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THE COMPOSITION OF SOME OF THE GREAT PLAINS GRASSES AND THE INFLUENCE OF RAINFALL ON PLANT COMPOSITION

H. F. Murphy, *Stillwater,* and H. A. Daniel, *Goodwell, Oklahoma**

While some literature is available on the composition of various grasses in this section no very exhaustive references are found. Daniel [1,2,3] studied the composition of a large number of grasses and legumes commonly grown in Oklahoma while Harper, Daniel, and Murphy[5] collected a large number of weeds and grasses common in the section and presented data relative to their composition. Generally speaking, the weeds were higher in protein, phosphorus, and calcium than were the grasses though some exceptions were noted. Other workers have presented similar data.

*Associate Agronomist, Oklahoma Agricultural Experiment Station, and Acting Director, Panhandle Agricultural Experiment Station, respectively.

The condensed data of many analyses in Table I give the average composition of some common forage and hay plants, both native and cultivated, grown in Oklahoma.

TABLE I.

Plant	Nitrogen Per Cent	Phosphorus Per Cent	Calcium Per Cent
GRASSES—			
Big Bluestem	0.56	0.09	0.28
Little Bluestem	.61	.07	.27
Buffalo grass	.99	.13	.34
Grama grass	.94	.11	.31
Bermuda grass	1.29	.19	.66
Dallis grass	1.11	.14	.19
Crab grass	1.46	.19	.36
Sorghum	1.23	.09	.33
Red Top	1.08	.20	.38
Average of 25 different grasses	.87	.10	.35
LEGUMES—			
Alfalfa	2.22	.15	1.64
Sweet clover	2.12	.13	1.28
Hairy vetch	3.06	.32	1.31
Austrian Winter Peas	2.96	.25	1.28
Cowpeas	1.94	.17	1.83
Soybeans	1.80	.18	1.09
Mungbeans	1.27	.12	1.62
Peanut vines	1.27	.07	1.09
Lespedeza	1.96	.17	1.04
Average of 12 different legumes	2.28	.18	1.37

Compared with grasses, legumes contain 2.6 times as much protein if the nitrogen is assumed to be in this form, 1.8 times as much phosphorus and nearly 4 times as much calcium.

The most common native grasses in the tall grass section are big and little blue stems while buffalo and grama grasses are native of the short grass country. The short grasses contain one-half again as much protein and phosphorus as these tall grasses and are somewhat richer in calcium. Bermuda grass, which is an introduced grass and which does well in the state generally, is of very high mineral composition so far as grasses are concerned, while Dallis grass appears to be low in calcium. Sorghums are low in phosphorus, being much like the blue stem in this respect. Young plants are higher in these nutrients than are mature plants. The data presented are for plants at the more mature stages of growth.

Pasture plants were collected from 47 counties in Oklahoma and their calcium and phosphorus contents were determined. Soil samples were collected and analyzed as well. It was found that the kind of plant is more important than either the soil or soil treatment in determining the mineral content of the forage, which is to say, while soil composition has some effect there is a wide variation in the ability of different plants to remove nutrients from a given soil.

When it comes to the influence of moisture on the composition of plants, data indicate that in this state high rainfall (water) is associated with low calcium and high phosphorus percentages in the forage, whereas low rainfall produces plants high in calcium and low in phosphorus. This

is well indicated by some controlled greenhouse experiments where the moisture content of the soil was maintained at definite levels by the addition of distilled water each day. The results are given in Table II.

TABLE II. *Soil-Moisture, Calcium and Phosphorus Percentages*

Crop	Soil Moisture	Calcium	Phosphorus
Sudan hay	8	0.80	0.24
Sudan hay	15	.69	.38
Sudan hay	8	.99	.20
Sudan hay	15	.95	.43
Oat hay	8	.55	.62
Oat hay	15	.51	.69
Oat hay	8	.86	.77
Oat hay	15	.66	1.07
Hairy vetch	6	1.91	.30
Hairy vetch	10	1.60	.31
Hairy vetch	15	1.57	.37
Sudan hay	6	.93	.18
Sudan hay	10	.80	.20
Sudan hay	15	.71	.25
Mungbean hay	6	3.21	.61
Mungbean hay	10	3.00	.62
Mungbean hay	15	2.75	.79

Although the percentages shown are somewhat higher than those found when the plants are grown under field conditions, they indicate the influence of soil moisture on the mineral composition of the plant. Field data reported by Daniel and Harper[4] are in accordance with these results.

While it is recognized that the time of season has its influence, the data in Table III are of interest in this connection.

TABLE III. *Data Collected From Field-Grown Alfalfa*

Field	Treatment	Cutting	Period	Rainfall, In.	Phosphorus content, %
1	Unfertilized	1st	Mar. 1-May 14	1.59	0.138
1	"	2nd	May 14-July 2	8.24	.191
2	240 lb. superphosphate per acre	1st	Mar. 1-May 14	1.59	.184
2	"	2nd	May 14-July 2	8.24	.245
3	"	1st	Mar. 1-May 14	1.59	.197
3	"	2nd	May 14-July 2	8.24	.207
3	"	3rd	July 2-July 23	3.31	.216
3	"	4th	July 23- Sept. 9	12.01	.256

On reviewing the literature on mineral deficiency studies, rations with less than approximately 0.20 per cent phosphorous and 0.30 per cent calcium appear to be deficient in these nutrients. The grasses as a whole are near the border line so far as calcium is concerned and hence for pasture purposes grass and legume mixtures are preferable if a suitable combination adapted to the area can be found. When it comes to phosphorus, prac-

tically all mature forage used as hay is low or near the border line; hence the necessity for some phosphorus-carrying substance such as grain, steamed bone meal, tankage, or cottonseed meal in the ration. The legumes are higher in minerals than the native grasses in the Great Plains generally and hence the use of legume pasture and hay lessen the need for mineral supplements.

Where the pasture consists of young growth and especially where legumes are prevalent in the vegetative covering it may not be necessary to use the mineral supplements.

A study of grains indicates that they are low in calcium and high in phosphorus. Consequently rations made up of prairie grass and grain are likely to be deficient in calcium unless some legume hay, ground limestone, or other suitable source of calcium is included.

LITERATURE CITED

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