

Effect of stocking rate on performance, diet selection and apparent total-tract digestibility among heifers grazing cover crops

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B. R. Brunsvig, D. W. Brake, A. J. Smart, E. E. Grings

Department of Animal Science, South Dakota State University, Brookings



Introduction

- Winter feeding can account for 50% of beef cow production costs. (Schoonmaker et al.)
- Grassland for grazing and forage production can be limited.
- Grazing cover crops can increase lands available for cattle production and reduce winter feeding costs.
- Data on stocking rates that allow optimal utilization of cover crops by cattle is limited.

Materials & Methods

- 12, 1ha paddocks
 - Volunteer oat, ryegrass, turnips & radishes
 - Grazed 48 days.
- 3, 4 or 5 heifers (BW= 260±4.3 kg)
 - 2.7, 3.6 or 4.7 AUM/ha stocking rate
- Diet samples collected from cannulated heifers
 - Initial = d2, Intermediate = d24, Final = d46
- TiO₂ marker for fecal output determination
- Fecal Samples collected for digestibility measures.
- Weights were collected on consecutive days at the beginning middle and end of the trial.

References

- Schoonmaker et al., 2003 (J. Anim. Sci. 81:1099-1105),

Results

Table 1. Effects of stocking rate (AUM x ha⁻¹) and time on ruminal fill and diet selection among heifers grazing cover crops

Diet Selection, % DM	Stocking Rate			Time			Stocking Rate		Time		Stocking Rate x time
	2.7	3.6	4.7	Initial	Intermediate	Final	Linear	Quadratic	Linear	Quadratic	
DM	8.5	7.2	7.8	7.6	8.2	7.7	0.20	0.06	0.90	0.50	0.65
OM	82.7	81.7	83.0	82.0	84.2	81.2	0.92	0.59	0.44	<0.01	0.02
ADF	33.4	30.0	34.0	33.4	29.5	34.4	0.83	0.15	0.57	<0.01	0.67
NDF	41.2	39.0	44.0	48.2	33.3	42.6	0.38	0.20	0.10	<0.01	0.29
Ruminal fill, kg											
DM	3.1	3.1	3.5	4.2	2.7	2.8	0.26	0.49	<0.01	0.05	0.86
Liquid	25.7	25.9	28.3	31.0	23.2	25.8	0.35	0.65	<0.01	<0.01	0.10

Table 2. Effects of stocking rate (AUM x ha⁻¹) on diet digestibility among heifers grazing cover crops.

Digestibility, %	Stocking Rate			Contrasts	
	2.7	3.6	4.7	Linear	Quadratic
DM	67.8	84.9	79.7	0.01	<0.01
OM	76.7	88.1	84.5	<0.01	<0.01
ADF	74.1	80.4	80.4	0.23	0.47
NDF	69.0	75.3	78.9	0.06	0.72

Table 3. Effects of stocking rate (AUM x ha⁻¹) on performance among heifers grazing cover crops

Performance, kg	Stocking Rate			Contrasts	
	2.7	3.6	4.7	Linear	Quadratic
DMI	6.0	10.6	8.9	0.13	0.07
Intermediate ADG	0.75	0.34	0.22	0.06	0.05
Overall ADG	1.5	1.3	1.3	0.1	0.61

Conclusions

- These data indicate that reduced stocking rate among heifers grazing cover crops tends to increase performance.
- It is unclear why estimates of DMI and diet digestibility decreased with reduced stocking rate.

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- Stocking rate is a major grazing management tool that has great impact on livestock grains, forage production, nutrient cycling, soil health factors and subsequent crops' profitability.
- data are limited on stocking rates that allow optimal utilization of cover crops by cattle.

	Stocking Rate, AU			SEM	Contrasts	
	3	4	5		Linear	Quadratic
Digestibility, %						
DM	67.8	84.9	79.7	2.64	0.01	<0.01
OM	76.72	88.06	84.45	1.58	<0.01	<0.01
ADF	74.13	80.43	80.37	3.43	0.23	0.47
NDF	68.99	75.34	78.86	3.71	0.06	0.72

Performance	Stocking rate, AU			SEM	Contrasts	
	3	4	5		Linear	Quadratic
DMI	5.99	10.62	8.94	1.29	0.13	0.07
Intermediate ADG	0.75	0.34	.22	0.17	0.06	0.05
Overall ADG	1.5	1.33	1.28	0.12	0.1	0.61

Diet selection	Stocking rate, AU				Diet sample				Contrasts, treatment		Contrasts, time		Contrast
	3	4	5	SEM	1	2	3	SEM	Linear	Quadratic	Linear	Quadratic	
DM	8.51	7.21	7.77	.41	7.59	8.19	7.7	0.57	0.20	0.06	0.90	0.50	0.65
OM	82.72	81.68	82.95	1.74	81.99	84.16	81.20	1.12	0.92	0.59	0.44	<0.01	0.02
ADF	33.39	29.98	33.99	2.03	33.44	29.49	34.43	1.50	0.83	0.15	0.57	<0.01	0.67
NDF	41.16	38.96	43.98	2.23	48.21	33.27	42.62	2.27	0.38	0.20	0.10	<0.01	0.29

Ruminal fill	Stocking rate, AU				Diet Sample				Contrasts, treatment		Contrasts, time		Contrast
	3	4	5	SEM	1	2	3	SEM	Linear	Quadratic	Linear	Quadratic	
DM fill	3.11	3.10	3.46	0.39	4.23	2.69	2.75	0.42	0.26	0.49	<0.01	0.05	0.86
Liquid fill	25.71	25.90	2.34	2.77	30.96	23.16	25.83	2.20	0.35	0.65	<0.01	<0.01	0.10

	Stocking Rate			Time			Stocking Rate		Time		Stocking Rate x time
	2.7	3.6	4.7	Initial	Intermediate	Final	Linear	Quadratic	Linear	Quadratic	
Ruminal fill, kg	2.7	3.6	4.7	Initial	Intermediate	Final	Linear	Quadratic	Linear	Quadratic	Stocking Rate x time
DM	3.1	3.1	3.5	4.2	2.7	2.8	0.26	0.49	<0.01	0.05	0.86
Liquid	25.7	25.9	28.3	31.0	23.2	25.8	0.35	0.65	<0.01	<0.01	0.10
Digestibility, %											
DM	8.5	7.2	7.8	7.6	8.2	7.7	0.20	0.06	0.90	0.50	0.65
OM	82.7	81.7	83.0	82.0	84.2	81.2	0.92	0.59	0.44	<0.01	0.02
ADF	33.4	30.0	34.0	33.4	29.5	34.4	0.83	0.15	0.57	<0.01	0.67
NDF	41.2	39.0	44.0	48.2	33.3	42.6	0.38	0.20	0.10	<0.01	0.29