



## Growth Performance of Brown Swiss Calves Fed Early and Late Cut Hay from Meadow Fertilized by Two Levels of N and P<sub>2</sub>O<sub>5</sub>

Binali Comakli<sup>1</sup>, Mete Yanar<sup>\*2</sup>, Naci Tuzemen<sup>2</sup>, Mustafa Tan<sup>1</sup>,  
Leyla Turgut<sup>2</sup>, Ömer Mentese<sup>3</sup>

<sup>1</sup>Department of Agronomy

<sup>2</sup>Department of Animal Science

College of Agriculture, Atatürk University  
Erzurum, Turkey

<sup>3</sup>The Eastern Anatolian Research Institute  
Erzurum, Turkey

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### Abstract

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*To determine effects of rations mainly formed by early or late-bloom cut hay from meadows fertilized by N and P<sub>2</sub>O<sub>5</sub> or not fertilized, on the growth performance, 20 female Brown Swiss calves (6-12 m) were fed for 129 days. Average daily weight gain, feed per unit weight gain and total intake of meadow hay were better for hay from meadows fertilized with N and P<sub>2</sub>O<sub>5</sub> as compared to hay from not fertilized meadow. Similarly these parameters were better for calves fed early bloom hay than for calves fed late bloom hay. Application of N and P<sub>2</sub>O<sub>5</sub> fertilizers and early cutting stage for meadow hay is suggested for providing better growth performance and feed efficiency traits of the Brown Swiss calves.*

Keywords: Brown Swiss, calves, average daily gains, fertilization, cutting stage.

### Introduction

Approximately half of the meadow and pasture areas and 1/3 of livestock raised in Turkey exist in mountainous Eastern Region of the country. Livestock production, especially cattle raising, is very common in the Eastern Region of Turkey, but, hay yields are fairly low. This shortage of forage hay production could be

alleviated by fertilization of the meadow (Davison *et al.*, 2000). Even though there are numerous reports on the effects of fertilizers and cutting date of the meadow hay and pasture productivity, unfortunately, little information is available on the growth performance of female Brown Swiss calves fed diets mainly based upon hay harvested at early-bloom or late-bloom stages from meadows fertilized or not fertilized by N and P<sub>2</sub>O<sub>5</sub>.

The present study was undertaken with the objective of evaluating the effect of rations

\*Corresponding author: Ph: +90-442-231-2569,  
E-Mail: myanar@atauni.edu.tr

mainly formed by early or late-bloom cut hay from meadows fertilized or not fertilized with 150 kg N ha<sup>-1</sup> and 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> on the growth performance of female Brown Swiss calves.

### ***Materials and Methods***

Meadow of the Research Farm of Agricultural College at Atatürk University was divided into two portions. In early spring season, one of the meadow's portions chosen randomly was fertilized with 150 kg N ha<sup>-1</sup> and 50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>, while the fertilization was not applied to the other half of the meadow. Hay was cut from each part of meadows from either at early-bloom or late-bloom stages of the dominant plant species. The hay was dried, made up into bales and fed to calves. The quantity of the forage was determined by weighing the dry hay from different parts of the meadow.

A total of 20 female Brown Swiss calves of 6-12 months from cattle herd of the Research Farm of Agricultural College were used in this study. All calves were allotted to one of four treatment groups. While hay cut at early or late stages from fertilized meadow were offered to first and second groups of calves, respectively, third and fourth groups received early and late bloom cut hays from meadow not fertilized, respectively. Calves in all groups 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 to animals every morning at 8.30 a.m. other part was given every afternoon at 2.00 p.m. 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. The chemical composition (%) of the concentrate was 88.98 dry matter, 12.57 crude protein, 5.37 crude cellulose, 2.97 ether extract and 7.37 crude ash.

Calves were weighed individually at the beginning and end of the experiment as well as at 14 days intervals. The differences due to cutting stage and fertilizer treatments were statistically analysed by using 2x2 completely randomised factorial experimental design in SPSS statistics computer program (SPSS, 1998).

### ***Results and Discussion***

The application of the fertilizer resulted in an increase in meadow hay yield by 2100 kg ha<sup>-1</sup>. Late harvest of the meadow also caused an increase of the hay yield by about 771 kg ha<sup>-1</sup>. The results were in accordance with findings of Collins *et al.* (1990) and Davison *et al.* (2000), who also reported an increase of forage yields by nitrogen fertilization and late cutting time. On the other hand, crude protein level of the dry meadow hay was affected adversely from delayed cutting whereas, the fertilizer promoted crude protein level of the hay (Table 1). Similar results were already reported in different meadows and pastures by Lima *et al.* (1999), Davison *et al.* (2000) and Bailey *et al.* (2001). The results could be attributed to higher conversion rate of nitrogen given by fertilizer to the plant protein.

Initial weights of the calves assigned to the different treatment groups were not statistically different (Table 2). Average daily weight gain of the calves were significantly ( $P < 0.01$ ) influenced by application of fertilizer and cutting stages of the meadow hay (Table 2). The calves produced 21.7% increase in daily weight gain in favour of fertilized hay group. Similar results were reported by Lima *et al.* (1999), who indicated that application of the N fertilizer resulted in an increase in daily weight gain of heifers from 0.06 to 0.36 kg. The animal response could be due to effect of higher protein level of hay from fertilized meadow. Moore *et al.* (1991) have suggested that when crude protein concentration of forages is less than 70 g kg<sup>-1</sup>, there might be inadequate protein to supply the needs of rumen bacteria

Table 1  
Chemical compositions (% DM basis) of meadow hays and concentrate used in the study

	Dry matter	Crude protein	Crude cellulose	Ether extract	Crude ash
Fertilized and early cut hay	90.25	8.67	30.48	1.88	8.97
Not fertilized and early cut hay	89.73	6.52	32.04	1.53	9.59
Fertilized and late cut hay	90.85	6.79	29.53	2.40	10.39
Not fertilized and late cut hay	90.74	4.97	32.20	2.60	10.04
Concentrate	88.98	12.52	5.37	2.97	7.37

Table 2  
Growth performance, feed efficiency ratio and meadow hay intake of the calves (mean  $\pm$  SE)

	Initial weight (kg)	Daily wt. gain (kg)	Feed (kg) consumed per kg live weight			
			Concentrate	Meadow hay	Total feed	Meadow hay intake (kg)
<b>Application of fertilizer</b>						
Fertilized (F)	138.8 $\pm$ 9.5 <sup>a</sup>	0.561 $\pm$ 0.01 <sup>a</sup>	1.6 $\pm$ 0.06 <sup>a</sup>	6.8 $\pm$ 0.31 <sup>x</sup>	8.5 $\pm$ 0.38 <sup>a</sup>	484.6 $\pm$ 5.4 <sup>a</sup>
Not fertilized (NF)	138.9 $\pm$ 9.5 <sup>a</sup>	0.463 $\pm$ 0.01 <sup>b</sup>	2.0 $\pm$ 0.06 <sup>b</sup>	8.0 $\pm$ 0.31 <sup>y</sup>	10.0 $\pm$ 0.38 <sup>b</sup>	458.6 $\pm$ 5.4 <sup>b</sup>
<b>Cutting stage</b>						
Early bloom (EB)	139.2 $\pm$ 9.5 <sup>a</sup>	0.595 $\pm$ 0.01 <sup>a</sup>	1.5 $\pm$ 0.06 <sup>a</sup>	6.3 $\pm$ 0.31 <sup>a</sup>	7.8 $\pm$ 0.38 <sup>a</sup>	483.4 $\pm$ 5.4 <sup>a</sup>
Late bloom (LB)	138.5 $\pm$ 9.5 <sup>a</sup>	0.429 $\pm$ 0.01 <sup>b</sup>	2.1 $\pm$ 0.06 <sup>b</sup>	8.5 $\pm$ 0.31 <sup>b</sup>	10.6 $\pm$ 0.38 <sup>b</sup>	459.8 $\pm$ 5.4 <sup>b</sup>

<sup>a,b</sup>Means in a column in each subgroup with different superscripts differ ( $P < 0.01$ ).

Fertilization  $\times$  cutting stage interaction was not significant for any parameter except concentrate intake per kg live weight gain.

and forage intake and animal performance. The average daily weight gain of the female Brown Swiss calves fed early cut hay in the present study was 0.166 kg greater than that of calves consumed late cut hay (Table 2). Similar results were reported by Lacefield *et al.* (1998), who stated that heifers fed hay harvested at early bloom stage had 0.249 kg more daily weight gain than those given late cut hay. The results could be attributed to the decreasing of the crude protein level and digestibility of hay with advancing of the cutting time.

Forage intake and feed efficiency ratio were influenced significantly ( $P < 0.01$ ) by the application of the fertilizer and cutting time of hay (Table 2). The amount of fertilized hay

consumed per kg weight gain was 0.396 kg less than that of hay from not fertilized meadow. The fertilizer also reduced significantly ( $P < 0.01$ ) hay intake. The finding was in accordance with results of Lima *et al.* (1999). Feed efficiency ratio for early or late cut hay was also affected significantly ( $P < 0.01$ ) (Table 2). 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 nutrient content of the hay.

The overall results of this study indicated that application of N and P<sub>2</sub>O<sub>5</sub> fertilizers and cutting stage of hay from meadow had significant effects on the growth performance

of the Brown Swiss calves fed meadow hay based diets. It was suggested that the meadows should be fertilized and the hay should be cut at the early bloom stage of the dominant plants in the meadow for providing better growth performance of female Brown Swiss calves.

### References

- Bailey, C.R., Daniels, L.B., Coblenz, W.K., Kegley, E.B., Brown, A.H., Rosenkrans, C., Johnson, Z.B. and Wistuba, T.J. 2001. The effects of nitrogen fertilization and time of year on the quality and quantity of soft red winter wheat forage. Arkansas Animal Science Department Report, University of Arkansas, Research Series 488, Fayetteville, USA.
- Collins, M., Bringman, M.A. and Salman, A.A. 1990. Forage yield and quality of oat cultivars with increasing rate of nitrogen fertilization. *Agronomy J.*, 82: 724-728.
- Davison, J., Torell, R. and Hackett, I. 2000. *Intermountain Pasture and Hay Meadow Handbook: Pasture Hay and Profit*. Cooperative Extension, EB-00-03, University of Nevada, Reno, USA.
- Lacefield, G., Henning, J.C., Collins, M. and Swetnam, L. 1998. Quality hay production. University of Kentucky, College of Agriculture, Agricultural Communication Service, No: AGR-62, Kentucky, USA.
- Lima, G.F.C., Sollenberger, L.E., Kunkle, W.E., Moore, J.E. and Hammond, A.C. 1999. Nitrogen fertilization and supplementation effects on performance of beef heifers grazing limpgrass. *Crop Sci.*, 39: 1853-1858.
- Moore, J.E., Kunkle, W.E. and Brown, W.F. 1991. Forage quality and the need for protein and energy supplements. In: *Proc. 40th Annual Beef Cattle Short Course*, 1-3 May, 1991, Anim. Sci. Dep., Univ. of Florida, Gainesville, USA.
- SPSS. 1988. *SPSS for Windows*. Released 10.0, SPSS Inc., Chicago, IL., USA.
- बी. कोमाक्ली, एम. यानार, एन. तुजेमेन, एम. टैन, एल. तर्गत, ओ. मेन्टेसे। नाइट्रोजन और फास्फेट की दो मात्राओं से उर्वरित शाद्वल से अग्रिम और विलम्ब से कटे 'हे' के प्राशन पर ब्राउन स्वीस गोवत्सों का वर्धन निष्पादन।
- नाइट्रोजन और फास्फोरस की दो मात्राओं से उर्वरित अथवा बिना इन उर्वरकों के शाद्वल से अग्रिम और विलम्ब विकास के 'हे' से मुख्यतः निर्मित आहारों का वर्धन निष्पादन पर प्रभाव जानने के लिए 20 मादा ब्राउन स्वीस गोवत्सों (6-12 माह) को 129 दिनों तक खिलाया गया। नाइट्रोजन और फास्फेट उर्वरित शाद्वलों के 'हे' खिलाने से उर्वरक न डाले गए शाद्वल के 'हे' की तुलना में दैनिक भार वृद्धि, आहार प्रति इकाई भार वृद्धि और शाद्वल हे का सकल उपभोग अच्छा था। इसी प्रकार ये सभी मापदंड अग्रिम कटाई वाले हे खाने वाले पशुओं में विलम्बी हे खाने वालों से अच्छा था। ब्राउन स्वीस गोवत्सों में अच्छे वर्धन निष्पादन और अच्छी आहार उपयोग दक्षता के लिए शाद्वलों में नाइट्रोजन और फास्फेट उर्वरक डालना और अग्रिम कटाई करना उपयुक्त है।