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Alex H. Titlow
University of Nebraska-Lincoln

Karla H. Jenkins
University of Nebraska-Lincoln

Matthew K. Luebbe
University of Nebraska-Lincoln, mluebbe2@unl.edu

Drew J. Lyon
University of Nebraska-Lincoln, dlyon1@unl.edu

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Forage Availability and Quality of No-till Forage Crops for Grazing Cattle

Alex H. Titlow
Karla H. Jenkins
Matt K. Luebbe
Drew J. Lyon[1]

Summary

No-till forage crops were planted to determine forage quantity and quality for grazing cattle. Seven combinations were evaluated using different mixtures containing forage peas, oats, winter triticale, turnips, radishes, clover, vetch, and sunflower. The cover crops were planted April 9 and sampled three times (day 54, 70, and 86 after planting) to determine forage mass and nutrient content. Mixtures containing forage peas and oats yielded the greatest quantity of DM/acre. The NDF and CP content of the mixtures are comparable to native range during the growing season. When used in place of fallow in crop rotations, grazing cover crops may provide an alternative to native range.

Introduction

Forage crops can enhance the sustainability of a cattle operation by providing a grazing alternative to native range to prevent overgrazing range resources. Multispecies crops typically include legumes, annual grasses, and deep rooted species such as brassicas (turnips and radishes). Multispecies forage crops are becoming popular in no-till farming operations as an alternative to fallow. However, the expense of planting these crops warrants evaluation. Estimates of forage quality and quantity are needed to determine appropriate stocking rates for grazing cattle. The objective of this study was to determine the quantity and quality of no-till forage crops in a dryland cropping system for cattle grazing in a semiarid region.

Procedure

Seven combinations of forage crops were planted April 9, 2010, at the High Plains Ag Lab in Sidney, Neb., at a planting depth of 2 in using a no-till drill. The cover crops were replicated using four plots/treatment. Treatments (TRT) included 1) forage peas; 2) forage peas and oats; 3) forage peas, winter triticale, turnips, radishes, clover, vetch, sunflower; 4) forage peas, oats, turnips, radishes, clover, vetch, sunflower; 5) forage peas, winter triticale, grazing brassica hybrid mix, clover, vetch, sunflower; 6) forage peas, oats, grazing brassica hybrid mix, clover, vetch, sunflower; and 7) winter triticale (Table 1). To determine the nutrient composition and quantity of biomass for each combination, two clip samples per plot (8/TRT) were collected using a 2.7 ft^2 quadrat at 16-day intervals on June 1, June 16, and July 2, 2010. A portion of these samples were dried in a 105° F forced-air oven and weighed to determine the quantity of DM/acre. The remaining portion of the samples was freeze-dried and ground in a Wiley mill to pass through a 1-mm screen for laboratory analysis. Concentration of NDF, ADF, and CP was quantified, and IVDMD was estimated using a 48-hour *in-vitro* incubation.

Forage mass data were analyzed using the MIXED procedure of SAS (SAS Inst., Inc., Cary, N.C.), with plot as the experimental unit and sampling date as a repeated measure. The CORR procedure of SAS was used to determine the correlation between seeding rate (lb of seed/acre) and forage yield (DM/acre).

Results

Forage Yield

During the second week of May the nighttime low temperature was in the low 20s. These lower temperatures, coupled with a planting depth greater than 1 in, may have contributed to limited forage production by the brassicas, clovers, vetch, and sunflowers as their seeds are smaller compared with the other species evaluated. Forage mass (tons DM/acre) was greatest for the forage pea and oat combinations (TRT 2, 4, 6) at

(Continued on next page)

Table 1. Forage crop mixtures and planting rates[1].

Forage Crop	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6	Treatment 7
Forage Peas	120	80	40	40	40	40	
Oats		40		40		40	
Winter Triticale			50		50		65
Turnips			1	1			
Yellow Sweet Clover			1	1	1	1	
Sunflower			1.5	1.5	1.5	1.5	
Medium Red Clover			1	1	1	1	
Vetch			4	4	4	4	
Oilseed Radish			2.5	2.5			
Brassica Hybrid[2]					3.75	3.75	

[1]All values are in pounds per acre.
[2]Brassica Hybrid mix was 37.85% Hunter hybrid brassica, 25.84% Rangi rape, 18.94% Winfred hybrid brassica, and 17.17% Turnip.

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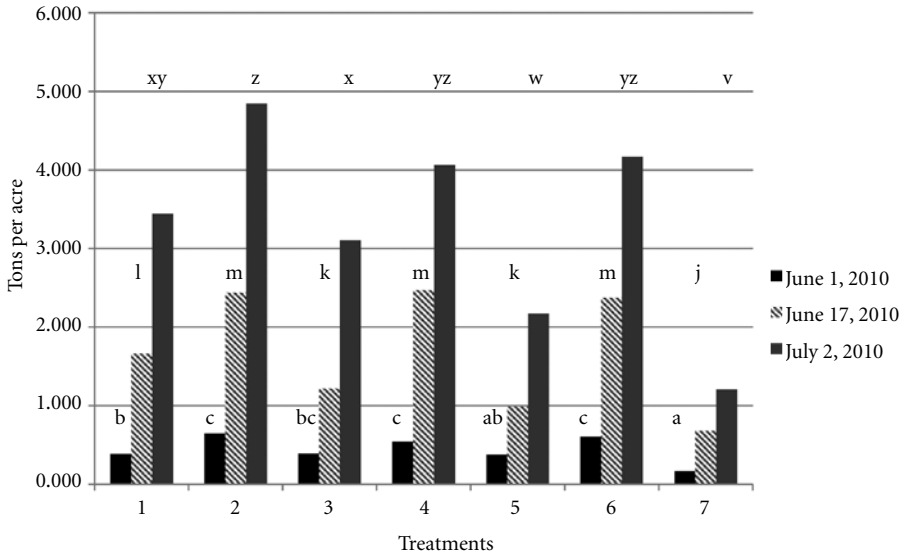
Table 2. Nutrient composition and IVDMD of forage crop mixtures during three sampling dates.[1]

	June 1, 2010				June 17, 2010				July 2, 2010			
	IVDMD, %	CP, %	NDF, %	ADF, %	IVDMD, %	CP, %	NDF, %	ADF, %	IVDMD, %	CP, %	NDF, %	ADF, %
Treatment 1	84.4	25.3	23.3	16.2	74.3	20	37.8	29.0	72.7	17.1	38.0	29.9
Treatment 2	82.5	25.8	30.6	17.3	78.1	17.2	42.7	27.1	65.2	8.1	62.4	37.9
Treatment 3	80.4	27.3	31.0	14.8	77.3	20.5	36.4	25.9	71.7	14.6	43.1	31.6
Treatment 4	82.5	25	29.3	18.0	77.1	13.2	42.4	26.7	59.8	7.7	63.2	38.3
Treatment 5	80.6	29	35.7	14.9	76.4	19.6	38.1	28.8	71.1	13.7	44.2	26.2
Treatment 6	83.4	25.1	33.6	30.5	78.8	14.6	43.9	19.1	59.0	7.5	62.2	41.2
Treatment 7	81.8	29.9	37.1	15.9	78.2	22.1	44.2	24.9	73.4	12.8	50.8	28.9

[1]Values reported on a 100% DM basis.

all three collection times (Figure 1; $P < 0.05$). Forage mass was the least for the triticale (TRT 7) at each collection ($P < 0.05$). The triticale used in the current experiment was a winter triticale hybrid, and it remained in a vegetative state throughout the growing season. However, the estimate of forage production on June 1 for the forage peas (TRT 1) was not different ($P > 0.10$) when compared with combinations containing triticale (TRT 3, 5). On June 17, forage mass of the peas was intermediate compared with the mixtures containing both peas and oats (TRT 2, 4, 6) and the treatments containing peas and triticale (TRT 3 and 5; $P < 0.05$). By July 2, the mixtures containing forage peas in combination with oats (TRT 2, 4, and 6) produced the greatest quantity of forage ($P < 0.05$) and the combinations containing oats (TRT 4, 6) were similar to the forage peas alone (TRT 1). Although there were differences in the seeding rates (lb of seed/acre) among mixtures evaluated, there was no correlation between seeding rate ($r = 0.26$; $P = 0.25$) and forage yield.



[abc]Means with unlike superscripts are different ($P < 0.05$) during the first clipping (June 1, 2010).
[jklm]Means with unlike superscripts are different ($P < 0.05$) during the second clipping (June 17, 2010).
[vwxyz]Means with unlike superscripts are different ($P < 0.05$) during the third clipping (July 2, 2010).

Figure 1. Forage production of no-till forage crops for grazing cattle.

Forage Quality

The IVDMD of all mixtures was greater than 80% during the first sampling on June 1, and greater than 74% during the second sampling on June 17 (Table 2). Digestibility estimated during the last clipping (July 2) ranged from 71 to 73% for the forage peas (TRT 1) and the combinations containing winter triticale (TRT 3, 5, and 7). The IVDMD of the mixtures containing oats was lower and ranged from 59 to 65% (treatments 2, 4, 6). The lower digestibility corresponds with the increased forage production. The NDF and ADF values increased, while concentration of CP and IVDMD decreased, which supports the conclusion that increased forage production results in higher fiber and, therefore, lower quality. The CP concentration for forage peas and oats decreased from June 1 (25-26%) to July 2 (7.5-8%). The CP concentration for mixtures containing triticale did not decrease to the same extent as other mixtures because it remained in a vegetative state throughout the growing season.

Based on the forage crop combinations evaluated in this study, mixtures containing forage peas and oats resulted in the greatest DM yield. If the forage is grazed early in the season, it may be possible to maintain acceptable animal performance based on the NDF and CP composition of the forage. When used in place of fallow in crop rotations, grazing cover crops may provide an alternative to native range. Additional data are being collected to determine diet selection of cover crops compared with native range.

Alex H Titlow, graduate student; Karla H. Jenkins, assistant professor; Matt K. Luebbe, assistant professor, University of Nebraska–Lincoln (UNL) Panhandle Research and Extension Center, Scottsbluff, Neb.; Drew J. Lyon, dryland crops specialist, UNL Panhandle Research and Extension Center, Scottsbluff, Neb.

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