Effect of Nitrogen on Yield and Quality of Wheat
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Before a new variety of wheat can be recommended generally, it must possess not only desirable agronomic characteristics such as high-yielding ability, resistance to disease, etc., but also certain quality factors of the grain and flour. Bayfield (1) has presented data which show that wheat strength and quality are influenced most by climate. Other factors are soil and variety. He concludes that the supply of nutrients available to the plant is probably the most important soil factor regulating the amount of protein. The soft red winter wheats grown in the Southeast are lower in protein than the hard wheats grown farther north. The low-protein flours are particularly suited for the making of biscuits and pastries while the high-protein flours are used for making of bread.

The importance of nitrogen in the production of wheat has long been recognized. On soils low in nitrogen, yields of wheat, within certain limits, can be progressively increased with each increment of nitrogen. Results from numerous experiments in Tennessee show that, on the average, 3 1/2 to 4 pounds of nitrogen is required to produce each additional bushel of wheat. The results also show that applications of nitrogen made as topdressings in the spring are more effective than fall applications made at time of seeding. Split-applications, where one-half of the nitrogen was applied in the fall and one-half as a spring topdressing, resulted in the highest yields (2).

The objective of the experiment reported in this paper was to study the effects of rate and time of application of nitrogen on yield as well as quality of wheat.

Methods

The experiment was conducted on a Hermitage silt loam. Wheat was seeded October 22, 1948. The variety designated as Tennessee 48:6, a hard red winter wheat, was developed by the Plant Pathology Department program. This wheat yields well and is resistant to lodging; it is also rust resistant.

Nitrogen in the form of ammonium nitrate was applied at two rates: 25 and 50 pounds per acre. The dates of application were November 20, March 8, and May 4. Size of plot was 1/100 acre with 4 replications. All plots were fertilized at time of seeding at 40 pounds N rate 600 pounds per acre. Thus the total nitrogen was either 49 or 74 pounds per acre, depending upon the topdressing was 25 or 50 pounds.

Results

Wheat yields and certain quality determinations on the wheat and flour are shown in Table 1.

Yields. — On the average, yields were higher with the 25- and 50-pound N topdressings than those with the 25-pound rate by an appreciable amount. The striking fact is the much lower yields obtained from the May 4 topdressings where yields averaged only 18.6 bushels.

Protein content. — The protein contents of the wheat and flour did not differ greatly when topdressings were made in November and March, but were appreciably higher where topdressings were made in May. Here the protein contents of flours at the 50-pound N rate were 15.3% and 15.6% respectively. Apparently the May 4 topdressings were made too late for the fertilizer to exert its full effect on yield but in time for an appreciable increase in protein take and elaboration by the plant. This is in agreement with those of Bayfield (1) that late applications of nitrogen result in a higher protein content but delaying applications until heading time resulted in very little increase in yield.

Table 1.—Yield and certain quality factors of wheat.

<table>
<thead>
<tr>
<th>Date of nitrogen topdressing</th>
<th>Amount N per acre applied as topdressing*</th>
<th>Acre yields of wheat</th>
<th>Wheat Protein content†</th>
<th>Pearling index†</th>
<th>Flour Protein content†</th>
<th>Ash †</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 20</td>
<td></td>
<td>25</td>
<td>25</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>March 8</td>
<td></td>
<td>25</td>
<td>25</td>
<td>50</td>
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<td></td>
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<td>May 4</td>
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<td>25</td>
<td>25</td>
<td>50</td>
<td>50</td>
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*Nitrogen applied as topdressing
†Protein content, pearling index, and ash content of flour