

Workshop Title:

Nitrogen Fertility for Small Grains

Speakers:

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Executive Summary:

The session covered sources of Nitrogen, the effect of Nitrogen on yields, and Nitrogen cycles. The speaker also covered the use/importance of Nitrogen in a manner aimed towards grain farmers.

Main Notes:

- Key Principals
 - Nitrogen (N) fertility is not just about N
 - N determines and protects yield potential
 - Yield and protein are often at odds
 - Tillers can be too much of a good thing
 - Timing is key
- N affects
 - Growth and development
 - Yield
 - Grain Protein
- Nitrogen needs for small grains
 - Depends on crop, slide provided with amounts
 - Spring wheat & winter wheat: 2 lbs. N per bushel
 - Spring oats & winter spelt: 1.0 lbs. N per bushel

- Winter rye: 1.5 -20 lbs. N per bushel
- Yield Area
 - Essentially weight per area
 - Different components of yield determined by timing of growth
 - Having good growth and development early on can be determined by tilling early on
 - Nitrogen helps determine and protect yield potential
 - Timing is key
- Other factors
 - All impact crops response to N
 - pH
 - Other nutrients
 - Weeds, disease, insects
 - Soil compaction
 - Plant stand
 - Variety
- N Sources
 - Manure, compost, green manure, organic fertilizer, Chilean nitrate (not in Canada)
 - Comes from soil resource
- Soil Nitrogen Cycle
 - Inputs change into organic N and Inorganic N, plants take up from inorganic N (in NH_4 or NO_3 forms, not just N)

- Inorganic happens from soil microbe fixation
 - Can leach, plants can go back in
- Manure N Sources
 - Different types of manures/compost have different mineralization rates
 - Speaker shows a table of how to manage N
 - How to get available nitrogen from the soil layers or dairy manure
 - Two sources act differently due to ratios of organic to inorganic N
 - Organic becomes more available as season goes on
 - Since Source N Mineralization rates
 - Most mineralize rapidly at first, then level off
- Wheat Growth and Stages
 - Need more uptake available quickly as plant grows
 - Often times can split application into 2-3 applications
 - N available early in the season boosts yield
 - N available later will boost protein more than yield
- Winter and Spring Wheat Variety Trials
 - Best way to boost protein is to choose a variety
 - Grain protein over 14 site years from 2010-2014 of 12 varieties of both spring and winter wheat
 - Average of 12% grain protein
 - Fertility is not the issue
 - Looking within one site year, there is a big range within varieties

- Variety choice is as important as N choice
 - If you choose a high protein variety, you might sacrifice a bit of yield
- Winter wheat and fertility issues
 - Greater yield potential, so greater N demand
 - Pre-plant manure or legume is most economical BUT long time period until rapid N uptake
 - Considerable growth during cool period when N mineralization is slow
 - Study on winter wheat pre-plant N source
 - N sources with higher inorganic N boosted yield more than dairy manure, but no change in protein
 - Applying manure before winter wheat has NO effect on grain protein
 - Top-dress study on winter wheat
 - Does conventional practice of this work in organic?
 - Used Chilean Nitrate (20 lbs./acre and dehydrated chicken manure (40 lbs./acre)
 - Did both sources at three timings, simply spread? (Could speak to lack of availability of chicken manure)
 - Grain yield for different treatments found that topdressing with dehydrated chicken manure had no effect, but Chilean nitrate did at later stages
 - For protein, manure had no effect, but top-dress treatments both did (chicken manure and Chilean nitrate)

- The later you can apply the better
- Adaptive N Management for Winter Grains
 - First test was a tiller count test (count shoots that could have seed heads)
 - Can determine if and what rate of top-dress N needed at “spring green up”
 - At stem extension, do a tissue test to determine how much more N the grower needs
 - This can determine critical tiller number
 - Had Yield vs. tiller density data which showed that as tiller density goes up, so does yield
 - Did a test of grain yield vs. top-dressing rate at spring green-up
 - At the low tiller site, found that grain yield increases with application
 - At high tiller site, little to now effect
 - To determine rate, did not get a boost after 60 lbs./acre, so 60 lbs./acres what grower should put on
 - How crop responds to N depends on plant stand was conclusion
 - Spike density vs. top-dressing rate at spring green-up
 - Found that putting N on early increased yield

- By putting on N, actually prevented abortion of a lot of tillers
which protected yield
- It's not just N, it includes seeding rate and plant population, and then N can help
get the tiller number rate. It effects rates of survival from there
- There is a yield vs. protein trade off