Nitrogen Rate Determination for Winter Wheat

Maximizing the Yield of Winter Wheat.

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Agri-Food Laboratories
Winter Wheat Maximizing Yield

- Maximizing Yield with seeding rates.
- Tiller Counts.
- Timing of Nitrogen
- Role of Nitrogen
- Uniformity of Application
- Source of Nitrogen
- Potash and N topdress
Seeding Rates

- Maximizing yield should have started last fall at seeding time.
- We should aim for 20 seeds per foot of 7 inch row.
- This will provide a stand of 1.5 million plants per acre.
- Plant by seeds per pound, a variety with 12,000 seeds per pound would require a rate of 125 pounds of seed per acre.
Tillering

- With early planting before Oct 10th, the 20 seeds per foot of row would likely produce 40 to 60 tillers this spring.
- Later plantings produce less tillering.
- The number of tillers is an important clue as to the status of the wheat crop this spring.
- The tillering will determine timing and rate of Nitrogen
Tillering and N Rates

- Some fields and areas within fields may have 6 to 8 tillers per planted seed.
- Other fields or areas within the field may only have single plants and no tillers.
- The highly tillered areas are indicating a large supply of Nitrogen already present and will indicate that N applications need to be delayed and reduced.
- Apply 70 pounds of N before Zadocs 31 (stem elongation.)
Tillering and N Rates

- Areas with few tillers probably from late planting or non uniform emergence will need a high rate of N and sooner.
- Apply 100 to 120 pounds of N as soon as possible.
- This high N rate early will be necessary to stimulate spring tillering.
- Wheat plants can only support 2 or 3 tillers any more than that the extra tillers take away nutrients, light and energy and may decrease yield if N is applied early.
Kill weeds early before Zadocs 31
Stand loss can occur at any time. Below, this occurred after a late March ice storm. Water and ice accumulated in this depression area for 5 days.
Milton Site OSCIA 2003 GHG Mitigation N Plots Winter Wheat

60 lbs N  April 25
90 lbs N  May 9
Milton Site OSCIA 2003 GHG Mitigation N Plots
Winter Wheat

60 N Apr 17

90 N May 9

125 N Apr 25
Delayed N Applications

- The advantage of delayed N application on highly tillered field will increase Nitrogen use efficiency.
- Decrease the likely hood of lodging.
- Reduce excessive vegetative growth and promote a canopy environment less likely to support disease development.
Role of Nitrogen

- Nitrogen provides 2 basic functions.
- It can be used to manipulate the number of tillers and number of heads.
- Nitrogen provides the necessary nutrition to form protein.
- Usually most soft winter wheats are destined for the pastry flour market and do not require high protein.
- Split applications of N are not necessary.
Uniformity of Application

- Uniform application of Nitrogen is a must.
- Non uniform rates can cause lodging and misses can cause lost yield.
- Both mishaps can cost you quality and lost marketing revenues.

Yield bus/ acre of Low and High N rates

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<thead>
<tr>
<th></th>
<th>Low N</th>
<th>High N</th>
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<tr>
<td></td>
<td>55</td>
<td>77</td>
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Non uniform applications can cost 22 bushel yield loss

Source Agronomy Guide Pg 189.
Uniformity of Application

- Rarely do pull type spinner spreaders provide uniform applications.
- Air flow applicators provide greater application uniformity.
- Sprayers equipped with stripper or streamer nozzles allow application of UAN with minimal burn to foliage.
Urea and UAN

- Urea and UAN are the 2 main sources of N on Wheat.
- Urea upon application breaks down into Ammonia and carbon dioxide in the presence of an enzyme called urease.
- The ammonia is extremely soluble in water and forms stable ammonium.
- The odds of receiving moisture within 24 hours of application in the early spring are favorable.
- It takes 3 to 4 days for ammonia to release under cool conditions.
UAN

- UAN or 28% nitrogen solution is a liquid formulation of urea and ammonium nitrate.
- Surface loss is less with 28% than urea.
- The use of stripper or streamer nozzles on farm sprayers as given additional flexibility to the application of Nitrogen.
- The reduced burn with the strip nozzles and smaller tracks made by tractors allows for delayed N applications if deemed necessary by excessive tiller counts.
Yield Loss Associated with Foliar Burn from UAN Broadcast Applied with Fan Nozzles

<table>
<thead>
<tr>
<th>% Leaf Burn</th>
<th>Yield BPA.</th>
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<tbody>
<tr>
<td>5</td>
<td>74</td>
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<tr>
<td>7</td>
<td>70</td>
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<td>13</td>
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<td>67</td>
</tr>
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<td>27</td>
<td>60</td>
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Nitrogen Credits

- Previous crop management practices must be considered in determining final N rates.
- N credits should be given consideration.
- Manure application from the fall should be estimated by manure test results and application timings.
- Manure may be better utilized on Spring Wheat where later release of organic N sources may enhance protein levels.
Nitrate Soil Tests

- Nitrate soil test has been calibrated for corn at sidedress time.
- There is no calibration for wheat.
- The sampling window is too early to estimate N release.
- If the test was taken in March the test result would have to be above 25 ppm to be assured of sufficient soil nitrate levels to reach maximum yield.
Nitrogen and Potash Applications

- It has become popular to apply muriate of potash with urea in the spring.
- The reasons are to keep pace with K removal, reduce lodging and provide a source of chloride.
- Cl has proven useful in controlling root rots.
- In Ontario a 1.5 bus advantage has been demonstrated when chloride from potash is used.
- Muriate of Potash is 47% Cl.
Chloride

- Wheat is sensitive to low Cl levels.
- Cl is necessary for photosynthesis, maintaining cell turgidity and plant health.
- In South Dakota they have a calibrated soil test for Cl.
- When the Cl in the top 2 feet is less than 30 pounds an application of 10 to 20 pounds of Cl will increase yield by as much as 4 bushels 69% of the time
Summary

- Scout your fields and determine overall vigor.
- Perform tiller counts and plant population.
- Tiller counts will determine timing and rates of N.
- Apply Nitrogen uniformly.
- Control weeds and use crop protection products when necessary.
- Protect a good crop.