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EVALUATION OF TWO GRAZING SYSTEMS APPLIED ON ARTIFICIAL PASTURES IN THE WEST MEDITERRANEAN REGION OF TURKEY

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Abstract

In this study, it was aimed to evaluate two grazing systems for the performance of beef cattle grazing on artificially established pastures under the West Mediterranean climate conditions. For this purpose, an experiment was conducted at university farm in Isparta province located in the west Mediterranean region of Turkey in 2012 and lasted for 70 days. A total of 20 Holstein breed beef cattle with an average of 6 months old were assigned equally to two grazing pastures which were composed of Medicago sativa L. (20%) + Bromus inermis L. (40%) + Agropyron cristatum L. (30%) + Poterium sanguisorba (10%). Two pasture areas with a 3 ha in size were established artificially next to each other and designed as one with zero grazing (ZG) and the other one with rotational grazing, using electrical fencing system (RG) to determine the grazing performance of beef cattle. Biomass available for grazing was also monitored. It was found that there were no effects of grazing types on the performance of the animals. The total weight gains of the animals were 66 and 69 kg for ZG and RG respectively at the end of the experiment. Similarly, there were also no statistical significant differences in daily live weight gains (DLWG) of the animals. DLWGs were 0.954 and 0.996 kg for ZG and RG respectively. Consequently, both type of grazing systems can be recommended for beef cattle production in the region. However, it should be taken into consideration that there was a tendency for the animals perform better in rotational grazing system on artificially established pastures in the West Mediterranean climate conditions.

***Key words**: Holstein, Artificial Grassland, Performance, Beef Production, Mediterranean.*

INTRODUCTION

In developing countries, where there is a much smaller scale of farming practices divided mainly into smaller farms, meat is produced primarily as a by-product of dairy production and the cattle are mainly dual purpose for milk and beef. For the last decade, beef producers in Turkey have been facing a big challenge in meeting the great demand for red meat consumption of the population along with its rapid growth rate and due to the lack of roughage and insufficient natural grasslands. Therefore, beef production systems using artificial grasslands have gained a big interest due to its low investment and efficient management applications (Ecevit, 1999).

Beef production constitutes an important sector of the agricultural industry of many countries. The type of beef industry which develops in any country depends largely on climatic conditions and land types (Allen and Kilkenny, 1984).

One of the ways to resolve the lack of roughage was to establish artificial pastures. Artificial pasture establishment increased in recent years in Turkey. The commonly used species in establishing artificial pasture in Turkey is crested wheatgrass, smooth bromegrass and alfalfa (Acar et al., 2011). Flora, stage of maturity, soil composition, climate, altitude and other managerial factors affect the physical and chemical properties of grassland (Church, 1991; Holmes, 1994; McDonald et al., 1995).

Beef cattle production systems ranges from the beef cow herds that typically graze on pastureland or graze the remaining residue on the land after grain harvest to growing and finishing young cattle in feedlots. The feedlot-housing systems used in beef cattle production typically varies by climate and can range from open earthen lots with very little shelter to open shed and lot or an enclosed confinement building (Pastoor et al., 2012).

In literature there are many studies in favour of different grazing systems for improving performance of grazing animals. However, the best grazing system can change according the situations. Producers always search for the most effective grazing system and that utilize grazing livestock are continually faced with the need to develop, implement, monitor and evaluate their grazing systems. It is important to have effective and efficient grazing systems for profitable cattle and sheep productions.

Therefore, in this study it was aimed to evaluate two different grazing systems (zero grazing) for the performance of grazing beef cattle on artificial pastures.

MATERIALS AND METHODS

Experimental Location

This research was conducted in 2012 in Isparta Province (37°45′N, 30°33′E, elevation 1035 m) located in the Mediterranean region of Turkey. During the experimental year, total precipitation as a long-term average was 450 mm. Average temperature was 12.1ºC.

Animals

The experiment was set up at Süleyman Demirel University Research Farm and lasted for 70 days in 2012. It was involved a total of 20 Holstein beef cattle with an average 6 months old and divided into two grazing groups in this experiment with an initial weight of 230 and 240 kg for Rotational Grazing (RG) and Zero Grazing (ZG) experiments respectively.

Animal and Pasture Management

Animals were initially weighed at the beginning of the experiments and were randomly divided according to their weights into two grazing groups. Each group was weighed and monitored on a fortnightly basis, using electronic weighing scale (True-Test2000 SmartUnit). The animals had free access to water throughout the experimental period.

For the establishment of artificial grazing land, 3 ha pasture land was chosen adjacent to the university farm and cultivated in March 2010 with a botanical composition of *Medicago sativa* L. (20%) + *Bromus inermis* L. (40%) + *Agropyron cristatum* L. (30%) + *Poterium sanguisorba* (10%).

The chemical composition changes in pastures were monitored in order to determine the nutritious properties of grasses. The grass samples were collected by using $1m^2$ quadrates fortnightly from May to August. The fresh biomass (FB) yield, dry matter (DM) yield, crude protein (CP), acid detergent fibre (ADF) and neutral detergent fibre (NDF) contents were determined as well.

Statistical Analysis

The data were subjected to the statistical analysis by performing General Linear Model (GLM) procedure using Minitab.16 statistical software programme and in the statistical model, initial weight and age were taken as covariates to eliminate the weight and age differences at the start of the experiment.

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

where *Yijk* is the *ijk* th observation of animal weight,

μ is the overall mean,

αi is the effect of treatments,

βj is the effect of initial weight and,

εijk is the residual effect or random error associated with the individual animal

RESULTS AND DISCUSSIONS

The least-squares means and standard errors for liveweights for grazing systems are shown in Table 1.

As it is presented in Table 1, final weights of the animals in 2012 were 306 and 299 kg; the average total weight gains 66 and 69 kg and finally daily liveweight gains of 0.954 and 0.996 kg respectively. Similarly, in respect to performance of animals in grazing systems, the final weights were 306 and 299 kg for ZG and RG respectively. The average total weight gains 66 and 69 kg and finally daily live weight gains of 0.954 and 0.996 kg respectively.

There were no significant (P >0.05) differences between grazing systems in terms of Final Weights (FW), Total Weight Gains (TWG) and Daily Liveweight Gains (DLWG). However, the animals in RG tended to perform better than the cattle in ZG in all parameters observed.

Table 1. Overall performance comparisons of animals by grazing system types*

Grazing System	N	IW(kg)	s.e.	FW(kg)	s.e.	TWG(kg)	s.e.	DLWG(kg)	s.e.
ZG	10	240	19.7	306	16.7	66	4.93	0.954	0.071
RG	10	230	17.7	299	15.6	69	5.44	0.996	0.078

IW= Initial weight, FW= Final weight, TWG= Total weight gain, DLWG= Daily liveweight gain
* The means with the same superscripts presented in the table are not statistically significant (P >0.05).

There were also no statistical differences in chemical compositions of grasses in both pastures.

In the literature, there are similar or contradictory results obtained to the findings of this study. In contrast to the finding of this study, Bozkurt and Kaya (2011) reported that rotational grazing resulted in greater weight gains than set stocking to achieve maximum cattle performance. However, their study was carried out at a high altitude on hilly rangeland conditions.

The results of the study conducted by Bozkurt and Kaya (2011) confirmed that rotational grazing has shown superiority over set-stocking grazing on high mountain ranges in many studies (Howery et al., 2000). It was also pointed out by Poland et al. (2004) that using a rotational grazing system improved animal performance with increased stocking rate, calf average daily gain and calf gain per acre and resulted in an improved financial status for the operation. However, in this study there was no superiority of any grazing systems over each other. Vendramini and Sollanberger (2007) reported that no single grazing management system is suitable for all forage systems in all environments. Because of the possibility of greater forage production and pasture persistence, rotational grazing has potential to improve animal production on beef cattle operations in many grazing conditions. The results of this research can be considered to be consistent with the statement that rotational grazing increased performance of the animas although there was no statistical difference in the performance of animals in both grazing systems in this study (Hensler et al., 2007).

Pointed out that rotational grazing provides continual ground cover and high quality, good-yielding forage for the livestock and as a result better animal performance In contrast, animals in a set stocking grazing system are left in a single, undivided pasture for weeks or months, often yielding overgrazed, sparse pastures with low persistence (Broomer and Moore, 2000; Teague and Dowhower, 2003). Bozkurt and Kaya (2011) concluded that rotational grazing using electrical fencing system can substantially improve grazing performance of beef cattle on hilly rangeland conditions.

Performance potential varies greatly between different breeds of cattle and different production systems. While there are certainly differences between performance of animals 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 of animals, provided that animal is fed and managed according its own environment (Wilkinson, 1985; Bozkurt and Ap Dewi, 1996; Bozkurt, 2012).

The results of these comparisons, including those reported in literature are not necessarily applicable outside the countries where such experiments were carried out due to the differences in factors such as production systems, slaughter weights and climate etc.

CONCLUSIONS

Consequently, both type of grazing systems can be recommended for beef cattle production in the region. However, it should be taken into consideration that there was a tendency for the animals perform better in rotational grazing system on artificially established pastures in the West Mediterranean climate conditions.

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