

EORDC
Belle Valley

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Fescue Response to Variable Rates of
Nitrogen Fertilization

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Fescue Response to Variable Rates of Nitrogen Fertilization

Nitrogen fertilization is essential for intensively managed swards of grass. Meadows where the predominate forage species is grass are often most limited by availability of nitrogen. The current economic and environmental cost of nitrogen fertilization are major factors influencing farm profitability and water quality. The objectives of every forage producer is to apply nutrients efficiently to maximize forage production while minimizing risks to the environment. Producers are interested in learning the point of diminishing returns when it comes to nitrogen application. A study conducted at EORDC suggested fescue yield and nitrogen application per pound of dry matter produced may be more economically applied than suggested by current soil test reports. In the demonstration plots receiving 75 lb. of actual nitrogen per acre returned 13.56 lb. of dry matter per pound of nitrogen applied. Plots receiving 125 lb. of actual nitrogen yielded 12.48 lb. of dry matter per pound of nitrogen applied. Further research is needed to investigate forage response to reduced nitrogen application. Producers are interested in applying commercial fertilizers at the lowest possible levels and to a point where forage quality and yield are not negatively impacted.

Problem:

Agronomists do not know to what level nitrogen application can be reduced on fescue swards and still maintain acceptable forage yields and quality.

Objectives:

To determine if nitrogen application can be reduced from 125 lb. of available N to 75 lb. of available N while maintaining acceptable forage quality and yield on fescue swards.

Methods:

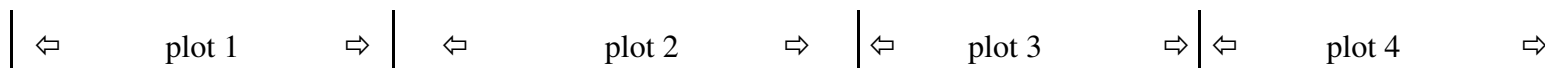
A random block design will be developed and replicated four times. Individual plot size will be 22 feet x 86 feet. Recommended levels of P and K will be applied according to soil test. Nitrogen will be applied at recommended levels according to soil test, 125 lb N, 100 lb N, 75 lb N and a control with no additional nitrogen. Recommended levels of P and K will be applied in one application after first cutting to all plots. Nitrogen application will be applied in the spring after first cutting. Plots will be managed for three cuttings and 200 hundred square feet of forage would be harvested with a plot harvester, a sub-sample taken, dried, and analyzed for dry matter yield after each cutting. Dry matter yield would then be calculated for each experimental treatment.

Outcome and Measures:

Standard statistical analysis calculations would be utilized to detect variation in treatments measuring response in total dry matter production, and forage nutrients.

Fescue Fertilization Plots

75	100	Cont **	125	100	Cont	125	No P & K ***	75	Cont.	75	100	75	Cont.	125	100	No P & K	No P & K	No P & K
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- * Denotes lbs. of Nitrogen applied per acre
- ** Control plots have received recommended levels of P & K applied with no Nitrogen.
- *** Two plots have no Nitrogen and no P & K applied

1st hay harvest 5/28/99. Fertilizer applied after 1st cutting. Date of application: 6/9/99

2nd harvest 6/25/99

3rd harvest 9/29/99

Plot size: 20 x 86 feet. Plot treatment replicated 4 times and randomly selected.

YIELD RESULTS

2nd Cutting Yield

	Plot 1	Plot 2	Plot 3	Plot 4
75 lb. N/A (with recommended P & K applied)	4168	3750	4650	4935
mean	4376 lbs dry matter			
Control (no nitrogen) (recommended P & K applied)	3188	3750	2628	1720
mean	2822 lbs. dry matter			
125 lb. N/A (recommended P & K applied)	5172	2812	2903	
mean	3629 lbs. dry matter			
100 lb. N/A (recommended P & K applied)	2866	3175	3145	4180
mean	3342 lbs. dry matter			
No P & K or N	2573	2163	2168	2152
mean	2264 lbs. dry matter			

3rd Cutting Yield

75 lb. N/A (recommended P & K applied)	178	163	172	187
mean	175 lbs dry matter			
100 lb. N/A (recommended P & K applied)	161	158	172	149
mean	160 lbs. dry matter			
Control (no nitrogen) (recommended P & K applied)	130	133	126	143
mean	133 lbs. dry matter			
125 lb. N/A (with recommended P & K applied)	165	171	167	
mean	168 lbs. dry matter			
No P & K or N	160	167	170	163
mean	165 lbs. dry matter			

Mean yield for 2nd and 3rd cuttings combined for each treatment.

	Mean Yield Total	Sample Size
75 lb. N/A	4551	4
Control	2955	4
125 lb. N/A	3797	3
No P & K or N	2429	4
100 lb. N/A	3502	4

Nitrogen Level	Cutting 2 nd , 3 rd	N replicants	Mean	Standard Deviation
0	2	4	2321.5	865.48
0	3	4	133.0	7.25
75	2	4	4375.7	523.67
75	3	4	175.0	10.09
100	2	4	3341.5	576.05
100	3	4	160	9.48
125	2	3	3629.0	1337.05
125	3	3	167.6	3.05

Means with the same letter are not significantly different.			
T grouping	Mean	N	Application Rate
A	2275.4	8	75
B A	1898.3	6	125
B A	1750.8	8	100
B	1477.3	8	0
The least significant difference test for comparing pairs of means only shows significant difference between 75 lb. N; and the Control at the 5% probability level of significance.			

Conclusion:

These results tell us that on these plots 75 lb. of nitrogen (N) was as effective as higher rates of N (when applied in a single application in the spring). Putting on more than 75 lb. of N, plus P & K in a single application in the spring was a poor use of resources. This also tells us that putting on some nitrogen produced more than not applying any. Furthermore, the research would suggest split applications of nitrogen fertilizer to maximize production and to avoid salt injury from the nitrogen source and potassium.

