

Determination of Fattening Performance, Some Slaughter and Carcass Traits of Blonde d'Aquitaine, Charolais, Limousin and Simmental cattle

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ABSTRACT

This study aims to evaluate the fattening performance and some slaughter and carcass characteristics of four different cattle breeds (Blonde d'Aquitaine, Charolais, Limousin, and Simmental) fattened in a private enterprise in Türkiye. Data from a total of 120 imported male cattle were used in the research. These animals were placed on a fattening with an average initial live weight of 294.10 kg. In this study, parameters such as average daily live weight gain, slaughter weight, carcass weight, and dressing percentage were examined. Statistical analyses were performed using analysis of variance (ANOVA) and multiple comparison tests. The average daily live weight gains for Blonde d'Aquitaine, Charolais, Limousin, and Simmental bulls were found to be 1.416 ± 0.035 , 1.641 ± 0.060 , 1.457 ± 0.024 , and 1.538 ± 0.082 kg, respectively, with a significant difference among breeds ($p < 0.05$). The dressing percentages for these breeds were determined as $58.90 \pm 0.41\%$, $58.20 \pm 0.80\%$, $59.10 \pm 0.30\%$, and $56.50 \pm 1.00\%$, respectively. The results revealed statistically significant differences among breeds in terms of initial live weight, daily live weight gain, and slaughter weight ($p < 0.05$). In particular, the Charolais breed stood out for its higher average daily live weight gain. It was also concluded that the Simmental breed shows similarities to specialized beef breeds in certain traits and has potential as an alternative. The findings obtained from this study can provide valuable insights to producers regarding productivity and performance when selecting cattle breeds for fattening.

Keywords: Beef cattle, Daily live weight gain, Dressing percentage

Blonde d'Aquitaine, Şarole, Limuzin ve Simental Sığırların Besi Performansı, Bazı Kesim ve Karkas Özelliklerinin Belirlenmesi

ÖZ

Bu çalışmada, Türkiye'deki özel bir işletmede besiyeye alınan dört farklı sığır ırkının (Blonde d'Aquitaine, Şarole, Limuzin ve Simental) besi performansı, bazı kesim ve karkas özelliklerinin ortaya konulması amaçlanmıştır. Araştırmada toplam 120 baş ithal erkek sığırın verileri kullanılmıştır. Bu sığırlar ortalama 294,10 kg canlı ağırlıkla besiyeye alınmıştır. Bu çalışmada günlük canlı ağırlık artışı, kesim ağırlığı, karkas ağırlığı ve randımanı gibi parametreler incelenmiştir. İstatistiksel analizler varyans analizi (ANOVA) ve çoklu karşılaştırma testleri ile gerçekleştirilmiştir. Blonde d'Aquitaine, Şarole, Limuzin ve Simental boğalarda günlük canlı ağırlık artışı değerleri sırasıyla; $1,416 \pm 0,035$, $1,641 \pm 0,060$, $1,457 \pm 0,024$ ve $1,538 \pm 0,082$ kg bulunmuş olup ırklar arasındaki fark önemli ($P < 0,05$) olmuştur. Aynı ırklarda karkas randımanı sırasıyla; $\%58,90 \pm 0,41$, $\%58,20 \pm 0,80$, $\%59,10 \pm 0,30$ ve $\%56,50 \pm 1,00$ olarak tespit edilmiştir. Sonuç olarak, ırklar arasında besi başı ağırlığı, günlük canlı ağırlık artışı ve kesim ağırlığı bakımından istatistiksel olarak anlamlı farklar olduğu ortaya konulmuştur ($p < 0,05$). Özellikle Şarole ırkı yüksek günlük canlı ağırlık artışı bakımından öne çıkmıştır. Simental ırkının da etçi ırklarla belirli özellikler bakımından benzerlikler gösterebildiği ve bir alternatif sunma potansiyeli olduğu sonucuna varılmıştır. Elde edilen bulgular, etçi sığır ırkı seçiminde üreticilere verimlilik ve performans bakımından fikir verebilecek niteliktedir.

Anahtar Kelimeler: Etçi sığır, Günlük canlı ağırlık artışı, Karkas randımanı

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INTRODUCTION

Animal husbandry holds significant importance both world and in Türkiye, as it serves as a vital source of nutrition, creates employment opportunities, and contributes to the national economy through exports (Ergün and Bayram, 2021). In Türkiye, the distribution of red meat production in 2023 was 70.1% beef, 23.9% sheep meat, 5.4% goat meat, and 0.6% buffalo meat (TUIK, 2025). Cattle stand out as one of the main sources of adequate and balanced nutrition for humans worldwide, as well as in Türkiye (Duru and Sak, 2017). Their ability of cattle to efficiently utilize roughages rich in cellulose has made them products an indispensable source of nutrition for people. With the increasing population and changing demands, variations in the productive traits of cattle have also emerged (Pınarbaşı and Yazgan, 2020). Considering Türkiye's growing population and the associated demand for high-quality, healthy food, the importance of cattle breeding becomes evident (Göncü and Bozkurt, 2019). Cattle fattening is of great importance due to its economic advantages and its role in the production of meat, which is essential for ensuring adequate and balanced nutrition for the population (İmİK et al., 2000). In order to meet the resulting demand, there is a need for beef breeds with high fattening performance and the ability to produce high-quality carcasses. The importation of live animals for fattening has laid the groundwork for the development of a livestock sector that relies on imported beef cattle in Türkiye (Arıkan and Gökhan, 2018). Over the past two decades, significant progress has been made in beef production in Türkiye: farm capacities have grown, and greater emphasis has been placed on technological innovations in housing, feeding, health management, and marketing. Today, cattle fattening is increasingly concentrated in large, specialized farms that meet modern entrepreneurial standards (Göncü and Bozkurt, 2019). The consumption of beef is influenced by economic conditions, health concerns, socio-cultural backgrounds, traditions, and habits (Cankurt et al., 2010). Identifying variations in fattening performance and carcass characteristics among breeds is of great importance for improving the efficiency of meat production systems and ensuring carcass quality that meets market demands. In this context, production parameters such as average daily live weight gain, feed conversion ratio, slaughter weight, dressing percentage, and carcass conformation emerge as key indicators for determining economic profitability. This study aims to determine the fattening performance, as well as some slaughter and carcass characteristics, of Blonde d'Aquitaine, Charolais, Limousin, and Simmental cattle raised under private farm conditions.

MATERIALS and METHODS

The material of this study consisted of records on the fattening performance and some slaughter and carcass characteristics of a total of 120 male cattle imported to a private enterprise in Afyonkarahisar province, including 70 Limousin, 33 Blonde d'Aquitaine, 11 Charolais, and 6 Simmental animals. After pre-fattening health procedures (antiparasitic treatments, vaccination, etc.) and an adaptation period, the animals were weighed and placed in a fattening. Animals were fed with a diet including corn silage, concentrate, crushed barley, alfalfa, oats, corn flake, straw, and ryegrass in the routine feeding practiced by the farm. During the fattening period, they were housed in free stall-semi-open barns and weighed monthly. Descriptive statistics for some extra carcass characteristics were also determined in 5 Limousin bulls.

For initial live weight and daily live weight gain;

$$Y_{ij} = \mu + \text{genotype}_i + e_{ij}$$

For hot carcass weight, dressing percentage, and slaughter weight;

$$Y_{ij} = \mu + \text{genotype}_i + b_1(\text{initial weights}) + b_2(\text{fattening period}) + e_{ij}$$

In the model, Y represents the observation value; genotype refers to Blonde d'Aquitaine, Charolais, Limousin, and Simmental; and initial weights (b_1) and fattening period (b_2) were considered as covariates for carcass weight, dressing percentage, and slaughter weight. Descriptive statistics, analysis of variance (ANOVA), and multiple comparison tests were performed using the SPSS 18.0 for Windows software (SPSS Inc., Chicago, IL, USA).

RESULTS

The average daily live weight gain, slaughter weight, hot carcass weight, and dressing percentages of Blonde d'Aquitaine, Charolais, Limousin, and Simmental bulls are presented in Table 1. The initial live weights at the start of fattening for Blonde d'Aquitaine, Charolais, Limousin, and Simmental bulls were determined as 294.65 ± 10.60 , 361.86 ± 18.37 , 271.52 ± 7.28 , and 248.35 ± 24.87 kg, respectively. The differences among breeds were found to be statistically significant ($p < 0.001$). According to the results of the multiple comparison test, Charolais bulls were observed to be distinct from the other breeds. Additionally, Simmental bulls had the lowest initial live weight among the breeds. Regarding average daily live weight gain, values for Blonde d'Aquitaine, Charolais, Limousin, and Simmental were 1.416 ± 0.035 , 1.641 ± 0.060 , 1.457 ± 0.024 , and 1.538 ± 0.082 kg, respectively, and the differences among breeds were found to be

significant ($p < 0.05$). Charolais bulls were found to be statistically different from Limousin and Blonde d'Aquitaine, while Simmental bulls did not differ from the other breeds. Hot carcass weights for Blonde d'Aquitaine, Charolais, Limousin, and Simmental were 383.86 ± 5.56 , 393.36 ± 10.29 , 398.07 ± 3.84 , and 406.21 ± 13.22 kg, respectively, and dressing percentages were $58.90 \pm 0.41\%$, $58.20 \pm 0.80\%$, $59.10 \pm 0.30\%$, and $56.50 \pm 1.00\%$, respectively. For both traits, genotype effect was not

statistically significant, while initial live weight and fattening period as covariates were significant. Slaughter weights were 650.87 ± 8.37 , 676.55 ± 15.50 , 673.54 ± 5.79 , and 719.17 ± 19.91 kg, respectively. For this trait, breed, initial live weight, and fattening period were all found to be significant ($p < 0.05$). Simmental bulls, showing the highest value, were separated from Blonde d'Aquitaine with the lowest value in the multiple comparison test, while Charolais and Limousin were similar to both breeds.

Table 1. Fattening performance, some slaughter and carcass traits of Blonde d'Aquitaine, Charolais, Limousin and Simmental bulls

Factor	n	Initial live weight, kg	Daily live weight gain, kg	Hot carcass weight, kg	Dressing percentage, %	Slaughter weight, kg
μ	120	294.10 ± 8.37	1.513 ± 0.027	395.37 ± 4.36	58.18 ± 0.30	680.03 ± 6.57
Breed		***	*			*
Blonde d'Aquitaine	33	294.65 ± 10.60^b	1.416 ± 0.035^b	383.86 ± 5.56	58.90 ± 0.41	650.87 ± 8.37^b
Charolais	11	361.86 ± 18.37^a	1.641 ± 0.060^a	393.36 ± 10.29	58.20 ± 0.80	676.55 ± 15.50^{ab}
Limousin	70	271.52 ± 7.28^b	1.457 ± 0.024^b	398.07 ± 3.84	59.10 ± 0.30	673.54 ± 5.79^{ab}
Simmental	6	248.35 ± 24.87^b	1.538 ± 0.082^{ab}	406.21 ± 13.22	56.50 ± 1.00	719.17 ± 19.91^a
Initial live weight^c		-	-	***	*	***
Fattening period^c		-	-	***	***	***

*: $p < 0.05$, ***: $p < 0.001$

^{ab}: Different superscripts in same column are significantly different ($P < 0.05$)

^c: The initial live weights and fattening period were fitted to the model as a covariate in hot carcass weight, dressing percentage and slaughter weight

Descriptive statistics for some slaughter and carcass characteristics of Limousin bulls are presented in Table 2. Slaughter weight ranged from 648 to 748 kg, with an average of 686 kg. Hot carcass weight varied between 395.00 and 480.40 kg, averaging 428.36 kg. Similarly, cold carcass weight ranged from 389.40 to 473.60 kg, with an average of 421.85 kg. Bone weight in the carcass ranged from 57.50 to 60.20 kg, with a mean of 58.74 kg. The weight of the unconsumed amount in the carcass ranged from 13.50 to 16.40 kg, with an average of 14.74 kg.

Table 2. Descriptive statistics on Some slaughter and carcass traits of Limousin bulls

Trait	Mean	Std. Error	Min	Max
Slaughter weight, kg	686.00	19.424	648.00	748.00
Hot carcass weight, kg	428.36	16.163	395.00	480.40
Cold carcass weight, kg	421.85	15.989	389.40	473.60
Bone weight in carcass, kg	58.74	0.514	57.50	60.20
Unconsumed amount weight in carcass, kg	14.74	0.585	13.50	16.40
Muscle weight in carcass, kg	348.38	14.939	317.80	397.00
Ribeye weight, kg	17.00	1.045	14.40	20.40
Striploin weight, kg	11.74	0.678	10.60	14.20
Tenderloin weight, kg	5.78	0.360	5.10	6.80
Chilling loss percentage, %	1.52	0.075	1.40	1.80

DISCUSSION

In this study, the average initial live weight at the start of fattening was determined as 294.10 kg, and the effect of genotype on this trait was found to be statistically significant ($p < 0.001$). The value of 294.65 kg recorded for Blonde d'Aquitaine falls between the 278 kg and 323 kg values reported by Chambaz et al. (2001). For Charolais and Simmental, the present study found initial weights of 361.86 kg and 248.35 kg, respectively, which were higher for Charolais (276.7 kg) but lower for Simmental (261.6 kg), reported by Duru and Sak (2017). Additionally, the Simmental's initial weight exceeded the 118.00–230.5 kg range reported in other studies (Altuntaş and Arpacık 2004; Üstüner et al., 2020). The initial weight (271.52 kg) for Limousin found in this study aligns with the 249.05–297.14 kg range reported by Arıkan and Gökhan (2018) and Duru and Sak (2017). Such differences may result from variations in the origin of animal material, management conditions, and feeding programs. In this study, the average daily live weight gain was found to be 1.51 kg, with statistically significant differences observed among breeds ($p < 0.05$). The value found for Blonde d'Aquitaine was 1.42 kg, which exceeded the 0.87–1.20 kg range reported by various researchers (Chambaz et al., 2001; Sochor et al., 2005; Vinet et al., 2021) in pure and crossbred Blonde d'Aquitaine. For Limousin, the 1.46 kg

recorded in this study is at the upper limit of the 0.95–1.46 kg range reported in the literature (Duru and Sak, 2017; Arıkan and Gökhan, 2018; Chambaz et al., 2001; Alberti et al., 2008; Şenyüz et al., 2020). For Charolais, the mean average daily weight gain was 1.64 kg, which was within the 1.10–2.30 kg range reported by other studies (Chambaz et al., 2001; Sochor et al., 2005; Barton et al., 2006; Alberti et al., 2008; Duru and Sak, 2017; Şenyüz et al., 2020; Strydom and Hope-Jones, 2022). For Simmental, the average daily weight gain was 1.54 kg, which was higher than the range of 1.04–1.49 kg previously reported (Chambaz et al., 2001; Altuntaş and Arpacık, 2004; Sochor et al., 2005; Barton et al., 2006; Alberti et al., 2008; Duru and Sak, 2017; Şenyüz et al., 2020). These differences between the present study and the literature may be due to genetic factors, management conditions, and variations in feeding programs.

In this study, the average slaughter weight was determined as 680.03 kg, and genotype affected significantly ($p < 0.05$). For Blonde d'Aquitaine, this value was 650.87 kg, which is within the 227–820 kg range reported by other researchers for pure and crossbred Blonde d'Aquitaine (Chambaz et al., 2001; Sochor et al., 2005; Vinet et al., 2021). For Limousin, the value was 673.54 kg, close to the upper limit of the 565.4–697.0 kg range reported in the literature (Alberti et al., 2008; Salamonczyk et al., 2022; Lunesu et al., 2024), and consistent with previous findings. Average slaughter weight for Charolais was 676.55 kg, which is higher than the range of 620.7–653.3 kg reported in previous studies (Sochor et al., 2005; Barton et al., 2006; Alberti et al., 2008). For Simmental, the mean slaughter weight was 719.17 kg, and this value is higher than the 593.66–694.1 kg range reported in earlier studies (Sochor et al., 2005; Barton et al., 2006; Alberti et al., 2008; Üstüner et al., 2020). These differences may be from variations in management conditions, feeding strategies, and genetic factors. Particularly, the fattening period, initial weight, and other environmental factors can affect slaughter weight.

Dressing percentage was calculated 58.18 % for all fattening young bulls. The value of 58.9% determined for Blonde d'Aquitaine was in the range between 56.7% and 64.3% reported by researchers (Chambaz et al. 2001; Sochor et al., 2005; Vinet et al., 2021). Average dressing percentage for Charolais was 58.2%, which was within the range of the 57.4–61.0% reported in previous studies (Chambaz et al. 2001; Sochor et al., 2005; Barton et al., 2006; Alberti et al., 2008; Duru and Sak, 2017; Şenyüz et al., 2020; Strydom and Hope-Jones, 2022). For Limousin, the dressing percentage (59.1%) was with the range of 57.2% and 63.7% reported by previous studies (Chambaz et al. 2001; Alberti et al., 2008; Duru and Sak, 2017; Şenyüz et al., 2020; Salamonczyk et al., 2022; Lunesu et al., 2024). The dressing percentage of simmental was 56.5%, which was between the

53.40% and 62.02% values reported by different researchers (Chambaz et al. 2001; Altuntaş and Arpacık, 2004; Sochor et al., 2005; Barton et al., 2006; Alberti et al., 2008; Duru and Sak, 2017; Şenyüz et al., 2020; Üstüner et al., 2020). These differences may be attributed to variations in management practices, feeding strategies, and genetic factors. This study despite Simmental bulls having lower initial weights compared to other breeds, the analysis of fattening performance, slaughter and carcass weights shows that they achieved superior carcass and slaughter weights.

When Limousin bulls were evaluated in terms of some carcass characteristics, muscle weight in the carcass ranged from 317.80 to 397.00 kg, with an average of 348.38 kg. Ribeye weight varied among individuals from 14.40 to 20.40 kg, with an average of 17 kg. Similar variation was observed in striploin weight, which ranged from 10.60 to 14.20 kg and averaged 11.74 kg. Tenderloin weight ranged from 5.10 to 6.80 kg, with an average of 5.78 kg. Meanwhile, chilling loss percentage varied between 1.40% and 1.80%, with an average of 1.52%. These findings highlight the phenotypic diversity among Limousin bulls and reveal differences in the evaluated carcass characteristics.

CONCLUSION

In this study, the fattening performance and certain slaughter and carcass characteristics of Blonde d'Aquitaine, Charolais, Limousin, and Simmental bulls raised under the same environmental and feeding-management conditions were evaluated. The findings showed significant differences among breeds. These results highlight the importance of breed selection in countries like Türkiye that aim to improve meat production efficiency and quality. Charolais was found to offer a suitable alternative for fattening enterprises due to its high meat yield and economic potential. The Simmental breed, known for its dual-purpose characteristics, also showed similarities to specialized beef breeds in certain traits and presents an alternative potential. Future studies conducted in different regions could help provide a more comprehensive assessment of the performance of these breeds.

Conflict of interest: The authors have no conflicts of interest to report.

Authors' Contributions: SK, MD, SÇ and KY contributed to the study design and conduct of the study. Data organization and statistical analysis were performed by SK, MD, SÇ and KY. SK, MD and SÇ drafted and wrote the manuscript. SK, MD and SÇ reviewed the manuscript critically. All authors have read and approved the finalized manuscript.

Ethical approval: This study is not subject to the permission of HADYEK in accordance with the “Regulation on Working Procedures and Principles of Animal Experiments Ethics Committees” 8 (k). The data, information and documents presented in this article were obtained within the framework of academic and ethical rules.”

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