Project Title: Evaluation of Clearfield Winter Wheat Lines for Herbicide Tolerance.

Project Leader: Bob Stougaard

Project Personnel: Phil Bruckner, Jim Berg, Qingwu Xue, and Fernando Guillen

Objectives: Evaluate crop tolerance, yield potential and agronomic attributes of experimental herbicide resistant winter wheat lines.

Results:

Ten herbicide resistant (Clearfield) winter wheat lines and 2 susceptible cultivars were evaluated for herbicide resistance and agronomic performance during the 2003-2004 season. Cultivars were either treated with Beyond herbicide (imazamox) at the normal 1X use rate or twice that amount (2X) on April 16, 2004 using a tractor sprayer when seedlings were 5" tall. Non-treated controls were also included for each entry.

Despite lower than normal temperatures during the winter months (Nov.-Jan.), winterkill was minimal. All of the herbicide resistant lines demonstrated excellent crop safety, regardless of the herbicide rate applied. Heading date was not affected by herbicide treatment. However, there was a trend towards shorter plant height as herbicide rates increased, with average heights of 43, 42, and 41 inches being recorded at the 0, 1X, and 2X rates, respectively.

Although several lines had minor TCK infection, stripe rust was by far the most prevalent disease. Stripe rust pressure of severe this year, and several entries were infected by the disease. MTCL0303, MTCL0306, MTCL0316 and 'Above' had stripe rust infections ranging from 10% to 62%. Fortunately, the majority of entries appeared to have resistance to the disease. Although disease symptoms were not uniformly present across the experiment, disease symptoms tended to increase in some entries as the rate of beyond increased. Although the overall effect of herbicide rate on disease incidence was nonsignificant, future trials should be aware of the possible interaction between herbicide rate and disease susceptibility with some varieties.

In some cases disease incidence probably had a greater effect on yield than did herbicide rate. This was most apparent for MTCL0303. But despite the high level of disease, yields in general did not appear to suffer. Overall, herbicide treatments did not affect grain yield, test weight, heading, or protein content. Yields averaged 111 Bu/A. Several entries yielded more than check cultivar (Above, a commercially available herbicide resistant cultivar). Test weight was excellent for all entries with a mean of 63 lb/bu. Protein content ranged from 12.3% to 15.2%.

Summary:

Despite some minor crop injury at the higher herbicide rate, Clearfield entries performed very well. This year was an ideal season for evaluating disease pressures. More than half of the Clearfield entries showed excellent resistance to stripe rust and TCK.

Future Plans:

Continue to evaluate herbicide resistant winter wheat materials for herbicide tolerance and agronomic attributes.

Table 1. Crop injury, lodging and disease infection in Clearfield winter wheat lines grown at the Northwestern Agricultural Research Center, Kalispell, MT in 2003-2004.

Planted: September 18, 2003 Harvested: July 29, 2004

Entry	ID	Crop injury (%) (5/3/04)			Crop injury (%) (5/10/04)			Lodging index (%)			Stripe rust (%)			TCK (0-1)		
		0X	1X	2X	0X	1X	2X	0X	1X	2X	0X	1X	2X	0X	1X	2X
1	MTCL0303	0.0	0.0	11.7	0.0	0.0	6.7	0.0	1.7	1.7	33.3	40.0	61.7	0.3	0.0	0.3
2	MTCL0306	0.0	0.0	8.3	3.3	0.0	6.7	0.0	0.0	0.0	13.3	36.7	11.7	0.0	0.0	0.3
3	MTCL0313	0.0	0.0	5.0	1.7	0.0	8.3	0.0	1.7	3.3	1.7	0.0	13.3	0.0	0.7	0.7
4	MTCL0316	0.0	0.0	1.7	0.0	0.0	5.0	0.0	0.0	0.0	10.0	10.0	20.0	0.0	0.3	0.0
5	MTCL0318	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.3	0.3
6	MTCL0319	0.0	0.0	3.3	1.7	0.0	1.7	0.0	0.0	0.0	0.0	8.3	11.7	0.0	0.0	0.0
7	MTCL0322	0.0	0.0	13.3	3.3	0.0	8.3	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
8	MTCL0325	0.0	0.0	13.3	0.0	3.3	10.0	0.0	0.0	0.0	1.7	1.7	0.0	0.0	0.0	0.0
9	MTI01159	0.0	0.0	6.7	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0
10	Above	0.0	0.0	11.7	3.3	0.0	1.7	0.0	0.0	0.0	18.3	28.3	16.7	0.0	0.0	0.0
	Mean	**0.0**	**0.0**	**8.0**	**1.3**	**0.3**	**6.0**	**0.0**	**0.3**	**0.5**	**7.8**	**13.2**	**13.7**	**0.0**	**0.1**	**0.1**
11	Rampart	0.0	81.7	85.0	1.7	98.0	98.0	1.7			0.0			0.0		
12	Neeley	0.0	81.7	85.0	3.3	98.0	98.0	0.0			10.0			0.0		
	LSD (0.05)															
	Entry		**2.41**			**2.45**			**1.24**			**13.67**			**0.31**	
	Rate		**1.20**			**1.23**			**NS**			**NS**			**NS**	

NS: Not significant at level of 0.05.

Table 2. Agronomic data from Clearfield winter wheat lines grown at the Northwestern Agricultural Research Center, Kalispell, MT in 2003-2004.

Planted: September 18, 2003 Harvested: July 29, 2004

Entry	ID	Yield (bu/A)			Grain moisture (%)			Test weight (Lb/Bu)			Heading date (Julian)			Plant height (in)			Protein (%)		
		0X	1X	2X	0X	1X	2X	0X	1X	2X	0X	1X	2X	0X	1X	2X	0X	1X	2X
1	MTCL0303	114.1	115.4	95.4	12.9	12.0	11.2	63.0	62.5	61.4	150.7	150.7	151.0	45.7	44.2	42.7	12.6	13.0	13.0
2	MTCL0306	119.2	113.8	122.5	12.6	11.9	12.7	62.9	62.9	63.0	151.0	149.3	150.0	44.5	45.4	43.2	13.1	13.7	13.1
3	MTCL0313	119.7	122.3	122.8	11.7	11.8	10.8	63.7	63.6	62.5	152.0	150.7	151.7	47.6	45.4	45.8	12.3	13.0	12.6
4	MTCL0316	123.6	120.5	116.9	12.5	11.9	11.2	63.5	63.6	63.4	150.7	150.3	150.0	44.2	44.9	44.1	12.5	12.7	12.7
5	MTCL0318	109.4	114.8	115.9	12.4	10.5	11.8	63.5	63.3	63.6	150.7	150.0	150.3	42.5	42.0	40.9	14.0	14.1	14.1
6	MTCL0319	107.6	100.4	106.4	11.3	11.0	11.4	62.9	63.2	63.1	149.3	148.7	148.3	41.5	41.1	38.2	14.4	14.8	15.2
7	MTCL0322	105.4	102.4	104.6	11.6	11.6	11.8	63.5	63.4	63.7	150.0	148.3	149.0	40.4	40.0	38.8	13.9	14.5	14.0
8	MTCL0325	111.2	110.6	113.5	14.0	13.0	14.6	62.7	62.9	62.7	151.0	150.3	150.3	45.4	43.4	42.7	13.7	14.2	14.0
9	MTI01159	101.1	100.2	104.8	11.8	11.3	10.8	61.3	61.0	60.3	151.7	151.7	151.7	39.1	38.6	37.0	12.6	13.1	13.0
10	Above	109.1	100.3	105.8	11.4	11.0	11.4	62.8	63.1	63.1	148.0	148.0	148.0	39.8	39.8	37.3	12.7	12.9	13.0
	Mean	**112.0**	**110.1**	**110.9**	**12.2**	**11.6**	**11.8**	**63.0**	**63.0**	**62.7**	**150.5**	**149.8**	**150.0**	**43.1**	**42.5**	**41.1**	**13.2**	**13.6**	**13.5**
11	Rampart	115.2	0.0	0.0	12.0	0.0	0.0	63.0	0.0	0.0	152.7	0.0	0.0	43.8	0.0	0.0	14.1	0.0	0.0
12	Neeley	122.2	0.0	0.0	11.9	0.0	0.0	62.2	0.0	0.0	155.7	0.0	0.0	43.8	0.0	0.0	12.5	0.0	0.0
	LSD (0.05)																		
	Entry		**10.37**									**0.75**			**1.51**				
	Rate		**NS**									**0.34**			**0.70**				

NS: Not significant at level of 0.05.