Improving Quality Standards And Economics Of Winter Wheat In Ontario Through Innovative Management Strategies With Nitrogen Fertilizer

(Golden Horseshoe SCIA Regional Partner Grant Project)

INTERIM REPORT

Purpose:

This project will generate strategies to fine-tune management toward consistently high protein wheat into the huge market that demands this quality. The Greenseeker may be used as a tool to determine required nitrogen rates, improving nitrogen efficiency and limiting environmental impact. If successful, this research would generate a preliminary nitrogen calculator for wheat (similar to corn), increase utilization of Ontario grown hard red wheat within the province, reduce the oversupply of soft wheat, and replace western red spring with Ontario hard red winter. This would increase the potential profit of wheat production significantly; both through improved basis on soft wheat, increased acreage and utilization of hard wheat, and less environmental impact through more targeted nitrogen applications.

This project, to date, has generated data on some early and relatively late split nitrogen applications towards the development of consistently higher concentrations of protein. Optical sensing technologies were introduced and deployed toward the development of strategies to predict optimum N requirements of the wheat crop, for not only to maximize grain yield, but to increase quality in the seed harvested by fine-tuning N rates around heading. Early results indicate a potential for fine-tuning N rates for improved economics and wheat quality using sensors; these preliminary datasets will be used later in the overall project to fine-tune N rates and timing strategies in hard red wheat.

Methods:

A total of seven small plot trials were planted in 2007 and 2008 to investigate the effect of genetics, N rates, and split applications on wheat yield and quality. Five more trials were planted in the fall of 2009. These trials were conducted in Elora, Palmerston, Nairn, Huron Research Station, and Ridgetown Campus. Some of these trials included the use of ESN fertilizer (over and above the original proposal). Field-length strips of various nitrogen rates and timings were deployed on a total of 23 farm fields in 2007 and 2008. These were conducted on fields mainly in Huron, Middlesex, and Kent Counties. Field scale trials will be conducted in Golden Horseshoe, Heartland and St. Clair Regional Soil and Crop Improvement Associations regions.

Even though we currently have exceeded the data requirements in the original proposal, we plan to conduct trials on 8 more fields before the project is completed in 2009. Sensor measurements were performed on most of these fields. The data collected has been added to the Wheat Nitrogen Database, towards the development of a wheat nitrogen calculator, similar to the Corn N Calculator. Wheat samples from key treatments will be subjected to baking tests. Soil N tests were conducted after harvest on most field locations to assess any environmental implications.

Results:

Early results show an increase in protein with N rates up to 120 kg/ha in early spring applications, but more importantly, a further increase of between 0.5 to 1.0% with 30 kg/ha of N streamed on as 28% several days after heading. The highest protein concentrations were achieved more consistently with the late application of 28% after heading. It appears that the newest wheat genetics responds to higher N rates than current older wheat varieties. Protein concentrations may be higher and more consistent with a split-application of N that would be directed more toward building protein than making up for lost yield because of under-application of nitrogen in early spring.

Preliminary results indicate that this project has the potential to have a significant economic and environmental benefit to Ontario Agri-Food production. Increasing product quality through more efficient nitrogen management will have a significant impact on all aspects of the wheat industry in Ontario.

Summary:

Preliminary results indicate a refinement of current N management strategies for hard red wheat towards higher quality. Our data indicate that new algorithms will be developed for Ontario conditions. These first datasets will be incorporated with subsequent datasets for calibration, which holds promise to fine-tune N requirements for hard red winter wheat and for attaining higher and more consistent protein concentrations at harvest. Currently, no such recommendations exist in Ontario.

Next Steps:

Continuation of small plot cultivar by nitrogen rate and nitrogen timing with GreenSeeker investigations will occur in the final year of the project in 2009. Field scale trials will also be conducted in Golden Horseshoe, Heartland and St. Clair Regional Soil and Crop Improvement Associations regions. A beta version of the Wheat N Calculator will be presented following the 2009 growing season.

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