Yields and Sward Characteristics of Timothy Cultivars under Grazing

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YIELDS AND SWARD CHARACTERISTICS OF TIMOTHY CULTIVARS UNDER GRAZING

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Abstract

Seven timothy (*Phleum pratense* L.*)* cultivars were evaluated over three pasture seasons under rotational grazing to 7 or 11 cm post-grazing heights and regrowth periods of four to seven weeks. There was a trend for the pasture type timothy cultivars to outyield Champ timothy (check). Dry matter yields were lower for the 7 cm than 11 cm post-grazing height. Although the overall cultivar x post-grazing height interaction was not significant (P>0.05), there was variability in grazing tolerance among timothy cultivars. Yield of Kahu was maintained and vegetative tiller density of Kahu increased over the experimental period under 7 cm grazing. Proportion of vegetative tillers among the cultivars ranged from 0.20 to 0.61 in the primary growth but this proportion increased to 0.95 in the fourth grazing.

Keywords: timothy, *Phleum pratense* L., cultivars, grazing intensity

Introduction

Timothy (*Phleum pratense* L.) is well adapted to the cold winter climate of Eastern Canada where it is grown extensively for hay and silage. There is also interest in using timothy

in pastures but due to its upright growth habit, with the raised position of the stem apex, timothy is sensitive to frequent defoliation and less persistent under grazing than perennial ryegrass (*Lolium perenne* L.) (Kunelius and Narasimhalu, 1993). Limited effort has been placed on developing grazing tolerant cultivars of timothy (Stevens et al., 1993), and little is known about the impact of grazing on presently available cultivars. The aim of this study was to evaluate the yield potential and sward characteristics of timothy cultivars rotationally grazed to two post-grazing heights.

Material and Methods

The experiment was conducted in Charlottetown, Prince Edward Island (46^{o}N, 63^{o}W). The soil was a fine sandy loam with a pH of 6.6. Timothy cultivars 'Champ', 'Comtal', 'Drummond', 'Kahu', 'Motim', 'Promesse' and 'Tiller' were sown at 10 kg ha^{-1} on 20 August, 1994. Ammonium nitrate was applied at 50 kg N ha^{-1} in spring and after the first grazing and at 40 kg ha^{-1} after second and third grazing periods. Phosphorus and K were applied at rates based on soil test. A 20 x 20 cm area on each sub-plot was clipped at soil surface before grazing, separated into reproductive and vegetative timothy tillers, and dry weights determined. Herbage yields were determined before grazing by cutting 1.5 x 3.0 m areas at 7 cm stubble height in an area of sub-plot grazed during the grazing season and dry matter determined. The seven sub-plots in each main plot (4.5 x 5.0 m) were grazed simultaneously by steers from pre-grazing heights of 18 to 30 cm down to average post-grazing heights of 7 or 11 cm within two days. The plots were grazed four times in years 1 and 2, and three times in year 3.

The experiment was set out as a split-block design with two post-grazing heights randomized to main plots, in two replicates, and cultivars were randomized to strips within each

replicate. Analysis of variance was performed on the combined three year data, with years, main plots, and strips treated as random effects in the model. Cultivars and grazing treatments were fixed effects in the analysis.

Results and Discussion

Dry matter yields in year 1 were not influenced ($P > 0.05$) by cultivars or post-grazing heights (Table 1). In year 2, Comtal, Kahu, Promesse and Tiller outyielded ($P = 0.05$) the check, cultivar Champ. The effects of grazing management were greatest in year 3 ($P = 0.05$) when the mean dry matter yields were 8.23 and 10.40 t ha^{-1} for the 7 and 11 cm post-grazing heights, respectively. In year 3, the yields of Kahu timothy were, however, similar for both post-grazing heights indicating good adaptation and persistence of this cultivar under grazing. Tiller is an early maturing cultivar and had greater yields than other cultivars in the early season.

The density of reproductive tillers was highest for Tiller and Kahu (Table 2). Motim and Comtal, both late maturing cultivars, had lowest reproductive tiller densities. Kahu was the only cultivar with a greater density of reproductive tillers for the 7 than 11 cm post-grazing height. Reproductive tiller density of cultivars ranged from 1030 to 2400 tillers m^{-2} in the first grazing with Tiller and Kahu having the highest tiller density (not shown). Reproductive tiller densities in the second grazing were higher for the post-grazing height of 7 cm (840 m^{-2}) than 11 cm (380 m^{-2}). Reproductive tiller density decreased further averaging (317 m^{-2}) in the third and 114 m^{-2} in the fourth grazing and was not influenced by cultivar nor grazing treatment.

Vegetative tillers of cultivars ranged from 1130 to 1970 m^{-2} (Table 2). The cultivar responses to grazing intensity varied; vegetative tiller density of Kahu was greater for the 7 than 11 cm post-grazing height. Comtal and Drummond on the other hand had lower vegetative tiller

density for the 7 cm post-grazing height. Vegetative tiller density of cultivars ranged from 610 to 1890 m^{-2} in the first grazing with Drummond and Motim, both late maturing cultivars, having the highest density of vegetative tillers (not shown). In the second grazing vegetative tillers averaged 1810 m^{-2}. In the third and fourth grazing vegetative tiller density averaged 1530 and 1920 m^{-2}. The proportion of vegetative tillers among the cultivars ranged from 0.20 to 0.61 in the primary growth but this proportion increased to about 0.95 in the fourth grazing. The differences in the density of vegetative tillers among cultivars are likely related to the position of growing point at the time of first grazing (Kunelius and McRae, 1986). Early maturing cultivars had growing points removed during the first grazing while late cultivars' growing point was below the grazing height. Post-grazing height did not influence density of vegetative tillers. Kahu was the only cultivar showing an increase in tiller density with the 7 cm post-grazing height over the three year period.

Animal performance was not determined in the current study but in a related two-year pasture experiment the following average live-weight gains by crossbred steers were recorded (kg day^{-1}): Promesse 1.40, Kahu 1.17, Champ 1.16, Drummond 1.14, Tiller 1.13, Comtal 1.12 and Motim 1.07 (unpublished). These data suggest that steers performed better on pasture type timothy cultivar Promesse than Champ (check).

In conclusion, there was a trend for the pasture type timothy cultivars to outyield Champ timothy (check). Yields were greater for the 11 than 7 cm post-grazing height. There was variability in grazing tolerance among timothy cultivars; vegetative tiller density of Kahu increased over the experimental period. All cultivars persisted over the three year period under a rotational grazing system with regrowth periods ranging from 4 to 7 weeks.

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Table 1 – Total dry matter yield (t/ha) for two post-grazing heights in three pasture seasons.

	Year 1 (SEM=0.829) †		Year 2 (SEM=0.395)		Year 3 (SEM =0.549)	
Cultivar/grazing	11 cm	7 cm	11 cm	7 cm	11 cm	7 cm
Champ (check)	8.16	5.62	6.71	5.55	9.51	7.67
Comtal	8.78	7.88	8.33	8.22	10.77	8.96
Drummond	7.13	5.98	7.85	5.91	10.38	7.16
Kahu	10.44	7.93	8.49	7.29	9.38	9.24
Motim	9.61	7.55	8.29	6.49	9.58	7.59
Promesse	8.42	7.25	8.72	7.98	10.70	8.02
Tiller	10.45	7.92	8.88	8.64	12.50	9.44
SEM(n=2, 6df)‡	1.019		0.518		1.052	

† Standard error of mean within cultivar

‡ Standard error of mean among cultivars within post-grazing height

Table 2 - Reproductive and vegetative tillers (m^{-2}) for two post-grazing heights, 3 year means.

	Reproductive tillers (SEM=99) †		Vegetative tillers (SEM=149)		Total tillers (SEM=126)	
Cultivar/grazing	11 cm	7 cm	11 cm	7 cm	11 cm	7 cm
Champ	1010	760	1250	1130	2270	1890
Comtal	580	730	1780	1370	2360	2100
Drummond	850	620	1970	1640	2830	2260
Kahu	910	990	1580	1780	2490	2770
Motim	580	470	1580	1710	2160	2180
Promesse	970	700	1720	1820	2690	2520
Tiller	1120	880	1310	1400	2430	2280
SEM(n=2, 6df)‡	101		177		146	

† Standard error of mean within cultivar
‡ Standard error of mean among cultivars within post-grazing height