Evaluation of Hay-Type and Grazing Tolerant Alfalfa Hybrids in Season-Long or Complementary Rotational Stocking Systems for Beef Cows

A. S. Leaflet R1724

Mary L. Hermann, research assistant,
James R. Russell, professor of animal science,
Stephen K. Barnhart, professor of agronomy, and
Rod Berryman, superintendent of ISU Beef
Nutrition Research Center

Summary

Pastures containing hay-type and grazing tolerant alfalfa hybrids were grazed in a season-long or complementary rotational stocking system with N-fertilized smooth bromegrass. The pastures were stocked at a seasonal density of .8 cow-calf pairs per acre for 120 days in 1998 and 141 days in 1999. Pastures were intensively managed by daily strip-stocking with the assumptions that 50% of live forage was available and daily live dry matter consumption of each cow-calf pair was 3.5% of the cow's body weight. First-cutting forage was harvested as hay from 40% of the pasture acres to remove excess forage growth early in the grazing season. Grazing occurred on the remaining 60% of each pasture for the first 44 and 54 days and 100% of each pasture after days 45 and 55 in 1998 and 1999, respectively. Proportions of 'Amerigraze' and 'Affinity' alfalfa in the live forage dry matter decreased by 70% and 55% in pastures stocked season-long and by 60% and 42% in pastures used for complementary stocking (alfalfa type, $p<.05$; grazing management, $p<.05$) in 1998, but decreased by a mean of 72% and was unaffected by hybrid or stocking system in 1999. Cows grazing either alfalfa hybrid by either grazing system had greater weight gains during the breeding and overall grazing seasons and greater increases in body condition score pre-breeding and during the breeding season than the cows that grazed smooth bromegrass for the entire season in 1998. Also, cows grazing either alfalfa hybrid in the season-long system had greater breeding season increases in body condition score than cows grazing alfalfa in the complementary system with smooth bromegrass in 1998. Cows grazing in the season-long alfalfa system had greater prebreeding season weight ($p<.10$) increases and condition score ($p<.05$) increases than cows grazing alfalfa in the complementary system in 1999. Daily and seasonal body weight gains of calves were not affected ($p>.10$) by the presence of alfalfa in 1998 or by alfalfa type and grazing management in 1998 and 1999. Total animal production (cow and calf) in 1998 was greater ($p<.10$) from the season-long alfalfa pastures compared with the complementary stocked pastures. Total ($p<.10$) and live ($p<.05$) forage masses, estimated by monthly clippings, were greater in September of 1998 from the season-long alfalfa pastures than pastures using alfalfa for complementary stocking. Total ($p<.10$) and live ($p<.05$) forage masses were greater in August of 1999 from season-long alfalfa pastures than pastures using alfalfa for complementary stocking.

Introduction

The incorporation of alfalfa into cool season grass pastures seems advantageous because of its ability to fix nitrogen and, thereby, reduce needs for nitrogen fertilizers. Alfalfa is flexible in its use and increases the productivity of mid- to late-season pasture growth. It increases the overall forage quality because it is highly digestible and high in protein, calcium, and magnesium concentrations. However, problems with bloat and poor plant persistence have limited the use of alfalfa in pastures.

In a previous experiment, we found that calf production was nearly 15% greater in the alfalfa-grass pastures that were rotationally stocked at 1 cow-calf unit per acre for a 140 day grazing season than in smooth bromegrass pastures fertilized with 100 pounds nitrogen per acre. However, daily seasonal gains of yearlings that grazed with the cows for the first 28 to 42 days of the grazing season were 25 to 33% greater from N-fertilized smooth bromegrass pastures than from the alfalfa-grass pastures. These results imply that greater animal production may result from grazing N-fertilized smooth bromegrass early in the grazing season and an alfalfa-grass mixture in mid- to late-season when productivity of the cool season grass is reduced. Furthermore, because problems with alfalfa persistence seem to result from grazing under muddy conditions, limiting the use of alfalfa to only mid- and late-season might reduce persistence problems. Three management strategies utilized in this experiment to overcome the persistence problem were rotational stocking, deferred grazing, and the use of grazing tolerant hybrids.

The objective of this project was to determine cow-calf productivity, forage productivity, and legume persistence from pastures containing hay-type and grazing tolerant alfalfa hybrids stocked by either season-long or complementary rotational systems.

Materials and Methods

In the spring of 1997, 50 acres of cropland at the Iowa State University Beef Nutrition Research Center was divided into ten 5-acre fields. Soils were tested and fertilized with lime, P, and K, according to recommendations. Replicate fields were seeded with 'Barton' smooth bromegrass over the entire 5 acres (season-long smooth bromegrass treatment), a mixture of 'Barton' smooth bromegrass and 'Affinity' alfalfa over the entire 5 acres (season-long hay-type alfalfa treatment), a mixture of 'Barton' smooth bromegrass and 'Amerigraze' alfalfa over the entire 5 acres (season-long grazing tolerant alfalfa treatment), 'Barton' smooth bromegrass over 3 acres and a mixture of 'Barton' smooth bromegrass and 'Affinity' alfalfa over 2 acres (complementary hay-type alfalfa treatment), and 'Barton' smooth bromegrass over 3 acres and a mixture of 'Barton' smooth bromegrass and 'Amerigraze' alfalfa over 2 acres (complementary grazing tolerant alfalfa treatment).

In the spring of 1998 and 1999, each smooth bromegrass pasture was fertilized with 100 pounds of nitrogen per acre. Pastures were divided into 10 paddocks with a lane. Three waterers were available in each pasture.

On May 18, 1998, and on May 6, 1999, four Simmental x Angus x Charolais cows (1 primiparous and 3 multiparous) with calves were allotted at a stocking rate of .8 cow-calf pairs per acre to each pasture based on cow weight, condition score, age, and calf sex. Cows grazing the smooth bromegrass pastures received a mineral supplement with a high magnesium concentration whereas those grazing alfalfa received a mineral supplement containing poloxalene to prevent bloat.

For the first 44 days in 1998 and the first 54 days of grazing in 1999, the 60% of each pasture nearest the water hydrant was rotationally strip-stocked to control bloat and forage maturity. In pastures with the complementary treatments, this area of the pastures was planted in smooth bromegrass. Daily allowance of strip-grazed forage was calculated assuming that a cow-calf pair consumes 3.5% of the cow's initial body weight per day as live forage as estimated at a harvest efficiency of 50%. Using the measurement of sward heights as animals entered and were moved from paddocks showed that an average of 46% and 51% of initial forage remained when animals were removed from pastures in 1998 and 1999, respectively. First harvest forage from the remaining 40% of each pasture was mowed on June 1 and May 26 and removed on June 16 and May 30 in 1998 and 1999, respectively. These paddocks were incorporated into the grazing system after a minimal regrowth period of 33 days post-mowing, and each total pasture was grazed for 120 days in 1998 and for 141 days in 1999. However, if a paddock's average sward height fell below 5 cm, the paddock could not be used, or if all paddocks from a pasture fell below 5 cm then grazing for that pasture would be terminated.

Cows were time-bred by artificial insemination on June 23, 1998, following estrus synchronization with prostaglandin and on June 23, 1999, following a two-shot lutalyse synchronization program. Bulls were placed in pastures and rotated every 12 hours for the next 42 days.

Live forage mass was estimated from forage sward heights using a falling plane meter (8.8 pounds per square yard). Available forage mass in areas of the fields that were only grazed or sequentially harvested and grazed was determined by hand-clipping twelve and eight .25-square meter locations, respectively. Clipped forage samples were hand-sorted into dead forage and live grass, legume, and broadleaf weed species. Each fraction was weighed, dried, and ground. A composite of live forage was prepared from the grass, legume, and broadleaf weed fractions for chemical analysis. Live and dead forage matter were analyzed for crude protein, neutral detergent fiber, acid detergent fiber, and in-vitro dry matter digestibility. Cows and calves were weighed and cows were condition scored monthly (1=very thin, 5=moderate, 9=obese).

Results and Discussion

By experimental design, the proportions of legumes in the full-season paddocks, stocked for the entire grazing period, (Table 1) were greater ($p<.05$) in all of the alfalfa pastures compared with the season-long smooth bromegrass pastures except for the months of May and June of 1999. In August and September of 1999, the proportion of legumes was greater ($p<.05$) in the hay-type alfalfa pastures than the grazing tolerant alfalfa pastures. By design of the species seeded in the paddocks, the proportions of legumes in full-season paddocks of the season-long alfalfa pastures were higher ($p<.05$) than those in the complementary alfalfa pastures in both years.

As designed in the mid-season paddocks, the proportion of legumes in all of the alfalfa seeded paddocks were greater ($p<.05$) than the season-long smooth bromegrass paddocks (Table 2). The mid-season paddocks had a first cutting of hay removed and were grazed from days 45 to 120 of 1998 and days 55 to 141 of 1999. In June and July of 1998, the proportion of legumes was greater ($p<.05$) in the hay-type alfalfa paddocks as compared with the grazing tolerant alfalfa paddocks. However, at grazing termination in 1999, the proportion of legumes was greater ($p<.05$) in the grazing tolerant alfalfa paddocks than the hay-type alfalfa paddocks. The mid-season alfalfa paddocks grazed season-long had a higher ($p<.05$) proportion of legumes than the complementary alfalfa paddocks in June and July of 1998 and at grazing initiation in 1999.

First cutting hay yields from the mid-season paddocks are shown in Table 3. Even though there are numerical differences between treatments, none of these differences

are significant (p>.05). Likewise, there were no significant differences (p>.05) between treatments in the average days of grazing per paddock (Table 4). The number of days grazing per paddock tended to decline, however, as the grazing season progressed in both years.

Cows grazing the season-long smooth bromegrass in 1998 had greater (p<.05) breeding season weight decreases and total season weight decreases compared with any of the cows on all of the alfalfa pastures (Table 5). Cows grazing the hay-type alfalfa pastures had greater (p<.10) breeding weight increases than the cows grazing on the grazing tolerant alfalfa pastures in 1998. The season-long alfalfa cows had greater breeding season weight increases (p<.10) and total season weight increases (p<.05) in 1998 and greater prebreeding weight increases (p<.10) in 1999 compared with the cows grazing alfalfa on the complementary stocking system. In 1998, cows on all of the alfalfa pastures had higher (p<.05) condition score increases during the prebreeding and breeding season than those grazing smooth bromegrass. Also in 1998, cows on the grazing tolerant alfalfa pastures had greater (p<.10) prebreeding condition score increases than the cows on the hay-type alfalfa pastures. The cows grazing the complementary alfalfa pastures in 1998 had higher (p<.10) prebreeding condition score increases versus the season-long alfalfa treatment cows. The cows on the season-long alfalfa pastures had greater condition score increases in the breeding season (p<.10) of 1998 and during the prebreeding season (p<.05) of 1999 than the cows stocked on the complementary alfalfa treatments. There were no significant differences in both years in rebreeding efficiencies and calving interval days between treatments. In 1999, the calves from all of the alfalfa pastures, either season-long or complementary, had greater (p<.05) daily gains and seasonal body weight production (pounds per acre) compared with the calves from the season-long smooth bromegrass pastures. Total animal production (cow and calf) was greater (p<.10) in 1998 from the season-long alfalfa pastures than from the complementary stocked alfalfa pastures.

Table 6 and Table 7 show monthly total and live forage masses from all pastures in both years. In August 1999 and September 1998, the season-long alfalfa treatment had greater total forage mass (p<.10) and greater live forage mass (p<.05) than the complementary stocked alfalfa pastures.

At grazing initiation in 1998, the crude protein of both live and total forage dry matter were greater from all alfalfa pastures (p<.10) than the season-long smooth bromegrass pastures and from the season-long alfalfa pastures (p<.05) from both alfalfa types than the complementary alfalfa treatments (Table 8). Live and total forage crude protein in July 1998 and total forage crude protein in August 1998 were greater (p<.05) from all alfalfa pastures compared with the season-long smooth bromegrass pastures and from the season-long alfalfa pastures compared with the complementary alfalfa pastures. Live forage crude protein in August 1998 was lower (p<.10) from the season-long smooth bromegrass pastures than from all of the alfalfa pastures grazed in the season-long or complementary systems.

In 1998, the season-long alfalfa pastures from both alfalfa types had high concentrations of in vitro digestible dry matter in live forage (p<.10) and total forage (p<.05) in May (Table 9). At grazing termination in September, IVDMD concentrations of live and total forage were higher (p<.05) in all of the alfalfa pastures compared with the season-long smooth bromegrass pastures. Total forage IVDMD concentration was greater (p<.05) in September from the season-long alfalfa pastures compared with the complementary stocked alfalfa pastures.

Implications

In 1999, there were no differences in monthly cow weights, condition scores, and total and live forage masses with the incorporation of alfalfa into smooth bromegrass pastures. There were greater calf daily and seasonal gains on all alfalfa pastures stocked season-long or complementary and having both alfalfa hybrids than on the season-long smooth bromegrass. At grazing termination in 1999, the full-season paddocks had a greater proportion of legumes in the hay-type alfalfa paddocks but the mid-season paddocks had a greater proportion of legumes in the grazing tolerant alfalfa paddocks. At grazing initiation of the mid-season paddocks in 1999, the season-long alfalfa pastures had a higher proportion of legumes versus the complementary stocked alfalfa pastures. In August 1999, the season-long alfalfa pastures had more total and live forage mass available to the cows than the complementary stocked alfalfa pastures.

Acknowledgments

This project is supported in part by a grant from the Leopold Center for Sustainable Agriculture, Iowa State University. The authors gratefully acknowledge the assistance of M. Hersom, M. Kruse, D. Primm, A. Pugh, and the animal caretakers at the ISU Beef Nutrition Research Center.

Table 1. Legume percentage of live dry matter in full-season paddocks of alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
		Bromegrass	Season	Comp	Season	Comp	f	a	g
Species seeded		Smooth Bromegrass	Alfalfa	Smooth Bromegrass	Alfalfa	Smooth Bromegrass			
Date	Year	% of live dry matter							
May 18	1	0%	80%	4%	87%	1%	**	NS	**
June 16	1	0%	76%	1%	74%	3%	**	NS	**
July 17	1	0%	55%	3%	69%	2%	**	NS	**
August 15	1	0%	38%	3%	45%	1%	**	NS	**
Sept 15	1	0%	19%	1%	37%	0%	**	NS	**
May 4	2	0%	43%	0%	49%	3%	NS	NS	**
June 1	2	0%	42%	1%	33%	1%	NS	NS	**
June 30	2	0%	28%	1%	37%	0%	NS	NS	**
July 27	2	0%	15%	0%	19%	0%	**	NS	**
August 24	2	0%	8%	0%	22%	2%	**	**	**
Sept 21	2	1%	8%	0%	15%	1%	**	**	**

[a]Significance:**, p<.05.

Table 2. Legume percentage of live dry matter in mid-season paddocks of alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
		Bromegrass	Season	Comp	Season	Comp	f	a	g
Species seeded		Smooth Bromegrass	Alfalfa	Alfalfa	Alfalfa	Alfalfa			
Date	Year	% of live dry matter							
May 18	1	6%	78%	85%	90%	83%	**	NS	NS
June 16	1	0%	100%	78%	100%	100%	**	**	**
July 17	1	0%	87%	60%	83%	88%	**	**	**
August 15	1	0%	54%	35%	53%	57%	**	NS	NS
Sept 15	1	0%	28%	34%	43%	48%	**	NS	NS
May 4	2	2%	72%	66%	74%	55%	**	NS	**
June 1	2	0%	80%	61%	81%	61%	**	NS	NS
June 30	2	4%	69%	72%	79%	59%	**	NS	NS
July 27	2	0%	35%	41%	30%	28%	**	NS	NS
August 24	2	0%	16%	24%	20%	19%	**	NS	NS
Sep 21	2	1%	25%	19%	18%	16%	**	**	NS

[a]Significance:**, p<.05.

Table 3. First cutting hay yields from mid-season paddocks in alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999[a].

	Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa	
	Bromegrass	Season	Comp	Season	Comp
Year	dry matter lb/ac				
1	2297	2392	1073	2010	2423
2	2485	2321	1356	2078	2913

[a]No significant differences between treatments were observed (p>.05).

Table 4. Average days of grazing per paddock in alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999[a].

65

		Smooth	Grazing To	falfa	Hay-Type Alfalfa	
Month	Year	Bromegrass	Season	Comp	Season	Comp
May	1	5.1	3.8	4.4	3.3	4.0
June	1	3.5	2.4	4.4	2.3	2.8
July	1	2.0	2.1	1.9	2.6	2.2
August	1	1.6	2.3	2.6	2.6	1.9
Sept	1	2.0	2.8	1.9	3.1	1.8
Average	1	2.8	2.7	3.0	2.8	2.5
May	2	3.7	4.3	2.9	4.5	4.3
June	2	2.8	2.6	2.2	2.9	2.8
July	2	2.5	2.6	2.1	2.9	2.1
August	2	2.2	3.6	2.2	3.5	2.1
Sept	2	2.0	3.5	1.9	3.4	1.8
Average	2	2.6	3.3	2.3	3.4	2.6

[a]No significant differences between treatments were observed (p>.05).

Table 5. Cow weight, condition score, rebreeding efficiency, and calf production from alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
Item	Year	Bromegrass	Season	Comp	Season	Comp	f	a	g
Cow weight, lb									
Initial	1	1397	1322	1377	1305	1338	NS	NS	NS
Change	1	-71	6	-69	43	-46	**	NS	**
Prebreeding	1	-38	-11	-12	-9	-23	NS	NS	NS
Breeding	1	1	35	-27	63	34	**	*	*
Postbreeding	1	-34	-18	-30	-11	-57	NS	NS	NS
Initial	2	1161	1202	1134	1167	1186	NS	NS	NS
Change	2	62	108	59	144	76	NS	NS	NS
Prebreeding	2	-13	15	-6	30	-20	NS	NS	*
Breeding	2	21	11	13	43	14	NS	NS	NS
Postbreeding	2	54	83	52	72	82	NS	NS	NS
Condition Score									
Initial	1	5.4	5.1	5.1	5.1	5.2	NS	NS	NS
Change	1	-0.3	0.2	0.0	0.0	-0.3	NS	NS	NS
Prebreeding	1	-0.2	0.0	0.2	-0.1	0.0	**	*	*
Breeding	1	0.0	0.3	-0.3	0.4	0.0	**	NS	*
Postbreeding	1	-0.1	-0.1	0.1	-0.3	-0.3	NS	NS	NS
Initial	2	4.8	4.9	4.7	4.8	4.8	NS	NS	NS
Change	2	0.2	0.3	0.0	0.5	0.0	NS	NS	NS
Prebreeding	2	0.1	0.1	-0.3	0.2	-0.2	NS	NS	**
Breeding	2	-0.1	-0.1	0.2	0.3	0.2	NS	NS	NS
Postbreeding	2	0.2	0.3	0.1	0.0	0.0	NS	NS	NS

Table 5 continued.

Rebreeding efficiency, %	1	63	88	100	88	100	NS	NS	NS
Calving interval, days	1	371	363	361	376	364	NS	NS	NS
Rebreeding efficiency, %	2	75	88	88	88	88	NS	NS	NS
Calving interval, days	2	374	374	371	383	366	NS	NS	NS
Calf weight change									
lb/day[b]	1	2.35	2.56	2.45	2.75	2.54	NS	NS	NS
lb/acre[b]	1	225.6	245.6	235.6	264.2	243.8	NS	NS	NS
lb/day[b]	2	2.07	2.51	2.25	2.54	2.53	**	NS	NS
lb/acre[b]	2	232.9	283.2	253.3	286.5	285.4	**	NS	NS
Total animal production									
lb/acre[bc]	1	169.0	250.4	179.9	298.8	206.9	NS	NS	*
lb/acre[bc]	2	282.0	368.9	300.1	402.1	346.0	NS	NS	NS

[a]Significance:**,p<.05;*,p<.10.

[b]1998 = 120 days, 1999 = 141 days.

[c]Cow and calf.

Table 6. Monthly total mass from alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
		Bromegrass	Season	Comp	Season	Comp	f	a	g
Date	Year	dry matter lb/ac							
May 18	1	3401	4582	2882	5196	3924	NS	NS	NS
June 16	1	1839	1585	1425	1964	1479	NS	NS	NS
July 17	1	1312	1337	1800	1715	1407	NS	NS	NS
August 15	1	1001	1034	1653	1820	1192	NS	NS	NS
Sept 15	1	1092	2167	1393	2542	1126	NS	NS	*
May 4	2	2192	3069	2103	3098	2298	NS	NS	NS
June 1	2	1628	997	1158	1556	1233	NS	NS	NS
June 30	2	1513	1770	1427	1803	1681	NS	NS	NS
July 27	2	1316	2057	1054	1909	1261	NS	NS	NS
August 24	2	1215	2871	1060	2087	1350	NS	NS	*
Sept 21	2	1468	2273	1172	2347	1447	NS	NS	NS

[a]Significance:**, p<.05;*,p<.10.

Table 7. Monthly live mass from alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998 and 1999.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
		Bromegrass	Season	Comp	Season	Comp	f	a	g
Date	Year	dry matter lb/ac							
May 18	1	2565	3654	2137	4003	2895	NS	NS	NS
June 16	1	1339	1001	1035	1372	947	NS	NS	NS
July 17	1	619	767	1227	1006	729	NS	NS	NS
August 15	1	563	644	1068	1125	620	NS	NS	NS

Table 7. Continued

Sept 15	1	510	1418	818	1653	593	NS	NS	**
May 4	2	1134	1658	971	1688	1326	NS	NS	NS
June 1	2	1170	673	726	963	812	NS	NS	NS
June 30	2	816	1031	818	1078	950	NS	NS	NS
July 27	2	622	1270	561	1276	664	NS	NS	NS
August 24	2	535	1840	557	1330	715	NS	NS	**
Sept 21	2	860	1418	655	1572	733	NS	NS	NS

[a]Significance:**, p<.05;*,p<.10.

Table 8. Monthly crude protein from alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
		Bromegrass	Season	Comp	Season	Comp	f	a	g
Date	Item	% crude protein							
May 18	Live	16.9	20.1	17.9	19.0	17.2	*	NS	**
	Total	16.5	20.0	17.5	19.0	17.1	*	NS	**
June 16	Live	13.3	16.3	15.5	15.3	15.7	NS	NS	NS
	Total	12.2	14.0	13.0	13.8	13.3	NS	NS	NS
July 17	Live	13.6	19.0	15.6	18.4	15.7	**	NS	**
	Total	11.0	14.9	12.9	15.5	12.8	**	NS	**
August 15	Live	13.0	15.9	13.9	15.9	15.7	*	NS	NS
	Total	10.9	14.3	11.3	14.7	12.8	**	NS	**
Sept 15	Live	13.5	13.9	13.3	15.2	15.1	NS	NS	NS
	Total	12.0	13.2	11.6	14.1	12.9	NS	NS	NS

[a]Significance:**, p<.05;*,p<.10.

Table 9. Monthly in vitro digestible dry matter from alfalfa/smooth bromegrass and smooth bromegrass pastures in 1998.

		Forage species (f), alfalfa type (a), and grazing management (g)							
		Smooth	Grazing Tolerant Alfalfa		Hay-Type Alfalfa		Significance[a]		
		Bromegrass	Season	Comp	Season	Comp	f	a	g
Date	Item	% ivdmd							
May 18	Live	59.1	60.1	57.9	59.4	57.6	NS	NS	*
	Total	57.9	59.9	57.2	59.2	57.3	NS	NS	**
June 16	Live	48.9	48.4	49.8	47.2	48.9	NS	NS	NS
	Total	45.5	43.7	46.0	44.2	45.0	NS	NS	NS
July 17	Live	53.2	54.4	56.3	53.0	52.8	NS	NS	NS
	Total	44.9	43.8	48.4	44.8	42.3	NS	NS	NS
August 15	Live	56.3	55.8	55.5	55.4	56.5	NS	NS	NS
	Total	47.1	47.9	46.1	49.3	46.2	NS	NS	NS
Sept 15	Live	51.6	54.7	53.2	54.6	54.0	**	NS	NS
	Total	41.4	51.3	44.8	48.9	44.5	**	NS	**

[a]Significance:**, p<.05;*,p<.10.