SMART Wheat: "Managing Wheat intensively to assess Yield Potential"

(Elgin SCIA 2008 Major Grant)

Purpose:

Many trials have been done investigating the impact of single factors on winter wheat yields. However, information from the United Kingdom and elsewhere indicate a strong interaction between nitrogen and fungicide inputs. Studies of these as independent variables may overlook these interactions. This project was undertaken to assess if an interaction exists in Ontario, as well as to assess what the maximum yield potential of wheat might be under Ontario environmental conditions. While economics must always play a role in final management decisions, this trial included one treatment where economics was ignored, to assess potential yield. Environmental impacts of this treatment were also investigated.

Methods:

Two replicate field scale trials were initiated on six farms in Elgin County in the fall of 2007. High yield, early planted fields were targeted, and only fields planted to soft red winter wheat were considered (soft red has the highest yield potential). Treatments were applied in the spring of 2008, and included a check (normal N rate, no fungicides), a fungicide treatment (normal N rate, a weed control fungicide and a head fungicide applied), and a high N treatment (double N rate, both fungicides applied, and a plant growth regulator to prevent lodging). Leaf disease ratings were taken on a weekly basis; head disease ratings were taken bi-weekly following heading and lodging scores taken prior to harvest. Harvest measurements included yield, moisture, test weight, thousand kernel weight (TKW) protein, and fusarium damaged kernel (FDK) scores. Soil nitrate samples were collected and analyzed post harvest.

Results:

Yields increased dramatically with the interaction of adding both extra nitrogen and fungicides. Response to fungicide only was much more modest, in line with what previous studies had shown.

Standability was excellent on all treatments across all locations and even high rate nitrogen strips without a growth regulator, the result of cool May temperatures decreasing stem elongation and increasing stem thickness. Leaf disease ratings remained low across locations, although check treatments (untreated) did show higher disease levels. Site K had a severe outbreak of armyworm but was caught early and sprayed in a timely fashion. Head disease ratings remained low across locations. Moisture, test weight, TKW and FDK scores were not significantly different across treatments, although there was a trend to lower FDK scores with fungicides applied. Higher nitrogen treatments also showed a slight trend to higher TKW's.

Table 1 summarizes the yields of the Elgin trials. There was a positive yield response to fungicides at all sites but the average yield increase of 4 bu/ac would not pay for two fungicide treatments. Figure 1 suggests that the bulk of the yield increase from fungicide application can be attributed to the head fungicide, and 4 bu/ac would be close to breakeven for this application. This outcome is consistent with fungicide data collected over previous years.

The data in Table 1 show a significant and consistent response to the combination of fungicide and higher nitrogen applications. It is impossible to ascertain from these trials if this is strictly a

nitrogen response or a response to the interaction of nitrogen by fungicides. Data from previous years, however, would have predicted a 2-3 bushel yield response to higher N rates, not the 13 bu/ac average yield response recorded.

Table 1: Wheat Yields

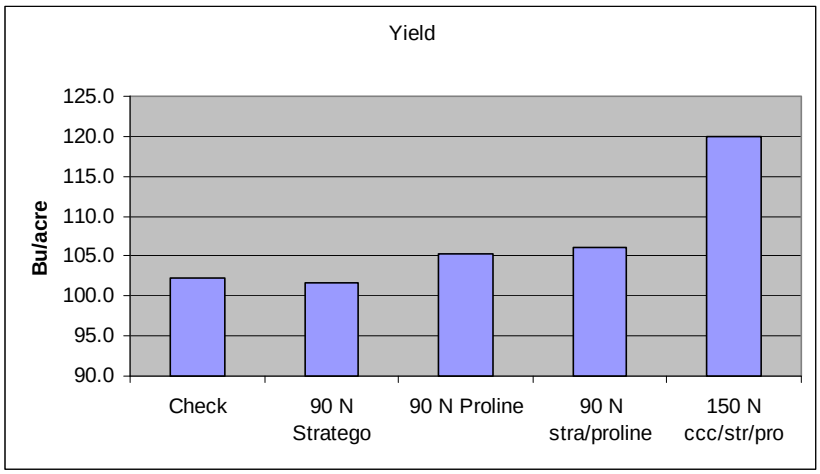
	Check	Fungicide	N Plus
Elgin "R"	99.7	100.4	117.6
Elgin "H"	90.3	93.3	104.1
Elgin "J"	102.3	106.3	125.1
Elgin "K"	102.2	106.1	120.0
Elgin "B"	119.0	123.5	128.6
Elgin "L"		98.1	107.3
Avg 5 sites	102.7	105.9	119.1
Avg 6 sites		104.8	117.4

Table 2 shows the impact of increased inputs on protein. Higher nitrogen rates increase protein levels by 0.5% on average. This outcome is anticipated and well supported in worldwide literature. The impact of this increased protein is less clear. Domestic users generally prefer low protein soft wheat while export buyers prefer high protein. Seventy percent of our SRW currently is exported, but the domestic market is the most consistent and important to supply. Whether this added protein is a benefit or detriment remains open to debate.

Table 2: Protein

	Protein		
	Check	Fungicide	N Plus
Elgin "R"	9.4	9.3	9.8
Elgin "H"	9.3	9.2	9.9
Elgin "J"	9.8	9.8	10.4
Elgin "K"	9.8	10.0	10.6
Elgin "B"	9.7	9.9	10.1
Elgin "L"		10.4	10.5
Avg 5 sites	9.6	9.6	10.2
Avg 6 sites		9.7	10.2

Figure 1: Elgin "K" Data



Summary:

These results show that higher yields are possible in Ontario wheat production. At current prices and costs, the economics of these yields is not suspect. However, yield increases in excess of 15 bu/ac, coupled with protein increases of 0.5%, appear to be realistic objectives. The interaction of N with fungicides can not be clearly established from this data set.

Next Steps:

It is essential that this project continue for another two years. Plans are in place to ensure that these trials are undertaken. Evaluation of high N applications without fungicides will be part of the small plot research component of this project.

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