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PHYSICAL PERFORMANCE AND CARCASS CHARACTERISTICS OF HOLSTEIN AND BROWN SWISS CATTLE GROWN IN AN INTENSIVE BEEF SYSTEM

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Abstract

In this study, it was aimed to compare the physical performances and carcass characteristics of Holstein and Brown Swiss cattle grown in an intensive beef production system.
For this purpose, 20 Holstein and 20 Brown Swiss male cattle with an average age of 6 months old were assigned to two feedlot paddocks evenly and fed on the similar ration for 12 months in 2012. The average initial weights of Holstein and Brown Swiss breed animals were 158 and 132 kg respectively. General Linear Model (GLM) procedure was used for the statistical analysis of the data and initial weight and age were taken as covariates to eliminate the weight differences at the start of the experiment. It was found that at the end of the experiment, the differences in final weights were not statistically significant (P>0.05) and Holstein and Brown Swiss animals reached average final weights of 502 and 493 kg, respectively. Furthermore, there were no significant (P >0.05) differences in mean total gains (344 v. 361 kg) and average daily liveweight gains (0.985 v. 1.028 kg). The slaughter weight of the animals was 502 and 493 kg for Holstein and Brown Swiss cattle, respectively. Hot carcass weight was approximately similar for both breeds (264 kg) and Dressing percentages were 52.6 and 53.6% for Holstein and Brown Swiss cattle, respectively. Total fat values were 9.2 and 8.8 kg, Fat ratios were 3.52 and 3.45 % for Holstein and Brown Swiss cattle, respectively. Total bone values were 49.37 and 44.29 kg, Bone ratios were 19.8 and 18.3 % for Holstein and Brown Swiss cattle, respectively. There was only statistical differences (P<0.05) in total bone and bone ratio between breeds. The results indicated that under the Mediterranean climate conditions both breed animals performed similarly and there was no superiority of any breeds over each other although Brown Swiss cattle tended to show better performances. Therefore, both breeds can be recommended for an intensive beef system in the region.

Key words*: Holstein, Brown Swiss, beef cattle, Mediterranean, performance, carcass traits.*

INTRODUCTION

Traditional beef production is highly dependent on climate and soil, and very much linked to the availability of local resources either plant growth or the animal breeds reared. In addition, it is also related to the socio-economic conditions such as environment, the land tenure situation, quality of life and a reasonable degree of advanced technology. The animal production based on extensive systems have common features such as limited number of animals per unit area, relatively limited use of resources and advanced technology, low productivity per animal and hectare of land, feeding mainly based on natural grazing (Boyazoglu and Nardone, 2005).

Beef production constitutes an important part of the agricultural sector of many countries. The development of beef industry in many countries depends largely on climatic conditions and land types. It also depends on the size of agricultural holdings and the overall structure of the cattle industry especially the relationship between beef and dairy production (Allen and Kilkenny, 1984).

Meat is produced primarily as a by-product of milk production and the cattle are mainly dual purpose for milk and beef in Turkey, where there is a much smaller range of farming

environments divided mainly into smaller farms.

Feedlot beef production systems have gained a big interest due to its low investment and operational costs for the last decade in Turkey and beef producers have been facing a big challenge in meeting the great demand for red meat consumption of the population along with its rapid growth rate (Ecevit, 1999). The Average carcass weight has increased from 200 kg to 275 kg within a decade in the country.

While there is some information on the comparative feedlot performance of Holstein with Brown Swiss cattle breeds, there is not much information on comparative evaluation of carcass characteristics of both breed especially under the Mediterranean climatic conditions. Therefore, this study was aimed to provide some information about physical and carcass performance comparisons of breeds grown in intensive beef system in the Mediterranean part of the country.

MATERIALS AND METHODS

Animals

The experiment was conducted in Isparta province located in the west Mediterranean part of Turkey at the Süleyman Demirel University Research Farm. The data composed of a total of 40 beef animals with a mean initial weight of 145 kg; including 20 Holstein and 20 Brown Swiss breeds. The initial average weights of cattle were 132 and 158 kg for Brown Swiss and Holstein respectively.

Animal Management

Animals were obtained from local cattle markets with approximately six months and were initially weighed at the beginning of the experiment and were randomly allocated according to their weights into two groups, each group having the same type of breed and were kept in feedlots with two pens The free access of the experimental animals to water was available throughout the experimental period. Each group was weighed and monitored on a fortnightly basis, using electronic weighing scale (True-Test2000 SmartUnit). The experiment lasted for 12 months and at the end of the experiment, the animals were slaughtered at a commercial abattoir.

Diets

Dried alfalfa and hay as roughages and ground barley and cattle fattening feed as concentrates were provided to obtain a target of 1 kg daily live weight gain (DLWG) and the rations were rearranged according to live weight changes of the animals as required.

The rations were weighed out into bags and fed twice a day. The chemical compositions of concentrate diets used in this study are shown in Table 1.

Table 1. Chemical composition of concentrate diets

Dry matter %	88	Sodium %	0.3-0.6
Crude Protein %	14	Metabolic Energy, Kcal/kg	2600
Crude Fibre %	14	Vitamine A, I.U/kg	5000
Crude Ash %	9	Vitamine D3, I.U/kg	700
Calsium %	1.0-2.0	Vitamine E, Mg/Kg	30
Phosphate %	0.5		

Statistical Analysis

The data for breed types and seasons were analysed by GLM (General Linear Model) procedure (Minitab v.16), using the following model:

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \varepsilon_{ijk}$$

where Y_{ijk} is the ijk th observation of animal weight,

μ is the overall mean,

α_i is the effect of breed type,

β_j is the effect of initial weight and,

ε_{ijk} is the residual effect or random error associated with the individual animal

Breed type factor was fitted as fixed effect, and initial weight was included in the model as a covariate (average 145 kg approximately).

The data related to carcass traits were statistically analysed by Two-sample Student's *t*-Test.

Table 2. Overall physical performance comparisons of breed types

Breed Type	N	IW (kg)	s.e.	FW (kg)	s.e.	TWG (kg)	s.e.	DLWG (kg)	s.e.
Holstein	19	158	4.92	502	6.16	344	5.12	0.985	0.023
Brown Swiss	20	132	4.52	493	6.67	361	8.05	1.028	0.028

IW= Initial weight, FW= Final weight, TWG= Total weight gain, DLWG= Daily Live weight gain

Table 3. Carcass traits comparisons of breed types*

Breed Type	N	SW (kg)	s.e.	HCW (kg)	s.e.	DP (%)	s.e.	TF (kg)	s.e.	FR (%)	s.e.	TB (kg)	s.e.	BR (%)	s.e.
Holstein	19	502	6.16	264.1	2.5	52.6	0.36	9.2	1.0	3.52	0.42	49.4^{a}	1.1	19.8^{a}	0.42
Brown Swiss	18	493	6.67	263.8	6.1	53.6	0.3	8.8	0.49	3.45	0.18	44.3^{b}	1.4	18.3^{b}	0.32

SW = Slaughter weight, HCW = Hot Carcass weight, DP = Dressing Percentage, TF = Total Fat, FR = Fat Ratio, TB = Total Bone, BR = Bone Ratio.
* The statistically significant means are shown with the different superscripts within the same columns ($P < 0.05$).

RESULTS AND DISCUSSIONS

There were some health problems encountered during the winter and one Holstein was died of pneumonia and dismissed from statistical analysis.

The least-square means and standard errors for liveweights for breed types are shown in Table 2. There were no significant ($P > 0.05$) differences between breed types in FW, TWG and DLWG. Holstein cattle performed better than Brown-Swiss cattle in all parameters observed. Mean daily liveweight gains for Holstein and Brown-Swiss cattle were 0.985 and 1.028 kg respectively.

Final weights and overall weight gains of Holsteins (502 kg and 344 kg respectively) were no statistically higher ($P >0.05$) than those of Brown Swiss cattle (493 kg and 361 kg respectively). The least-square means and standard errors for carcass parameters for breed types are shown in Table 3.

The slaughter weight of the animals was 502 and 493 kg for Holstein and Brown Swiss cattle, respectively. Hot carcass weight was approximately similar for both breeds (264 kg) and Dressing percentages were 52.6 and 53.6% for Holstein and Brown Swiss cattle, respectively. Total fat values were 9.2 and 8.8 kg, Fat ratios were 3.52 and 3.45 % for Holstein and Brown Swiss cattle, respectively. Total bone values were 49.37 and 44.29 kg, Bone ratios were 19.8 and 18.3 % for Holstein and Brown Swiss cattle, respectively.

As shown in Table 3, there were no significant ($P > 0.05$) differences between breed types in SW, HCW, DP, TF and FR. However, there were significant ($P < 0.05$) differences between breed types in TB and BR.

It was reported by Wilkinson (1985) that conformation and growth potential vary greatly between different breeds of cattle. While there are certainly differences between breeds in growth rate, the liveweight gain which can be achieved from a given area of grass or quantity of feed is similar for most breeds, provided that each breed is fed and managed according to its own particular requirements. This is supported by the results of this study that both breeds were fed on similar feeding conditions.

Bozkurt (2006, 2007 and 2011) reported about the superior weights of Holstein cattle, However, in this study the results were not in agreement with the results reported by Wilkinson (1985), Bozkurt and Ap Dewi (1996) and Bozkurt (2012). The results of this study showed that under the Mediterranean conditions Holstein and Brown Swiss cattle were performed similarly and both can be well-suited to the feedlot beef systems.

However, as Keane *et al.* (1989) and Keane and More O'Ferrall, (1992) reported that the results of these comparisons, including those reported in this study are not necessarily applicable outside the countries where comparison studies were carried out due to the differences in factors such as production systems, slaughter weights and climate, etc.

In relation to carcass traits, Onenc (2004) found that there were no statistically significant differences in hot carcass weights between Holstein and Brown Swiss cattle slaughtered in the Aegean region. These results were similar to those found in this study. However, there were differences in conformation and fatness between both breeds while no difference in fatness was found in this study.

Similar results to the findings of this study was reported by Diler et al. (2016) who worked on cold carcass traits of Holstein and Brown Swiss young bulls grown in the Eastern Anatolia Region. They reported that cold carcass weights as 237.4 and 248.6 kg for Holstein and Brown Swiss cattle respectively. Cold dressing percentages were found as 53.3 and 51.9 % for Holstein and Brown Swiss cattle respectively. Fatness scores were as follows; 2.2 and 2.1 for Holstein and Brown Swiss cattle respectively. Similar results were also reported by Aydin et al (2013) that there were no significant differences in the same carcass parameters observed in this study.

CONCLUSIONS

It can be concluded that under the Mediterranean climate conditions both breed animals performed similarly in terms of physical performance and carcass characteristics and there was no superiority of any breeds over each other although Brown Swiss cattle tended to show better performances. Therefore, both breeds can be recommended to be kept in an intensive beef system in the region.

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REFERENCES

Allen D., Kilkenny B., 1984. Planned Beef Production, Collins, London.

Aydin R., Yanar M., Diler A., Kocyigit R., Tuzemen N., 2013. Effects of different slaughter ages on the fattening performance, slaughter and carcass traits of Brown Swiss and Holstein Friesian young bulls. Indian J. Anim. Res., 47(1):10-16.

Bozkurt Y., 2006. Seasonal performance of different breeds of feedlot beef catle grown under the Mediterranean conditions. EAAP, European Association for Animal Production 57 th Annual Congress, Antalya, Turkey.

Bozkurt Y., 2007. Comparison of growing and finishing performance of different breeds of feetlot beef cattle grown under the Mediterranean conditions. EAAP, European Associotaion for Animal Production 58 th Annual Congress, Dublin, Ireland.

Bozkurt Y., 2011. An evaluation of feedlot performance of Holstein and Brown Swiss Cattle grown under Mediterranean climate conditions. IV. International Symposium of Livestock Production. Macedonian J. Anim. Sci., vol.1:17-20.

Bozkurt Y., 2012. Seasonal performance of different breeds of feedlot beef cattle grown under the Mediterranean conditions. Bulg. J. Agric. Sci., 18: 443-445.

Bozkurt Y., Ap Dewi, I., 1996. Effect of Breed Type, Sex, Birth Year and Season of Birth and Their Interactions on Liveweight Change in Beef Cattle. Selcuk Univ. J. Agric. Fac., 10 (13): 125-140.

Diler A., Kocyigit R., Yanar M., Aydin R., Tuzemen N., 2016. Effects of different initial weights on fattening performance, slaughter and carcass characteristics of Holstein Friesian and Brown Swiss young bulls. Indian J. Anim. Res., 50(1):112-117.

Ecevit F., 1999. Açıkta sığır besisi paneli, 25 Kasım 1999, Süleyman Demirel Üniversitesi Ziraat Fakültesi, Isparta , s. 3-6

Keane M.G., More O'ferrall G.J., 1992. Comparison of Friesian, Canadian Hereford × Friesian steers for growth and carcass composition. Anim. Prod. *55: 377-387.*

Keane M.G., More O'ferrall G.J., Connoly J., 1989. Growth and carcass composition of Friesian, Limousin × Friesian and Blonde Daqutaine × Friesian steers. Anim. Prod. 48: 353-365.

King J.O.L., 1978. An Introduction to Animal Husbandry. Blackwell Scientific Publications Ltd, Oxford.

Minitab. 2010. Statistical Package, Version. 16. Minitab Inc. USA.

Onenc A., 2004. A comparison of Holstein Friesian, Brown Swiss and Eastern Anatolian Red cattle slaughtered in Turkey for carcass conformation and fatness in SEUROP system. Czech. J. Anim. Sci., 49:169-176.

Wilkinson J.M., 1985. Beef production from silage and other conserved forage. Longman, London and New York.