

## **A MOTION TO RELEASE MT1172 AS A CLEARFIELD SPRING WHEAT FOR DISTRICTS 1-6 UNDER DRYLAND CONDITIONS**

We propose licensing the line to a BASF-approved entity partner for commercialization.

MT1172 was derived from the cross of Vida//8209-1/Vida made in 2004 to be used as a Clearfield wheat. '8209-1' was an experimental line derived from the cross of CDCTeal11A/McNeal/SWP965001 made in 2003. SWP965001 is a WestBred line descended from 'Fidel' with TaAHASL1D (als1) gene for resistance to imidazolinone herbicides. CDCTeal11A is a Canadian wheat variety with TaAHASL1B (als2) gene for resistance to imidazolinone herbicides. The experimental line that became MT1172 was assayed for herbicide resistance and presence of the two resistance genes via PCR. MT1172 was tested following BASF protocols for herbicide resistance in qualification trials managed by Ed Davis (Land Resources and Environmental Sciences)

Four sets of data provided justification for release of MT1172. These include two years of results from the statewide Advanced Yield Trial (AYT), one year of data from the Preliminary Yield Trial, six locations of data from herbicide qualification trials, and data from the Montana Cereal Quality Lab.

Data from the AYT in 2012 shows that MT1172 had grain yield (Table 1) similar to Vida and higher than most other varieties at most sites. The average grain yield of MT1172 over all sites was similar to Vida. MT1172 was similar to Vida for agronomic traits in the 2012 AYT (Table 2). Similar results were obtained in 2013 as MT1172 was most similar to Vida for both grain yield (Table 3) and other agronomic characteristics (Table 4).

Data from the Preliminary Yield Trial (PYT) grown in 2011 are shown in Tables 5 and 6. Table 5 shows the grain yield of MT1172 was similar to Vida and higher than most other varieties. Table 6 shows that agronomic characteristics of MT1172 were most similar to Vida. Table 7 shows that the end-use quality characteristics of MT1172 based on four locations in 2012 were most similar to Vida.

The rights to use of the genes for resistance to imidazolinone are owned by BASF. BASF requires six herbicide qualification trials over a two-year period to insure that the genes provide ample herbicide resistance. The qualification trials were conducted in 2012 and 2013 by Ed Davis (LRES). Data on herbicide tolerance and grain yield is shown in Table 8. The key data from these trials are that there was no injury due to herbicide in any of the trials.

Table 1. 2012 GRAIN YIELD (BU/AC) SUMMARY FOR THE ADVANCED SPRING WHEAT NURSERY GROWN ACROSS MONTANA

PEDIGREE	HAVRE RAINFED	SIDNEY RAINFED	SIDNEY IRR	MOCCASIN RAINFED	HUNTLEY RAINFED	CONRAD RAINFED	BOZEMAN RAINFED	BOZEMAN IRR
CAP400	31.5	34.9	48.2	25.4*	53.3	71.5	51.9	92.5*
THATCHER	27.1	26.7	53.3	16.6	42.5	57.9	46.6	71.6
FORTUNA	32.7	36.5	50.3	21.6	52.4	62.6	46.1	60.1
MT1172	35.3*	43.0*	71.6*	26.1*	62.6*	76.9	60.1	86.4
REEDER	31.4	41.3*	71.2*	24.4	61.5*	74.2	55.4	82.8
MCNEAL	33.2	35.8	67.8	23.9	55.2	74.5	54.4	89.8*
CHOTEAU	30.5	37.3	56.3	18.9	54.1	75.0	54.2	97.2*
VIDA	35.4*	40.0*	66.8	24.2	60.0*	79.9*	64.7*	91.9*
DUCLAIR	33.9	39.8*	60.7	21.8	61.7*	74.3	55.4	91.5*
SITE MEAN *****	32.6	36.6	60.9	22.6	57.2	75.4	55.7	91.1
C.V.	6.2	8.5	16.3	14.1	7.3	5.9	6.1	9.4
F-VALUE (ENTRY)	4.54**	4.03**	2.79**	2.45**	2.62**	3.06**	4.37**	2.38**
LSD (.05)	4.21	5.29	16.35	5.37	7.03	7.56	5.81	14.55
PEDIGREE	AVG <sup>1</sup>	KALISPELL RAINFED						
CAP400	51.2	84.3*						
THATCHER	42.8	27.6						
FORTUNA	45.3	59.1						
MT1172	57.7*	77.2						
REEDER	55.3	63.7						
MCNEAL	54.3	56.4						
CHOTEAU	52.9	43.1						
VIDA	57.9*	53.4						
DUCLAIR	54.9	57.0						
SITE MEAN *****	54.0	51.1						
C.V.	9.2	9.8						
F-VALUE (ENTRY)	3.59**	22.36**						
LSD (.05)	4.86	8.43						

Table 2. Agronomic Summary Over All Locations 2012 Advanced Yield Trial

PEDIGREE	Yield (bu/ac)	Test wt (lb/bu)	Headdate	Pl. Ht. (In)	Protein (%)
CAP400	51.2	57.7	177.0	29.6	15.5
THATCHER	42.8	55.2	178.3	<u>37.5</u>	14.8
FORTUNA	45.3	59.2	175.9	34.9	14.7
MT1172	57.7*	57.7	177.0	29.2	14.4
REEDER	55.3	59.0	176.0	30.4	14.9
MCNEAL	54.3	57.6	176.5	30.6	14.8
CHOTEAU	52.9	58.2	175.8	28.7	14.8
VIDA	57.9*	58.2	176.3	29.9	14.3
DUCLAIR	54.9	57.4	174.4*	29.8	14.5
SITE MEAN *****	54.0	58.5	175.7	29.2	14.7
C.V.	9.2	1.6	0.5	4.4	3.99
F-VALUE (ENTRY)	3.59**	11.22**	16.16**	17.84**	5.96**
LSD (.05)	4.86	0.91	0.85	1.26	0.58

Table 3. 2013 GRAIN YIELD (BU/AC) SUMMARY FOR THE ADVANCED SPRING WHEAT NURSERY GROWN ACROSS MONTANA

ENTRY	ID	HAVRE	MOCCASIN	HUNTLY	CONRAD	BOZEMAN	KALISPELL	AVG	RANK
1	THATCHER	44.9	33.9	34.2	66.5	35.8	68.5	47.3	64
2	FORTUNA	49.3	39.2	43	74.5	48.6	88.3	57.1	61
3	MCNEAL	53	43.2	49.9	83.3	46.3	107.6	63.9	31
4	REEDER	62.7	41.1	45	77.1	49.5	102.6	63	39
5	CHOTEAU	53.9	43.4	48.7	74.4	45.8	106.7	62.2	46
6	VIDA	67.2	52.4	51.4	79.6	46.8	109.6	67.8	6
7	DUCLAIR	61.7	48.9	49.9	74.4	51.2	112.8	66.5	14
25	MT 1172	62.6	53	49.5	83.7	50.7	105.5	67.5	10
31	CAP400-1	55.6	38.6	42.3	72.3	52.3	111.6	62.1	47
	MEAN	59.3	44.8	47.2	74.3	49.4	106.2	63.6	
	C.V.	7.7	12	6.9	13.6	14.6	5.2	9.2	
	F-VALUE(ENTRY)	4.95***	1.62*	5.85***	1.35NS	1.56*	11.32***	2.51***	
	LSD(0.05)	7.4	8.7	5.2	16.4	11.6	8.9	6.7	

**Table 4. Agronomic Summary Over All Locations 2013 Advanced Yield Trial**

<b>ID</b>	<b>YIELD (BU/AC)</b>	<b>TEST WEIGHT (LB/BU)</b>	<b>HEADING DATE (DAYS FROM JAN.1)</b>	<b>PLANT HEIGHT (IN.)</b>	<b>PROTEIN (%)</b>
THATCHER	47.3	58.6	180.8	40.7	14.7
FORTUNA	57.1	60.9	178.6	38.3	14.4
MCNEAL	63.9	59.8	179.5	32.6	14.2
REEDER	63.0	60.7	178.6	32.5	14.4
CHOTEAU	62.2	59.8	179.1	31.0	14.2
VIDA	67.8	59.6	179.6	32.4	13.4
DUCLAIR	66.5	59.1	177.2	31.4	13.9
MT 1172	67.5	59.4	179.3	31.0	13.7
CAP400-1	62.1	59.6	179.9	31.4	15.3
MEAN	63.6	60.1	178.7	31.3	14.1
C.V.	9.2	1.5	0.6	3.3	3.3
F- VALUE(ENTRY)	2.51***	8.30***	7.66***	17.76***	7.36***
LSD(0.05)	6.7	1.0	1.1	1.4	0.5

Table 5. Grain Yield of MT1172 compared to check varieties in the 2011 Preliminary Yield Trial grown at four locations.

Line	Grain Yield (bu/ac)				
	Havre	Sidney	Moccasin	Bozeman	Average
MT1172	46.9	49	33.1	53.7	45.7
Vida	40.8	47.6	24.9	59.7	43.2
McNeal	37.3	41.7	30.6	53.7	40.8
Mean	38.9	43.1	26.3	52.6	40.2
LSD	5.3	4.4	6.9	5.6	2.1

Table 6. Agronomic characteristics of MT1172 based on means over four locations for the 2011 Preliminary Yield Trial.

Line	Grain Yield	Test Weight	Head Date	Height	Protein
MT1172	45.7	58.9	189	27.1	14.4
Vida	43.2	59.7	188	27.5	14.4
McNeal	40.8	59.1	189	28.3	15.3
Mean	40.2	59.6	187	27.0	15.1
LSD	2.1	1.2	0.95	1.7	1.2

Table 7. Cereal Quality data in 2012 for Four Advanced Yield Trial Locations

	<b>Wheat Protein, % (12% m.b.)</b>	<b>Single Kernel Hardness</b>	<b>Flour Yield, %</b>	<b>Flour Protein, %</b>	<b>Flour Ash, %</b>	<b>Wheat Ash, %</b>	<b>Mixing Tolerance</b>	<b>Mixing Time, min</b>
THATCHER	16.125	81.75	61.825	14.15	0.4025	1.7475	4.75	4.375
FORTUNA	15.825	75.25	59.25	14.25	0.435	1.6625	3.75	4.1
MCNEAL	16.225	95.5	56.1	14.725	0.44	1.7	6	7.425
REEDER	15.85	79.25	63.05	14.125	0.3775	1.595	3.5	3.975
CHOTEAU	16.125	77.5	63.25	14.45	0.39	1.66	4.75	4.425
VIDA	15.625	84.75	66.1	13.85	0.3875	1.54	3.25	4.15
DUCLAIR	15.875	73.25	62.025	14	0.3975	1.635	4.75	5.8
CAP400	17.1	86.75	62.225	14.925	0.395	1.79	6.5	9.6
MT1172	15.2	77.75	64.6	13.425	0.385	1.595	3.25	3.35
LSD (0.05)	0.76	5.1	3.2	0.65	0.02	0.11	1.1	1.4

	<b>Mixing Water Absorption, %</b>	<b>Bake Mixing Time, min</b>	<b>Bake Water Absorption, %</b>	<b>Loaf Volume</b>	<b>Crumb Grain Score</b>
THATCHER	65.35	7.575	75.3	1217.5	8
FORTUNA	65.5	6.8	75.7333	1195	7.66667
MCNEAL	68.075	11.7	78.5667	1310	8
REEDER	65.325	5.775	74.65	1217.5	7.25
CHOTEAU	65.975	6.225	75.675	1216.25	6.5
VIDA	65.25	5.725	74.825	1170	6.75
DUCLAIR	65.275	8.425	75.1	1258.75	7.25
CAP400	68.575	15.9	79.775	1258.75	7.5
MT1172	64.4	3.675	71.975	1101.25	6.75
LSD (0.05)	1.92	2.5	1.97	56	1.1

Table 8. Herbicide Qualification Trials

These trials were conducted by Ed Davis following BASF-approved protocols. The data has been sent to BASF for their approval.



Station Year	Year	Trial Code	Location	Variety	Treatment			Data				
					Herbicide	X Rate	Rate (g ai/ha)	Crop Injury at 7-10 DAT (%)	Crop Injury at 14-21 DAT (%)	Grain Moisture %	Grain Test Wt LB/BU	Grain Yield BU/A
1	2012		Springhill	Jed	Control	--	--	0	0	8.6	57.8	24.3
1			Springhill	Jed	Beyond	1X	43.8	0	0	9.1	58.4	25.9
1			Springhill	Jed	Beyond	2X	87.6	0	0	9.1	56.8	21.6
1			Springhill	MT 1166	Control	--	--	0	0	8.7	53.9	25.7
1			Springhill	MT 1166	Beyond	1X	43.8	0	0	8.7	54.9	21.8
1			Springhill	MT 1166	Beyond	2X	87.6	0	0	9.4	49.8	18.5
1			Springhill	MT 1168	Control	--	--	0	0	8.9	56.2	23.3
1			Springhill	MT 1168	Beyond	1X	43.8	0	0	9.1	56.4	23.4
1			Springhill	MT 1168	Beyond	2X	87.6	0	0	9.8	56.2	19.8
1			Springhill	MT 1172	Control	--	--	0	0	8.9	55.3	21.6
1			Springhill	MT 1172	Beyond	1X	43.8	0	0	8.9	55.8	22.6
1			Springhill	MT 1172	Beyond	2X	87.6	0	0	8.9	56.4	19.7
1			Springhill	MT 1173	Control	--	--	0	0	8.7	53.7	21.8
1			Springhill	MT 1173	Beyond	1X	43.8	0	0	9.1	53.6	23.4
1			Springhill	MT 1173	Beyond	2X	87.6	0	0	8.7	54.7	19.2
							LSD					
							(0.05)	0	0	1.532	4.174	6.81
							CV	0	0	10.21	4.51	18.37
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1	2012		Moccasin	Jed	Control	--	--	0	0	7.8	58.2	21.6
1			Moccasin	Jed	Beyond	1X	43.8	0	0	7.7	58	22.6
1			Moccasin	Jed	Beyond	2X	87.6	0	0	7.4	57.5	23.3
1			Moccasin	MT 1166	Control	--	--	0	0	7.2	55.7	20.7
1			Moccasin	MT 1166	Beyond	1X	43.8	0	0	7.4	55.1	21.1
1			Moccasin	MT 1166	Beyond	2X	87.6	0	0	7.6	54.8	20
1			Moccasin	MT 1168	Control	--	--	0	0	6.8	53.3	19.2
1			Moccasin	MT 1168	Beyond	1X	43.8	0	0	6.7	53.5	20.5
1			Moccasin	MT 1168	Beyond	2X	87.6	0	0	6.6	52.8	19.3
1			Moccasin	MT 1172	Control	--	--	0	0	8.2	57.8	22.6
1			Moccasin	MT 1172	Beyond	1X	43.8	0	0	8.3	57.6	24.3
1			Moccasin	MT 1172	Beyond	2X	87.6	0	0	8.4	57.6	24.1
1			Moccasin	MT 1173	Control	--	--	0	0	8.2	57.7	21.5
1			Moccasin	MT 1173	Beyond	1X	43.8	0	0	7.9	57	21.8
1			Moccasin	MT 1173	Beyond	2X	87.6	0	0	8.1	56	21.1
							LSD					
							(0.05)			0.53	1.28	0.1
							CV			4.14	1.37	4.57

Station Year	Year	Trial Code	Location	Variety	Treatment			Data				
					Herbicide	X Rate	Rate (g ai/ha)	Crop Injury at 7-10 DAT (%)	Crop Injury at 14-21 DAT (%)	Grain Moisture %	Grain Test Wt LB/BU	Grain Yield BU/A
1	2012		Bozeman	Jed	Control	--	--	0	0	9.1	60.2	35.7
1			Bozeman	Jed	Beyond	1X	43.8	0	0	9.7	59.9	31.3
1			Bozeman	Jed	Beyond	2X	87.6	0	0	8.9	60.2	34.6
1			Bozeman	MT 1166	Control	--	--	0	0	9.1	57.9	35.3
1			Bozeman	MT 1166	Beyond	1X	43.8	0	0	8.9	59.2	34.4
1			Bozeman	MT 1166	Beyond	2X	87.6	0	0	8.9	59.7	34.7
1			Bozeman	MT 1168	Control	--	--	0	0	10	56.9	39.7
1			Bozeman	MT 1168	Beyond	1X	43.8	0	0	9.2	57.9	40
1			Bozeman	MT 1168	Beyond	2X	87.6	0	0	9.2	59	42.6
1			Bozeman	MT 1172	Control	--	--	0	0	9	57.7	40.4
1			Bozeman	MT 1172	Beyond	1X	43.8	0	0	9.8	57.3	43.1
1			Bozeman	MT 1172	Beyond	2X	87.6	0	0	10.6	56.8	41.1
1			Bozeman	MT 1173	Control	--	--	0	0	8.8	59.5	34.3
1			Bozeman	MT 1173	Beyond	1X	43.8	0	0	9.2	58.8	32.2
1			Bozeman	MT 1173	Beyond	2X	87.6	0	0	9.4	59.5	31.9
					<b>Statistics</b>		LSD (0.05)	0	0	1.64	2.63	9.05
							CV	0	0	10.53	2.68	24.64
1	2013		Rapelje	AP 605	Control	--	--	0	0	10.1	57.9	23.1
1			Rapelje	AP 605	Beyond	1X	43.8	0	0	10	57.8	22.2
1			Rapelje	AP 605	Beyond	2X	87.6	0	0	10	57.7	21.8
1			Rapelje	MTCL 1172	Control	--	--	0	0	9.8	57.5	22.6
1			Rapelje	MTCL 1172	Beyond	1X	43.8	0	0	9.9	57.6	21.8
1			Rapelje	MTCL 1172	Beyond	2X	87.6	0	0	9.9	57.4	22
1			Rapelje	MTCL 1173	Control	--	--	0	0	9.9	57.5	21.4
1			Rapelje	MTCL 1173	Beyond	1X	43.8	0	0	9.7	57.8	21.9
1			Rapelje	MTCL 1173	Beyond	2X	87.6	0	0	10	57.8	21.3
					<b>Statistics</b>		LSD (0.05)	0	0	0.36	0.7	1.41
							CV	0	0	2.52	0.84	4.41

Station Year	Year	Trial Code	Location	Variety	Treatment			Data				
					Herbicide	X Rate	Rate (g ai/ha)	Crop Injury at 7-10 DAT (%)	Crop Injury at 14-21 DAT (%)	Grain Moisture %	Grain Test Wt LB/BU	Grain Yield BU/A
2	2013		Bozeman	AP 605	Control	--	--	0	0	10.2	63.7	63.2
2			Bozeman	AP 605	Beyond	1X	43.8	0	0	10.1	62.6	63.7
2			Bozeman	AP 605 MTCL	Beyond	2X	87.6	0	0	10.1	63.7	56.8
2			Bozeman	1172 MTCL	Control	--	--	0	0	9.63	61.6	71
2			Bozeman	1172 MTCL	Beyond	1X	43.8	0	0	9.78	61.2	70.7
2			Bozeman	1172 MTCL	Beyond	2X	87.6	0	0	9.85	60.7	68.4
2			Bozeman	1173 MTCL	Control	--	--	0	0	9.75	60.2	77.2
2			Bozeman	1173 MTCL	Beyond	1X	43.8	0	0	9.7	60.6	72
2			Bozeman	1173 MTCL	Beyond	2X	87.6	0	0	9.9	60.9	71.7
					<b>Statistics</b>		LSD (0.05)	0	0	0.41	2.22	6.29
							CV	0	0	2.84	2.46	6.31
2	2013		Springhill	AP 605	Control	--	--	0	0	9.6	55.7	20.3
2			Springhill	AP 605	Beyond	1X	43.8	0	0	9.65	55.8	20
2			Springhill	AP 605 MTCL	Beyond	2X	87.6	0	0	9.68	55.6	20.2
2			Springhill	1172 MTCL	Control	--	--	0	0	9.58	56	19.8
2			Springhill	1172 MTCL	Beyond	1X	43.8	0	0	9.63	56	20.1
2			Springhill	1172 MTCL	Beyond	2X	87.6	0	0	9.7	56.1	20.2
2			Springhill	1173 MTCL	Control	--	--	0	0	9.8	55.8	20
2			Springhill	1173 MTCL	Beyond	1X	43.8	0	0	9.73	55.9	19.8
2			Springhill	1173 MTCL	Beyond	2X	87.6	0	0	9.4	55.9	19.8
					<b>Statistics</b>		LSD (0.05)	0	0	0.33	0.49	0.5
							CV	0	0	2.35	0.61	1.71