

## CHARACTERISTICS AND INDICES OF REPRODUCTION IN DORPER SHEEP

E. ELIAS\*, D. COHEN\* and P. DAYENOFF\*

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In seventeen adult Dorper ewes imported from South Africa into Israel and nine of their primiparous, first-generation daughters born in Israel, characteristics and indices of reproduction were determined during the period of April 1982 to April 1984. This study showed that, during the period from April 1982 to January 1984, three lambings occurred in the adult ewes; the lengths of the oestrous cycles for adult and primiparous ewes were  $17.6 \pm 1.1$  and  $16.6 \pm 1.2$  days, respectively; the number of services per ewe in oestrus were  $3 \pm 1$  services; the average length of pregnancy was 146–147 days; the lambing intervals were  $6.2 \pm 0.46$  and  $7.7 \pm 0.62$  months from the first to second lambing and the second to third lambing, respectively; of 17 ewes, 3 had twins in all 3 lambings (17.6%) and 4 had twins in only the first 2 lambings (23.5%). The sex ratio recorded in 70 lambs of adult ewes (in three lambings) was 41 males to 29 females (41:29). A high percentage of fecundity (137.2%) and prolificity (149%), an unrestricted breeding seasons, a short lambing interval and a short postweaning anoestrus period, recommend this breed of sheep as commercially advantageous for arid zones.

Key words: Dorper sheep, oestrous cycle, length of pregnancy, lambing interval, prolificity, fecundity, sex ratio.

## INTRODUCTION

The Dorper sheep has been a recognized breed since 1950 and has been described as a true South African success<sup>8</sup>. This new breed was developed by crossing a Dorset Horn with a black-headed fat-tailed Persian. By strict selection of the desired type, the new breed was established<sup>2</sup>. The breed was developed primarily for arid zones<sup>1,2</sup>, where it demonstrated that it could very effectively utilize available grazing<sup>4</sup>. Dorper sheep were first imported into the arid Negev area of Israel in April 1982. The objective of the present study was to determine breeding characteristics and indices of reproduction in these first Dorper sheep imported into Israel.

## MATERIALS AND METHODS

## Sheep in experiment:

Seventeen adult Dorper ewes (2 years old), two rams (2½ years old), and nine primiparous ewes (13–14 months) were observed for the period of April 1982 to April 1984 at the Isan Center for Comparative Medicine, Ben-Gurion University, Beer-Sheva. During the quarantine period (April to September 1982) and later on, in the paddocks, the rams were separated from the ewes during the experiment.

## Feeding program:

During the quarantine period the sheep received per head per d 3 kg alfalfa hay and 250 g concentrates. According to the analysis these concentrates contained: protein min. 16%, fat min. 2%, fibre max. 7.5% and ash 6.5%. Moisture was 13%. During the paddock period the sheep were fed differently according to the physiological condition. Non-pregnant ewes and rams were fed with 1.5 kg hay and 500 g concentrates; pregnant sheep in the last 50–60 d of pregnancy received 1.5 kg hay and 750 g concentrates; nursing ewes were fed

with 2.5 kg hay and 1 kg concentrates and young lambs (2.5–12 months) received 1 kg hay and 300 g concentrates. In the pre-mating period (50 d prior to mating) rams received as supplement 400 g oats per head per d. All the sheep were fed twice daily (morning and afternoon).

## Reproductive management

The program of reproductive management is based on three mating periods of 5 weeks each, in April-May 1982, November-December 1982 and July-August 1983 for the adult ewes and one mating period of eight weeks for the primiparous ewes, in October-November 1983. The two rams were exposed for 30 min to the ewes twice daily, once in the morning (at 06h30) alternating with the other ram in the afternoon (at 17h30). The same procedure was used for dams ten d prior to weaning (55 d postpartum).

Factors studied were: the number of services per ewe in oestrus, the duration of oestrus, the length of the oestrous cycle, the mean gestation period, the lambing intervals, the weight of lambs at birth, the sex ratio, the repetition of twinning characteristic in the second and third lambings and the indices of reproduction. These followed the scheme described by Desvignes, 1968, as cited in Tafta<sup>9</sup> (Table 1). Prolificity is defined as the ability of ewes to reproduce live offspring and fecundity is their potential capacity to produce fertile ova. The Index of Prolificity is defined as the number of lambs born (p in Table 1) per number of lambing ewes (g in Table 1) and the Index of Fecundity is defined as the number of lambs born (p in Table 1) per number of ewes designated for mating (a in Table 1), not all of whom conceived.

## RESULTS

During the period of April 1982 to January 1984 three lambings of adult ewes were recorded. The first lambing occurred during the quarantine period, September-October 1982. One lambing of young ewes (primi-

\*Isan Centre for Comparative Medicine, Ben-Gurion University of the Negev, P.O. Box 653, Beer-Sheva 84105, Israel.

parous) was recorded in March-April 1984. The rams showed high libido during all three mating periods emphasized by mountings without coitus ( $4 \pm 1$  times in 30 min) and by the number of services per ewe in oestrus in 30 min. ( $3 \pm 1$  services).

Conception rates were lower for first mated ewes in the nursing period (8.8%) than in first mated ewes in the postweaning period (91.2%). The mating response of Dorper ewes during the mating periods are shown in Table 2. The values indicate that a high percentage of ewes remained pregnant in the first oestrous cycle in all three mating periods. On the other hand, a ewe's

response in the July-August period was lower than in the first and second mating periods (April-May and November-December, Table 2). Three ewes returned to oestrus (second oestrous cycle). The length of the oestrous cycles were  $17.6 \pm 1.1$  and  $16.2 \pm 1.2$  d for adult and primiparous ewes, respectively (Table 3). In the postweaning period, the first oestrous cycle occurred  $16.3 \pm 8.4$  d after the first lambing for 15 adult ewes and only for 12 ewes after the second lambing. The second oestrous cycle in the same period occurred  $17.8 \pm 2.4$  d after the first cycle in the remaining non-pregnant ewes.

The duration of oestrus ranged from 28 to 44 h and 24 to 36 h in adult and primiparous ewes, respectively (Table 3). The onset of oestrus was abrupt, while the cessation was gradual. The average length of pregnancy in this breed was 146–147 d (Table 3). The lambing interval from the first to second lambing was  $6.2 \pm 0.46$  months and from the second to third lambing  $7.4 \pm 0.62$  months. The weight of the single lambs born were not significantly heavier ( $P < 0.05$ ) than that of the twin lambs born (Table 4). At the day of weaning (65 d post partum) sixteen lambs weighed  $20.5 \pm 0.8$  kg. For twins the number of males exceeded that of females (29 to 17) compared with variable results received for single lambs born (Table 5). Three ewes out of seventeen (17.6%) lambled twins during all three lambings and four out of the seventeen (23.5%) had twin lambings in only the first and second lambings.

Good values for prolificity (149%) and fecundity (137.2%) were found in all three lambings (Table 6). A high percentage of fertility (98.03%) was obtained in adult ewes per total lambings (Table 6).

The total of 47 lambing adult ewes produced 57 weaned lambs (121.3%) (Table 6). In all of the lambings, including primiparous ewes, no uterine inertia or dystocia was presented due to the fetomaternal disproportion. Three dams giving birth (to twins) rejected one lamb immediately after parturition during the second and third lambings. Vaginal prolapses were observed in four adult ewes pregnant with twins in the fourth month of their pregnancy.

## DISCUSSION

It is generally agreed that breeding activity of ewes is stimulated by declining d length or a particular low number of h of light per d and is suppressed by increasing d length or a larger number of h of light per d.

The lambing rate, a high rate of prolificity and fecun-

Table 1: CHARACTERISTICS OF REPRODUCTION OF EWES (DESIGNES, 1968 CITED IN TAFTA<sup>9</sup>)

Specific characteristic	Symbol	Formula	Indices
Ewes designated for mating	a		
Non-mated ewes	b		
Mated ewes	$c = a - b$		
Sterile ewes	d	$d/a \cdot 100$	of Sterility
Pregnant ewes	$e = a - d$	$e/a \cdot 100$	of Fertility
Ewes which aborted	f	$f/e \cdot 100$	of Abortion
Lambing ewes	$g = a - d - f$	$g/a \cdot 100$	of Apparent Fertility
Single lambing	h	$h/g \cdot 100$	of Single lambing
Double lambing	i	$i/g \cdot 100$	of Double lambing
Single lambs	h	$h/p \cdot 100$	of % of single lambs
Twin lambs	2i	$2i/p \cdot 100$	of % of twin lambs
Total of lambs born	$p = h + 2i$	$p/g \cdot 100$ $p/a \cdot 100$	of Prolificity of Fecundity
Stillborn births	q		
Live births	$r = p - q$	$q/p \cdot 100$	of Mortality
Dead lambs post-partum	s	$s/r \cdot 100$	of Perinatal mortality
0-5 days			
Living lambs at day 5 post-partum	$t = r - s$		of Mortality during growth period
Dead lambs, day 5 post-partum till weaning	u	$U/t \cdot 100$	
Weaned lambs	$V = t - u$	$v/a \cdot 100$	of Numerical productivity
Total dead lambs	$w = q + s + u$	$w/p \cdot 100$	of Total mortality

Table 2: MATING RESPONSE OF DORPER EWES

Ewes in experiment	First mating period April-May 1982						Second mating period November-December 1982						Third mating period July-August 1983					
	Number and percentage of pregnant ewes post coitus in:																	
	F		S		T		F		S		T		F		S		T	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Adult (n=17)	16	94.1	1	5.9	—	—	15	88.2	2	11.8	—	—	12	70.6	5	29.4	—	—
	October-November 1983																	
Primiparous (n=9)	6	66.7	1	11.1	2**	22.2												

\*F = First oestrous cycle; S = Second oestrous cycle; T = Third oestrous cycle

\*\*One out of two ewes was not pregnant; n = number

Table 3: DURATION OF SEXUAL CYCLE AND PREGNANCY PERIOD IN DORPER SHEEP

Ewes in experiment	Duration of oestrous cycle		Duration of oestrus		Duration of pregnancy period (days)		
	The period Days	Mean $\pm$ SE Days	The period Hours	Mean $\pm$ SE Hours	Single born lambs		Twins born lambs
					Male	Female	
Adult (n = 17)	16-18	17.6 $\pm$ 1.1	28-44	36 $\pm$ 8	147.1 $\pm$ 0.28	147.7 $\pm$ 0.25	146.6 $\pm$ 0.32
Primiparous (n = 9)	15-17	16.6 $\pm$ 1.2	24-36	28 $\pm$ 6	146.8 $\pm$ 0.2	146.3 $\pm$ 0.1	146.2 $\pm$ 0.12

n = number

Table 4: LAMB BIRTH WEIGHT\*

Ewes in experiment	Lambs born	Sex	n	Birth weight (kg) mean $\pm$ SE
Adult	Single	Males	4	3.1 $\pm$ 0.2
		Females	4	2.9 $\pm$ 0.08
Primiparous	Twin	Males	5	2.6 $\pm$ 0.8
		Females	5	2.5 $\pm$ 0.1
	Single	Males	2	2.9 $\pm$ 0.3
		Females	3	2.9 $\pm$ 0.15
	Twin	Males	2	2.6 $\pm$ 0.1
		Females	4	2.3 $\pm$ 0.14

\*Lambs from first lambing  
n = Number

dity observed in this study show that the photoperiodic mechanism is not applicable to Dorper sheep. Since there was no seasonal limitation to the breeding cycle of the Dorper sheep it can be presumed that the hypothalamo-hypophyseal axis was not influenced by day length in Dorper ewes and this then suggests that there are differences in the reproductive endocrine cycle in Dorper sheep destined to return to oestrus post-weaning as compared to other breeds<sup>6,7,9</sup>.

This unrestricted breeding season in Dorper ewes is a key point in sheep production making it possible to call the breed a breeding factory. Our observed three lambings in a two year period, a short lambing interval and a high value of fecundity and prolificity, confirmed the high rate of reproduction reported for Dorper sheep<sup>1-3</sup> as compared with the local Awassi breed<sup>5</sup>.

The high percentage of ewes which did not return to oestrus after mating represents a good rate of fertility. Also, in the majority of mated ewes ovulation occurred

in the first oestrous cycle as estimated by the time of lambing. Each ewe was serviced more than once during oestrus, thus increasing their chances of becoming pregnant over the ewes serviced only once. The mean gestation period in Dorper ewes was shorter by  $3 \pm 1$  than in Awassi ewes in our area<sup>5</sup>.

Birth weights of Awassi lambs have been recorded<sup>5</sup> as being heavier than birth weight in Dorper lambs found in this study. However, from our unpublished observations of Dorper lambs, the rate of growth is more rapid in the first three months of life than in Awassi lambs in the same period. In our opinion the Dorper lamb has greater growth potential.

In Bedouin and fellahin Awassi flocks, not more than 5% of the adult ewes have twins<sup>5</sup>. In this study in the three lambings of adult ewes, 49.2% of ewes had twins. The sex ratio recorded in 70 lambs of adult ewes (in three lambings) was 41 males and only 29 females. However, the fact that the number of males exceeded that of females coincides with those in a stationary flock purchased from Awassi nomads ewes<sup>5</sup>.

A lambing interval of 6-7 months in this breed is considered very good and confirmed previous observations that the lambings interval in Dorper ewes does not exceed 8 months<sup>1</sup>.

In the mating periods of spring and summer, more lambs resulted per lambing ewe (1,52 and 1,57, respectively) than in the mating of the end of autumn (1,37), but the difference was not significant.

In conclusion, the high reproductive rate of this breed is based on: high values of fecundity and prolificity, an unrestricted breeding season, a short lambing interval and the twinning characteristic. These characteristics recommend the Dorper sheep for consideration as a commercially advantageous animal for meat production in arid zones.

Table 5: SEX RATIO IN DORPER LAMBS

Ewe in experiment	Lambs born	First lambing				Second lambing				Third lambing				Total			
		Males	(%)	Fe-males	(%)	Males	(%)	Fe-males	(%)	Males	(%)	Fe-males	(%)	Males	(%)	Fe-males	(%)
Adult	Single lambs	4	(50)	4	(50)	8	(80)	2	(20)	0		6	(100)	12	(50)	12	(50)
	Twins	10	(55.6)	8	(44.4)	8	(66.6)	4	(34.4)	11	(68.7)	5	(31.3)	29	(63.6)	17	(36.7)
Primiparous	Single lambs	2	(40)	3	(60)												
	Twins	2	(33)	4	(67)												

Table 6: INDICES OF REPRODUCTION OF DORPER SHEEP

Specific characteristic	Indices	Date of lambing							
		Adult ewes (n = 17)						Primiparous (n = 9)*	
		Sept-Oct. 1982		April-May 1983		Dec. 1983-Jan 1984		March-April 1984	
		No	%	No	%	No	%	No	%
Ewes designated for mating		17		17		17		9	
Non-mated ewes		0		0		0		0	
Mated ewes		17	100	17	100	17	100	9	100
Sterile ewes	of Sterility	0		0		1	5.8	1	0.11
Pregnant ewes	of Fertility	17	100	17	100	16	94.1	8	88.8
Ewes which aborted	of Abortion	0		1	5.8	2	12.5	0	
Lambing ewes	of Apparent fertility	17	100	16	94.1	14	82.3	8	88.8
Single lambing	of Single lambing	8	47	10	62.5	6	42.8	5	62.5
Double lambing	of Double lambing	9	52.9	6	37.5	8	57.2	3	37.5
Single lambs	of % of Single lambs	8	30.8	10	45.4	6	27.2	5	45.4
Twin lambs	of % of Twin lambs	18	69.2	12	54.5	16	72.7	6	54.5
Total of lambs born	of Prolificity of Fecundity	26	152.9	22	137.5	22	157.1	11	137.5
Stillborn birth	of Mortality	0		0		0		0	
Live birth		26	100	22	100	22	100	11	100
Dead lambs-post partum 0-5 days	of Perinatal mortality	3	11.5	1	4.5	5	22.7	0	
Living lambs at day 5 post partum	of Mortality during growth period	23	88.5	21	95.5	17	77.3	11	
Dead lambs day 5 post partum till weaning		1	4.3	1	4.7	2	11.7	0	
Weaned lambs	of Numerical productivity	22	129.4	20	117.6	15	88.2	11	100
Total dead lambs	of Total mortality	4	15.3	2	9.0	7	31.8	0	

\*First generation of females from first lambing (Sept-Oct. 1982)

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