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THE REPRODUCTIVE PERFORMANCE OF BROWN SWISS CATTLE RAISED IN THE EASTERN TURKEY

Reproductive traits of Brown Swiss reared under harsh climatic conditions of the eastern region of Turkey were investigated. Least squares means with their standard errors for calving interval, age at first calving, gestation length and service period of the breed were obtained as 439.88 ± 10.86 days, 39.34 ± 0.77 months, 284.18 ± 0.44 days, 144.49 ± 8.12 days respectively. Average birth weight of male Brown Swiss calves was 36.10 ± 0.37 kg and for female 33.35 ± 0.36 kg. Results of the study indicate that some reproductive parameters such as the service period and age at first calving need great care for improvements.

INTRODUCTION

Several purebred and crossbred cattle beeds, namely Brown Swiss, Holstein Friesian, Simmental, Jersey and native breeds (Yerli Kara, Dogu Anadolu Kirmizisi, Guney Anadolu Kirmizisi, Boz Step, etc.) are raised in different regions of Turkey. Approximately 13.7 % of the cattle are reared in the eastern part of the country. In recent years, the number of Brown Swiss cattle in this region has considerably increased. According to the statistics, today, there are about 1.72 million purebred and crossbred Brown Swiss cattle in Eastern Turkey.

The east region of Turkey has completely different geographical and climatic conditions compared to rest of the country. In this region, altitude from sea level ranges from 1200 to 2000 meters and several high plateaus are located among high mountains. The climatic conditions during the winter are too rough. Temperature in winter sometimes drop to -30°C and is frequently below 0°C during November and April. Also, it snows a lot in this region. Maximum temperature in Summer is 35°C and relative humidity values in Summer, Fall, Winter and Spring are 50, 61, 76 and 60% respectively. The study was undertaken to evaluate the reproductive performance of Brown Swiss cattle raised under the harsh (especially during Winter season) climatic conditions of Erzurum in Eastern Turkey.

MATERIAL AND METHODS

The performance records of 212 Brown Swiss cattle reared at the Research Farm of Agricultural College at Ataturk University from 1981 to 1994 were used. However, since the data collected in 1984 was not recorded, it couldn't be utilised in the study. The Brown Swiss herd was

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first established by purchasing one bull and five cows from the Eskisehir Sugar Factory Farm. Two years later, 16 pregnant heifers and one bull was imported from Switzerland. In 1985, 17 cows and 10 heifers from Kazova and Hafik State Farms were also bought. The performance records of cows and their progenies were collected.

All animals were kept in a stall barn between October ad April. After the weather got warm, lactating cows and heifers were put in open shed barn for about 2 months. Then, cattle were moved into the pasture of the Research Farm where the herd grazed until October. Calves were housed in a special calf unit containing individual pens with feeders and water-milk for 6 months. Male calves were sold to breeders and female calves incorporated to the herd.

Lactating cows were offered around 4-5 kg/head concentrate feed daily. The amount was kept constant during lactation period. Chemical composition of the concentrate feed was; 16% crude protein. 14% crude cellulose, 9% crude ash, 88% dry matter and 2400 Kcal/kg metabolic energy. Before the animals were moved into the pasture, heifers and cows were also fed dried hay and wet sugar beet pulp. *Ad libitum* feeding of the dried hay was practised. The quantity of wet sugar beet pulp offered daily to each animal ranges from 8 to 10 kg.

The production parameters investigated in this research were age at first calving, gestation length, birth weight, service period and calving Interval. The effects of year of calving, season of calving, age of dam, sex of calf were evaluated by the method of fitting constants, least squares analysis of variance as described by Harvey (1987). Accordingly, several statistical models were used for evaluating the effect of various fixed environmental factors influencing the reproductive parameters. The models used for analysis of variance were as follows:

For age at first calving
$Y_{ijk} = \mu+a_i+b_j+e_{ijk}$

For gestation length and birth weight
$Y_{ijkl} = \mu+a_i+b_j+c_k+e_{ijkl}$

For service period
$Y_{iklm} = \mu+a_i+c_k+d_l+e_{iklm}$

For calving Interval,
$Y_{ijklm} = \mu+a_i+b_i+c_k+d_l+e_{ijklm}$

Where, Y represented calving interval, age at first calving, gestation length or birth weight. μ was the least squares means. a, b, c and d corresponded the effect of year of calving, sex of calf, age of cow and season of calving respectively. The random error in the mathematical model was indicated by e.

RESULTS AND DISCUSSION

Birth Weight

The average birth weights of male and female Brown Swiss cattle raised under harsh climatic condition of Eastern Turkey are presented in Table 1. The difference between sex groups was statistically significant ($P<0.05$). Similar

Table 1
Least squares means and standard errors for birth weight and gestation length of brown swiss cattle

Traits	Birth Weight N	Birth Weight X ± SE	Gestation Length N	Gestation Length X± SE
Overall Means	478	34.73±0.29	462	284.18±0.44
Year of Calving		**		NS
1981	7	32.13±1.91[c]	8	283.86±2.74
1982	14	31.52±1.35[c]	14	287.98±2.11
1983	12	29.07±1.42[d]	18	282.15±1.81
1985	14	25.35±1.33[e]	19	283.27±1.75
1986	35	35.65±0.84[b]	48	285.18±1.12
1987	37	36.92±0.82[ab]	41	283.55±1.22
1988	44	35.79±0.76[b]	46	283.05±1.14
1989	41	37.70±0.78[ab]	39	285.61±1.23
1990	58	36.28±0.67[ab]	55	285.13±1.04
1991	43	37.98±0.77[ab]	50	282.96±1.10
1992	49	36.87±0.73[ab]	50	284.38±1.10
1993	69	36.64±0.60[a]	74	282.99±0.89
1994	55	37.54±0.69[ab]		
Age of Cow (Months)		**		**
<36	80	30.19±0.63[d]	65	281.75±1.03 c
37-48	89	32.38±0.58[c]	92	282.63±0.88 bc
49-60	89	34.86±0.56[b]	90	282.60±0.87 bc
61-72	78	35.94±0.59[ab]	79	285.21±0.90 ab
73-84	65	36.47±0.63[ab]	57	285.85±1.03 ac
85-96	38	36.05±0.81[ab]	36	284.89±1.29 ab
97<	39	37.19±0.81[a]	43	286.30±1.19 a
Sex of Calf		**		NS
Male	236	36.10±0.37[a]	224	284.22±0.58
Female	242	33.35±0.36[b]	238	284.13±0.55
Season of Calving		**		
1	136	35.75±0.47[a]		
2	101	35.06±0.54[a]		
3	90	33.40±0.53[b]		
4	151	34.69±0.47[a]		

X±SE: Mean±Standard Error
a, b, c, d, e: Means with same superscript are not significantly (P>0.05) different from one another.
** P<0.01; NS: Non-Significant

results were also observed by Cengiz (1982) and Yanar and Ockerman (1993). The birth weights of male and female Brown Swiss calves born in the same area were reported as 35.66±1.05 and 36.18±1.24 kg (Aydin *et al.* 1994); 39.7±1.0 and 35.9±0.9 kg (Yanar *et al.* 1994); 36.4±0.76 and 34.4±0.75 kg (Yanar *et al.* 1995); 34.51 ±1.26 and 34.7±1.26 kg (Yanar *et al.* 1997). The difference between results of the present study and findings of other studies could be attributed to the use of less number of animals in other studies. The age of dam had significant influence on the birth weight as expected. As the age of dam increased, the body weight of the cow went up gradually as expected. Therefore, the increase in the weight of the dam could result in increase in the birth weight of the calves.

Gestation Length

Least squares means with their standard errors and test of significance for factors affecting the gestation length of Brown Swiss cattle are given in Table 1. The results are in agreement with the findings of Ilaslan *et al.* (1977). The gestation length of Brown Swiss cattle reared in Eastern Turkey was found to be shorter than findings of Guven (1977). Age of dam significantly affected ($P<0.05$) gestation length, but the effects of sex and year of calving on the same parameter were not significant.

Calving Interval

The average calving interval of Brown Swiss cattle reared in the cold climatic condition of the east region of Turkey is given in Table 2. Similar results of the studies carried out in Turkey were also reported by Guven (1977). The calving interval values of Brown Swiss cattle raised in Colombia, Bolivia, Iran were 544 days (Salazar and Huertas, 1978), 470.4 days (Wilkins *et al.* 1985), 439.5 days (Bhargava and Rajaie, 1985).

The year of calving had a significant ($P<0.05$) influence on the calving interval. The result indicated that the factors affecting calving interval were not adequately controlled in this farm. The calving season also had significant effect on the calving interval value.

Service Period

Least squares means with their standard errors and results of Duncan's test for factors influencing service period are presented in Table 2. The average service period of Brown Swiss cattle was 144.49±8.12 days. As indicated in the Table 2, the influences of the age of dam and season of calving on this parameter were highly significant ($P<0.01$). As age of cows increased until 49-60 months of age, the average value of the service period reduced. Then, it begun to raise gradually, The cows which were older than 97 months had the shortest service period compared to other age groups.

The service period value determined in this study was longer than results of Tumer (1985) and Ilaslan *et al.* (1977). In fact, length of the service period in cattle is supposed to be 60-

Table 2
Least squares means and standard errors for calving interval and service period of Brown Swiss cattle

Traits Effect	Calving Interval (Days) N	Calving Interval (Days) X ± SE	Service Period (Days) N	Service Period (Days) X ± SE
Overall Means	315	439.88±10.86	293	144.40±8.12
Year of Calving		*		**
1981	8	552.99±54.74[a]	8	157.62±41.44[abc]
1982	14	371.32±41.24[c]	13	147.24±32.42[bc]
1983	20	491.06±34.20[ab]	11	116.79±34.22[c]
1985	15	439.81±38.47[bc]	17	144.93±27.24[bc]
1986	22	508.08±31.93[ab]	42	223.87±18.12[a]
1987	36	428.88±25.76[bc]	30	187.52±20.63[ab]
1988	32	463.66±27.06[abc]	30	206.17±20.81[ab]
1989	31	455.53±27.32[bc]	26	109.29±22.56[c]
1990	46	390.37±22.95[c]	34	137.71±19.77[bc]
1991	42	421.22±23.83[bc]	38	114.43±18.72[c]
1992	18	437.63±36.53[bc]	34	99.95±20.61[c]
1993	22	384.65±32.73[c]	10	88.42±37.92[c]
1994	9	373.29±50.15[c]		
Season of Calving		*		NS
1	78	417.10±18.22[b]	91	117.74±13.27
2	60	453.19±20.74[ab]	47	158.63±17.31
3	69	410.44±19.64[a]	60	141.66±15.63
4	108	478.80±17.56[a]	95	159.90±2.74
Age of Cow (Months)		NS		**
<36	19	427.04±38.26	36	215.82±21.01[a]
37-48	36	411.24±26.88	60	170.39±16.31[ab]
49-60	57	443.20±21.00	63	104.42±15.65[cd]
61-72	69	445.49±18.62	45	124.82±17.78[bcd]
73-84	55	477.31±20.23	43	145.98±17.61[bcd]
85-96	34	436.22±26.33	22	154.34±24.07[bc]
97<	45	438.68±23.58	24	95.69±24.16[d]
Sex of Calf		NS		
Male	150	439.64±14.40		
Female	165	440.13±13.34		

X±SE: Mean±Standard Error
a, b, c, d, e: Means with same superscript are not significantly (P>0.05) different from one another.
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90 days in order to produce one calf in a year. According to the results of the present study, it can be concluded that a concentrated effort is needed to diminish the service period of Brown Swiss raised in the east region of Turkey.

Age at First Calving

As shown in Table 3, the average value of the age at first calving of Brown Swiss was 39.34±0.77 months. However, the age at first calving of the same breed was 37.5 months in Colombia (Salazar and Huertas, 1978), 29.2 months in Iran (Bhargava and Rajaie, 1985), 30 months in South Africa (Anonymous, 1988) Different environmental factors such as managemental practices and different feeding programmes may explain the difference in age of first calving procured in different studies.

Table 3
Least squares means and standard errors for age at first calving of Brown Swiss cattle

Traits Effect	Age at First Calving N	Age at First Calving X ± SE
Overall Means	185	39.34±0.77
Year of Calving		*
1985	5	35.96±3.85^{c}
1986	26	38.54±1.70^{bc}
1987	6	48.38±3.41^{a}
1988	15	48.41±2.17^{a}
1989	14	34.92±2.26^{cd}
1990	31	39.51±1.51^{bc}
1991	15	43.35±2.14^{ab}
1992	19	38.94±1.98^{bc}
1993	31	35.55±1.52^{cd}
1994	23	29.82±1.74^{d}
Season of Calving		**
1	68	36.34±1.08^{b}
2	42	38.20±1.40^{ab}
3	30	41.23±1.69^{a}
4	45	41.15±1.33^{a}

X±SE: Mean±Standard Error
a,b,c,d,e: Means with same superscript are not significantly
(P>0.05) different from one another.
** P<0.01; NS: Non-significant

The findings of this research suggest that the age at first calving needs to be reduced. Better nutrition and good management practices of Brown Swiss heifers reared under the harsh climatic conditions of Eastern Turkey would be helpful to reduce the age at first calving.

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