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Winter Small Grains for Green Chop and Silage on the Vander Horst Dairy, Stephenville, 1997-1998

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Summary

Six small grains were evaluated on an Erath County producer's field during the winter of 1997-1998. Samples were taken twice at boot stage for green chop or once at soft dough for silage. Dry matter mass differences amongst entries in both categories were not significant although the rye tended to be higher and wheat lower. Average small grain dry matter yield/acre was 3855 lbs for green chop and 5463 lbs for silage. Oats had the highest nutritive value since they had the lowest NDF and ADF values. Green chop quality indicators were higher than the silage quality indicators. On average, green chop had 3.55 times the crude protein concentration compared to silage.

Introduction

The dairy industry in the Cross Timbers region has shown an increased interest in utilizing winter small grains for green chop and, when rainfall and temperatures combine to produce excess biomass, silage. Producers, however, are as yet unsure as to which small grain species is best adapted, most productive and, at the same time, of acceptable quality for dairy cows. In an effort to answer these questions, this demonstration was initiated by a producer on-farm and looked at forage yield and quality indicators of green chop (boot stage) as well as silage (soft dough stage) in 6 small grains.

Procedure

TAM 500 barley, 833 oats, Trical triticale, 9663 coker wheat, RH-JT wheat and Elbon rye were seeded in 15' X 1000' strips replicated twice on December 1, 1997, considerably later than the September/October recommended planting dates for the region. Nitrogen was applied at 55 lbs/acre at planting to a tilled clay loam soil testing high for P (281 ppm) and K (692 ppm) following a corn silage crop. The site had approximately 14 in. of rain during the growth period.

Four 1-m^2 quadrats were collected per replication on February 27 and the same areas harvested again on March 27 to estimate green chop yield and quality at the boot stage. Due to low rainfall in late spring, no further green chop harvests took place after March. Each of the small grains was also harvested for silage when they reached the soft dough stage. These samples, using the same sampling methodology as the green chop, were taken from areas adjacent

to the green chop quadrats. Yield per acre was estimated on a dry matter (DM) basis and all samples were analyzed for neutral determent fiber (NDF), acid detergent fiber (ADF), phosphorus (P) and crude protein (CP) percentage of DM.

Results & Discussion

Statistically, there were no differences among species for either the total green chop or the silage yields (Table 1). However, the wheats tended to produce the least while Elbon rye and TAM500 barley in the green chop and Elbon rye and 833 oats in the green chop had the highest production. Trical triticale appears to be a late producer and might better serve producers with early spring feed deficits. There was a 30% decrease in yield for green chop (boot stage) compared to silage (soft dough stage) on average for all the small grains. Had it rained in the last 6 wk of the experiment, the green chop may have had greater regrowth.

Green chop NDF values (Table 2) were 42.7% lower than silage values. Oats had the lowest NDF values and rye the highest in both harvest types. Likewise, green chop ADF values (Table 3) were 33.5% lower than silage values. Once again, oats had the lowest ADF values and rye the highest in both harvest types.

Crude protein concentration (Table 4) was high for the green chop, 23.8 % on average. This may have been a reflection of the immature stage at harvest of the small grains soon after the N fertilizer application. Coker wheat had the highest green chop CP value, followed closely by barley. The silage CP concentration, by contrast, were low, averaging only 6.7%. Elbon rye and Coker wheat were particularly low and triticale, at 10.3%, was considerably higher than the other entries.

Phosphorus concentration (Table 5) was 2.34 times higher for the green chop than for the silage (0.713 versus 0.304 %, respectively). Even when lower DM yield was factored in, the green chop still extracted 1.63 times more P than the silage crop (27.2 versus 16.7 lbs P/acre, respectively). This would be the equivalent of over 8,200 lbs manure applied per acre (at 0.55% P and 60% moisture) or approximately 13 ppm of P extracted from the soil. With earlier fall seeding and better spring rains, the amount of P extracted could conceivably double.

The triticale extracted the highest concentration of P in the green chop, 0.903% and 33.9 lbs/acre or the equivalent of over 10,200 lbs manure/acre. This is also the equivalent to approximately 16 ppm P extracted from the soil. RH-JT wheat, both as green chop and silage, extracted the least amount of P. This difference in P concentration, both among species and between harvest systems, has ration formulation implications: higher forage concentrations of P will result in a decreased need to import additional P onto the dairy. In a situation where the

dairy producer needs to lower the P ppm in the soil, these differences could likewise be significant.

High moisture forages, such as silage and green chop, are commonly fed between 10 and 30 pounds of material (wet basis) per cow per day. The upper inclusion limit is determined by the forage quality and other feeds available. Total ration ADF and NDF goals are 19-22% and 28-33%, respectively. Above these ranges, milk production may be comprised due to the effects of high fiber levels on feed intake or ration digestibility. The first cutting of green chop in this trial gave forage quality parameters similar to Prime Grade alfalfa hay. Overall, the oats, barley, triticale, and wheat green chop harvests yielded acceptable quality forages for dairy rations. However, due to the variability in dry matter content, forage maturity, and weather, there is an intensive management factor involved in feeding green chop to lactating cows. Producers must be willing to monitor the crop on a regular basis and adjust the ration accordingly. The intensive management required with green chop feeding may be offset by the economics of this forage in the ration.

As a silage crop, the oats and triticale produced the highest quality in this study. While the rye produced the greatest dry matter tonnage per acre, the high fiber, low protein content of this feed would limit its inclusion in a lactating ration.

Conclusions

Producers must decide for themselves which small winter grain to plant, depending on their overall objectives. Elbon rye, for example, produced more DM (perhaps due in part to its early production in a wet winter) but had far lower quality indicators. The wheats, on the other hand, had lower DM productions (again, perhaps due to a tendency for later maturity in a dry spring) but higher quality. Green chop produced less but was of much higher quality and, if fed directly to dairy animals or stockers, may avoid the DM losses and storage costs associated with silage production. Waiting until soft dough increases yields of fiber but decreases quality to very low levels.

P management, both in the soil and feed formulation, could be affected by the plant P concentration and total mass extracted from the soil. Green chop, due to repeated regrowth of plant material high in mineral content, will result in greater soil P extraction as well as P available to dairy animals. Small grain species and variety selection appear to make a difference in P plant concentration and, when factored with DM yield, total P extracted from the soil and made available to cattle.

The Stephenville extension and research group plans to undertake experiments during the winter of 1998/1999 to estimate optimal maturity stages at which yield is high but quality is not sacrificed completely in winter small grains utilized for silage. Other useful studies might include a planting date study over several years with climatic variations, in particular low temperatures.

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Table 1. Dry matter production of six small grains during the 1997-1998 winter season on the Vander Horst Farm, Erath County.

Small grain	Feb/27	Mar/27	Total Chop	Silage	Tillers
	----------lbs DM/acre----------				count/row ft
TAM 500 barley	2629	1754	4384	5353	47
833 oats	2219	1561	3781	5821	34
Elbon rye	2553	1868	4421	5877	33
Trical triticale	1742	2025	3768	5353	26
9663 coker wheat	2598	1021	3621	5108	33
RH-JT Wheat	2379	654	3032	5264	35
P-value species	0.10	0.04	0.18	0.55	0.15
LSD (0.05) species	739	905	1368	1471	48
P-value harvest			--------0.001--------		

Table 2. NDF percent of six small grains during the 1997-1998 winter season on the Vander Horst Farm, Erath County.

Small grain	Feb/27	Mar/27	Total Chop	Silage
	----------% NDF----------			
TAM 500 barley	36.9	44.7	40.8	60.1
833 oats	36.2	42.7	39.5	57.6
Elbon rye	40.1	52.4	46.2	67.9
Trical triticale	34.3	48.6	41.4	63.8
9663 coker wheat	40.4	46.8	43.6	64.0
RH-JT wheat	41.5	47.9	44.7	65.4
P-value species	0.02	0.004	0.005	0.09
LSD (0.05) species	2.6	3.5	4.9	6.9
P-value harvest			--------0.001----------	

Table 3. ADF percent of six small grains during the 1997-1998 winter season on the Vander Horst Farm, Erath County.

Small grain	Feb/27	Mar/27	Total Chop	Silage
	----------% ADF----------			
TAM 500 barley	21.6	27.8	24.7	35.0
833 oats	20.7	24.2	22.5	32.7
Elbon rye	22.7	29.6	26.2	42.8
Trical triticale	19.1	27.9	23.5	37.0
9663 coker wheat	23.1	26.3	24.7	36.8
RH-JT wheat	23.4	26.2	24.8	35.9
P Value Species	0.02	0.02	0.05	0.03
LSD (0.05) Species	2.1	2.3	4.0	4.9
P Value Harvest			--------0.001----------	

Table 4. CP percent of six small grains during the 1997-1998 winter season on the Vander Horst Farm, Erath County.

Small grain	----------% CP----------			
	Feb/27	Mar/27	Total Chop	Silage
TAM 500 barley	29.4	20.2	24.8	6.6
833 oats	24.9	23.0	24.0	8.3
Elbon rye	25.3	19.5	22.4	4.2
Trical triticale	27.9	19.5	23.7	10.3
9663 coker wheat	25.7	24.4	25.1	4.8
RH-JT wheat	23.3	22.5	22.9	5.9
P-value species	0.11	0.24	0.53	0.06
LSD (0.05) species	4.4	5.4	3.9	3.9
P-value harvest			---------0.001---------	

Table 5. Phosphorus concentration and DM accumulation in six small grains during the 1997-1998 winter season on the Vander Horst Farm, Erath County.

Small grain	----------% P----------		---------lb P/acre---------	
	Total Chop	Silage	Total Chop	Silage
TAM 500 barley	0.671	0.394	29.5	21.4
833 oats	0.588	0.322	22.3	18.8
Elbon rye	0.644	0.254	28.3	15.1
Trical triticale	0.903	0.293	33.9	15.7
9663 coker wheat	0.790	0.293	28.6	14.9
RH-JT wheat	0.681	0.270	20.7	14.2
P-value species	0.0009	0.11	0.047	0.38
LSD (0.05) species	0.075	0.102	8.8	9.0
P-value harvest	----------0.001----------		----------0.001----------	