1984

Fertilizing Oats

Cooperative Extension South Dakota State University

Follow this and additional works at: https://openprairie.sdstate.edu/extension_fact

Recommended Citation
https://openprairie.sdstate.edu/extension_fact/755

This Fact Sheet is brought to you for free and open access by the SDSU Extension at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in SDSU Extension Fact Sheets by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.
FERTILIZING OATS

Cooperative Extension Service
South Dakota State University
U.S. Department of Agriculture
FERTILIZING OATS

Jim Gerwing, Extension agronomist, soils
Paul Fixsen, Assistant professor, plant science
Ron Gelderman, Extension agronomist, soils
Paul Carson, Professor, plant science

High oat yields require large quantities of available plant nutrients. For example, each bushel of oats will take up approximately 1.3 lb nitrogen, 0.4 lb phosphorus (P<sub>2</sub>O<sub>5</sub>), and 1.2 lb potassium (K<sub>2</sub>O) per acre.

In addition to the primary nutrients (nitrogen, phosphorus, and potassium), there are 10 other essential nutrients necessary for plant growth. They are the secondary nutrients (calcium, magnesium, and sulfur), and the micronutrients (boron, chlorine, copper, iron, manganese, molybdenum, and zinc).

Fortunately, most South Dakota soils can supply the necessary amounts of secondary and trace elements needed for maximum yields. The use of fertilizers containing these nutrients seldom significantly or profitably increases oat yields. Many South Dakota soils, however, can not provide the necessary amounts of nitrogen, phosphorus, and potassium required by today’s high yielding quality oats.

Nitrogen

Today’s oats is usually seeded on fields that are continuously cropped. Additional nitrogen from fertilizer, manure, or legumes will nearly always increase oat yields, except where previous production practices have created high available nitrogen reserves. Oats seeded in fallowed soil may require little or no additional nitrogen. Above normal levels of nitrate-nitrogen will usually be found in fallowed soil following the non-crop year. The deep (0-2 ft) nitrate soil test can measure such reserves.

Nitrogen in excess of the amount needed for optimum plant growth and grain yield will usually result in higher protein levels. Oats is very susceptible, however, to lodging where excessive nitrogen exists. Therefore it is very important to measure soil nitrate reserves with the nitrate soil test before applying nitrogen fertilizer.

The amount of actual nitrogen recommended for a desired yield can be determined by subtracting the nitrate-nitrogen soil test values from the total nitrogen requirement shown in Table 1. If a deep (0-2 ft) nitrate-nitrogen soil test is not taken, nitrogen needs can be estimated using the soil organic matter level. The organic matter test, however, does not measure the wide fluctuations of available nitrogen in soil, and its use may result in recommendations for more or less nitrogen fertilizer than the crop actually needs.

Table 1. Nitrogen recommendations

<table>
<thead>
<tr>
<th>Yield goal (bu/A)</th>
<th>Soil plus fertilizer nitrogen required lb (0-2 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>52</td>
</tr>
<tr>
<td>60</td>
<td>78</td>
</tr>
<tr>
<td>80</td>
<td>104</td>
</tr>
<tr>
<td>100</td>
<td>130</td>
</tr>
<tr>
<td>120</td>
<td>156</td>
</tr>
</tbody>
</table>

1Fertilizer nitrogen to apply is equal to the value in the table minus soil nitrate-nitrogen to a 2-ft depth.

To estimate the fertilizer nitrogen needed without a 2-ft nitrate-nitrogen test, use the following formula based on the organic matter test: required nitrogen minus 30, 45, or 60 lb for a low (less than 2.5%), medium (2.5-4.0%), or high (more than 4.0%) organic matter test, respectively. If the previous crop was black fallow, subtract an additional 45 lb from each category.

Phosphorus

Phosphorus applications as either fertilizer or manure, are often needed to obtain maximum oat yields. Soil test level and yield goal will determine the amount of additional phosphorus that is needed (Table 2).

Table 2. Phosphorus recommendations

<table>
<thead>
<tr>
<th>Yield goal (bu/A)</th>
<th>Soil test P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt; lb/A recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>22</td>
</tr>
<tr>
<td>60</td>
<td>22</td>
</tr>
<tr>
<td>80</td>
<td>24</td>
</tr>
<tr>
<td>100</td>
<td>35</td>
</tr>
<tr>
<td>120</td>
<td>41</td>
</tr>
</tbody>
</table>

*Recommendations listed are for the center of each soil test range.

Fallowing does not increase available soil phosphorus reserves. Soil phosphorus levels will not fluctuate from high to low in 1 or 2 years. Neither will they change from low to high in a few years unless fertilizer rates in excess of crop needs have been applied.

Phosphorus is converted to less available forms when mixed extensively with soil. This is part of the reason phosphorus fertilizer is more effective when banded near the seed as opposed to broadcasting it. If phosphorus is band applied near the seed, recommended rates in Table 2 can be reduced by one third.

Small amounts of phosphorus placed with the seed have occasionally increased oat yields at high and very high soil test levels. Ten pounds of phosphorus (P<sub>2</sub>O<sub>5</sub>) applied as a starter on these soils may be necessary for maximum yields.

Potassium

Potassium requirements of oats greatly exceed those of all other essential elements with the exception of nitrogen. Fortunately, most South Dakota soils contain very large reserves of available potassium; therefore, only small amounts (if any) are recommended as fertilizer. There are, however, a number of fields (particularly in the eastern third of the state) that are low in this nutrient. Potassium additions on these fields will be necessary to reach maximum yields. Potassium fertilizer recommendations are given in Table 3.

Table 3. Potassium recommendations

<table>
<thead>
<tr>
<th>Yield goal (bu/A)</th>
<th>Soil test K&lt;sub&gt;2&lt;/sub&gt;O lb/A recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>39</td>
</tr>
<tr>
<td>60</td>
<td>59</td>
</tr>
<tr>
<td>80</td>
<td>79</td>
</tr>
<tr>
<td>100</td>
<td>99</td>
</tr>
<tr>
<td>120</td>
<td>119</td>
</tr>
</tbody>
</table>

*Recommendations listed are for the center of each soil test range.
Secondary and Micronutrients
Secondary and micronutrients are as essential as the primary
nutrients for high yield levels. Most South Dakota soils,
however, have adequate available reserves of these nutrients.
SDSU research has not shown significant profitable yield
increases from fertilizer containing these nutrients. This may
change with continued cropping and release of new varieties.

Fertilizer Application
Phosphorus and potassium should be applied before seeding
and incorporated by tillage, applied by injection, or applied with
the seed at planting. Broadcast phosphorus rates can be
reduced by a third when banded with a grain drill in contact
with or close to the seed. Nitrogen can be applied anytime
before stooling with equal results.

Thinner plant stands or reduced seedling vigor can occur if
too much nitrogen and/or potash are placed in contact with the
seed. This type of injury happens more easily in dry or sandy
soils. The total amount of actual nitrogen plus potash placed
with the seed in a drill attachment (6-inch row spacing) should
be kept below 25 lb/A in such soils. If either urea or DAP
(18-46-0) nitrogen sources are used, limit drill applications to 12
lb/A. Reduce these values correspondingly for wider row widths.
These drill application amounts can be doubled for heavier
textured, moist soil.

Topdressed nitrogen after seeding should be applied before
stooling for best results. Lack of rainfall after topdressing can
make topdressing less effective than preplant incorporation.

Topdress applications of liquid nitrogen fertilizer are as
effective as dry nitrogen when applied prior to stooling. Liquid
nitrogen rates in excess of 25 lb nitrogen per acre can cause
considerable leaf burn. Rates greater than 50 lb/A may cause
enough leaf burn to reduce yield. Liquid nitrogen should not be
applied once the flag leaf emerges.

Fertilizing Reduced and No-Till Oats
Limited adjustments in fertilizer rates and placement may be
necessary with reduced tillage. Available nitrogen levels in soil
are usually lower, resulting in higher nitrogen fertilizer needs.
The deep (0-2 ft) nitrate-nitrogen soil test will measure nearly all
change in available soil nitrogen levels regardless of tillage. If
the deep soil test is not taken and nitrogen recommendations are
made using the less accurate organic matter test, nitrogen
recommendations should be increased 30 lb/A from the
calculated values.

Surface residues and fewer opportunities for incorporation
increase the potential for volatilization losses of nitrogen from
surface applied urea. Nitrogen may also be tied up by surface
residues. Incorporation or injection of nitrogen fertilizer,
therefore, will often result in more efficient nitrogen use.

Topdressed phosphorus fertilizers will remain near the
surface with reduced and no-tillage systems. If soil test levels
are low or conditions are dry, deeper incorporation, injection, or
starter applications may be necessary.