Yield and Protein Content of Pasture Herbage As Influenced by Nitrogen Fertilization and Frequency of Clipping

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Production of an adequate amount of nutritious pasture is one of the problems of livestock production. The investigation reported here was undertaken with the purpose of studying means for increasing the yield and crude protein content of herbage obtainable from permanent pastures during the first year of planting. Pastures should, by proper management and adequate fertilization, provide a large part of the protein feed necessary for livestock. White (10) has shown that protein feed and total digestible nutrients for livestock can be produced more economically by employing a pasture rather than a grain and hay rotation.

The soil used in this investigation was Cecil sandy loam located on the University of Georgia Agronomy Farm at Whitehall, Ga. The specific aspects investigated were the effect, on the yield and protein content of the herbage produced, of (a) various mixtures of grasses and legumes, (b) the intensity of grazing, as simulated by clipping with a lawn mower, and (c) the addition of inorganic nitrogen fertilizer.

METHODS

Mixtures used.—The plan of this investigation called for the establishment of six mixtures of plants commonly used in permanent pastures in the Piedmont section of Georgia. One of the six, Dallis grass (Paspalum dilatatum), did not become established. Naturally seeded crabgrass (Digitaria sanguinalis) became an important part of each mixture. The final mixtures were as follows:

1. Bermuda grass (Cynodon dactylon) and crabgrass (Digitaria sanguinalis).
2. Crabgrass alone.
3. Bermuda grass and crabgrass with common lespedeza (Lespedeza striata).
4. Bermuda grass and crabgrass with White Dutch clover (Trifolium repens).
5. Bermuda grass and crabgrass with common lespedeza and White Dutch clover.

Bermuda grass was established on plots designed to have it in the mixture by sprigging the Bermuda grass in rows 18 inches apart across the plots. Leptpedezza and White Dutch clover were seeded at the rates of 20 and 5 pounds per acre, respectively. These rates are in excess of those usually recommended, but since this study was not one of seeding rates, the excess was considered desirable. Seeding was done during the latter part of February and the early part of March, 1946, which was late for all of the crops used. Prior to planting, the area to be used was disked twice lengthwise and crosswise and cultivated in both directions.

Fertilizer used.—Since nitrogen was the only fertilizer variable, a uniform application of other fertilizer materials was made at rates indicated necessary by soil tests (3, 4) of comparable soils. Nitrogen, as nitrate of soda, was applied with a lime spreader with one half distributed in parallel trips across the area and the other half applied in parallel trips at right angles to the first. The fertilizer materials and their rates of application were:

<table>
<thead>
<tr>
<th>Material</th>
<th>Rate</th>
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<tbody>
<tr>
<td>Basic slag (8% P₂O₅)</td>
<td>2,000 lbs</td>
</tr>
<tr>
<td>Superphosphate (18% P₂O₅)</td>
<td>800 lbs</td>
</tr>
<tr>
<td>Muriate of potash (50% K₂O)</td>
<td>800 lbs</td>
</tr>
<tr>
<td>Borax</td>
<td>40 lbs</td>
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<tr>
<td>Dolomitic limestone</td>
<td>1,600 lbs</td>
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</tbody>
</table>

Nitrogen, as nitrate of soda, was applied by botanical mixture at the rates of 0, 20, 40, and 60 pounds of nitrogen per acre.

Clipping intervals.—One plot at each level of each botanical mixture in each of the three replicates was clipped at each clipping interval. Clipping intervals were 1, 2, 3, and 4 weeks.

Field design.—The experimental field was divided into three replicates. The experimental design was that of a split split-plot. The major divisions in each replicate were the botanical mixtures which were first split on the basis of the amount of nitrogen fertilizer applied and then a further split of the latter subdivision was made to allow for different clipping intervals. This arrangement resulted in 16 plots for each botanical mixture within each replicate. The plots were randomized within each replicate, but the fertilizer treatments were reversed on the second replicate.

Sampling.—The samples from the individual plots were taken by cutting with an 18-inch rotary lawn mower equipped with a pan for receiving the cuttings. Record was made of the green weight of the cuttings. The samples were allowed to dry in the open for not less than 3 weeks after which they were again weighed. The air-dry weights of the samples were used to determine the yields of air-dry material per acre.

Preparation of samples.—Samples from the clipping interval of each 4-week interval of the investigation were subjected to chemical analysis except in the case of samples of 3-week intervals. Samples from the plots at 3-week intervals which corresponded most nearly to the 2-week interval were used. Subsamples of the air-dry material were ground by the use of a small Wiley mill to pass a 20-mesh screen.

Moisture.—Moisture determinations were made by the procedure outlined by the Association of Official Agricultural Chemists (2, paragraph 27.8, page 405). The moisture content of the air-dry material varied as much as 10% during the period of analysis, due to changing conditions of humidity.

Crude protein content.—The crude protein content of the samples, which had been dried for moisture determination, was determined by the Gunning method modified for the nitrate nitrogen (2).

RESULTS AND DISCUSSION

Yields.—The air-dry yield data are presented in Tables 1, 2, and 3. Statistical analysis of these data shows no significance for botanical mixtures and clipping intervals. The air-dry data are presented in Tables 1, 2, and 3. Statistical analysis of these data shows no significance for botanical mixtures and clipping intervals.