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A Study of some Reproduction Aspects in Sheep under Semi-arid Conditions

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Records on 1546 conceptions and 2036 gestations of sheep were analysed to study the effect of year, breed and age of ewe,breed and age of ram, size of mating pen and weight of ewe on number fo services per conception (NS) and effect of year, breed and age of ewe sex, type of birth and birth weight of the lambs on gestation length (GL).

NS in the flock was estimated as 1.33 ± .03. Year and pen size were the only factors contributing significantly ($P \leq .01$) to the variability in NS.

The mean GL was estimsted as 151.2 ± -1 days. GL was significantly ($P \leq .01$) affected by year, breed of ewe and birth weight of lamb. The partial regression coefficient of GL on lamb birth weight was estimated as 1.5 ± -2 day/kg.

Besides its bearing on the flock management, repeated mating is important indicator of reproductive effictency. It could indicate defects on the part of either the ewe, the ram or both. This aspect of reproduction assumes even greater importance in flocks with breeds recently imported to less favourable conditions.

This investigation was carried out to study factors affecting the number of services per conception in pure endogenous and exogenous breeds of sheep and their crosses under semi-arid environment. Also, gestation length and factors affecting it are studied.

Material and Methods

Animals

Data used in this study were recorded on ewes during a period of five breeding seasons in Ras El-Hekma, Desert Research Station, Egypt. Ras El-Hekma is situated on the Mediterranean coast 230 km west of Alexandria. The ewes

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are a part of a crossbreeding project started in 1958 to investigate the improvement of the native Barki breed (B) by crossing with the Hungarian Merino (M) and Syrian Awassi (A). More details on the project and management of the flock were provided by Fahmy, Galal, Ghanem and Khishin (1969).

Mating season usually started in mid-summer (June — July) and lasted for two months. According to plan, each mating group consisting of a ram and 10 to more than 50 ewes were placed in an individual pen. The rams briskets were grease painted to make it possible to identify serviced ewes. All mating pens were cheked daily and the paint colour was changed weekly. On the avearge 25 rams were used annually. Some rams were used repeatedly for a maximum of three years.

Measurements

Ewes were checked daily and the service date was recorded. A ewe marked once with a certain colour was given a score of one, while a ewe marked with two colors was scored as two, etc. On the other hand, an ewe with no marking at all during the breeding season was excluded from the study. An ewe was considered conceived if she gave birth to a dead or alive lamb or if she had aborted.

The numbed ot services per conception(NS) was considered as the total recorded services of the ewe till conception in a given mating season. This did not include ewes receiving an extra service after conception which was easiiy recognized by matching the date of service and the normal gestation length.

The number of services per conception was estimated from 1546 conceptions.

Gestation length (GL) was calculated as the number of days elapsed between the dates of last service and lambing. Gestations of length outside the range of 140 to 160 days were discarded.

The total number of gestations studied was 2036.

Statistical

The model used to study number of services per conception was as follows :

$$Y_{i\,jklmno} = u + t_i + d_j + a_k + s_l + r_m + p_n + B_1\,X_{i\,jklmno} + e_{i\,jklmno}$$

where Y is the observation on the o*th* ewe in the i*th* year, of the j*th* breeding and k*th* age bred to a ram of l*th* breeding and of m*th* age in a pen of the n*th* size. u, t, d, a ; r ; p and e are the mean, and effects due to year, breed of ewe, age of ewe, breed of ram ; age of ram and size of pen and error, respectively, while, B_1 is the regression coeffiient of the observation on ewe weigth and x is the deviation of ewe weight from the mean of that character. Ewe weigth was measured at the beginning of the breeding season. Model ueed for the analyisi of GL was :

$$Y_{i\,jklm} = u + t + d_j + b_k + G_1 + B_2\,X_{i\,jklm} + e_{i\,jklm}$$

TABLE 1. Least squares estimates, standard errors and Ducan's multiple range test ofdifferences between constants for different measurements studied.

Classification	No. of service per conception			Gestation length		
	No.	Const.±S.E.	DMRT*	No.	Const. ±S.E. (day)	DMRT*
Mean.	1546	1.33.03		2036	151.2 .1	
Year						
1962	315	—.05.04	a	381	—.2 .3	ab
1963	224	.40.02	c	403	.6 .2	a
1964	259	—.05.03	a	313	.2 .3	a
1965	334	—.10.04	ab	497	.2 .2	a
1966	414	—.20.03	b	442	—.8 .3	b
Breed of ewe . . .						
B	788	—.05.09	a	1038	.4 .3	ac
M	250	.03.10	a	347	—.6 .4	bd
A	113	.05.11	a	150	1.2 .5	a
1/4 M 3/4 B . . .	88	—.04.10	a	107	.5 .5	ab
3/8 M 5/8 B . . .	24	.10.35	a	28	.4 .9	acd
½M½B	124	.05.10	a	182	.0 .4	ade
5/8 M 3/8 B . . .	21	—.23.29	a	25	—1.7 1.0	bcd
3/4 M 1/4 B . . .	34	.05.12	a	46	—1.0 .7	bce
½A½B	86	.05.11	a	111	.7 .5	ab
Age of ewe						
1.5 yr	345	.00.03	a	471	.4 .2	a
2.5 yr	382	.00.02	a	465	.2 .2	a
3.5 yr	294	—.01.03	a	388	—.3 .2	a
≥4.5 yr	525	.01.02	a	712	—.3 .2	a
Breed of ram . . .						
B	445	.02.10	b			
M	436	.02.10	ab			
A	184	.16.10	a			
1/4 M 3/4 B . . .	85	.07.11	ab			
3/8 M 5/8 B . . .	16	—.28.37	ab			
1/2M 1/2B	216	.03.10	ab			
5/8 M 3/8 B . . .	27	.00.31	ab			
3/4 M 1/4 B . . .	54	.05.13	ab			
½A½B.	83	—.07.11	b			
Age of ram . . .						
1.5 yr	189	.07.04	a			
2.5 yr	554	—.03.02	a			
3.5 yr	479	—.01.03	a			
≥4.5 yr	324	—.03.03	a			
Pen size						
10-19 ewes	58	.27.08	b			
20-29 ewes	267	—.04.05	a			
30-39 ewes	646	—.01.04	a			
40-49 ewes	451	—.07.04	a			
≥50 ewes.	124	—.15.06	a			
						a
Sex of lamb				1009	—.2 .1	a
male				1027	.2 .1	
female						a
Lamb type of brith				1963	—.2 .3	a
single				73	.2 .3	
twin						
Reg. on ewe wt.. .		—.04.03				
Reg on lamb birth wt					1.5.2	

* Within each classification those constants followed by the same letter do not differ significantly from each other, otherwise they differ at $P \leq .05$ using Duncan's Multiple Range Test.

where Y, u, t, d and e are defined as before and b_k is the effect of k*th* type of birth, C_1 the effect of 1*th* sex, B_2 the regression coefficient of GL on lamb birth weight and x is the deviation from the mean of that weight. In the case of multiple births, birth weight was taken as the sum of the lambs birth weights.

Levels of each effect are shown in Table 1.

Least squares procedures were followed to estimate different effects in the models and partition the variability in characters studied.

Results and Discussion

Year and pen size were the only factors that had significant overall effect on NS (Table 2). Year 1963 in which ewes required the highest NS (1.73) (Table 1) coincides with the lowest rain fall among the five seasons. Rain fall corresponding to different breeding seasons was 88, 70, 230, 280 and 130 mm, respectively, from 1962 to 1966. Rain is generally associated with richer pasture, thus among other things, more vitamin A is available. Ghanem (1964) reported a clear relationship between vitamin A and reproductive efficiency in this flock. Contrary to the expected ewes in the smallest mating group (10 — 19) required significantly higher NS than those in other sizes. This might indicate forced contacts resulting in colouration.

TABLE 2. Analysis of variance of characters studied.

Source of variation	NS		GL	
	d.f.	Mean Sq.	d.f.	Mean Sq.
Year	4	10.26**	4	98.70**
Breed of ewe	8	.35	8	74.10**
Age of ewe	3	.03	3	43.86
Breed of ram	8	.42		
Age of ram	3	.25		
Pen size	4	1.14**		
Sex of lamb			1	55.48
Lamb type of birth			1	13 03
Weight of ewe	1	.54		
Birth wt. of lamb			1	1925.63**
Residual	1514	.27	2917	29.28

Although age and breed of both ram and ewe had no signifiant effect on NS, it seems that the ram's age and breed had relatively more pronounced effect than the ewe's on NS.

Overall mean gestation length in this flock was estimater as 151.2 days (Table 1). This estimate falls within the normal range reported by Hafez (1952), while year, breed of ewe and lamb birth weight contributed highly significatly to the variability in GL, other factors did not affect it significantly (Table 2).

Thrift and Dutt (1972) reported significant effect of year on GL. It is probable that year-to-year variation in nutritional status may affect GL (Forbes, 1967). Among the purebred ewes the longest gestation was exhibited by the Awassi ewes followed by the Barkis, while the Merinos had the shortest. This finding confirms earlier findings by Ghanem, Fahmy, Seoudy and Farid (1963). While the difference between A and B was not statistically significant, they both had significantly longer gestations than M. The ½ A ½ B ewes had GL nearly in the middle between their parental breeds. On the other hand the GL of M-B different grades was not generally at the mid-parent value. However, among these crosses as M blood increases GL got shorter with only one exception (Table 1). Age of ewes showed no significant effect on GL, there was slight trend of decreasing GL as ewes got older. This agrees with the results of Ghanem *et al.* (1963) and Forbes (1967). Terrill and Hazel (1947) and Jancie (1965) reported opposite trends. Female lambs were carried approximately. 0.4 day longer than male lambs, the difference being nonsignificant. These results are in general agreement with those reported by Terrill asd Hazel (1947), Jancie (1965) and Ghanem *et al.* (1963). Paim (1950) found that male lambs were carried 0.81 day longer than females. Thrift and Dutt (1972) found nonsignificant effect of the sex of lamb on GL of its mother. Single lambs were carried nonsignificantly shorter lengths than twins. Terrill and Hazel (1947) and Thrift and Dutt (1972) reported nonsignificant differesce due to type of birth but in a different direction from that observed in the present study. Birth weight of the lamb showed a highly significant relationship with GL of their dams. The partial regression coefficient of GL on lamb birth weight was 1.5 day/kg. Thrift and Dutt (1972) reported a significant estimate of. 0.35 day/kg for that coefficient. In such cases as that of studying the relationship between GL and lamb birth weight, the latter authors pointed out that it is difficult to define which is the cause and which is the effect. Therefore, such highly significant regression should be interpreted as indicating strong relationship rather than a pattern of dependence.

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دراسة على بعض الاعتبارات التناسلية فى الأغنام تحت الظروف شبه الجافة

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تم تحليل ١٥٤٦ سجل أخصاب بجانب ٢٠٣٦ سجل حمل أغنام لدراسة تأثير السنة سلالة وعمر النعجة سلالة وعمر الكبش وحجم مجموعة التلقيح ووزن النعجة على عدد الوثبات اللازمة للاخصاب كما درس تأثير السنة وسلالة وعمر النعجة وجنس ونوع ميلاد ووزن المولود على طول فترة الحمل .

وقد قدرت عدد الوثبات اللازمة للاخصاب بمقدار ١ر٣٣ ± ٠ر٠٣ كما بينت الدراسة أن السنة وحجم ومجموعة التلقيح هما العاملان الوحيدان اللذان يؤثران معنويا على عدد الوثبات (احتمال ٠ر٠١) . أما طول فترة الحمل فقد قدرت بمقدار ١٥١ر٢ ± ٠ر١ يوما . وقد أثر عليها معنويا (احتمال ٠ر٠١) : السنة ـ السلالة النعجة ووزن ميلاد الحمل . وحسب معامل الاعتماد الجزئى لفترة الحمل على وزن الحمل عند الميلاد بمقدار ٥ر١ ± ٠ر١ يوم/كجم .