠٪ على التوالى اثبتت الدراسة ان الاختلافات فى معدلات الخصوبة بين المواسم المختلفة لا ترجع كلها الى اختلافات غذائية ولكن ربما تعزى الى اختلافات فى العوامل المناخية وخصوصا طول ساعات الاضاءة ودرجات الحرارة .