EORDC
Belle Valley

1998
Fescue Fertilization Demonstration Plots

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RESULTS OF 1997-98
FESCUE FERTILIZATION
DEMONSTRATION PLOTS

DEMONSTRATION PLOTS SUMMARY BY
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Enclosed you will find a summary of the fescue fertilization demo plots. The data is useful in demonstrating how this grass responded to fertilization. The results do not prove anything, however, the data supports know trends in plant growth. Fifty-one standard forage analysis and DM analysis were taken for all plots. It's important to remember that these results are for one growing season at one location.

FINDINGS SUPPORTED BY OTHER RESEARCH

Nitrogen source i.e. urea, ammonium nitrate, etc. did not significantly change forage quality or DM production when comparing equal application rates. The key is utilizing the nitrogen source correctly and, in the case of urea, prior to a rain.

DM production was impacted by various amounts of P and K. The response was difficult to measure because the effect was slight and inconsistent.

Based on the data, further research with lower nitrogen rates should be considered. Seventy-five pounds and recommended N application, by soil test, with the same levels of P and K applied.

Nitrogen rate did have an impact on forage CP content. The response can be great in the spring (for a short period) and the response is much longer when plots are fertilized in the fall or late summer. This could be important for producers who have poor quality forage.

Copper levels declined from spring to fall and were low.

Energy levels were fairly constant as all forages were harvested at the same time.

Potassium levels were extremely high despite low soil test values. The potassium concentrations were also high for unfertilized plots in the spring. Spring fertilized plots were extremely high and had the potential to reduce mg availability.

Table One of the fertilizer blends dramatically illustrates the need for producers to consider the availability of the nutrients they need (by soil test) before purchasing. Buy the nutrients needed.

The application of fertilizer, in a timely manner, can be used to compensate for seasonal variations in forage quality.

Red clover plants were not seeded. At the start of the project we could find approximately one plant per 800 square feet. At the end of '98 we can find an average of three plants per 40 square

feet. In the mowed paths 1/3 of the sword is clover.

When relying on organic nitrogen sources such as manure and sludge, I would consider more frequent applications throughout the growing season to improve forage yield.

1st, 2nd & 3rd Cutting Fescue Fertilization Demonstration Plots

Harvest Dates: 5/15/98, 7/22/98, 10/14/98

Fertilization Dates: Split, Spring & Fall Fertilization: 4/13/98, 9/8/98
Spring only plots: 4/13/98
Fall only plots: 9/12/97 & 9/8/98

Total Fall Fertilized Plot Yields

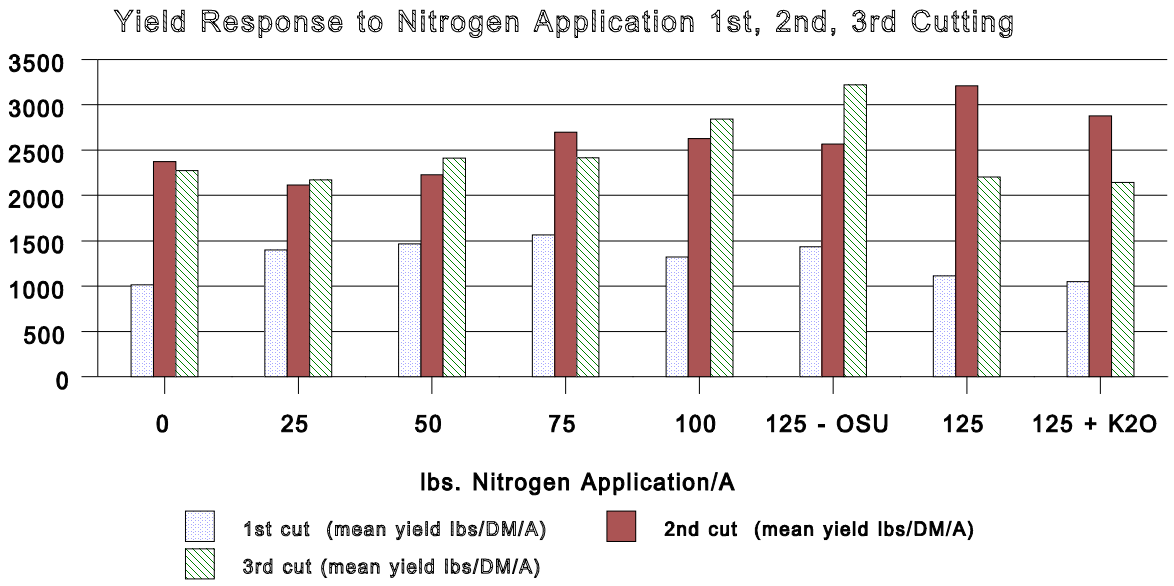
Plot A	6868/lb DM - 100/N, 19-19-19
Plot B	7647/lb DM - 75 lb/N, 19-19-19
Plot C	6207/lb DM - 50 lb/N, 19-19-19
Plot D	5961/lb DM - 25 lb/N, 19-19-19
Plot H	5965/lb DM - 50 lb/N, 15-15-15

Total yield of Spring and Fall fertilized plots (split applied):

Plot E	50 lbs/N, Amm. Nit. 6-24-24	—	6562 lbs. DM/A
Plot F	50 lbs/N, urea base 18-7-30	—	5958 lbs. DM/A
Plot G	OSU plot 125 lbs/N, 25 lbs. P205, 300 lbs. K20	—	7220 lbs. DM/A

Total plot yield of Spring fertilized plots:

I	50 lbs/N	19-19-19	4599 lbs DM/A
J	100 lbs/N	19-19-19	8209 lbs DM/A
K	25 lbs/N	19-19-19	5312 lbs DM/A
L	75 lbs/N	19-19-19	6364 lbs DM/A
M	25 lbs/N	15-15-15	5229 lbs DM/A
N	50 lbs/N	15-15-15	5400 lbs DM/A
O	75 lbs/N	15-15-15	5649 lbs DM/A
N*	50 lbs/N	Manure	4472 lbs DM/A
P*	25 lbs/N	Sludge	4288 lbs DM/A
Q	25 lbs/N	Manure	5003 lbs DM/A
R	Control	-------	5660 lbs DM/A
CONTROL*		-------	5660 lbs DM/A
S	25 lbs/N	18-7-30	5367 lbs DM/A
T	100 lbs/N	18-7-30	6406 lbs DM/A
U	50 lbs/N	18-7-30	5500 lbs DM/A
V	75 lbs/N	18-7-30	6313 lbs DM/A
W	75 lbs/N	18-7-30	6598 lbs DM/A
X	12 lbs/N	4-11-45	5713 lbs DM/A
Y	25 lbs/N	4-11-45	6050 lbs DM/A
Z	50 lbs/N	4-11-45	5069 lbs DM/A
A1	100 lbs/N	15-15-15	4930 lbs DM/A
Sludge	50 lbs/N		3978 lbs DM/A
A3	125 lbs/N	after 1st cutting	6021 lbs DM/A
A2	125 lbs/N + 300 K_20	after 1st cutting	6393 lbs DM/A
Potash	300 lbs/N		6086 lbs DM/A



Fescue Fertilization Demonstration Plots

Nitrogen Rates DM Mean Sample size (n)

125	7220	a 1
100	6603	ab 4
75	6514	ab 5
12	5713	bc 1
50	5658	bc 8
25	5268	c 7

LSD (0.05) = 1169 lbs/acre

Timing DM Mean Sample Size (n)

Split	6580	a 3
Fall	6530	a 5
Spring	5648	b 18

LSD (0.05) = 770 lbs/acre

Fertilizer Types DM Mean Sample Size

OSU	7220	a 1
6-24-24	6562	ab 1
19-19-19	6396	ab 8
18-7-30	5909	bc 5
4-11-45	5773	bc 4
15-15-15	5435	bcd 5
manure	5003	cd 1
sludge	4288	d 1

LSD (0.05) = 1189 lbs/acre

treatment means followed by the same letter are not significantly different at the 5% level of significance.

Interactions

1.) At P = 0.05, there was no significant interaction between the rate of nitrogen applied and when it was applied (Nitrogen Rate x Timing). This indicates the relative yield performance of each level of nitrogen was the same whether it was applied in the fall, spring, or split. In other words, 75 lbs/acre N yielded better than 25 lbs/acre no matter when they were applied.

2.) At P = 0.05, there was no significant interaction between the type of fertilizer used and when it was applied (Fertilizer Source x Timing). This indicates the relative yield performance of each fertilizer source was the same whether it was applied in the fall, spring, or split. In other words, timing of application did not favor one fertilizer source over another.

3.) At P = 0.05, there was no significant interaction between the type of fertilizer used and the rate of nitrogen used (Fertilizer source x Nitrogen rate). This indicates that a pound of nitrogen from one fertilizer source was equivalent in yield performance as any other fertilizer source.

Coefficient of Variation = 12.1%. Experimental error or unexplained variation was within acceptable levels of field research.

Discussion:
Of the nitrogen rates for which there were at least four replications, 25 lb. yielded significantly less than 100 and 75 lb. Based on the results of one year of data, it appears 50 lb. yielded as well as 75 and 100 lb. and cost savings in fertilizer could be realized.

In regards to timing of applying nitrogen, spring applications as a group yielded significantly less than fall and split applications of fertilizer.

For all fertilizer sources for which there were at least four replications, there were no significant differences in yield performance.

We normally compare Total pounds produced per acre rather than comparing to the control. For example:
OSU 7220 lbs DM x .035 = $252.70/A
Control 5660 lbs DM x .035 = $198.10/A
Cost/A for OSU $57.50 = 252.70 - 57.50 = 195.20 or -$2.9/A

Value calculation do not account for differences in forage quality.

50 lb N 214 lb DM/A difference from control@ $70/ton hay value $7.49/A
75 lb N 762 lb DM/A difference from control@ $70/ton hay value $26.67/A
100 lb N 877 lb DM/A difference from control@ $70/ton hay value $30.69/A
OSU 1305 lb DM/A difference from control@ $70/ton hay value $45.68/A

Price calculations do not include spreading cost

1) Net profit OSU - Cost $230/ton fertilizer cost/A = $54.20/A
Compared to Control: net profit $-11.82/A

2) 19-19-19 urea Cost $206.80/ton fertilizer cost/A = $54.20/A
(100 lb N/A) net profit $-23.51/A

3) 19-19-19 urea Cost $206.80/ton fertilizer cost = $40.82/A
(75 lb N/A) net profit = $-14.14/A

4) 15-15-15 urea Cost $161.70/ton fertilizer cost = $53.90/A
(100 lb N/A) net profit = $-23.31/A

5) 15-15-15 urea Cost $161.70/ton fertilizer cost = $40.42/A
(75 lb N/A) net profit = $-13.75/A

6) 125 lb N Cost $26/A 865 lb forage at .035 = $30.27 or net $4.20/A

7) 15-15-15 urea Cost $161.70/ton fertilizer cost = $26.95/A
(50 lb N/A) net profit = $-19.46/A

8) Urea Cost $187.20/ton fertilizer cost = $10.40/A
(50 lb N/A) net profit = $2.91/A

9) Urea Cost $187.20/ton fertilizer cost = $15.60/A
(75 lb N/A) net profit = $+11.07/A

10) Urea Cost $187.20/ton fertilizer cost $20.80/A
(100 lb N/A) net profit = $+9.89/A

11) Ammonium Nitrate 34-0-0 $234.60/ton fertilizer cost $25.86/A
(75 lb N/A) net profit = $+.79/A

12) Ammonium Nitrate 34-0-0 $234.60/ton fertilizer cost $34.50/A
(100 lb N/A) net profit = $-3.81/A

13) Break even of OSU plot:

$$\frac{\$57.50 \text{ cost}}{\$45.68 \text{ earnings}} = 1.2587 \times 7220 = 9088 \text{ lbs forage } 4.5 \text{ ton/A at } \$70/\text{ton}$$

Avg. DM yield per pound of fertilizer: control yield - 5660

25 lb N: $\frac{\text{25 lb DM increase}}{\text{25 lb N}}$ = 1 lb DM per pound of Nitrogen

50 lb N: $\frac{\text{469 lb DM increase}}{\text{50 lb N}}$ = 9.38 lb DM per pound of Nitrogen

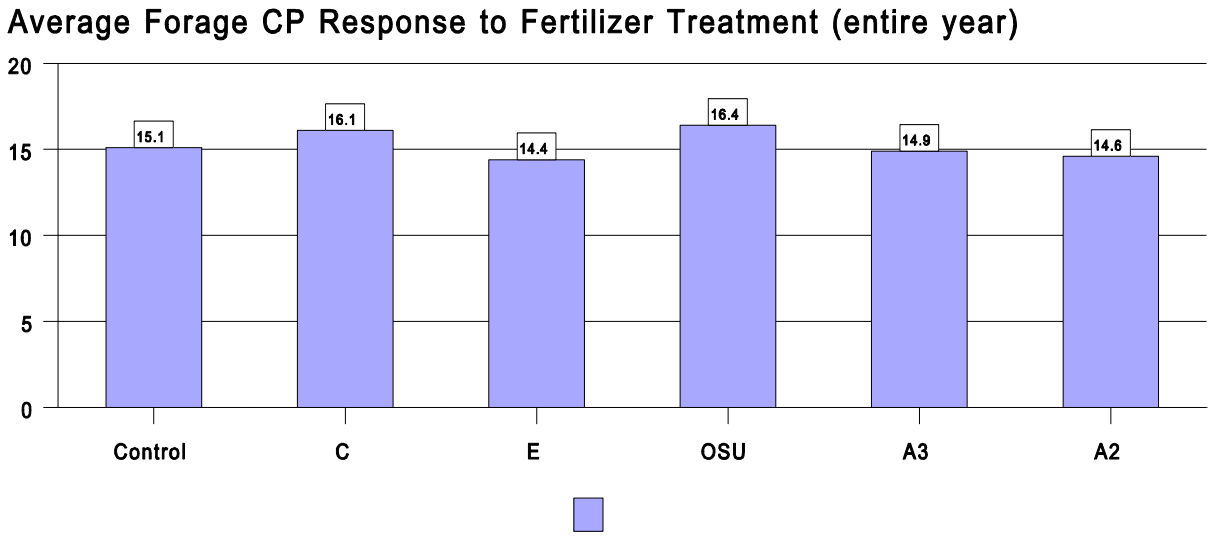
75 lb N: $\frac{\text{1017 lb DM increase}}{\text{75 lb N}}$ = 13.56 lb DM per pound of Nitrogen

100 lb N: $\frac{\text{1132 lb DM increase}}{\text{100 lb N}}$ = 11.32 lb DM per pound of Nitrogen

OSU lb N: $\frac{\text{1560 lb DM increase}}{\text{125 lb N}}$ = 12.48 lb DM per pound of Nitrogen

125 lb N: $\frac{\text{865 lb DM increase}}{\text{125 lb N}}$ = 6.92 lb DM per pound of Nitrogen

Potash: $\frac{\text{424 lb DM increase}}{\text{300 } K_20}$ = 1.41 lb DM per pound K_2O



Plots analyzed all three cuttings

C = 19-19-19, Fall fertilized, 50 lb N/A
E = 6-24-24, Split App. SP/Fall, 50 lb N/A
OSU = 125 lb N, 25 lb P_2O_5, 300 lb K_2O, Split App.
A3 = 125 lb N after 1st cutting
A2 = 125 lb N + 300 lb K_2O after 1st cutting

The spring application of fertilizer was made 4/13/98, 1st harvest 5/15/98. The spring fertilized plots had a dramatically higher 1st cutting CP content than the controls. In addition, if we compare the same fertilizer blend applied in the spring and the fall, spring fertilized plots generally have a higher forage CP content. Spring fertilizer plots were approximately a percentage point higher than the control for CP content until nitrogen application reached 100 lb/A when CP content averaged over 20.5 percent CP content
compared to 16.3 for the controls. Other nutrient changes:

ADF ranged from 39.3 (control) to 35.4 (OSU)
NEM ranged from .57 (control) to .60 (OSU)
NEG ranged from .28 (control) to .30 (OSU)
P ranged from .49 (control) to .54 (OSU)
K ranged from 3.08 (control) to 4.01 (OSU)
Ca ranged from .49 (control) to .52 (OSU)
Mg ranged from .27 (control) to .31 (OSU)
Mn ppm ranged from 58 (control) to 67 (OSU)
Fe ranged from 85 (control) to 87 (OSU)
Cu ranged from 5 (control) to 6 (OSU)
Zn ranged from 54 (control) to 30 (OSU)

By second cutting 99 days after spring fertilization CP content ranged from 14.2 (control) to 13.3 (OSU). The highest testing plots for CP content second cutting were plots A3 and A2 which had fertilizer applied after 1st cutting CP contents were 15.2 and 14.3 respectively. Other changes:

	Control	A3	OSU
ADF	40.40	39.9	40.30
NEM	.54	.55	.54
NEG	.24	.25	.25
P	.52	.47	.49
K	2.49	2.92	3.31
Ca	.70	.66	.50
Mg	.36	.40	.31
Mn	47	68	48
Fe	61	79	73
Cu	5	6	4
Zn	25	23	19

By third cutting 10/14/98, approximately 1 month after fertilization had been applied to the fall fertilized plots, fescue CP content increased again. The control tested approximately 15.5 percent CP (dry matter basis) and the OSU plot tested 16.4% CP. Plots like A2 and A3 which had high amounts of nitrogen applied after 1st cutting tested 13.6 and 13.3 percent CP respectively. Fall fertilized plots like plot A, 19-19-19, 100 lb N tested 18.2% CP and plot C 19-19-19, 50 lb N tested 16.7 % CP nearly the same as plot H, 50 lb N, 15-15-15, tested 16.8% CP. On two of the three plots where 25 lb of N was applied CP levels were 13.6, 13.6 and 18.6. Looking at plot B, 19-19-19, 75 lb N and the Control:

3rd Cutting Analysis	B	Control
CP	18.3	15.5
ADF	30.0	32.1
NEM	.66	.64
NEG	.36	.34
P	.47	.51
K	2.97	2.47
Ca	.63	.82
Mg	.37	.39
Mn	51	41
Fe	73	54
Cu	5	5
Zn	35	28
Mo	2.68	2.91

Winter of 98 we forage tested stockpiled fescue which had 50 lb. of nitrogen applied/A as urea, and it was 2 percent higher in CP content (10.5) than unfertilized fescue (8.2). Fall fertilized fescue plots appeared to hold onto forage quality changes for long periods during the cooler months. This could be of particular importance in grazing situations and when animals are needing improvements in body condition or under stress of pregnancy or lactation.

PLOT DESIGN

Lb of fertilizer/A

BULL BARN

Fall fertilizer application:
9/12/97

Purpose of study:
1. Compare fertilization responses on forage (comparing yield and nutrient content).
2. Compare cost of forage response to different fertilizer blends.
3. Compare fertilizer timing.
4. Measure forage response to manure applications as a crop nutrient.

We have:

_ randomly selected treatment sites & treatments whild grouping split & single fertilizer applications.
_ followed OSU recommendations on one plot.
_ collected a preliminary soil test on the site and forage test.

DATES: Fall Fertilization (A2, A3)
Fescue Plot Harvest9/4/97
1st Cutting Harvest7/31/97

Fall Plots Fertilized9/12/97
Spring Plots Fertilized4/13/98
Fall Fertilized9/8/98

1st Cutting Harvest5/15/98
2nd Cutting Harvest7/22/98
3rd Cutting Harvest10/14/98

* Sheep were permitted to graze existing winter forage prior to spring fertilization.

SOIL TEST VALUES:		BASE SATURATION:	
pH	7.2	% Ca	82
Lime Test Index	70	% Mg	16
Phosphorus ppm	58	% K	1.9
Potassium	102		
Calcium	2260		
Magnesium	257		
CEC	14		
Manganese ppm	150		
Zinc ppm	4.7		
Boron ppm	0.8		
Organic Matter	4.2%		

FESCUE PLOTS
Located at far East end of plots.

A3 Summer 98 Application 125 lbs N after 1st cutting	
A2 Summer 98 Application of 125 lb N & 300 lb K_2O after first cutting	

A 526.3 19-19-19 100 lbs N/A fall treatment	CONTROL
B 395 19-19-19 75 lbs N/A fall treatment	500 0-0-60 Potash
C 263 19-19-19 50 lbs N/A fall treatment	managed for legumes
D 132 19-19-19 25 lbs N/A fall treatment	P 156 sludge 25 lbs N/A
E 833 6-24-24 50 lbs N/A split Ammon. Nit. fall treatment	Q 143 manure 25 lbs N/A
F 278 18-7-30 50 lbs N/A split fall treatment	R CONTROL
G OSU Recommendations 125-25-300 split fall treatment	S 139 18-7-30 100 lbs N/A single/spring
H 333 15-15-15 50 lbs N/A Ammonium Sulfate fall treatment	T 556 18-7-30 100 lbs N/A single/spring
I 263 19-19-19 50 lbs N/A single/spring	U 278 18-7-30 50 lbs N/A single/spring
J 526 19-19-19 100 lbs N/A single/spring	V 417 18-7-30 75 lbs N/A single/spring
K 132 19-19-19 25 lbs N/A single/spring	W 1875 4-11-45 75 lbs N/A single/spring
L 395 19-19-19 75 lbs N/A single/spring	X 310 4-11-45 12 lbs N/A single/spring
M 167 15-15-15 25 lbs N/A single/spring	Y 625 4-11-45 25 lbs N/A single/spring
N 333 15-15-15 50 lbs N/A single/spring	Z 1250 4-11-45 50 lbs N/A single/spring
O 500 15-15-15 75 lbs N/A single/spring	A1 666 15-15-15 100 lbs N/A single/spring
N 285 Manure 50 lbs Av N	312 Sludge 50 lbs Av N