



## Forage Research in Texas

Departmental Technical Report No.80-6  
Department of Soil and Crop Sciences



Project: H-6254, H-6303  
Date: 1980  
Workers: W. T. W. Woodward  
R. P. Wiedenfeld

FG - 0017

## FORAGE FERTILIZATION IN SOUTH TEXAS

### OBJECTIVE:

To evaluate the effects of various rates of N and  $P_{2}O_{5}$  fertilization on forage yield and nutrient content of Common buffelgrass and Pretoria 90 bluestem under dryland conditions of South Texas.

### PROCEDURE:

A study location in Hidalgo County near McCook on a Hebbronville sandy upland soil was fenced to exclude livestock. The site had a well established stand of Common buffelgrass which had not been recently fertilized. Part of the area was disked to remove buffelgrass and to provide a good seedling bed. Pretoria 90 bluestem seedlings were started in the greenhouse and transferred to the disked area on May 25th. Seedlings were planted in 40 in. rows with plants spaced 20 in. apart. About one quart of water was applied to each plant 4 days later.

Plots (10 ft. x 33 ft.) were established on each area for fertility treatments. Fertilizer treatments consisted of 3 rates of nitrogen - 0, 100 and 200 lbs N/A; and 3 rates of phosphorus - 0, 30 and 60 lbs  $P_{2}O_{5}$ /A; combined in a factorial arrangement and replicated 4 times in a randomized block design. Phosphorus was applied as triple super phosphate (0-44-0), while nitrogen was applied as ammonium nitrate (33-0-0).

Soil samples were taken prior to fertilizer application and submitted to the Extension Service Soil Testing Laboratory for fertility analyses.

A 3.3 ft. wide by 26.6 ft. long swath from the center of each plot was harvested with a flail type small plot harvester. Subsamples were taken for determining dry weight yields and for analysis of N and P content.

### RESULTS AND DISCUSSION:

The fertility status of the soils in the study area prior to fertilizer applications in the spring of 1979 is shown in Table 1. Nitrogen levels were extremely low throughout. Phosphorus levels were high throughout the buffelgrass plots and ranged from low to medium where the Pretoria 90 was planted. Higher pH and calcium levels were found in the upper layers on the buffel site than on the Pretoria 90 site. Potassium levels were adequate, and salt levels were low throughout the study area.



Forage yields for individual harvest dates at the 3 N application rates are shown in Table 2. Pretoria 90 bluestem was not ready to harvest on June 27th since it had been planted one month earlier. On September 14th, Pretoria 90 yields averaged about 23% less than the average of the buffelgrass plots. On November 29th, the Pretoria 90 was standing about 18 in. tall, while the buffelgrass did not have enough growth to be harvested.

Nitrogen fertilizer use efficiency by buffelgrass was good at the rates applied. The application of 100 lbs N/A produced an additional 2800 lbs of forage or a 70% improvement over the unfertilized control. The application of 200 lbs N/A resulted in an additional 1900 lbs of forage produced over the 100 lbs N/A rate. The second 100 lbs of N was, therefore, 68% as effective in enhancing forage yields as was the first 100 lbs N applied.

Forage tissue N content showed significant relationships with N application rates for both grasses at all harvest dates (Table 3). Nitrogen fertilizer recovery by buffelgrass averaged about 50% at both application rates.

Phosphorus content in buffelgrass tissue was strongly influenced by N application rates (Table 4). As rate of N fertilization increased, forage P decreased. Indications were that the plants could extract only a certain amount of P, and that higher yields due to N fertilization diluted P in the plant tissue.

Phosphorus fertilization had an affect on P removal by Pretoria 90 at the high rate of application (Table 4). The soils in the Pretoria 90 area had a greater P deficiency prior to fertilizer applications than did the soils in the buffelgrass area.

Table 1. Soil fertility status at the study location on the Cozad Ranch, Northwest Hidalgo County, May 25, 1979.

| Grass       | Depth | $\text{NO}_3^- - \text{N}$ | $\text{P}_2\text{O}_5$ | K   | pH  | Ca    | Salt |
|-------------|-------|----------------------------|------------------------|-----|-----|-------|------|
|             | ft.   |                            | PPM                    |     |     | PPM   |      |
| Pretoria 90 | 0-1   | <4.5                       | 11                     | 421 | 7.6 | 2460  | 156  |
|             | 1-2   | <4.5                       | 10                     | 245 | 7.9 | 2860  | 172  |
|             | 2-3   | 5                          | 27                     | 140 | 8.3 | >5000 | 160  |
| Buffelgrass | 0-1   | 4.5                        | 52                     | 440 | 8.3 | 5000  | 176  |
|             | 1-2   | 4.5                        | 51                     | 367 | 8.4 | >5000 | 182  |
|             | 2-3   | 4.5                        | 51                     | 142 | 8.4 | >5000 | 195  |

Table 2. Forage yields at the various harvest dates and 1979 summary at various N application levels.

| Grass       | N Rate  | Harvest Date |        |       | 1979<br>Total |
|-------------|---------|--------------|--------|-------|---------------|
|             |         | 6/27         | 9/14   | 11/29 |               |
|             | Lbs N/A | lbs/A        |        |       |               |
| Buffelgrass | 0       | 2163 a       | 1881 a |       | 4044 a        |
|             | 100     | 4188 b       | 2683 b |       | 6872 b        |
|             | 200     | 5860 c       | 2927 b |       | 8787 c        |
| Pretoria 90 | 0       |              | 2176   | 657   | 2833          |
|             | 100     |              | 1924   | 825   | 2749          |
|             | 200     |              | 1658   | 730   | 2388          |

Means within each column for each grass followed by the same letter are not significantly different at the 10% significance level according to Duncan's Multiple Range Test. Where no letters follow means, no statistically significant differences were found.



Table 3. Forage tissue N content at the various harvest dates, and total annual N removal and N fertilizer recovery at various N application rates.

| Grass       | N Rate  | N Content |        |        | N Removal | Fertilizer Recovery |
|-------------|---------|-----------|--------|--------|-----------|---------------------|
|             |         | 6/27      | 9/14   | 11/29  |           |                     |
|             | lbs N/A | %         |        |        | lbs/A     | %                   |
| Buffelgrass | 0       | 0.92 a    | 1.39 a |        | 46 a      | -                   |
|             | 100     | 1.16 b    | 1.84 b |        | 98 b      | 51                  |
|             | 200     | 1.45 c    | 2.03 c |        | 143 c     | 48                  |
| Pretoria 90 | 0       |           | 1.42 a | 0.87 a | 35        |                     |
|             | 100     |           | 1.69 b | 0.93 a | 38        | 3                   |
|             | 200     |           | 1.89 b | 1.03 b | 38        | 2                   |

Means within each column for each grass followed by the same letter are not significantly different at the 10% significance level according to Duncan's Multiple Range Test. Where no letters follow means, no statistically significant differences were found.

Table 4. Forage tissue P content at the various harvest dates, and total annual P removal and  $P_2O_5$  fertilizer recovery at various N or  $P_2O_5$  application rates.

| Grass       | N Rate  | $P_2O_5$ Rate   | P Content |        |       | P Removal | Fertilizer Recovery |
|-------------|---------|-----------------|-----------|--------|-------|-----------|---------------------|
|             |         |                 | 6/27      | 9/14   | 11/29 |           |                     |
|             | lbs N/A | lbs $P_2O_5$ /A | %         |        |       | lbs/A     | %                   |
| Buffelgrass | 0       |                 | 0.16 a    | 0.30 a |       | 9.1 a     | 1                   |
|             | 100     |                 | 0.13 b    | 0.27 b |       | 12.7 b    | 2                   |
|             | 200     |                 | 0.10 c    | 0.23 c |       | 12.4 b    | 21                  |
| Buffelgrass |         | 0               | 0.12 a    | 0.26   |       | 10.5      |                     |
|             |         | 30              | 0.13 ab   | 0.28   |       | 11.9      | 11                  |
|             |         | 60              | 0.14 b    | 0.27   |       | 11.7      | 5                   |
| Pretoria 90 | 0       |                 |           | 0.21   | 0.16  | 5.5       | 2                   |
|             | 100     |                 |           | 0.21   | 0.18  | 5.5       | 4                   |
|             | 200     |                 |           | 0.23   | 0.17  | 5.0       | 3                   |
| Pretoria 90 |         | 0               |           | 0.21   | 0.18  | 4.8 a     |                     |
|             |         | 30              |           | 0.22   | 0.16  | 4.9 a     | 1                   |
|             |         | 60              |           | 0.22   | 0.16  | 6.2 b     | 5                   |

Means within each column and each group (separated by lines) followed by the same letter are not statistically different at the 10% significance level. Where no letters follow means, no statistically significant differences were found.