Double Cropping Annual Forages

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Winter cereals have been evaluated as a forage/cover crop at the CREC with results demonstrating their value as a reliable forage crop that provides cover and extends the haying/grazing season. The use of winter cereals as forage is a method of integrating cropland into a livestock system along with producing quality forage with dependable yields. One of the advantages of using winter cereals as a forage crop is the early spring growth along with an associated early harvest. When harvesting winter cereals as a forage crop there is a period of time where no crop is growing, leaving an opportunity to sow a second crop of forage for haying, grazing or cover crop. Taking an annual forage crop off early presents the option of double cropping annual forages if adequate moisture and fertility levels are present.

The CREC evaluated winter cereals as a forage crop during the 2014 growing season with the goal of double cropping Piper sudangrass into each treatment after harvest. Winter cereals used in the trial were rye, triticale, wheat, and spelt. Rye varieties included Hazlet, a recent release from Ag Canada, and ND Experimental, an experimental rye variety being developed by NDSU as a potential new variety. Both rye varieties were developed as a grain type variety. Thunder Cale and Metzger are private winter triticale varieties developed for forage use. Jerry winter wheat is an adapted winter grain variety developed by NDSU while Willow Creek is a winter wheat variety developed by Montana State University (MSU) as a forage type. Oberkulmer spelt is a Swiss variety that is used for both grain and forage, while Frank was developed by MSU as a grain variety. The trial was sown on September 24, 2013, into undisturbed flax stubble. Fall soil test results indicated 80 lbs/ac soil N with no additional fertilizer applied. No herbicides were used on this trial. Rye, triticale and wheat were sown at 1.2 million PLS/ac with spelt sown in the hull at 110 lbs seed/ac. All winter cereal treatments were harvested (Table 1) 7 to 10 days after heading in the anthesis stage. Double crop treatments (Table 3) of Piper sudangrass were sown on the same day the winter cereal was harvested to keep all treatments uniform. All sudangrass treatments were direct seeded into the harvested winter cereal stubble.

Table 1. Winter Cereal Forage - yield data **Carrington**

Variety	Crop Type	Harvest Date[1]	Harvest Stage	Jday of Heading	Plant Height	Harvest Moisture	15% Forage Yield	DM Forage Yield
					inch	%	ton/ac	ton/ac
ND Dylan	rye	23-Jun	late anthesis	162.5	46.7	72.5	2.53	2.15
Hazlet	rye	23-Jun	late anthesis	163.5	39.8	72.7	2.37	2.02
Thunder Cale	triticale	23-Jun	late anthesis	162.0	38.9	72.5	2.41	2.05
Metzger	triticale	2-Jul	late anthesis	174.3	44.1	72.9	3.03	2.57
Jerry	wheat	26-Jun	mid anthesis	170.8	36.6	69.6	2.90	2.46
Willow Creek	wheat	7-Jul	mid anthesis	181.0	47.2	71.4	3.65	3.10
Oberkulmer	spelt	7-Jul	end anthesis	178.5	48.5	70.5	3.74	3.18
Frank	spelt	7-Jul	early anthesis	181.8	44.8	72.6	3.73	3.17
Mean				171.7	43.3	71.8	3.04	2.58
C.V. (%)				0.5	3.3	2.9	7.6	7.6
LSD 0.10				1.1	1.8	2.5	0.28	0.24

Results (Table 1) illustrate differences in yield and quality and differences that exist in maturity or harvest date which are important factors to consider if double cropping is a goal. Data is consistence

with past performance with rye the earliest to harvest and spelt the last. The harvest period for the treatments in this trial was spread out over 15 days, June 23 to July 7. Generally the order of harvest by maturity has been rye, triticale, wheat, then spelt. This year maturity was similar with the exception of varieties selected for triticale and wheat which differed. Willow Creek wheat and Metzger triticale were later in maturity when compared to Thunder Cale and Jerry.

Forage yields (Table 1) illustrate significant differences between the types of winter cereals and differences among varieties within types. Yield data gathered show a strong relationship in yield by harvest date. Yields significantly increased with later harvest dates in this trial. Lowest yields were from rye and triticale which was harvested on June 23 compared to the highest yields of spelt harvested on July 7. Varietal differences within triticale and wheat demonstrate a significant yield increase as harvest dates were delayed. Metzger triticale had a 0.5 DM ton/ac increase when compared to the earlier variety Thunder Cale. A similar yield increase of 0.6 DM ton/ac occurred with Willow Creek wheat when compared to Jerry.

Quality data (Table 2) is consistent with past data illustrating slight differences among the crops used in this trial. Rye tends to be lower in quality when compared to wheat or other crops used. Although significant quality differences exist they were minor when compared among treatments. Jerry winter wheat had the highest crude protein and TDN along with the lowest fiber values. Relative Feed Value (RFV) which uses multiple quality parameters to measure the forage, showed Jerry at the highest RFV at 103 and Willow Creek the lowest at 80.

Table 2. Winter Cereal Forage - quality data **Carrington**

Variety	CP	ADF	NDF	TDN	Ca	P	Mg	K	S	RFQ	RFV
	%	%	%	%	%	%	%	%	%	%	%
ND Dylan	10.4	42.1	66.6	51.8	0.40	0.28	0.15	2.43	0.11	78.40	90.37
Hazlet	11.3	41.4	65.6	52.2	0.40	0.29	0.16	2.30	0.12	80.29	91.57
Thunder Cale	11.0	40.2	64.2	53.1	0.41	0.27	0.16	2.25	0.13	83.45	96.99
Metzger	11.2	41.5	65.1	52.0	0.42	0.28	0.14	2.45	0.13	80.86	90.09
Jerry	11.4	38.8	62.6	54.3	0.40	0.28	0.16	1.92	0.12	87.08	103.21
Willow Creek	10.7	43.4	64.6	50.6	0.52	0.26	0.12	2.41	0.12	79.29	80.27
Oberkulmer	10.8	40.9	63.1	53.3	0.43	0.26	0.14	1.94	0.13	84.05	92.72
Frank	10.9	42.2	64.4	51.6	0.45	0.26	0.13	2.24	0.13	80.82	86.45
Mean	11	41.3	64.5	52.40	0.43	0.27	0.14	2.24	0.12	81.80	91.50
C.V. (%)	8.2	3.0	1.6	1.5	15.4	6.2	10.9	9.1	11.8	2.8	4.6
LSD 0.10	NS	1.5	1.3	1.0	0.08	0.02	0.02	0.25	0.02	2.8	5.1

Results from the double crop of Piper sudangrass are presented in Table 3. Planting dates ranged from June 23 to July 7 depending on the previous harvest. Data gathered show the tallest plant heights were achieved from the earliest planting dates. The highest yields were also associated with the earliest planting dates of the sudangrass. Planting dates on June 23 averaged 1.75 DM ton/ac while the July 7 planting averaged 0.7 DM ton/ac. Totaling the first and second yields results in minimal differences among the treatments. Total yields (data not presented) range from 3.7 DM ton/ac to 4.0 DM ton/ac.

Table 3. Winter Cereal Forage - double crop yield data **Carrington**

Variety	Crop Type	Planting Date	Plant Height	Harvest Moisture	15% Forage Yield	DM Forage Yield
			inch	%	ton/ac	ton/ac
ND Dylan	rye	23-Jun	43.9	65.3	2.01	1.71
Hazlet	rye	23-Jun	51.3	69.3	2.36	2.01
Thunder Cale	triticale	23-Jun	44.8	68.1	1.91	1.62
Metzger	triticale	2-Jul	41.1	71.2	1.55	1.31
Jerry	wheat	26-Jun	43.5	68.7	1.73	1.47
Willow Creek	wheat	7-Jul	34.9	74.2	0.75	0.64
Oberkulmer	spelt	7-Jul	37.2	75.0	0.91	0.78
Frank	spelt	7-Jul	41.5	74.9	0.90	0.76
Mean			42.3	70.8	1.52	1.29
C.V. (%)			9	3.5	22.9	22.9
LSD 0.10			4.6	3.0	0.42	0.36

Planted by date into previous crop listed in table 3.

Harvest Date = September 25; Previous Crop = Piper Sudangrass

The CREC will continue to evaluate double cropping annual forages as a forage management system. This trial will be continued in 2015 to gather multiyear performance of this strategy. Research trials will be expanded to add additional species to test how they will perform in a double crop forage system.

Left: Willow Creek (left) in boot stage and heading Metzger triticale on June 26. Right: Piper sudangrass on September 25 illustrating differences in growth by planting date.