

Growth Performance Characteristics of Holstein Friesian Calves Fed Early and Late Cut Meadow Hay

Ömer MENTEŞE

Eastern Anatolian Agricultural Research Institute, Ilıca, Erzurum

Leyla TURGUT Olcay GÜLER Mete YANAR Naci TÜZEMEN,
Department of Animal Science, College of Agriculture, Atatürk University, Erzurum (myanar@atauni.edu.tr)

Mustafa TAN Binali ÇOMAKLI
Department of Agronomy, College of Agriculture, Atatürk University, Erzurum

Geliş Tarihi : 18.10.2005

ABSTRACT: The study was conducted to determine the effects of feeding by early or late bloom cut hay from meadows on the growth performance of female Holstein Friesian calves. For this purpose, a total of 12 female Holstein Friesian calves at 8-10 months of ages were fed for 129 days. The cutting time of the meadow hay had significant ($P<0.01$) influence on the growth performance and feed efficiency ratio parameters in favour of the early cutting practice. Total weight gain of the calves fed early cut hay was 17.5 kg greater than that of calves given late cut hay. The amount of early cut hay consumed per kg weight gain was 1.725 kg lower than that of late cut fed per kg weight gain. It was concluded that the early bloom cutting stage for meadow hay production could be suggested for providing better growth performance and feed efficiency ratio of female Holstein Friesian calves raised in the Region of Eastern Anatolia.

Key Words: Holstein Friesian, Calves, Cutting Stage, Meadow Hay, Growth Performance

Erken ve Geç Biçilmiş Çayır Otu ile Beslenen Siyah Alaca Danaların Büyüme Performansı Özellikleri

ÖZET: Bu çalışma, dişi Siyah Alaca danaların büyüme performansı üzerine erken veya geç çiçeklenme döneminde biçilen çayır otu ile beslemenin etkisini belirlemek üzere yürütülmüştür. Bu amaçla 8-10 aylık yaşlarda 12 adet dişi Siyah Alaca dana 129 gün süre ile beslenmiştir. Çayır otu biçim zamanının, erken biçim uygulaması lehine olmak üzere büyüme performansı ve yemden yararlanma oranı bakımından önemli etki yaptığı belirlenmiştir. Erken biçilmiş çayır otu ile beslenen buzağular, geç biçilmiş ot verilen buzağulardan 17.5 kg daha fazla toplam canlı ağırlık artışı yapmışlardır. Bir kg canlı ağırlık artışı için tüketilen erken biçim çayır otu miktarı geç biçilen ot ile beslenenlerden 1.725 kg daha azdır. Doğu Anadolu Bölgesinde yetiştirilen dişi Siyah Alaca danalarda daha iyi bir büyüme performansı ve yemden yararlanma değeri sağlanması bakımından, erken çiçeklenme döneminde çayır otu üretiminin tavsiye edilebileceği sonucuna varılmıştır.

Anahtar Kelimeler: Siyah Alaca, Buzağular, Biçim Zamanı, Çayır Otu, Büyüme Performansı

INTRODUCTION

Climatic and geographic conditions in the Region of Eastern Anatolia are more appropriate for growing of meadow and pasture compared with cash crops. Meadow and pasture areas cover 56 % of the land of the region, and about half of the meadow and pasture area of the country presents in this region (Gökkuş and Koç 1996). Therefore, around 20 % of Turkey's cattle population is raised in this part of the country.

Although meadow areas in the Eastern Region of Turkey are in large quantity, their hay yields are fairly low. As a result of this fact, farmers generally prefer to harvest meadow hay late in the growing season to obtain the highest herbage yield. The growth and phenological stage of plant when harvested is the most important factor affecting meadow hay quality (Lacefield et al. 1998; Davison et al. 2000). It has been recognized that there is a decline in the nutritive value of the meadow hay with advancing stages of growth (Lacefield et al. 1998). As meadow hay advances from the vegetative to

reproductive (seed) stage, it becomes higher in fiber and lignin content and lower digestibility, acceptability to calves and crude protein content (Globe et al. 1989; Reece et al. 1994; Ankee et al. 1994). The lower crude protein content of hay influences the amount of crude protein needed to meet nutritional requirements. Therefore, cattle breeders used forages harvested beyond the optimum harvest date may require more supplemental crude protein to attain requirements, and it results in an increase of the feeding expenses.

Even though many studies on the effects of cutting stages on the quality and productivity of meadow hay were conducted, there was little information available to guide the cattle producers on growth performance traits of female calves fed diets consisting mainly of meadow hay harvested at early or late bloom stages (Reece et al. 1994; Norton et al. 1997; Menteşe, 1998; Çomaklı et al. 2005). Therefore, the present study was undertaken with the objective of evaluating the effect of rations mainly

formed by early or late bloom cut dried meadow hay on the growth performance traits of female Holstein Friesian calves.

MATERIALS AND METHODS

A part of the meadow of Agricultural College Research Farm at Atatürk University was divided into two portions. Hay was harvested from each part of meadows from either at early bloom or late bloom stages of the dominant plant species. Then, the meadow hay was dried and made up into bales, and offered to calves. The quantity of the forage was determined by weighing of the dry hay from two parts of the meadow.

A total of 12 female Holstein Friesian calves at 8-10 months of ages from cattle herd of The Research Farm of Agricultural College were used in this study. The calves were housed in a closed stall barn during the trial. All calves were allocated one of two treatment groups. While first group of the calves was fed meadow hay harvested at early bloom period, the second group animals consumed late cut meadow hay during the experiment. The calves consumed 3.5 kg/day of meadow hay for first 14 days. While 4 kg/day of hay was offered to calves from second to fifth 14 days period, 5 kg/day hay per animal was given until end of the trial. Water was supplied by automatic waterers during the feeding period of 129 days. Half portion of the hay was offered animals every morning at 8.00 am, other part was given every afternoon at 2.30 pm. The amount of the concentrate given for each animal was 1 kg/day. Calves were fed individually and amount of the hay and concentrate remained in the feeder was weighed daily and recorded. Calves were also weighed individually at the beginning and final of the experiment.

Chemical analyses of the meadow hay and concentrate were performed according to AOAC (1990). ADF content was also determined by the method of Goering and Van Soest, (1970). Metabolic energy contents of the hays were estimated by using prediction equation given by Alçiçek et al. (1997).

The differences due to time of cutting were statistically analysed by using Independent Samples

T test in SPSS statistics computer program (SPSS, 1998).

RESULTS AND DISCUSSION

The advancing of the time of the cutting increased meadow hay yield from 3847 kg/ha to 4618 kg/ha. Similar result was reported by Lacefield et al. (1998) who indicated that late cut hay yield was 492.5 kg more than early cut hay yield. On the other hand, crude protein level of the meadow hay was influenced adversely from delayed cutting, and it decreased from 9.6 % to 7.5 % (Table 1). The finding was in agreement with result of Davison et al. (2000) who reported that crude protein level of late cut hay was 2.2 % lower than that of early cut hay. Late cut hay tended to have slightly higher concentrations of ADF, crude cellulose, ether extract as already reported by Messman et al. (1991), Cherney et al. (1993), Ammar et al. (1999), Bochi Brum et al. (2001).

Average initial weights of the Holstein Friesian calves were not statistically different (Table 2). However, final weights of the female calves were significantly ($P < 0.01$) affected by time of cutting. The calves fed forage cut at early bloom stage had 16.67 kg heavier final weight than those consumed forage harvested at late bloom stage of plants in the meadow. The result was in agreement with findings of Lacefield et al. (1998) and Davison et al. (2000) who reported that early cut hay produced heavier heifer and steers than those fed late cut hay.

Average daily and total weight gain of the calves were also significantly ($P < 0.01$) influenced by cutting stages of the meadow hay (Table 2). The average daily weight gain of the female Holstein Friesian calves fed early cut hay was 0.135 kg greater than that of calves consumed late cut hay. Similar result was reported by Lacefield et al. (1998) who revealed that heifers fed hay harvested at early bloom stage had 0.249 kg more daily weight gain than those given late cut hay. The animal response could be attributed to the decreasing of the crude protein level and digestibility of the hay with advancing of the cutting time.

Table 1. Chemical composition of early and late cut meadow hay and concentrate (%100 DM)

	Crude Protein	Crude Cellulose	Crude Ash	Ether Extract	Nitrogen Free Extract	ADF	ME (MJ/kg DM)
Early cut hay	9.6	32.7	9.9	2.1	36.0	41.7	8.4
Late cut hay	7.5	33.5	11.4	2.6	35.9	42.0	8.3
Concentrate	14.2	6.1	8.3	3.5	56.8	-	-

The feed efficiency ratio was also affected significantly ($P<0.01$) by the cutting time of the meadow hay (Table 3). The amount of early cut hay consumed per kg weight gain was 1.725 kg less than that of late cut hay. The adverse influence of the late harvest stage on the feed efficiency value could be attributed to maturation of meadow hay and decrease of digestibility as well as crude protein content of the hay. Even though digestibility of the meadow hay was not investigated in the present study, Messman et al. (1991), Cherney et al. (1993) reported that digestibility of the fiber decreased as maturity advanced. On the other hand, meadow hay intake

was not significantly affected by the stages of the maturity (Table 3). The result could be attributed to the close ME values (8.4 vs 8.3 MJ/kg DM) of the hays harvested at two different stages of the maturity (Table 1).

The overall results of this study indicated that cutting stage of meadow hay had significant effects on the growth performance characteristics of the calves fed rations made up mainly with dry meadow hay. It was suggested that meadow hay should be cut at the early bloom stage of the dominant plants for providing better growth performance for female Holstein Friesian calves.

Table 2. Growth performance of the female Holstein Friesian calves (kg) ($X\pm S_x$)

	Cutting Stages		Significance
	Early Cut Hay (N=6)	Late Cut Hay (N=6)	
Initial weight	131.83±10.86	132.66±11.72	NS
Final weight	209.50±31.39	192.83±30.96	**
Total weight gain	77.66±3.07	60.16±3.20	**
Daily weight gain	0.601±0.002	0.466±0.002	**

$X\pm S_x$: Mean ± standard error of mean, NS: Non-significant, **: $P<0.01$

Table 3. Feed efficiency ratios and meadow hay intake of the calves ($X\pm S_x$)

	Cutting Stages		Significance
	Early Cut Hay (N=6)	Late Cut Hay (N=6)	
Amount of feed (kg) consumed per kg live weight;			
For concentrate	1.488±0.006	1.930±0.008	**
For meadow hay	6.458±0.254	8.183±0.379	**
For total feed	7.946±10.113	10.113±0.461	**
Meadow hay intake (kg)	497.63±5.145	486.63±8.054	NS
Total feed intake (kg)	612.41±5.140	601.41±8.05	NS

$X\pm S_x$: Mean ± standard error of mean, NS: Non-significant, **: $P<0.01$

REFERENCES

- Alçiçek, A., Sevgican, F., Şayan, Y., Çapçı, T., Özkul, H. 1997. Bazı kaba yemlerde enerji içeriğinin Van Soest analiz yöntemi ile saptanmasına yönelik bir araştırma. Proje Raporu No:96-ZRF-051, Ege Üniversitesi Ziraat Fakültesi, Zootekni Bölümü, İzmir.
- Amnar, H., Lopez, S., Bochi Brum, O., Garcia, R., Ranilla, M.J. 1999. Composition and in vitro digestibility of leaves and stems of grasses and legumes harvested from permanent mountain meadows at different stages of maturity. *J. Anim. and Feed Sci.* 8(4): 599-610
- AOAC, 1990. Association of official analytical chemists, official methods of analysis, 15th ed. AOAC, Arlington, VA, USA.
- Anke, M., Groppe, B., Gleis, M. 1994. Der einfluss des nutzungszeitpunktes auf den mengen- und spurenelementgehalt des grünfutters. *Wirtschaftseigene Futter*, 40 : 304-319.
- Bochi Brum, O., Lopez, S., Garcia, R., Calleja, A., Perez, M., Gonzalez, J.S. 2001. Composicion quimica, botanica y digestibilidad in vitro de forrajes de prados permanentes en relacion con la fecha de siega. *ITEA*. 22(1): 358-360
- Cherney, D.J.R., Cherney, J.H., Lucey, R.F. 1993. In vitro digestion kinetics and quality of perennial grasses as influenced by forage maturity. *J. Dairy Sci.* 76:790-797.
- Çomaklı, B., Menteşe, Ö., Koç, A. 2005. Nitrogen fertilizing and pre-anthesis cutting stage improve dry matter production, protein content and botanical composition in meadows. *Acta Agriculturae Scandinavica, Acta Agriculturae Scandinavica, Section B, Soil and Plant Science*, 55: 125-130.
- Davison, J., Torelli, R., Hackett, I. 2000. Intermountain pasture and hay meadow handbook: Pasture hay and profit. Cooperative Extension, EB-00-03, University of Nevada, Reno, USA.
- Globe, A., Berloznik, Z., Leskosek, M., Stibilj, V. 1989. Effect of fertilizers and cutting time on chemical composition of sward from permanent meadow. *Proceedings of the XVI International Grassland Congress*, 4-11 October 1989, p.769-770, Nice, France.

- Gökkuş, A., Koç, A. 1996. Doğu Anadolu'da Tarımsal Yapı. Tarım Öğretimini 150. Yılında Türkiye 3. Çayır-Mera ve Yem Bitkileri Kongresi, 17-19 Haziran 1996. Erzurum.
- Lacefield, G., Henning, J.C., Collins, M., Swetnam, L. 1998. Quality hay production. University of Kentucky, College of Agriculture, Agricultural Communication Service, No: AGR-62, Kentucky, USA.
- Messman, M.A., Weiss, W.P., Ericson, D.O. 1991. Effects of nitrogen fertilization and maturity of brome grass on in situ ruminal digestion kinetics of fiber. J. Anim. Sci. 69: 1151-1161.
- Menteşe, Ö. 1998. Farklı taban suyu seviyesine sahip çayırlarda değişik azot dozu ve biçim zamanı uygulamalarının çayırın kuru ot verimi ham protein kapsamı ve botanik kompozisyonuna etkileri. (Yüksek Lisans Tezi) Atatürk Üniv., Fen. Bil. Enst., Erzurum.
- Norton, N.A., Clark, R.T., Reece, P.E., Eskridge, K.M. 1997. Quality as a factor in the optimal choice of fertilization and harvest date of meadow hay. J. Prod. Agric. 10:551-557.
- Reece, P. E., Nichols, J.T., Brummer, J. E., Engel, R. K., Eskridge, K. M. 1994. Harvest date and fertilizer effects on native and interseeded wetland meadows. J. Range Management, 47:183.
- SPSS, 1998. SPSS for windows. Released 10.0, SPSS Inc., Chicago, IL., USA.
- Van Soest, P.J., Goering, H.K. 1970. Forage fiber analyses. Agriculture Handbook No. 379. Agricultural Research Service, United States Department of Agriculture, Washington, D.C., USA.