NITROGEN MANAGEMENT IN WHEAT

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ABSTRACT

Yields for current wheat varieties are quickly approaching 200 bu/a in high yielding environments. There are many approaches to managing nitrogen in wheat production systems using a variety of products on the market today. Urea, ESN, Agrotain, Arborite, DCD and many other nitrogen products are available for making sound agronomic decisions. Once the wheat plant is grown at about Fekes 7.0 there is the quandary of making protein when hard red winters or DNS types are grown. Choices become endless between products and time of when and how to use nitrogen for making protein.

Products like ESN and Agrotain are well established and have many years of research data to show where and how they fit into a nitrogen fertilization program. Other products are either new to the market or have little data supporting them. The constant flow of products is endless, making determination of which work difficult to discern.

METHODS

Various trials have been conducted over the past ten years looking at wheat yields and the impact of different nitrogen strategies. All trials were conducted at the Hermiston agricultural research and extension center in Hermiston, OR. Nitrogen was applied in all trials starting in late winter. This late winter application usually occurs in either late January or early February. This is the time when the soil transitions from being frozen to thawed and first signs of spring are evident. Split application were applied after the F7 growth stage in an effort to make protein.

RESULTS

Understanding wheat growth stages is important for Managing nitrogen. Most nitrogen fertilizer for yield and growth needs to be applied prior to Feekes six growth stage. This is when the wheat plants changes from tillering to elongation. Stem elongation is when wheat uses the majority of its N. Stem elongation is a relatively short period of time, usually only a couple of weeks in the Pacific Northwest. Research done at OSU has sown by the end of Feekes seven the wheat plant will have accumulated approximately 80% of its N. More and more products are being sold to enhance nitrogen uptake into the plant or reduce nitrogen loss. Table one shows wheat yields for series of products. Rarely do these products work in high yield environments and commonly do not statistically increase yield over the control. Other products like N-boost in tables two and three maintain yield but may be negatively impacted when combined with a fungicide application.

Urea is the main source of top-dressed N. When left on the surface urea fertilizers may volatilize and be lost to the air as ammonia. Ammonia loss decreased the amount available for

wheat growth (fig 1.). As irrigation rate is increased volatilization rate decreases and more N is found in the wheat plant. The urea treatment in figure 1 had less N in the plant where no irrigation water was applied, as irrigation rate increased there was no difference between treatments as ammonia volatilization was decreased.

In the Columbia basin it takes about 225 lb. N/a to raise a 150 bu wheat crop (figure 3). Making protein requires a little more attention than just making yield. ESN for example, is very effective at making yield (figure 3) but only semi-effective at making protein (figure 2 and 3). A split application of nitrogen is required regardless of N form applied at F5 growth stage.

Table 1. Soft white wheat yield for four treatments in 2012, Hermiston OR

	Dry Matter	**Dry Yield**	**Yield at 15%**
Check	0.9379 A	136.32 AB	156.77 AB
A	0.9317 A	133.18 AB	153.16 AB
B	0.9223 A	127.32 B	146.42 B
A+B	0.9362 A	143.85 A	165.43A

Table 2. Soft white wheat from an N-boost application in 2012, Hermiston OR

	Treatment	**F5**	**F10**	**Bushels/acre**
1	Control	-	-	175.9 ab
2	N-Boost	2.2 pts/acre	-	181.4 a
3	N-Boost	1.1 pts/acre	1.1 pts/acre	166.0 abc
4	N-Boost	-	2.2 pts/acre	166.6 abc
5	N-Boost plus Tilt	2.2 pts/acre	-	144.0 d
6	N-Boost plus Tilt	1.1 pts/acre	1.1 pts/acre	154.1 cd
7	N-Boost plus Tilt	0	2.2 pts/acre	159.7 bcd

Table 3. Dark northern spring wheat from an N-boost application in 2012, Hermiston OR

	Treatment	**F5**	**F10**	**Bushels/acre**
1	Control	-	-	135.7 a
2	N-Boost	2.2 pts/acre	-	131.1 ab
3	N-Boost	1.1 pts/acre	1.1 pts/acre	128.5 ab
4	N-Boost	-	2.2 pts/acre	126.3 ab
5	N-Boost plus Tilt	2.2 pts/acre	-	128.7 ab
6	N-Boost plus Tilt	1.1 pts/acre	1.1 pts/acre	117.6 b
7	N-Boost plus Tilt	0	2.2 pts/acre	134.1 a

Figure 1. Whole plant nitrogen at F6 following the application of urea, NBPT (urea with Agrotain) and MA (Organo acid complex) at three irrigation rates following the N application.

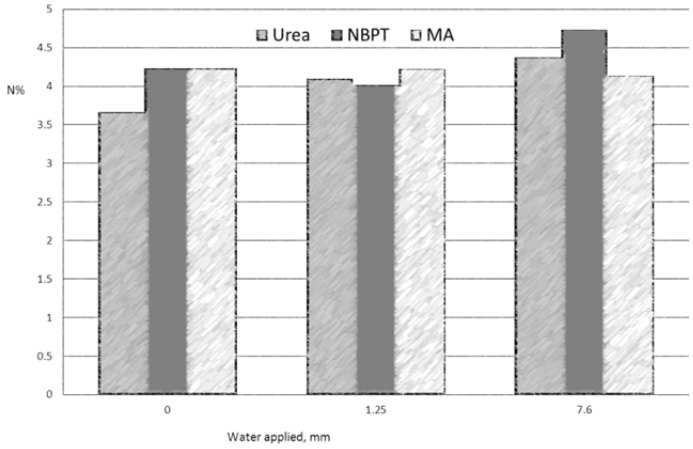

Figure 2. Flag leaf N at F7 and F10.5 and grain protein when at 300 lb. N/a is applied at F5 for ESN, ESN split with late season N, urea split with late season urea and urea.

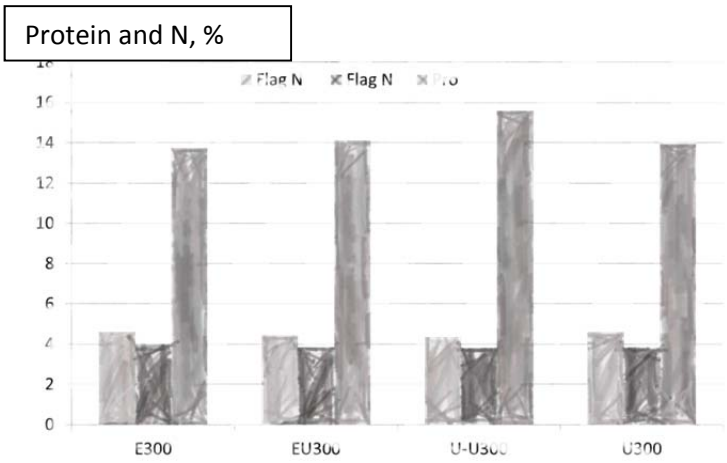

Figure 3. Yield and grain protein for ESN, urea treatments and split urea treatments.