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Reproductive Efficiency of Rambouillet X Kaghani Crossbred Sheep

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ABSTRACT

The data for the reproductive records of 201 Rambouillet X Kaghani crossbred sheep kept at the Livestock Experiment Station, Jaba, district Mansehra (NWFP) during the years 1983-89 were analyzed. Various parameters of reproductive efficiency e.g. age at first service, age at first lambing, number of services required per conception, gestation period, service period, lambing interval, sex ratio and twining percentage were computed. The age at first service averaged 583.02±1.05 days, the range being 535 to 635 days. The age at first lambing ranged from 680 to 791 days, the average being 735.67±1.13 days. The number of services required per conception averaged 1.16 ± 0.02, while the average gestation period was 149.37± 0.76 days. Male lambs were carried for longer periods than females, while ewes carrying twin lambs showed shorter gestation length than those carrying single lambs. The service period and lambing interval averaged 250.12±7.06 and 399.88±7.21 days, the ranges were 167 to 595 and 312 to 745 days, respectively. The effects of parity on services per conception, gestation length, service period and lambing interval were significant ($p<0.05$). The sex ratio of male to female lambs was 47.12:52.88; whereas, the twining percentage was 9.58. The effects of type of birth (single male, single female of twin lambs) on service period and lambing interval were non significant. It was concluded that delayed age at first service, resulting in delayed age at first lambing, and long lambing intervals were the major causes of lower reproductive efficiency of crossbred sheep.

Key Words: Reproductive efficiency; Sheep; Crossbred

INTRODUCTION

The most important factor determining the success of sheep production is its reproductive efficiency, which is the net biological accomplishment of all reproductive activities i.e. puberty, oestrus, ovulation, fertilization, implantation, gestation and successful lambing. It reflects the fecundity, fertility and prolificacy of an adult animal. Realizing the importance of fine wool production in the country, 85 Rambouillet sheep, including 80 pregnant ewes and five rams, were imported from USA in 1957 (Jadoon, 1986). These animals were kept at the Livestock Experiment Station, Jaba, District Mansehra, NWFP. In order to improve the quality of wool produced, cross breeding between locally available Kaghani sheep and these Rambouillet sheep has successfully been carried out. However, no efforts have been made so far, to study the reproductive efficiency of these crossbred sheep. The present project was, therefore, conducted to study various parameters of reproductive efficiency in Rambouillet X Kaghani crossbred sheep maintained under prevailing managemental and climatic conditions of NWFP, Pakistan.

MATERIALS AND METHODS

The data on the reproductive records of 201 Rambouillet X Kaghani crossbred sheep kept at the Livestock Experiment Station, Jaba, district Mansehra for a period of six years from 1983 to 1989 were used for the present study. The information regarding the date of birth, date of first service, dates of repeat services if any, date of fruitful service, date of lambing, sex of the lamb and number of lambs born (single or twins) was recorded from the history sheet of each animal. Data on animals in which abortion or premature births occurred were excluded from analysis. From the available information, the means with standard error for various parameters of reproductive efficiency e.g. age at first service, age of first lambing, number of services per conception, gestation period, service period, lambing interval, sex ratio and twining percentage were worked out. The effects of parity on services per conception, gestation length, service period and lambing interval were also investigated. Similarly, the effects of type of birth (single male, single female of twin lambs) on the gestation length, service period and lambing interval were studied. In order to see the magnitude of variation in these parameters among various groups studied, the data were subjected to statistical analysis using analysis of variance technique (Steel & Torrie, 1980). Duncan's multiple range test (Duncan, 1955) was applied for multiple mean comparisons, where

necessary.

RESULTS AND DISCUSSION

Age at first service. The average age at first service for 201 ewes was 583.02±1.05 days, the range was 535 to 635 days. In only 5.97% ewes, the age at first service was less than 565 days, in 87.06% ewes it was between 566 and 605 days. In only 6.97% animals, the age at first service was more than 605 days (Table I).

Table I. Frequency distribution for the age at first service and age at first lambing in the crossbred sheep

Age at first service (days)			Age at first lambing (days)		
Groups	**Freq. (%)**	**C.F. (%)**	**Groups**	**Freq. (%)**	**C.F. (%)**
Upto 565	5.97	5.97	Upto 710	2.59	2.59
566-585	57.21	63.18	711-730	36.27	38.86
586-605	29.85	93.03	731-750	47.67	86.53
606-625	4.98	98.01	751-770	9.84	96.37
> 625	1.99	100.00	> 770	3.63	100.00
Average = 583.02±1.05 days. Range = 535-635 days.			Average = 735.67±1.13 days. Range = 680-791 days		

Freq.= Frequency; C.F.= Cumulative frequency

For optimum reproductive efficiency, an ewe should mature at the age of 1 to 1.5 years at the maximum. The present findings showed that only 5.97% ewes were first served at the age of up to 565 days. There were 6.97% ewes that matured at the age of more than 605 days. Such ewes are potential causes of lowered reproductive efficiency. Age at maturity in the ewes can be reduced through improved feeding, better management and selection of lambs showing heavier birth and weaning weights (Haque *et al.,* 1988). Introduction of rams into young stock can also hasten the onset of puberty in sheep (Hafez, 1987). Since maturity age is affected by heredity, animals showing late maturity should be culled from the breeding stock.

The results of the present study are in close agreement with those reported by Hafez (1980), who reported that fine wool sheep attained sexual maturity at 18-20 months (540-600 days) of age. According to Haque *et al.* (1988), the average age at puberty in 315 Kajli ewes was 502.0±8.9 days. Lower ages at puberty, 316.0 and 228.3 days, have been reported by Wiggins *et al.* (1970), and Dymundsson and Lee (1972). The discrepancies in the results of the present and previous studies can be attributed to breed differences, nutritional status, managemental practices and climatic conditions which vary from farm to farm, year to year and region to region.

Age at first lambing. The average age at first lambing of 193 ewes included in this study was 735.67±1.13 days with a range of 680 to 791 days. About 2.59% ewes gave birth to their first lambs at an age of up to 710 days while 83.94% ewes produced their first offsprings at the age of 711 to 750 days. Only 13.47% ewes produced their first lambs above 751 days of age (Table I). Kishore *et al.* (1982) recorded that age at first lambing in two crossbred groups (3/4 Rambouillet + 1/4 Chokla and 3/4 Rambouillet + 1/4 Malpura) averaged 716.32 and 1010±36 days, respectively, indicating that genetic make up of the ewes can affect their age at first lambing. Similarly, Sinha *et al.* (1979) observed the age at first lambing of 635.14, 660.22 and 716.70 days for 50 Muzaffarnagri, 48 Dorset Horn X Muzaffarnagri and 23 Suffolk X Muzaffarnagri ewes, respectively. For 293 Kajli ewes, the age at first lambing averaged 801.3±12.2 days (Haque *et al.,* 1988).

Services per conception. For 428 conceptions in 201 ewes, the overall average number of services per conception was 1.16±0.02 with a range of 1 to 4 services. Thus, the overall average conception rate in these animals was 86.21%. Among these, 84.82% ewes conceived at the first service, 14.25% conceived at the cost of two services; whereas, 0.93% ewes required 3-4 services for conception. These results are in line with the findings of Pereira *et al.* (1980), who observed that the number of services per conception averaged 1.03 and 1.14 for White and Black Santa Ines ewes, respectively. Similarly, Khan (1989) observed that the number of services per conception was 1.29±0.023 in 261 Rambouillet ewes. Relatively higher number of services per conception, 1.40 and 1.48, have been reported by Ishaq (1982) and Haque *et al.* (1988), respectively.

Parity-wise analysis of the data revealed that services per conception was significantly ($p<0.05$) affected by parity. It decreased from the first to the third parity and increased thereafter, reaching the maximum value (1.66±0.33) at the fifth parity (Table II). This might have been due to higher probability of exposure to infection in old animals particularly those of the fourth and the fifth parity. For economical sheep raising, conception should be aimed at the first service which was observed in 84.82% animals in this study. proper sexual health control, especially during post lambing period, appears to be necessary for improving conception rates at the first service (Haque *et al.,* 1988).

Gestation period. The average gestation period for 428 gestations in 201 ewes was 149.37±0.76 days, the range was 140 to 160 days. For 184 single male, 203 single female and 41 twin foetuses, the gestation length averaged 149.87±0.87, 149.13±0.94 and

148.24±0.45 days, respectively (Table III). The male lambs required significantly longer (P<0.05) gestation period than the females. Similarly, single lambs were carried for significantly (P<0.05) longer period than twins. After a non significant increase from the first to the third parity, the gestation length showed a significant increase up to the fifth parity (Table II). These results are in close agreement with those reported by Khan (1989), who reported that the duration of gestation in 261 Rambouillet ewes averaged 149.74±0.14 days. Bradford *et al.* (1972), indicated that the genotype of the fetus is the major determinant of length of gestation period. In sheep male lambs are carried longer than females, single lambs longer than twins.

Service period. For the records of 227 service periods in 201 ewes, the average service period was 250.12±7.06 days, the range was 167 to 595 days. Only 3.96% animals conceived within 190 days after lambing, 83.71% between 191 and 230 days after lambing, while 12.33% conceived beyond 230 days after lambing (Table IV). These results are in close agreement with those reported by Sinha *et al.* (1980) and Khan (1989). The former workers found average service periods of 212.1 and 202.31 days in Muzaffarnagri and Suffolk X Muzaffarnagri ewes, respectively. The latter observed that the average service period in 261 Rambouillet ewes was 217.81±1.16 days. It is suggested that to improve the reproductive efficiency the ewes showing service period above 230 days should be thoroughly investigated for the possible causes.

Lambing interval. The average lambing interval was 399.88±7.21 days, the range being 312 and 745 days. Table IV shows that in 8.41% animals, lambing interval was up to 350 days, in 60.17% it was between 351 and 370 days, in 19.03% it was between 371 and 380 days, while in the remaining 12.39% animals it was more than 380 days. These results are in agreement with those reported by Purushotom (1978). Kishore *et al.* (1982)

Table II. Effect of parity (lambing number) on various parameters of reproductive efficiency in crossbred sheep

Lambing No.	Services per conception	Gestation period (days)	Service period (days)	Lambing (days)
1	1.22±0.02a	149.06±0.12a	-----	-----
2	1.12±0.03b	149.40±0.11a	292.41±14.10a	438.51±14.37a
3	1.05±0.32b	149.60±0.13a	219.88±5.81b	374.37±6.90b
4	1.23±0.12a	150.48±0.34b	211.53±1.13b	364.52±2.23b
5	1.66±0.33c	155.33±2.40c	200.66±3.31c	342.50±5.05c
Average	1.16±0.02	149.37±0.76	250.12±7.06	399.88±7.21

Values with different letters within a column differ significantly from each other (P<0.05).

Table III: Effects of type of birth on various parameters of reproductive efficiency in crossbred sheep

Parameter (days)	Types of birth			Overall average
	Single male	Single female	Twins	
Gestation period	149.87±0.87a	149.13±0.94b	148.24±0.45c	149.37±0.76
Service period	249.09±8.60a	251.52±7.75a	250.09±8.75a	250.12±7.06
Lambing interval	399.50±10.78a	401.42±10.27a	400.36±12.90a	399.88±7.21

Values with different letters within a row differ significantly from each other (P<0.05).

Table IV. Frequency distribution for service period and lambing interval in the crossbred sheep

Service period			Lambing interval		
Groups (days)	Freq. (%)	C.F. (%)	Groups (days)	Freq. (%)	C.F. (%)
Upto 170	0.44	0.44	Upto 340	3.53	3.54
171-190	3.52	3.96	341-350	4.87	8.41
191-210	22.03	25.99	351-360	18.14	26.55
211-230	61.68	87.67	361-370	42.03	68.58
231-250	2.20	89.87	371-380	19.03	87.61
> 250	10.13	100.00	> 380	12.39	100.00
Average = 250.12 ± 7.06 days (Range = 167-595 days)			Average = 399.88 ± 7.21 days (Range = 312-745 days)		

Freq.= Frequency; C.F.= Cumulative frequency

reported longer lambing intervals of 451 and 422 days for 3/4 Rambouillet X 1/4 Chokla and 3/4 Rambouillet X 1/4 Malpura ewes, respectively. For 504 observations in 293 Kajli ewes, the average lambing interval was 331.38±6.8 days (Haque *et al.,* 1988). Considering 60 days as the optimum post lambing oestrus interval, conception at the first service and 150 days as the gestation length, the optimum lambing interval comes to be around 210 days. However, the sheep is a seasonal breeder, remaining almost anoestrus during summer. Keeping this in view, lambing interval of up to 365 days can also be taken within the acceptable range. In 12.39% ewes included in this study, this interval was even more than 380 days, which seems too long. The lambing interval consists of service period and the gestation period, the latter being more or less constant at around 150 days. The former, in turn, is dependent upon post lambing oestrus interval and services per conception. Therefore, in order to minimize the lambing interval, post lambing oestrus interval and services per conception should be minimized. The parity showed a significant effect ($P<0.05$) on the service period and lambing interval. The highest values of these parameters were recorded after the first lambing. Later, values of these parameters showed a gradual but significant decrease as the parity increased (Table II).

Sex ratio. Total lambs born to 201 ewes were 469, including 221 males and 248 females. Thus, the sex ratio of male to female was 47.12:52.88, indicating that the births of females were slightly higher than males. The present investigations are consistent with those of Khan (1989), who found the sex ratio of male to female lambs as 42.41:57.59. Ishaque (1972) observed the ratios of male to female lambs as 54:46, 50:50 and 51:49 for 3270, 2862 and 22817 births, respectively.

Twining percentage. In the present study, 41 twin births were recorded out of 428 births. Thus, the twining percentage was 8.74. No triplet was recorded during the study. Among the twins, members of 1.28% twins were both males, 1.91% were both females and 5.55% had members of both sexes. A twinning percentage of 14.7 in Iranian breeds of sheep has been recorded by Morwarid *et al.* (1981). Besides breed differences, nutritional status and physical status of animals can be attributed to minor differences in the reported results.

CONCLUSIONS

Delayed onset of puberty, resulting in delayed age at first lambing, and prolonged lambing intervals are the major factors of low reproductive efficiency of Rambouillet X Kaghani crossbred ewes kept under the climatic conditions of NWFP, Pakistan.

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