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Growth performance of Simmental calves born in different seasons

Abstract

In this study, the growth performance of Simmental calves born in different seasons in a private farm was emphasised. For this purpose, birth months were used to group calves born within a year, and daily weight gains and birth and weaning weights were compared. Three categories—cool, hot, and cold—were created from the information entered in the enterprise's birth book. An average of 39.28 kg was found to be the birth weight. The hot period between July and September was found to have the lowest birth weight, which was 21,00 kg, while the period between November and February had the highest birth weight, which was 54 kg. In the variance analysis, the differences between the birth weights between the periods were found to be statistically significant at $P<0.05$. The results of studies conducted recently and under intensive farming conditions are required, as the comparisons revealed higher calf birth and weaning weights.

Keywords: seasons, Simmental, calves, growth, performance

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Serap Göncü,[1] Mustafa Sucak[2]

[1]Department of Animal Science, Faculty of Agriculture, Çukurova University, Turkey

[2]Department of Veterinary Medicine, Kâhta Vocational School, Adıyaman University, Turkey

Correspondence: Serap Göncü, Department of Animal Science, Faculty of Agriculture, Çukurova University, Turkey, Email serapgonc66@gmail.com

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Introduction

In cattle breeding, calf production has a fundamental role in the sustainability and efficiency of the meat and dairy sectors. To maintain the herd in cattle farming, it is essential to rear a sufficient number of high-value breeding calves to enhance the genetic structure of the herd, thereby meeting the demand for animal products required on an economic scale. High-value breeding calves raised on farms may be used for replacements, but their sale as breeding stock contributes to the farm's profitability. The calf's breeding value determines the market price. Also, calves raised with adequate care and nutrition are more likely to join the herd early and remain there longer. Management and environmental conditions play a major role in the rearing of calves on farms with minimal losses under optimal conditions. While genetic characteristics interfere with the growth potential of a calf, environmental factors such as nutrition, care conditions, and diseases play a significant role in realizing this potential. Bilgıç and Alıç,[1] mentioned in their study that the heritability coefficient calculated using paternal-half-sibling resemblance was estimated to be 0.07 ± 0.041. Kaygısız[2] has reported that heritability coefficient of 0.07 ± 0.02.

The contribution of planned insemination to a calf's profitability is very important. First of all, a calf should be born within the expected standards for its own breed and be ready for sale at the targeted time if it is to be sold. In dairy farming, live weight is inevitably critical for artificial insemination and obtaining feedlot materials. Either the artificial insemination or a sale date for fattening a calf is only possible when it reaches the desired live weight at the desired time. Since the calf 's birth weight forms the basic calculation criterion for reaching final weights, it is important. The birth weight of a calf varies according to many factors, such as breed, gender, dam's age, dam body weight, farm conditions, and season (Bayrıl and Yılmaz, 2010; Yüceer and Özbeyaz, 2010).[2,3]

The Simmental breed, imported from Hungary to Turkey in 1925, has not gained as much prevalence as the Holstein breed. However, it possesses some advantages in terms of carcass yield that make it a solution for certain conditions. Therefore, in recent years, Simmental breeding has come into consideration as an alternative to the sensitivity associated with the Holstein breed. Much research has been conducted on the productivity level of Simmental cattle under breeding conditions in Turkey. In recent years, due to the demand from breeders for both meat and milk yield, there has been a demand for dual-purpose breeds, leading farms to focus on this breed. A list of studies on Simmental breeding in Turkey is noted in Table 1.

Yaylak et al.[20] investigated some environmental factors affecting the live weight, live weight gain, and weaning weight of calves in their study. They found that the interaction between calving year, month, gender, and the interaction between year and month had a significant effect on the birth weight (39.6±0.15 kg). Besides, the weight gained by the calf after liquid feeding, as it transitions from the single stomach period to the ruminant period, is important for performance and can sometimes lead to important losses due to the sensitivity of this period.

Season affects the development characteristics of the calf during the liquid feeding period. The season has direct and indirect effects on the overall performance of animals such as heat stress, parasites, feed quality, and management conditions. However, the response to seasonal effect may vary among regions and breeds Yaylak et al.[20] Breeds adopted to cooler climates may not perform at the desired level in hot conditions. Cold weather during winter months can increase the energy demands of cattle, potentially affecting birth weight due to energy deficiency. Environmental conditions such as cold weather and mud can affect the health of pregnant animals, thereby impacting calf birth weight. In summer months, hot and humid weather can enhance stress level in cattle, resulting in lower birth weights. Seasonal effects can also lead to changes in birth weight depending on these factors Abera et al.[21]

Therefore, many studies are conducted to mitigate seasonal effects through managemental factors to ensure year-round production stability. However, each region has its specific conditions, and each farm needs to perform its own program, identifying its own critical periods and taking precautions accordingly. Hence, studies conducted should be specific to their own conditions, and each region should determine foresight according to its own needs. Managing measures specific for each condition will result in more efficient production. Therefore, in this study, comparison results focusing on the growth performance of calves born in different seasons in a commercial farm are provided.

Table 1 A list of studies on Simmental breeding in Turkey

Researchers	Subject	Publication
Alpan et al.,[4]	Adaptation Study with Brown, Holstein and Simmental breeds.	Lalahan Zoot. *Araş Enst Derg*. 1976;16(1–2):3–18.
İlaslan M, Aşkın Y, Geliyi C, Alataş İ,[5]	Characteristics Related to Body Structure, Milk and Fertility in Brown and Simmental Cattle Raised in Kars Trial and Breeding Station.	Tarımsal Araş. Gen. Müd. Yayın No:5. Kars. 1978.
Geliyi C,[6]	Adaptation Study with Brown, Holstein and Simmental breeds in Kars district	Büyükbaş Hayvancılık Araş. Projesi (Ara Rapor). Çayır Mer'a Zootekni Araş. Enst. Ankara. 1983.
Tümer S, Kırcalıoğlu A, Nalbant M,[7]	Research on Various Yield Characteristics of Black, Brown and Simmental Cattle Raised in the Aegean Regional Agricultural Research Institute.	Ege Bölge Zirai Araş. Enst. Yayın No:53, Menemen İzmir. 1985.
Akbulut Ö,[8]	Evaluation of Brown, Advanced Blood Grade Brown Hybrids and Yellow Pied Cattle in Terms of Growth and Body Weight.	*Atatürk Üniv Ziraat Fak. Derg*. 1994;25(4):488–499.
Alpan O.,[9]	Fattening Ability and Carcass Characteristics of Brown, Holstein and Simmental Male Calves.	*Ankara Üniv Vet Fak Derg*. 1972;19(3):388–400.
Tömek Ö.,[10]	Research on Fattening Characteristics and Carcass Quality of Some Foreign Cattle Breeds Available in Turkey.	V. Bilim Kongresi VHAG Tebliğleri. TÜBİTAK. Yayın No: 351. Ankara. 1975.
Müftüoğlu Ş, Eşcan Ç, Coşar S, Polat M,[11]	A Comparative Research on the Fattening Performance of Simmental and Brown Breed Male Calves.	Lalahan Zoot. *Araş Enst Derg*. 1979;19(3–4):90–102.
Tüzemen N, Yanar M, Tellioğlu S, Emsen H,[12],	A Comparative Research on the Fattening Performance and Carcass Characteristics of Tawny, Black Pied, Dusky and Norwegian Red	*Doğa Tr J of Vet Anim Sci*. 1990;14(1):47–54.
Akbulut Ö, Tüzemen N,[13]	Fattening Performance, Slaughter and Carcass Characteristics of Dusky, Black–Dutch and Yellow–Dudawn Tosuns Fattened at the Age of 8–12 Months.	*Atatürk Üniv Ziraat Fak Derg*. 1994;25(2):134–144.
Özhan M, Uğur F, Yanar M, Tüzemen N, Akbulut Ö.[14]	Comparison Of Some Reproduction Characteristics Of Simmental Cattle That Were Imported From Germany To The Farm Of Atatürk University With Their Offsiprings That Were Reared In That Farm..	*Atatürk Üniv Ziraat Fak Derg*. 1995;26(2):215–222.
Şekerden Ö, Erdem H,[15]	A Research on Milk and Fertility Characteristics and Estimation of Some Parameters in Simmental Cattle Raised in Kazova Agricultural Enterprise.	*OMÜ Ziraat Fak Derg*. 1995;10(1):63–72.
Uğur, F, Yanar M, Özhan M, Tüzemen N, Aydın R, Akbulut Ö,[16]	Milk Production Characteristics of Simmental Cattle Reared in The Research Farm of Atatürk university.	*Tr J of Veterinary and Animal Sciences*. 1995;19:365–368.
Deliömeroğlu Y, Alpan O, Bakır A,[17]	Growth and Viability of Imported Simmental Cattle under Kazova Agricultural Enterprise Conditions.	*Lalahan Hayvancılık Araş Enst Derg*. 1995;35(3–4):1–15.
Deliömeroğlu Y, Bakır A, Alpan O,[18]	Milk and Reproductive Yields of Imported Simmental Cattle under Kazova Agricultural Enterprise Conditions.	*Lalahan Hayvancılık Araş Enst Derg*. 1996;36(2):42–53.
Özhan M, Uğur F,[19]	Some Fertility and Viability Characteristics of Pure Yellow Pied Cattle Raised in Atatürk University Agricultural Enterprise.	I. Ulusal Zootekni Kongresi. 5–7 Şubat 1996. Antalya. 1996.

Materials and methods

In this study, records of the Simmental calves born in a commercial dairy farm with a capacity of 600 were evaluated. Birth weights recorded in the farms were grouped depending on the birth months. The months of March, April, May, and June, with an average temperature of 15.68°C. The months of July, August, and September, with an average temperature of 23.70°C. Birth and weaning weights of calves were measured using a sensitive electronic scale available in the farm, up to 100 kilograms. Performance criteria included birth weight, total weight gain, daily live weight gain, and weaning weight, calculated from average values. Calves were barned in individual calf hutches and straw was used as bedding. Roughage and concentrate feed were provided separately in feeders. The alfalfa hay used in animal feed was implemented on the farm, while the concentrate feed was purchased externally. Fresh and clean water was provided ad libitum. Calves were kept with their mothers in the calving area for 3 days to ensure colostrum intake. They were fed twice a day with 6 liters of milk per day for 70 days. Calves were adopted to gradually introduce to drinking from a nipple bucket between days 4-7. Commercially available pelleted feed was used as the initial feed for calves in the farm, provided in 50 kg bags. Alfalfa hay harvested on the farm was used as roughage. The composition of the calf starter feed and alfalfa hay used in the study is provided in Table 2.

Table 2 The composition of the calf starter feed and alfalfa hay used in the study

Contents	Calf starter	Alfaalfa hay
Dry Matter (min) (%)	88	93,24
Crude protein (min) (%)	18	11,60
Cellulose (max) (%)	6	34,52
Ash (max) (%)	9	7,63
Fat (min–max) (%)	6–Mar	0,80
Calcium (min–max) (%)	1,2–1,3	
Phospor (en az) (%)	0,40	
Sodium (min–max) (%)	0,1–0,5	
Vitamin A (min) (iu/kg)	24000	
Vitamin D3 (min) (iu/kg)	6000	
Vitamin E (min) (mg/kg)	70	

To evaluate the growth performance of calves born in different seasons, a one-way analysis of variance (ANOVA) was conducted to determine whether they were statistically significant. The differences

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among the averages of birth weight, weaning weight, total weight gain, and daily live weight gain of calves born between November-February, March-June, and July-September. Post-hoc comparisons between groups were performed using the Duncan test in the SPSS program.

Results and discussion

In this study, data from a total of 367 calves born in different seasons were evaluated to compare their growth performances. Calves born between November-February, March-June, and July-September were included in the analysis. The distribution of calves according to their birth weights were summarized at Table 3 and Figure 1.

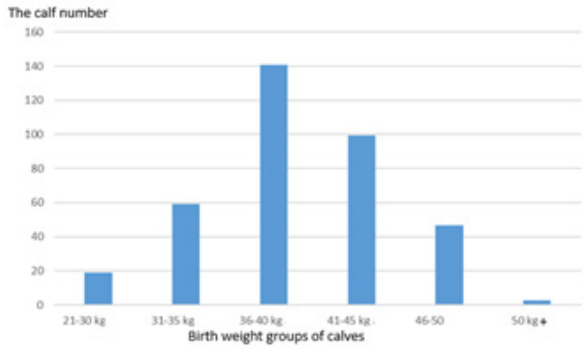

Figure 1 Birth weight groups of calves (kg).

Table 3 shows birth weight groups of calves (kg) according to their birth weights, understanding that 38.36% of the calves fell within the 36-40 kg range. Performance criteria such as birth weight, total weight gain, daily live weight gain, and weaning weight were utilized to assess the performance.

Table 3 The distribution of calves according to their birth weights

Birth weight groups of calves (kg)	Number	Ratio (%)
21–30	19	5,14
31–35	59	16,10
36–40	141	38,36
41–45	99	27,05
46–50	47	12,67
Over 50	3	0,68
Total	367	100,00

The average values of birth weight, weaning weight, total weight gain, and daily live weight gain of the calves are summarized in Table 4. In the study, July and September warm period had the lowest birth weight was determined to be 21.00 kg, while the highest birth weight of 54 kg occurred during the period between November and February. The analysis of variance revealed statistically significant differences in birth weights among the periods at $P < 0.05$. The average birth weights of the calves according to the periods are presented in Figure 2.

Table 4 The performance analysis of birth weights of calves

Performance parameters	Periods	N	Averages	Standard deviation	Standard error	Minimum	Maximum
Birth weight	November– February	120	39,84a	6,51	0,97	23	54
	March–June	115	38,28b	4,77	0,44	27	50
	July –September	132	39,95a	5,17	0,45	21	50
Significany level			0,033				
Weaning weight	November– February	120	87,51a	10,68	1,59	65	112
	March–June	115	84,81b	6,71	0,63	68	102
	July –September	132	78,08c	7,05	0,61	55	95
Significany			0,000				
Live Weight gain	November– February	120	47,67a	7,73	1,15	34	70
	March–June	115	46,53a	5,55	0,52	28	58
	July –September	132	38,12b	5,16	0,45	22	53
Significany level			0,000				
Daily Live Weight gain	November– February	120	70a	0,11	0,02	0,5	1,03
	March–June	115	68a	0,08	0,01	0,41	0,85
	July –September	132	56b	0,08	0,01	0,32	0,78
Significany level			0,000				

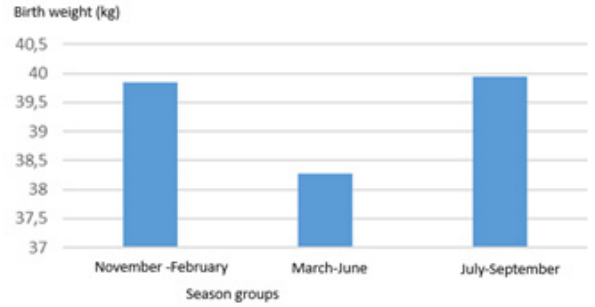

Figure 2 The average birth weight (kg) of calves according to the seasonal groups.

The managemental factors have a great impact on the birth weights of calves. Abera et al.[21] stated that the birth weights of calves are influenced by genetic and environmental factors. On th contrary Kaygısız et al.[2] reported that the effect of season on birth weight was statistically insignificant. Bardakçıoğlu[22] indicated that the birth weight was highest in spring (40.54 g) and lowest in autumn (39.88 g) ($P < 0.001$). Kaygısız et al.[2] found the effect of season on birth weight to be significant at the Polatlı farm ($P < 0.05$) but insignificant at the Tahirova farm. Koçak et al.[3] indicated the average birth weight of Simmental calves as 39.54 kg. Uğur et al.[16] reported the average birth weight of male and female calves as 37.7±0.86 and 35.9±0.95 kg, respectively. The birth weight of Simmental calves born in Romania, Sweden, and Bulgaria was reported as 40.3, 46.0, and 34.0 kg, respectively.[23–25] In studies conducted with Simmental breed in

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Turkey, the birth weights of male and female calves were mentioned as 36.0 and 35.0 kg, 40.4 and 37.1 kg, 41.3 and 34.5 kg, respectively.[4,7,26]

The lowest total weight gain was observed between July and September, with 38.12 kg, while the highest total weight gain was observed between November and February, with 47.67 kg (Table 4). Analysis of variance revealed statistically significant differences in total weight gain values among the periods ($P < 0.00$). The average total weight gains of calves according to the season is presented in Figure 2.

The lowest daily live weight gain was observed between July and September, with 0.560 kg, while the highest daily live weight gain was observed between November and February, with 0.700 kg. Analysis of variance revealed statistically significant differences in daily live weight gain values among the periods ($P < 0.00$). The average daily live weight gains of calves according to the periods is presented in Figure 3.

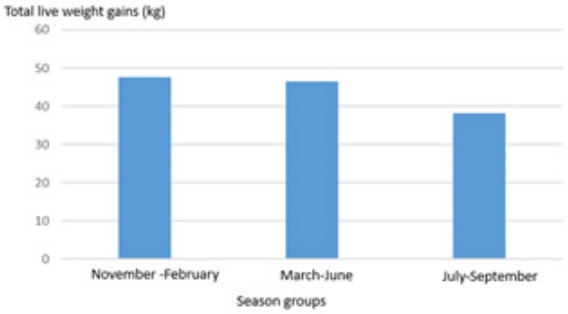

Figure 3 Total live weight gains of calves according to the season.

Yanar et al.[26] reported the average daily live weight gain of female calves during the period from birth to weaning as 0.230 kg. The researcher stated that weight differences in favor of calves weaned at 7 weeks of age disappeared by the age of 4 months.

Daily live weight gains of calves according to the season were shown Figure 4. The weaning weight of calves is an important parameter used by breeders to evaluate their breeding programs and to manage more efficient and stable animals. In the study, the lowest weaning weight was again found to be during the warm period between July and September, with 55.00 kg, while the highest weaning weight was recorded between November and February, with 112.00 kg (Table 4). When examining the distribution of calves' weaning weights according to their birth weights in Table 5, it is shown that 42.12% fell within the 76-85 kg range.

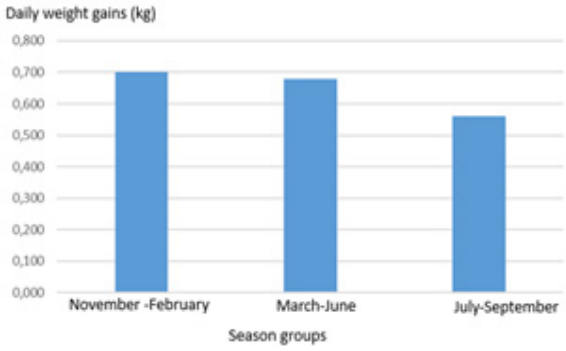

Figure 4 The average daily weight gains (kg) of calves according to the season.

The average weaning weights of calves according to the periods are presented in Table 5. Analysis of variance revealed statistically significant differences in weaning weight values among the periods ($P < 0.00$). The average weaning weights of calves according to the periods are presented in Table 5 and Figure 5.

Table 5 The weaning weight groups of calves

The weaning weights groups (kg)	Number	Ratio (%)
55–65	9	2,40
66–75	75	20,55
76–85	155	42,12
86–95	109	29,79
96–105	15	4,11
106+	4	1,03
	367	100

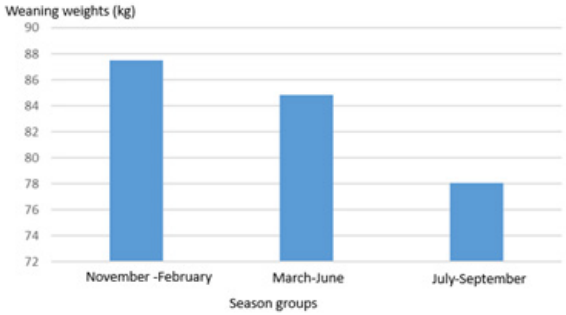

Figure 5 The average weaning weight of calves according to the season.

Ayaşan et al.[27] reported that the season has a significant effect on weaning weight, with the highest weaning weight realized in the spring season (97.13 kg), while the lowest weaning weight was observed in the winter season (89.02 kg). It is expected that there would be differences among the results because the conditions and durations of the studies vary, leading to variations in weaning weight. Weaning weight of calves is generally considered an important factor for breeders both in terms of sales and breeding potential. Calves with higher birth weights are considered to grow healthier on the other hand an important criterion evaluating the weaning weight of calves, typically. The growth rate after birth is also significant; rapidly growing calves are usually expected healthier. A healthy calf generally grows faster and reaches a higher weaning weight. Proper nutrition and management of the calf during this process are crucial factors affecting weaning weight. An appropriate nutrition and management program is necessary for healthy growth and development. Additionally, calves from high-yielding dairy breeds may have higher weaning weights. Analysis of variance revealed statistically significant differences in weaning weight values among the periods ($P < 0.00$). According to the comparisons made, higher birth and weaning weights of the calves were determined, indicating the need for further studies conducted under recent and intensive conditions.[28]

Conclusion

In recent years, cattle breeders have begun to prefer the Simmental breed due to its adaptability to different climatic conditions, long lifespan, high fertility, and low health problems. With a milk fat percentage of 4.2%, an average milk yield of 6500 L, and a meat yield percentage of 58%, Simmental cattle are recommended for breeding due to their combined productivity. Analysis of variance revealed statistically significant differences in weaning weight values among the periods ($P < 0.00$). According to the comparisons made, higher birth and weaning weights of the calves were found, indicating the need for further studies conducted under recent and intensive conditions. Because the geographical features of a region affect the

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adaptation of breeds to that region. Further studies conducted under recent and intensive farm conditions are necessary to verify these findings.

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Conflicts of interest

The authors declared no potential conflicts of interest of this article.

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