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RESEARCH PAPER

LIVESTOCK STUDIES

Comparison of fattening performance of Angus, Charolais, Limousine and Simmental cattle imported to Turkey

Hasan Hüseyin Şenyüz[1]*, Serkan Erat[2], Mehmet Akif Karslı[3], İsmail Soydemir[4]

[1] International Center for Livestock Research and Training, Lalahan, Mamak, Ankara, Turkey
[2] University of Kırıkkale, Departmant of Husbandry, Yahşihan, Kırıkkale, Turkey
[3] University of Kırıkkale, Departmant of Animal Nutrition and Nutritional Disease, Yahşihan, Kırıkkale, Turkey
[4] Kargı Construction and Livestock, Kargı, Çorum, Turkey

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***Corresponding Author**
hasansenyuzvet@yahoo.com

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Abstract

The purpose of this study was to compare the fattening performance of some cattle breeds under same care and feeding condition, which were imported to a private farm in Turkey. Approximately eight months old male Angus (AN) (n=12), Charolais (CH) (n=33), Limousine (LM) (n=40) and Simmental (SM) (n=9) breeds were imported from Ireland to a private farm in Çorum. Least squares means for AN, CH, LM and SM, respectively, for the elapsed time (ET) of the breeds from the beginning of feeding until slaughter were 181.42±8.07, 181.30±4.87, 186.15±4.42, and 194.78±9.32 days; for the initial live weights (IW) at the beginning of fattening period were 404.42±11.26, 418.70±6.79, 389.00±6.17 and 430.56±13.00 kg; for the live weights (LWS) at the time of slaughter were 616.78±14.29, 625.64±8.80, 636.00±8.13 ve 631.97±16.84 kg; for the average daily live weight gains (ADLWG) were 1.17±0.06, 1.23±0.04, 1.23±0.03 and 1.16±0.07 kg; for the hot carcass weights (HCW) were 355.45±10.20, 362.76±6.28, 385.15±5.80 and 368.98±12.02 kg; for the dressing percentages (DP) of the breeds were 57.47±0.95, 58.09±0.58, 60.64±0.54 ve 58.48±1.12 %. Mean consumption of DM, OM, NDF, ADF and CP were 11.43, 11.18, 5.03, 2.63 and 1.55 kg. ET (p=0.643), LWS (p=0.653), ADLWG (p=0.600), FE (p=0.871) and HCW (p=0.389) were not statistically different whereas IW (p=0.003) and DP (p=0.005) were statistically different for the breeds. The IW of Limousine was lower than Charolais (p=0.009) and Simmental (p=0.025) whereas Limousine had better performance for the DP than did Angus (p=0.027) and Charolais (p=0.014).

Introduction

Depending on the increasing population of the world, food demands also increase. Animal protein is one of the most important nutrients among the foods consumed. Therefore, in order to meet the increasing demand, both the number of animals and the yield should be increased.

Population of Turkey is increasing in parallel with the World population. Therefore, the need for animal protein is also increasing in Turkey. Since the amount of meat produced in Turkey does not meet the demand, beef cattle or carcass meat is imported from time to time [15]. Failure to meet the demand is due to the insufficient number of animals as well as the lack of beef breeds in Turkey. The animals raised for slaughter in Turkey are generally dual purpose breeds like Simmental, Brown Swiss, also male offspring of dairy breeds [2].

According to TSI [24] the cattle number of European breeds, cross breeds and local breeds, respectively, are 8,419,204, 7.030.297, and 1.593.005. In 2018, a total of 3.426.180 cattle were slaughtered and 1.003.859 tons of meat were produced. This resulted a mean carcass weight of 293 kg per animal, while this figure is 291 kg across European countries, and 362.8 kg in the United States [12].

Animals imported from abroad were brought from Australia, Uruguay, Brazil and the European Union under the control of the Ministry of Agriculture and Forestry

[4]. The number of imported animals was 132.844 cattle for slaughter and 1.211.719 cattle for fattening in 2018 [4]. Limousine, Charolais, Angus, Hereford and Simmental were the most preferred among imported beef breeds [11, 16]. In the world and in Turkey, the Simmental breed, which is a dual purpose breed, is commonly used in fattening performance studies along with other beef cattle breeds, since it has high fertility and milk yield as well as good resistance to diseases [17].

In Turkey, crossbreeding studies with the imported beef breeds from abroad [1, 6, 7, 9, 22] have been made for many years. Studies on slaughter and fattening performance of beef cattle imported from abroad have also been conducted [11, 16, 21]. These studies revealed that more studies on imported cattle were needed.

The aim of this study was to compare the fattening performance of different beef cattle breeds imported to a private farm in Turkey under the same management and feeding conditions.

Material and Method

The animal material of the study consisted of male Angus (AN) (n = 12), Charolais (CH) (n = 33), Limousine (LM) (n = 40) and Simental (SM) (n = 9) cattle, which were imported from Ireland at the average age of approximately 8 months. The study took place in a private farm of Çorum province in 2017. One week after the animals came into the farm, internal and external parasite treatments and necessary vaccinations were done and they were included in the intensive feeding program after the adaptation process was completed.

Live body weights were taken and recorded on a monthly basis starting from the second month in the morning with an empty stomach at the end of the fattening program, the animals were slaughtered in a private slaughterhouse and hot carcass weights were recorded.

The animals were fed in a free stall-semi-open farm. The animals consumed corn silage, alfalfa hay, straw, wet beet pulp as roughage, while they consumed feed mixtures commercially available as concentrate feed and barley. The average feed amounts (on a wet basis) given to the animals are given in Table 1. Nutritional needs were gradually increased according to NRC [19] based on live body weight gain. All consumed feeds are provided commercially. Dry matter, crude ash, and crude protein analyzes of the consumed feeds were made according to AOAC [5], NDF analysis according to Van Soest and Robertson [25] and ADF analysis according to Goering and Van Soest [14] and are given in Table 2. Daily body weight gains were calculated from monthly weighings. The general linear model (GLM) was used if there is a difference between the groups (breeds) in terms of the characteristics examined. The initial live weights (IW) at the beginning of fattening period was put into the statistical model as a covariate and covariance analysis was performed for the final body live weight, carcass weight and dressing percentage. The assumptions of whether the relationship between covariate and dependent variables is linear and whether the regression slopes are the same for each breed group were checked before conducting the covariance analysis. There was a linear relationship between post-fattening body weight, carcass weight and dressing percentage with the covariate and the regression slopes were same for each breed group. Pairwise comparisons between breed groups were made with the Bonferroni test in the covariance analysis and with the Tukey test if the covariance analysis was not performed. The least squares means and standard errors are given in the tables. P≤0.05 level was accepted as a significant difference. SPSS v15 package program [13] was used for statistical analysis.

Table 1. Daily feed consumption, kg/day.

Feeds	Consumption kg/day
Concentrated feed	6
Barley	1
Straw	1.8
Alfalfa hay	0.9
Wet Beet Pulp	1
Corn silage	1.8

Table 2. Nutrient contents of feed used in ration.

	DM %	OM %	HP %	NDF %	ADF %
Concentrated feed	90.06	90.94	14.52	26.71	9.27
Barley	91.66	96.91	10.58	18.95	5.57
Straw	95.34	90.91	4.11	77.65	48.34
Alfalfa hay	95.01	92.34	14.2	53.09	41.64
Wet Beet pulp	15.2	94.39	10.01	45.37	23.97
Corn silage	26.33	94.89	7.4	49.77	27.18

Table 3. Fattening performance and carcass parameters of cattle used in the experiment.

	Angus	Charolais	Limousine	Simmental	p
n	12	33	40	9	
Elapsed time, day	181.42±8.07	181.30±4.87	186.15±4.42	194.78±9.32	0.643
Initial live body weight, kg	404.42±11.26^{ab}	418.70±6.79^{a}	389.00±6.17^{b}	430.56±13.00^{a}	0.003
Final live body weight, kg	616.78±14.29	625.64±8.80	636.00±8.13	631.97±16.84	0.653
Hot Carcass weight, kg	355.45±10.20	362.76±6.28	385.15±5.80	368.98±12.02	0.389
Dressing percentage %	57.47±0.95^{b}	58.09±0.58^{b}	60.64±0.54^{a}	58.48±1.12^{ab}	0.005
Daily live weight gain, kg	1.17±0.06	1.23±0.04	1.23±0.03	1.16±0.07	0.600

^{a,b} The difference between averages carrying different letters in the same line is statistically important (P<0.05).

Results

The data regarding the fattening performance and carcass parameters of cattle used in the experiment are given in Table 3. Daily amounts of nutrients consumed by animals are shown in Table 4.

Table 4. Daily amounts of nutrient consumed by animals, kg.

	CDM	COM	CCP	CNDF	CADF
All breeds	11.43	11.18	1.55	5.03	2.63

DM: Dry matter; OM: Organic matter; CP: Crude protein; NDF: Neutral detergent fiber; ADF: Acid detergent fiber.

Discussion and Conclusion

The elapsed times of fattening period in this study changed from 181.30±4.87 days in Charolais to 194.78±9.32 days in Simental. Different fattening period times were reported by various studies. Such as 236.0±9.8 days for Brown [8], 132.4±3.61 days for Holstein [18], 138 days for Simmental [23], 206.7±5.4, 238.1±4.4, 261.4±4.4, 227.0±5.3 and 283.6±5.2 days for imported Simental, Aberden Angus, Hereford, Limousine and Charolais, respectively [11], 180 days for all imported Limousine, Charolais, Angus and Hereford [16], 389.2 days for LimousinexHolstein F_1 hybrids [20]. The elapsed times in fattening period of this study were either lower, higher or similar to the studies mentioned above. This time may vary depending on many factors such as the age of the animal, initial live weight, daily live weight gain, animal breed and market conditions [3]. The reasons for the differences between the studies may be attributed to one or more of these factors.

The initial live body weight in this study was lowest in the Limousine (389.00±6.17 kg) and the highest in the Simmental (430.56±13.00 kg) (p= 0.003). Barton et al. [10] reported this as 391.3, 297.5, 320.7 and 285.0 for Angus, Charolais, Simmental and Hereford. Duru and Sak [11] reported this as 261.6±1.4, 267.3±1.1, 276.7±1.1, 264.1±1.3 and 276.7±1.3 kg for the imported Simental, Aberden Angus, Hereford, Limousine and Charolais, respectively. Kayar and Inal [16] reported this as 349.4±5.5, 329.2±2.9, 340.3±4.3 and 341.5±3.7 for Limousine, Charolais, Angus and Hereford, respectively. The initial live body weights in the study were higher than the ones reported by Duru and Sak [11] and Kayar and Inal [16], were similar to the ones for Angus and were higher than the ones for other breeds reported by Barton et al. [10].

The live weights before the slaughter for Angus, Charolais, Limousine and Simmental in this study, respectively, were 616.78±14.29, 625.64±8.80, 636.00±8.13 and 631.97±16.84 kg. There was no statistical difference between the breeds in terms of live weight before the slaughter (p=0.653). Various studies reported this weight as 405.2±3.7 kg for Brown Swiss [8], 529.3±15.25 kg for Holstein [18], 673.7 kg for Simmental [23], 562.3, 620.7, 632.4 and 540.1 kg for Angus, Charolais, Simmental and Hereford, respectively [10], 523.4±5.2, 543.3±4.8, 563.1±4.8, 545.5±4.9 and 589.7±4,1 kg for Simmental, Aberdeen Angus, Hereford, Limousine and Charolais, respectively [11], 561.5±5.1, 590.7 ± 5.3, 570.5 ± 5.0 and 588.2 ± 5.1 kg for Limousine, Charolais, Angus and Hereford, respectively [16], 501.9 kg for LimousinexHolstein F_1 hybrids [20]. The live weights before the slaughter in this study were similar to the ones reported by Barton et al. [10], were higher than the ones reported by Arpacık et al. [8], Oğan et al. [20], Koç and Akman [18], Duru and Sak [11], Kayar and Inal [16] and were lower than the ones reported by Sami et al. [23]. Live weights before the slaughter varies according to factors such as initial live weight, elapsed time and daily live weight gain before and during the fattening period. It is evaluated that the differences arising here depend on these factors.

The hot carcass weights for Angus, Charolais, Limousine and Simmental in this study, respectively, were 355.45±10.20, 362.76±6.28, 385.15±5.80 and 368.98±12.02 kg (p=0.389). Various studies reported this weight as 234.9 ± 3.3 kg for Brown Swiss [8], 315.30±10.70 kg for Holstein [18], 350.9 kg for Simmental [23], 326.5, 361.5, 364.3 and 302.3 kg for Angus, Charolais, Simmental and Hereford, respectively [10], 303.4, 317.7, 332.1, 319.3 and 351.2 kg for Simmental, Aberdeen Angus, Hereford, Limousine and Charolais, respectively [11] 296.41 kg for LimousinexHolstein F_1 hybrids [20]. The hot carcass weights in this study were higher than the ones reported by Arpacık et al. [8], Oğan et al. [20], Koç and Akman [18] and Duru and Sak [11], were similar to the ones reported by Sami et al. [23] and Barton et al. [10]. It was evaluated that the high carcass weights in the study were related to the initial live weight and the elapsed time before and during fattening period.

The dressing percentages in this study, respectively, were 57.47±0.9, 58.09±0.58, 60.64±0.54 and 58.48±1.12% for Angus, Charolais, Limousine and Simmental (p=0.005), [(Limouine-Angus; p=0.027), (Limousine-Charolais; p=0.014)]. Various studies reported this values as 58.0±0.5% for Brown Swiss [8], 57.97±0.81% for Holstein [18], 57.3% for Simmental [23], 58.0, 58.3, 57.5, and 56.0%, for Angus, Charolais, Simmental and Hereford, respectively [10], 58.1, 58.5, 58.9, 58.6 and 59.5% for Simmental, Aberdeen Angus, Hereford, Limousine and Charolais, respectively [11], 59.06% for LimousinexHolstein F_1 hybrids [20]. The dressing percentages in this study were similar to the ones reported by Arpacık et al. [8], Oğan et al. [20], Koç and Akman [18], Sami et al. [23], Barton et al. [10] and Duru and Sak [11]. The dressing percentage basically varies according to the animal's breed and diet. In this study, feeding different breeds in the same way was found important to reveal the genetic differences between the breeds.

The amount of feed given to the animals was kept equal for all groups. The daily live weight gains in this study, respectively, were 1.17±0.06, 1.23±0.04, 1.23±0.03 and 1.16±0.07 kg for Angus, Charolais, Limousine and Simmental. There was no difference be-

tween breeds in terms of daily live weight increases (p= 0.600). Various studies reported this values as 1114.9 g for Brown Swiss [8], 1083.87±93.81 g for Holstein [18], 1371 g for Simmental [23], 1170, 1428, 1419 and 1315 g for Angus, Charolais, Simmental and Hereford, respectively [10], 1362.9, 1275.9, 1214.2, 1266.9 and 1101.1 g for Simmental, Aberdeen Angus, Hereford, Limousine and Charolais, respectively [11], 1.318, 1.492, 1.371 and 1.477 g Limousine, Charolais, Angus and Hereford, respectively [16], 1140 g for LimousinexHolstein F_1 hybrids [20]. The daily live weight gain in this study were similar to the ones reported by Arpacık et al. [8], Oğan et al. [20], Koç and Akman [18], Duru and Sak [11], and were lower than the ones reported by Sami et al. [23], Barton et al. [10], Kayar and Inal [16]. This is primarily due to genetic capacity and, in part, to conditions of care and feeding.

It has been observed that Angus, Charolais, Limousine and Simmental animals imported for fattening purposes have significant differences in terms of dressing percentage under the same breeding conditions and Limousine, therefore, may be more advantageous for dressing percentage.

Credit

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References

1. Akbulut Ö, Yanar M, Tüzemen N, Bayram B (2004). Possibilities of utilizing from European cattle breeds for improving beef production in Turkey. 4. National Animal Science Congress. p: 16-21.
2. Akcan A, Gürdoğan T, Çetin İ (1989). Effect of different final weight of Holstein young bulls on slaughter and carcass characteristics. Journal of Lalahan Livestock Research Institute. 29 (1-4): 21-36.
3. Alpan O, Arpacık R (1998). Sığır Yetiştiriciliği. Şahin Printing Press, Ankara.
4. Anonim (2019). Et ve süt kurumu sektör değerlendirme raporu. Access date: 08.08.2019. https://www.esk.gov.tr/upload/Node/10255/files/2018_Yili_Sektor_Degerlendirme_Raporu-.pdf
5. AOAC (1990). Official methods of analysis. Association of Official Analytical Chemists, Arlington, VA
6. Arpacık R, Alpan O, Bayraktar M, Çekgül E (1993)a: Commercial crossbreeding of Jersey cows for beef production using Belgian Blue and Chianina Bulls. Journal of Lalahan Livestock Research Institute. 33(3-4), 1-15.
7. Arpacık R, Bayraktar M, Alpan O, Çekgül E (1993)b: Calving ease rating and growth of calves from Jersey cows sired by Simmental, Piedmont and Charolais Bulls. Journal of Lalahan Livestock Research Institute. 33(3-4), 16-29.
8. Arpacık R, Nazlıgül A, Beyhan Z, Atasoy F (1994). The effects of initial weight on fattening traits and economy of the enterprise in Turkish Brown Bulls. Journal of Lalahan Livestock Research Institute. 34 (1-2): 79-89.
9. Aydoğan M, Alpan O, Karagenç I (1997). The livability, growth and reproductive characteristics of Limousin Breed of cattle in Central Anatolian conditions. Journal of Lalahan Livestock Research Institute. 37(2), 23-36.
10. Barton L, Rehak D, Teslik V, Bures D, Zahradkova R (2006). Effect of breed on growth performance and carcass composition of Aberdeen Angus, Charolais, Hereford and Simmental bulls. Czech J. Anim. Sci. 51 (2): 47–53.
11. Duru S, Sak H (2017). Fattening Performance and Carcass Characteristics of Simmental, Aberdeen Angus, Hereford, Limousin and Charolais Cattle Breeds in Turkey. Turkish Journal of Agriculture-Food Science and Technology, 5(11): 1383-1388.
12. FAO (2017). Food and Agriculture Organization of the United Nations. Access date: 29.06.2019 http://www.fao.org/faostat/en/#data.
13. Field A (2005). Discovering Statistics Using SPSS. Second Edition, London.
14. Goering HK, Van Soest PJ (1970). Forage fiber analyses (apparatus, reagents, prcedures, and some applications). USDA Agr Handb.
15. Karakuş K (2011). An overview to live animal and red meat ımports of Turkey. Iğdır Univ. J. Inst. Sci. & Tech. 1(1): 75-79.
16. Kayar T ve Inal Ş (2019). Comparison of fattening performance of Limousine, Charolais, Angus and Hereford breed bulls. Eurasian Journal of Veterinary Sciences. 35(2), 104-108.
17. Koç A (2016). A review on Simmental raising: 1. Simmental raising in the World and in Turkey. Journal of Adnan Menderes University Agricultural Faculty. 13(2): 97 – 102.
18. Koç A, Akman N (2003). Fattening performance and carcass characteristics of imported Holstein bulls at different initial weight. Hayvansal Üretim. 44(1): 26-36.
19. National Academies of Sciences, Engineering, and Medicine (2016). Nutrient requirements of beef cattle. National Academies Press.
20. Oğan M, Başpınar H, Balcı F, Petek M, Batmaz S, Yıldırım B (2000). Fattening performance and carcass characteristics in the LimousinxHolstein F_1 crossbred. Uludağ Üniversitesi Veteriner Fakültesi Dergisi, 19 (1-2): 67-73.
21. Özbeyaz C, Bağcı C, Yağcı T, Alpan O (1997). Commercial Crossbreeding of Jersey Cows for Beef Production Using Brangus, Limousin and Simmental Sires. 1. Growth. Journal of Lalahan Livestock Research Institute. 37(1): 1-19.
22. Özbeyaz C, Bağcı C, Yağcı T, Alpan O (1997). Commercial crossbreeding of Jersey cows for beef production using Brangus, Limousin and Simmental sires. II. fattening, slaughtering and carcass characteristics. Journal of Lalahan Livestock Research Institute. 37(2): 1-22.
23. Sami AS, Augustini C, Schwarz FJ (2004). Effects of feeding intensity and time on feed on performance, carcass characteristics and meat quality of Simmental bulls. Meat Science, 67 (2): 195-201.
24. TÜİK (2018). Hayvancılık İstatistikleri. Access date: 29.06.2019 http://www.tuik.gov.tr
25. Van Soest P, Robertson J (1979). Systems of analysis for evaluating fibrous feeds Standardization of analytical methodology for feeds: proceedings. IDRC, Ottawa, ON, CA.