Project data
Winter Wheat Managemet
South Dakota Wheat Commission
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Final Report

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Research Summary:
Production of good yields of high quality winter wheat with appropriate levels of protein requires careful management of nitrogen fertility. This project involved field-scale farmer cooperator sites. Two of the sites had trials of fertilizer placement methods with the common fertilizer sources of urea and urea ammonium nitrate. The third site focused on the potential value of using delayed release polymer coated urea (ESN) as part of the fertilizer program. Results from all of the trials indicate that use of deep (2 ft) nitrate soil tests accurately predicts the nitrogen fertilizer requirement for production of hard red winter wheat. Applying this nitrogen fertilizer as urea either 100% mid-row banded at seeding or 65% to 70% applied mid-row banded at seeding followed by the remaining requirement applied at Feekes 5-6 using stream bar techniques and urea-ammonium nitrate produced yields and protein contents not different from the best treatments at both sites. Use of a nitrogen rate 70% of the recommended rate reduced protein significantly at both sites and yield significantly at one site. Spring surface applied urea resulted in significantly lower protein at both sites. Yield was in the same group as the best treatments. Applying all the nitrogen as UAN with stream bars at Feekes 5-6 produced yield and protein at both sites among the best yielding groups. The least risky approach amongst those tested would be the treatments were all or part of the fertilizer is applied mid-row banded at seeding. Producers without the capability to mid-row band at seeding would have obtained comparable results in 2014 by using stream-bar applications of urea ammonium nitrate at Feekes 5-6. The stream-bar

treatment controlled excess tiller formation. The latter technique requires rainfall following application to move the fertilizer into the soil. Surface broadcast urea was among the lowest group for protein.

There were no significant differences among the 5 treatments used in the third study. Urea mid-row banded at seeding; urea and ESN in a 50:50 blend mid-row banded, the same two treatments surface banded between rows at seeding, and a treatment of the 50:50 blend at 70% of the recommended rate mid-row banded al produced comparable yields and protein levels.

Introduction:

Nitrogen fertilization represents a large portion of the cost involved in production of a wheat crop. If wheat does not receive the proper amount of N fertilizer in the right form at the right time and in the right place there can be substantial economic losses. Too much nitrogen or nitrogen supplied too early can cause excessive tiller formation which in turn can intensify lodging of the crop, enhance drought stress, increase disease pressure, reduce test weight, etc. Applying insufficient nitrogen can decrease yields, reduce protein content, etc. Improperly applied nitrogen can be lost. This causes financial and potentially crop loss for the farmer and poses risk of environmental consequences. The treatments used in this study cover the options available to producers for managing nitrogen fertilizer in no-till winter wheat production. The treatments all are premised on the use of deep (2 foot) nitrate soil tests. The producers determined their individual yield goals.

Description of Accomplishments:

The most dramatic finding of this study was the indication that the two foot nitrate soil test calibration works very well in South Dakota. In the trials used, the treatments that applied 65% to 70% of the recommended rate for the yield goal either produced significantly lower yield and/or protein than the best treatments or where there was not significand difference they were the lowest values among the treatments. When nitrogen fertilizer is insufficient, protein content will be reduced before yield level is lowered. There were no differences noted at the site where polymer coated urea was used even when application rates were reduced to 70% of recommended. The issue in this case was the yield goal (80 bu/a) was substantially higher than the yields obtained (66 bu/a). Consequently, it was not expected that response would occur. Nitrogen was not yield limiting in this situation.

The following table contains yield and protein results from the two sites where mid-row band placement was compared to surface techniques. The data are self-explanatory. The Tukey column presents the statistical analysis. Numbers followed by the same letter denotes that the values are not statistically different at the 0.05 level. This study included the collection of a large number of leaf samples and plant and tiller counts. It is hoped that the relationships associated with these data can be used to develop methods of fine tuning late-season nitrogen applications.

This study one in a long line that has focused on fine-tuning N fertilizer techniques for winter and spring wheat. It demonstrated that present techniques can work very well. Those with the capability to mid-row band are probably best served by using a lower rate at seeding time. The 65% to 70% value used here could represented a full rate for a conservative yield goal allowing the yield goal to be increased in conditions allow. It could also represent a rate that is convenient for efficient application. In both cased the remaining N can be applied at Feekes 5-6 when the producer has a much better feel for potential yield and possible protein premium or discounts.

2014 Wheat Commission- Winter Wheat N timing study								
	Arnoldy		Neuharth		Arnoldy		Neuharth	
Treatment	Yield	Tukey	Yield	Tukey	Protein	Tukey	Protein	Tukey
Urea, 70% rate, Mid-row Band at Seeding	69	A	66	A	12.8	AB	11.3	B
Urea, full rate, Mid-row band at Seeding	74	A	79	B	13.1	AB	11.7	A
Urea, full rate surface broadast early spring	68	A	82	B	12.5	B	11.4	B
UAN, full rate, Feekes 4-5	75	A	82	B	13.4	A	12.1	A
70% mid-row band remaining N via stream bar/surf strip	72	A	82	B	12.7	AB	12.1	A

There is significant interest in and promotion of new biological soil testing techniques. It is important that these be explored but this study and many of those done previously indicate that present techniques are powerful tools if properly used.

Publications/Data:
These results will be developed into an I-Grow article for use by producers in the State.