

# Forage Research in Texas

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## Evaluation of Alfalfa Response to Phosphorus and Potassium Fertilization

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### SUMMARY

Brazos River bottom soils are generally high in phosphorus and potassium. A test was conducted in 1978-80 to determine if phosphorus and potassium fertilization improves the performance of alfalfa on these soils. Phosphorus was applied at the rates of 60, 120 and 180 pounds per acre as top dressing in 1978 and again in 1980. Potassium was applied at the rate of 120 pounds per acre in combination with 120 and 180 pounds of phosphorus. A significant response to phosphorus occurred in 1980 accounted for largely by the 60 pounds per acre rate. There was no response to potassium in addition to phosphorus.

### Introduction

Alfalfa is well adapted to the Brazos River bottom soils which are high in phosphorus and potassium. A test conducted in the Brazos River bottom near College Station in the late 1940's showed no response the first year to 80 pounds of phosphoric acid annually but increasing responses in the succeeding two years (1). Some stand failures and poor performances in recent years have raised the question of adequacy of phosphorus and potassium. A test was initiated in 1978 to provide information on this question.

### Experimental Procedure

'Moapa' alfalfa was seeded in 12-inch drill rows at the rate of 10 pounds of seed per acre on December 19, 1977. The soil is an alluvial Norwood fine silty loam (fine, loamy, mixed, thermic typic udifluvents) in the Brazos River bottom near College Station. The plots are 5' x 20' with harvest from the center 3' x 17'. The following fertilizers were applied at planting and again in April, 1980: 0-0-0, 0-60-0, 0-120-0, 0-180-0, 0-120-120, 0-180-120. Harvests were made in the 1/10-1/4 bloom stage on the dates shown in Table 1.

### Results

Good stands were obtained and no winter damage occurred even though the test was planted late (Dec. 19). The yield data are given in Table 1. Average annual yields were 5 tons per acre and increased about 500 pounds per year. The only treatments that did not show an increasing trend in 1980 were the check (0-0-0) and 0-120-120.

Statistical analysis were conducted only on the three-year data so differences among years or among treatments within years have not

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been tested statistically. There appeared to be no trend or pattern among treatments until 1980 unless it was toward a reduced yield with higher combination rates of P and K in 1978. The three-year averages show a significantly higher ( $P < .10$ ) yield with phosphorus than without phosphorus. The difference required for significance per cutting is 172 pounds. The K effect was not significant.

Visual inspection of the data indicate that the P effect did not show up until 1980. Both visual inspection of the data and the significant quadratic component indicate that the response is entirely to the first 60 pounds of  $P_{205}$ . These data agree with those reported earlier (1) at this location and indicate that soil phosphorus is fairly adequate during the first one or two years, but that phosphorus fertilization is necessary for sustained production of high yields.

#### Literature Cited

1. Staten, Raymond O. 1957. Alfalfa production in Texas. Texas Agric. Exp. Stn. Bull. 855. 24 P.

Table 1. Yield of Moapa alfalfa with varying phosphorus and potassium levels, Brazos River Bottom near College Station

Harvest	0-0-0	0-60-0	0-120-0	0-180-0	0-120-120	0-180-120
6/2/78	2510	2620	2590	2480	2190	2520
7/11/78	3720	3650	3590	3130	3510	3280
8/15/78	1530	1670	1420	1180	1420	1220
9/26/78	<u>2530</u>	<u>2500</u>	<u>2240</u>	<u>2300</u>	<u>2390</u>	<u>2260</u>
Total	10290	10440	9840	9090	9510	9280
6/12/79	2420	2360	2520	2450	2460	2380
7/18/79	3030	2900	2500	2870	2860	2860
8/14/79	2480	2690	3080	2660	2290	2790
9/24/79	<u>2400</u>	<u>2510</u>	<u>2240</u>	<u>2170</u>	<u>2410</u>	<u>2360</u>
Total	10330	10460	10340	10150	10020	10390
5/27/80	3480	4360	4480	4390	3830	4770
6/20/80	2120	2450	2420	2730	2100	2530
7/21/80	2150	2430	2600	2710	2270	2560
9/23/80	<u>1550</u>	<u>1840</u>	<u>2010</u>	<u>1740</u>	<u>1770</u>	<u>2060</u>
Total	9300	11080	11510	11570	9970	11920