

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

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

#### Results:

Herbicide resistant winter wheat varieties are being developed in cooperation with Dr. Phil Bruckner, MSU winter wheat breeder, and BASF. BASF (formally American Cyanamid) developed a line of wheat with resistance to one of their proprietary herbicides – Beyond (imazamox). Beyond controls several troublesome weeds including downy brome, jointed goatgrass, wild oat, mustards, buckwheat and bedstraw. We have incorporated the resistant trait into several locally adapted hard red, hard white and soft white winter wheat varieties. A 36-entry nursery was established at Kalispell this past year to evaluate the level of herbicide resistance as well as agronomic and end-use quality attributes in these breeding lines. These experimental lines were either treated with the herbicide Beyond or not treated on April 29 when the winter wheat was 4 inches tall and had 5 leaves.

Winter wheat had only reached the 1.5 leaf stage when cold temperatures occurred. As a result, winter injury was evident, and stand reductions occurred for all entries. In some cases stand reductions were as high as 35 percent. However, the degree of winter injury was unrelated to the resistant trait since several control varieties (Rampart in particular) demonstrated similar levels of winter injury. This juvenile growth stage also resulted in a lack of tillering and yields were much lower than normal. Most lines demonstrated excellent herbicide tolerance. Crop injury varied from 0 to 22 percent depending on the breeding line. Yields ranged from 64 to 38 bu/acre. On average, those lines treated with the herbicide yielded 96 percent of the non-treated materials.

#### Summary:

Although some entries did exhibit herbicide injury symptoms, several line were comparable to 'Above', a commercially available herbicide resistant variety. On average, the differences between treated verses untreated were minor for all of the response variables evaluated. While these results are preliminary, it appears that there are several promising herbicide resistant lines under development.

#### Future Plans:

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

IMI winter wheat 2003, Kalispell. Planted: September 27, 2002; Harvested: July 29, 2003

Entry	ID	Yield Bu/A		Treated as %	Test weight Lb/Bu		Treated as %	Grain moisture %		Treated as %	Winter survival %		Treated as %
		treated	untreated	untreated	treated	untreated	untreated	treated	untreated	untreated	treated	untreated	untreated
1	MTCL0301	43.5	43.6	99.9	60.0	60.9	98.5	9.9	10.2	97.1	90.0	90.0	100.0
2	MTCL0302	48.2	46.0	104.7	60.4	60.2	100.3	12.0	13.2	90.9	80.0	85.0	94.1
3	MTCL0303	63.0	55.8	112.9	61.7	61.8	99.8	10.6	11.1	95.5	90.0	87.5	102.9
4	MTCL0304	58.9	60.3	97.8	62.3	61.7	101.0	10.4	11.4	91.2	90.0	90.0	100.0
5	MTCL0305	53.0	63.2	83.8	62.4	62.3	100.2	10.5	11.0	95.5	90.0	90.0	100.0
6	MTCL0306	53.4	57.9	92.2	62.0	61.9	100.2	11.0	11.1	99.1	87.5	87.5	100.0
7	MTCL0307	56.2	67.8	83.0	60.2	60.6	99.3	10.5	11.7	89.7	90.0	90.0	100.0
8	MTCL0308	49.9	56.9	87.7	60.8	60.5	100.5	10.6	11.0	96.4	90.0	85.0	105.9
9	MTCL0309	63.8	61.0	104.7	60.7	61.1	99.3	10.4	10.7	97.2	90.0	90.0	100.0
10	MTCL0310	57.4	69.8	82.3	58.8	60.7	96.9	11.4	11.0	103.6	90.0	90.0	100.0
11	MTCL0311	57.0	58.5	97.4	61.2	59.8	102.3	10.6	11.4	93.0	90.0	87.5	102.9
12	MTCL0312	47.9	54.8	87.4	61.3	62.3	98.4	12.8	12.0	106.7	80.0	80.0	100.0
13	MTCL0313	56.4	64.9	86.9	62.8	62.9	99.8	10.4	10.8	96.3	90.0	90.0	100.0
14	MTCL0314	58.1	53.2	109.2	65.9	62.6	105.3	11.1	11.5	96.5	90.0	85.0	105.9
15	MTCL0315	56.3	53.8	104.6	61.9	63.9	96.9	11.9	12.2	97.5	87.5	90.0	97.2
16	MTCL0316	56.1	52.2	107.6	67.3	63.1	106.7	10.3	10.9	94.5	90.0	87.5	102.9
17	MTCL0317	46.9	45.9	102.2	58.7	59.7	98.3	10.6	10.4	101.9	80.0	72.5	110.3
18	MTCL0318	45.8	46.2	99.1	62.7	62.2	100.8	10.1	10.6	95.3	82.5	70.0	117.9
19	MTCL0319	39.4	36.4	108.1	66.8	61.6	108.4	10.2	10.3	99.0	75.0	72.5	103.4
20	MTCL0320	45.9	57.1	80.5	61.4	61.1	100.5	10.6	11.0	96.4	77.5	77.5	100.0
21	MTCL0321	41.8	42.3	98.9	60.7	60.8	99.8	11.8	11.8	100.0	77.5	75.0	103.3
22	MTCL0322	40.5	40.4	100.2	64.6	62.4	103.5	10.0	10.3	97.1	82.5	67.5	122.2
23	MTCL0323	40.6	45.7	88.9	61.6	61.7	99.8	10.6	11.1	95.5	75.0	82.5	90.9
24	MTCL0324	38.3	43.1	88.7	60.6	62.4	97.1	10.5	10.3	101.9	72.5	65.0	111.5
25	MTCL0325	43.6	43.2	100.9	61.2	61.1	100.2	11.0	12.4	88.7	82.5	70.0	117.9
26	MTCL0326	38.4	38.1	100.9	69.3	60.9	113.8	10.5	10.4	101.0	80.0	80.0	100.0
27	MTCL0327	53.7	58.5	91.9	59.7	59.6	100.2	10.2	10.2	100.0	90.0	87.5	102.9
28	MTCL0328	61.2	67.8	90.2	58.6	57.1	102.6	12.2	12.5	97.6	85.0	85.0	100.0
29	MTCL0329	53.0	64.0	82.8	59.7	59.5	100.3	11.5	11.5	100.0	80.0	87.5	91.4
30	MTCL0330	51.0	53.1	96.0	56.8	55.5	102.3	14.3	15.0	95.3	80.0	72.5	110.3
31	MTI01158	53.7	56.2	95.5	61.9	62.2	99.5	12.1	12.0	100.8	85.0	85.0	100.0
32	Above	61.5	58.9	104.4	62.2	62.1	100.2	9.8	10.1	97.0	90.0	87.5	102.9
	<b>Mean</b>	<b>51.1</b>	<b>53.6</b>	<b>96.0</b>	<b>61.8</b>	<b>61.1</b>	<b>101.0</b>	<b>11.0</b>	<b>11.3</b>	<b>97.1</b>	<b>84.7</b>	<b>82.6</b>	<b>103.0</b>
33	Rampart	0.0	45.0	0.0	0.0	61.0	0.0	0.0	10.6	0.0	72.5	65.0	111.5
34	Eltan	0.0	65.5	0.0	0.0	55.8	0.0	0.0	13.2	0.0	85.0	85.0	100.0
35	NuWest	0.0	59.5	0.0	0.0	60.6	0.0	0.0	11.9	0.0	90.0	90.0	100.0
36	Neeley	0.0	60.8	0.0	0.0	61.9	0.0	0.0	11.1	0.0	90.0	87.5	102.9

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Entry	ID	Heading date Julian		Treated as %	Plant height in		Treated as %	Protein %		Treated as %	Crop injury %	
		treated	untreated	untreated	treated	untreated	untreated	treated	untreated	untreated	treated	untreated
1	MTCL0301	152.0	152.0	100.0	20.7	20.7	100.0	12.7	13.0	97.7	0.0	0
2	MTCL0302	158.0	157.0	100.6	22.6	22.6	100.0	13.8	13.6	101.5	12.5	0
3	MTCL0303	152.5	152.5	100.0	26.0	26.6	97.8	13.1	13.9	94.2	0.0	0
4	MTCL0304	152.5	153.5	99.3	26.2	26.0	100.8	13.3	13.5	98.5	0.0	0
5	MTCL0305	152.0	152.0	100.0	24.6	24.6	100.0	13.6	13.6	100.0	2.5	0
6	MTCL0306	153.0	153.5	99.7	22.8	23.0	99.1	13.8	13.9	99.3	10.0	0
7	MTCL0307	157.0	156.0	100.6	26.8	27.6	97.1	13.4	13.7	97.8	2.5	0
8	MTCL0308	155.0	155.0	100.0	25.2	25.8	97.7	14.4	14.0	102.9	0.0	0
9	MTCL0309	152.5	153.5	99.3	25.2	27.2	92.8	14.3	14.5	98.6	0.0	0
10	MTCL0310	155.0	157.5	98.4	27.0	29.7	90.7	12.9	13.0	99.2	0.0	0
11	MTCL0311	157.0	157.0	100.0	26.2	27.2	96.4	13.3	13.4	99.3	5.0	0
12	MTCL0312	156.5	155.5	100.6	22.0	24.6	89.6	14.1	14.1	100.0	7.5	0
13	MTCL0313	151.5	151.5	100.0	23.8	25.4	93.8	13.0	13.1	99.2	7.5	0
14	MTCL0314	152.0	153.5	99.0	25.8	26.0	99.2	14.1	14.2	99.3	0.0	0
15	MTCL0315	152.0	152.5	99.7	24.4	27.2	89.9	14.7	14.8	99.3	12.5	0
16	MTCL0316	151.0	152.0	99.3	22.8	22.4	101.8	13.4	13.1	102.3	0.0	0
17	MTCL0317	157.5	158.5	99.4	26.4	29.1	90.5	14.7	14.4	102.1	10.0	0
18	MTCL0318	153.0	154.0	99.4	26.4	27.0	97.8	14.3	14.1	101.4	17.5	0
19	MTCL0319	153.0	152.0	100.7	24.6	23.4	105.0	15.3	15.3	100.0	10.0	0
20	MTCL0320	153.5	154.5	99.4	24.2	27.8	87.2	14.2	13.9	102.2	12.5	0
21	MTCL0321	157.0	156.5	100.3	23.4	24.6	95.2	14.0	14.2	98.6	22.5	0
22	MTCL0322	151.5	152.5	99.3	23.4	24.0	97.5	14.4	14.6	98.6	7.5	0
23	MTCL0323	155.5	155.5	100.0	24.8	24.8	100.0	13.9	14.1	98.6	15.0	0
24	MTCL0324	153.5	153.0	100.3	22.8	25.8	88.5	15.2	14.9	102.0	5.0	0
25	MTCL0325	154.5	156.5	98.7	25.2	28.0	90.1	13.9	13.7	101.5	7.5	0
26	MTCL0326	153.0	153.5	99.7	25.6	25.0	102.4	15.3	15.9	96.2	7.5	0
27	MTCL0327	156.0	156.5	99.7	24.2	24.8	97.6	11.8	12.0	98.3	0.0	0
28	MTCL0328	156.0	157.0	99.4	25.6	27.6	92.9	12.0	12.3	97.6	5.0	0
29	MTCL0329	159.0	158.5	100.3	22.6	24.8	91.3	12.3	11.8	104.2	0.0	0
30	MTCL0330	159.0	160.5	99.1	23.8	23.4	101.7	12.2	12.6	96.8	10.0	0
31	MTI01158	152.5	155.5	98.1	23.2	25.2	92.2	14.2	14.2	100.0	2.5	0
32	Above	149.5	150.0	99.7	21.3	23.0	92.3	12.5	12.5	100.0	0.0	0
	<b>Mean</b>	<b>154.2</b>	<b>154.7</b>	<b>99.7</b>	<b>24.4</b>	<b>25.5</b>	<b>95.9</b>	<b>13.7</b>	<b>13.7</b>	<b>99.6</b>	<b>6.0</b>	<b>0.0</b>
33	Rampart	0.0	157.0	0.0	0.0	25.0	0.0	0.0	14.1	0.0	100.0	0
34	Eltan	0.0	161.0	0.0	0.0	23.8	0.0	0.0	13.1	0.0	100.0	0
35	NuWest	0.0	156.0	0.0	0.0	26.4	0.0	0.0	12.8	0.0	100.0	0
36	Neeley	0.0	155.5	0.0	0.0	27.0	0.0	0.0	13.3	0.0	100.0	0