The Reproductive Performance of Simmental Cattle Raised in Eastern Turkey

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Introduction

Various indigenous cattle breeds are raised on the different regions of Turkey. Approximately 13.7 percent of the cattle is reared in the eastern region of the country (Anonymous, 1989). Because of low beef and milk yield of indigenous breeds, various European cattle breeds have been imported to increase milk and beef production. Simmental is one of these breeds imported mainly from Germany. In recent years, the breed was recommended to the farmers living in eastern part of Turkey and distributed to the farms via Rural Development Project supported by Turkish Government and World Bank.

The east region of Turkey has distinct geographical and climatic conditions from the rest of the country. In this region, altitude ranges from 1200 to 2000 meters. Several high plateaus are located among high mountains. Temperature in Winter sometimes drops to -20 °C and is generally below zero degree centigrade during 5-6 months (between November and April). It also snows a lot in this region. There is no published study that reveals the reproductive performance of Simmental cattle raised under the cold climatic conditions of Eastern Turkey. Because of the harsh environmental conditions of this region, performance characteristics of Simmental cattle needs to be investigated before they are brought to the region in large number.

The study was undertaken to evaluate the reproductive performance of Simmental cattle which have been raised in the research farm of Agricultural College at Atatürk University, located in the middle part of Eastern Turkey.

Materials and Methods

In this research, the performance records of Simmental cattle were used. The Simmental herd in this research farm was first established by 12 pregnant heifers and 1 bull imported from Germany in 1971. The performance records of these animals have been collected since 1971.

Simmental cattle are housed in a stall barn between October and April. After the weather gets warm, animals are put in the open shed free stall barn for approximately two months. Then, cattle are moved into the pasture of the research farm where the herd grazes until October.

Lactating cows are fed 4-5 kg/head milk concentrates daily. Before the animals are moved into the pasture, heifers and cows are also offered dried hay *(ad libitum)* and wet sugar beet pulp. The quantity of wet sugar beet pulp offered to each animal ranged from 8 to 10 kg/head daily.

The birth season of calves is regulated by the adjusting date of matings so that the calves are not born in July and August. The young animals are reared in a particular building which contains individual pens for calves and delivery rooms for heavy pregnant cows. Calves are fed whole milk by using milk buckets before weaning, then they are given calf starter and dried hay for 6 months.

The production parameters studied included birth weight, calving interval, age at first calving, service period and gestation length. In addition, rates of stillbirth, abortion, twin birth, normal birth were investigated. The data were analysed by the method of fitting constants as described by Harvey (1972). Accordingly, several statistical models were used for evaluating the effect of various fixed environmental factors influencing the reproductive parameters. Comparisons among subclass means were carried out by the method of Duncan's multiple range test available in SAS program (SAS, 1985).

Statistical models used for analysis of variance were as follows:

For calving Interval,

$$Y_{ijkl} = \mu + a_i + b_j + c_k + d_l + e_{ijkl}$$

For age at first calving,

$$Y_{ij} = \mu + a_i + b_j + e_{ij}$$

For service period,

$$Y_{ijk} = \mu + a_i + c_k + d_l + e_{ikl}$$

For gestation length and birth weight,

$$Y_{ijk} = \mu + a_i + b_j + c_k + e_{ijk}$$

Where, Y represented calving interval, age at first calving, gestation

Table 1. – Least squares means and standard errors for calving interval, age at first calving and gestation length of Simmental cattle.

Calving Interval (Days)					Age at First Calving (Months)					Gestation length (Days).				
Trait Effect	n.	Mean	± SE	S	Trait Effect	n.	Mean	± SE	S	Trait Effect	n	Mean	± SE	S
Overall Mean	101	436.0	32.6		Overall Mean	42	40.5	3.4		Overall Mean	79	285.4	1.2	
Year of Calving				*	Year of Calving				**	Year of Calving				*
1971-1974	32	399.8	26.2	ba	1971-1974	12	31.7	2.5	c	1971-1974	8	286.4	2.8	ab
1975-1978	10	492.5	49.0	a	1975-1978	4	37.7	3.8	bc	1975-1978	17	280.7	1.7	bc
1979-1982	15	511.6	34.8	a	1979-1982	6	41.6	3.2	b	1979-1982	15	287.2	1.9	ba
1983-1986	13	463.9	40.4	a	1983-1986	11	41.4	2.8	bc	1983-1986	15	285.9	1.8	bac
1987-1990	17	420.1	36.1	ab	1987-1990	4	46.9	4.3	a	1987-1990	5	292.3	3.2	a
1991-1993	14	327.9	47.7	b	1991-1993	5	43.9	4.0	bc	1991-1993	19	280.3	1.6	c
Sex of Calf				NS	Season of Calving				NS	Sex of Calf				NS
Female	42	449.6	22.7		Spring	22	38.6	1.9		Female	41	286.2	1.2	
Male	59	422.4	22.1		Summer	3	33.9	5.8		Male	38	284.8	1.1	
					Autumn	5	43.8	3.7						
					Winter	12	45.8	2.2						
Age of Cow (months)				NS						Age of Cow (Months)				NS
≤ 36	11	437.9	49.0							≤ 48	14	283.5	1.9	
37-48	22	417.7	34.5							49-60	11	283.8	2.2	
49-60	20	432.3	32.9							61-72	11	285.1	2.3	
61-72	15	424.0	38.0							73-84	9	287.6	2.4	
73-84	14	429.2	35.8							85-96	11	287.1	2.2	
≥85	19	477.8	36.2							≥ 97	23	285.8	1.6	
Season of Calving				NS										
Spring	32	475.1	25.5											
Summer	15	347.7	37.2											
Autumn	12	439.7	42.5											
Winter	4	454.5	25.3											

a, b, c: Means with same superscript are not significantly (P > 0.05) different from one another.
All others differ significantly (P < 0.05).
*: P < 0.05; **: P < 0.01; S: Significance; NS: Non-significant; SE: Standard Error.

length or birth weight. μ is 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.

Years of calving were grouped into 6 periods, each consisting of 3 consecutive years assuming that managerial and genetic changes would be small during this period. Also, the ages of cows were grouped into 6 periods, each including 11 consecutive months.

Results and Discussion

Calving Intervals

Least squares means with their standard errors for factors influencing calving interval of Simmental cattle reared in Eastern Turkey is presented in Table 1. The effects of sex of calf, age of cow and season of calving on the calving interval were not significant (P > 0.05). However, year of calving had significant (P < 0.05) influence on the calving interval.

An average for calving interval was found as 436.0 ± 32.6 days. The result was in agreement with findings of studies conducted by

Alpan *et al.* (1976) and Ilaslan *et al.* (1978) who reported that the calving intervals of Simmentals in Turkey were 456 and 439 days respectively. In other countries, Trautman (1973) obtained an average calving interval of 423 days for Simmental in Poland, while Hincrichsen and Konold (1980) reported 366.7 days for the same breed in Germany. The same parameter determined from Simmental cattle reared in Austria and Paraguay were found as 407 and 377 days by Panic *et al.* (1985) and Talavera (1987) respectively. The average calving interval values determined in these countries were fairly shorter than our finding.

Values in Table 1, indicate an important variation among the years. The result demonstrated that the factors affecting calving interval were not adequately controlled at this farm.

The result relating to the effect of age on the calving interval were in agreement with findings of Martinez and Hernandez (1984) who reported that mature cows had shorter calving interval than young cows.

Age at First Calving

The least squares means with their standard errors and test of significance for factors effecting the age at first calving are given in Table 1. An average age at first calving was obtained of 40.5 ± 3.4 months and longer than the findings of many other researchers (Hocke, 1980; Husdjursskötsel, 1988; Ruegsegger, 1989). Their results relating to this parameter for Simmentals reared in Spain, Sweden and Switzerland were 28.2, 27.4 and 33.2 months respectively.

The effect of years on the age at first calving was highly significant ($P < 0.01$). However, season of calving has no significant ($P > 0.05$) effect on this parameter (Table 1).

The findings of this study indicate that concentrated effort is needed to reduce the age of first calving of Simmentals. Greater attention to improve nutrition and

Table 2. – Least squares means and standard errors for birth weight and service period of Simmental cattle.

Birth Weight (kg)					Service Period (Days)				
Trait effect	n	Mean ± SE		S	Trait effect	n	Mean ± SE		S
Overall Mean	115	36.84	1.6		Overall Mean	66	149.7	49.8	
Year of Calving				*	Year of Calving				*
1971-1974	37	37.9	1.2	ab	1971-1974	9	156.2	49.1	ab
1975-1978	17	34.7	1.7	ab	1975-1978	9	160.7	59.9	ab
1979-1982	15	40.4	1.8	a	1979-1982	12	150.7	40.9	ab
1983-1986	14	34.1	1.8	b	1983-1986	5	219.1	61.9	a
1987-1990	15	36.1	1.7	ab	1987-1990	22	144.6	34.9	ab
1991-1993	17	37.6	1.7	a	1991-1993	9	66.9	52.0	b
Sex of Calf				NS					
Female	51	35.9	0.9						
Male	64	37.7	0.8						
Age of Cow (Months)				*	Age of Cow (Months)				NS
≤ 36	16	33.7	1.8	b	≤ 48	12	162.8	41.5	
37-48	19	35.8	1.6	ab	48-60	15	125.6	42.6	
49-60	20	37.0	1.5	ab	61-72	10	121.3	49.9	
61-72	16	36.5	1.7	ab	73-84	14	118.9	39.6	
73-84	16	37.8	1.6	ab	≥ 85	15	219.9	44.7	
85-96	14	40.4	1.9	a					
≥ 97	14	36.3	1.8	ab					
					Season of Calving				NS
					Spring	13	203.9	37.4	
					Summer	11	124.3	42.1	
					Autumn	8	127.4	50.7	
					Winter	34	143.2	27.3	

a, b: Means with same superscript are not significantly ($P > 0.05$) different from one another.
All others differ significantly ($P < 0.05$).
*: $P < 0.05$; **: $P < 0.01$.
S: Significance; NS: Non-Significant; SE: Standard Error.

Table 3. – Rates of normal birth, abortion, still-birth, and twin birth of Simmental cattle.

Years	Number of Pregnant Cows	Normal Birth		Abortion		Still Birth		Twin Birth	
		n	%	n	%	n	%	n	%
1971	12	12	100	–	–	–	–	–	–
1972	12	11	91.6	1	8.3	–	–	–	–
1973	10	10	100	–	–	–	–	1	10
1974	12	11	91.6	–	–	1	8.3	–	–
1975	7	7	100	–	–	–	–	–	–
1976	11	9	81.8	1	9.1	1	10	–	–
1977	2	2	100	–	–	–	–	–	–
1978	9	8	88.8	1	11.1	–	–	–	–
1979	7	6	85.7	–	–	1	14.3	–	–
1980	6	5	83.3	–	–	1	16.7	–	–
1981	7	6	85.7	1	14.3	–	–	–	–
1982	8	8	100	–	–	–	–	–	–
1983	10	9	90	1	10	–	–	–	–
1984	5	5	100	–	–	–	–	–	–
1985	10	10	100	–	–	–	–	1	10
1986	7	7	100	–	–	–	–	–	–
1987	8	6	75	2	25	–	–	–	–
1988	6	6	100	–	–	–	–	–	–
1989	8	8	100	–	–	–	–	–	–
1990	5	5	100	–	–	–	–	1	20
1991	11	11	100	–	–	–	–	1	9
1992	9	7	77	–	–	2	22	–	–
1993	5	5	100	–	–	–	–	–	–
Total	187	174	93.0	7	3.7	6	3.2	4	2.1

management practices would be helpful to reduce the age at first calving.

Gestation Length

Data belonging to gestation length of Simmental reared under cold climatic condition of Eastern Turkey were classified as year, sex of calf, age of cow, and the results were represented in Table 1. The average gestation length was 285 ± 1.2 days. The result was in agreement with the findings of several other studies (Ilaslan et al;, 1978, and Tümer *et al.*, 1985). The researchers reported that gestation lengths of Simmentals reared in different regions of Turkey were 285.6, and 287.5 days respectively. Similar results, 284.3 and 286.8 days, were obtained by Wray *et al.*, (1987) in USA, and Mureşan *et al.*, (1979) in Romania.

Years significantly ($P < 0.05$) affected gestation length, but the effects of sex of calf and age of cow on the same parameter were not significant ($P > 0.05$) (Table 1).

Birth Weight

The least squares means with their standard errors and test of significance for factors influencing the birth weight of Simmental were shown in Table 2. The average birth weight of male and female calves were 37.7 ± 0.86 and 35.9 ± 0.95 kg. The birth weight of Simmental born in Romania, Sweden and Bulgaria were reported as 40.3, 46.0, 34.0 kg respectively (Mureşan *et al.*, 1979; Husdjursskötsel, 1988; Ivanov, 1982). In Turkey, Alpan *et al.*, (1976), Tümer *et al.*, (1985) and Yanar *et al.*, (1993) reported that the birth weight of male and female calves were 36.0 and 35.0 kg; 40.4 and 37.1 kg; 41.3 and 34.5 kg respectively. In another study, average birth weight of Simmental was reported as 39.2 kg by Yanar *et al.*, (1994).

The age of cow had significant ($P < 0.05$) effect on the birth weight as expected. The birth weight of calves gradually increased with increasing age of cow. The heaviest birth weight was obtained from calves of cows whose ages were ranged from 85 to 96 months. After this period,

the birth weight declined (Table 2). The result was supported by Cunningham *et al.*, (1987) and Burfening *et al.*, (1988).

Service Period

The average service period of Simmental cows reared in this farm were determined as 149.7 ± 49.8 days. The result was longer than findings of other investigators (Stanciu *et al.*, 1982; Tümer *et al.*, 1985; and Ilaslan et al;, 1978). The data belonging to the service period were not significantly ($P > 0.05$) influenced by age of cow and season of calving. However, year significantly ($P < 0.05$) affected the service period.

Birth Rates

The data concerning birth rates are tabulated in Table 3. The rates of normal birth, twin birth, abortion and still-birth were 93%, 2.1%, 3.7%, 3.2% respectively. The normal birth rates of Simmental cattle in Germany and Turkey were found as 98% by Golze and Scwark, (1988) and 88% by Alpan *et al.*, (1976).

The results relating to the twin birth rates were in agreement with the findings of Tümer *et al.*, (1985) who also reported that rates of abortion and still-birth were 0% and 2.5%. The still-birth rates of Simmental reared in Germany and Switzerland were reported as 1.6% by Golze and Scwark, (1988) and 2.6% by Hagger and Hofer, (1989).

The findings of the present study revealed that the rates of still-birth and abortion were fairly greater than the results of other studies.

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