

Project Title: Evaluation commonly grown barley, spring wheat and winter wheat cultivars for post harvest seed dormancy. Grant 4W4112

Project Leader: D. M. Wichman CARC Research Agronomist, Moccasin, MT

Project Personnel: B.J.S. Deanon CARC Cereal Res. Assoc. Moccasin, MT
S.J. Dahlhausen CARC Seasonal Field Tech, Moccasin, MT

Objective:

Identify those barley and wheat cultivars with higher or lower levels of post harvest seed dormancy.

Background

Knowledge of the relative post harvest dormancy of barley and wheat cultivars can be instrumental in variety selection by growers and by grain buyers. The grower's interests may be to have increased dormancy to minimize sprouting in the head or the grower may want reduced dormancy to reduce the chances of volunteer plants in subsequent crops or fallow period. Seed that shatters and falls to the soil surface has the potential to produce a weedy volunteer plant. Shattered seed that sprouts promptly can be controlled by post harvest herbicide application, tillage, or in the case of spring cereals by fall frost. Seed that is dormant does not sprout till it has experienced "dry ripening" or "after ripening" to grow through the dormancy stage and suitable moisture and temperatures are present. Seed remaining dormant beyond fall freeze up are viable to germinate in the spring and produce volunteer grain plants, weeds, in the next crop. End users, malt houses and others, that sprout the grain as part of their value added processing need to know if there are conditions that might inhibit or delay processing grain early post harvest.

Results:

The 2012 post harvest dormancy assessments were conducted on barley, winter wheat next, and spring wheat last. The species sequence is the order in which post harvest dormancy breaks down. The goal is to have all the germination/dormancy assessments completed by the end of October. By early November, in crop field conditions are often too cold for good cereal seed germination. Further, the chilling effect can override or break down seed dormancy. The 2012 germinations were conducted at 10°C as opposed to 15°C in 2011. This change resulted in approximate 24 hour (h) delay in the initial coleoptiles emergence. The seed is scored as germinated, when the length of the coleoptiles equal the seed length. The cooler temperature slows the germination process which may provide for greater demarcation in germination between cultivars. Plus it provides for better fit with fitting weekends into the work schedule. Seeds placed in the germinator on Friday, will not need to be checked till Monday.

In the fall of 2012, two germinators were used initially. A 1955 Montgomery Ward incubator and a 1994 Conviron Incubation Chamber. The initial barley incubations, in the Conviron chamber, were conducted at 6°C, rather 10°C due to failure to reset incubator setting. As a result the barley fall germination data is not as clean as it should be. The Montgomery Ward Chamber did

not have uniform temperature within the chamber or over time. It is now owned by Stanford Vo-Ag. All the wheat trials were germinated in the Conviron incubator at 10°C. Three reps of 50 seeds each were placed on blue blotter pads in 4.5 x 4.25 sandwich boxes with 23 mls of water added. When counted as germinated, the seed was removed from the box. The 2012 species location tables are sorted on 96 h percent total germination column for barley and 120 h percent germination for wheat. For more ease in comparing, the cultivars were also ranked within trial site and ranking summarized.

Seed germination was evaluated in September 2012, for 18 barley cultivars grown at Moccasin, Denton and Geraldine, in 2012, under continuous crop conditions. Initial germinated seeds were observed and counted after 72 h of incubation. As is typical, there were differences in level of germination between locations and cultivars (Tables 1-3). Gallatin, a cultivar known historically to produce volunteer plants in the following year's crop, is embolden and highlighted to provide a table reference point. In comparisons for the percent germinated seed after 96 h, Geraldine ranked adjacent to Gallatin at all three 2012 barley locations. For some entries, i.e. CDC Cowboy and others, the 96 h total seed germinated ranking varied greatly across the three locations. Amsterdam, Lenetah, and Tradition generally placed in the early germinating group. For the second year in a row, Harrington failed to place within early germinating group. In previous fall germination evaluation trials, Harrington was consistently in the top early germinating group. At present, no explanation comes to mind for Harrington's failure to be an early germinator. Further, other malt lines, Metcalfe and Hockett failed to be consistent early germinators.

Lowering the germination temperature to 6°C delayed barley germinations an additional 72 h. The 6°C germinations for the three barley locations are summarized in a single table (Table 4 & 5). Colder temperatures may confound the issue as colder temperatures may override dormancy in some lines, while some cultivars may germinate slower, relative to other entries in the same trial, at colder temperatures.

For the ten entries common to the 2011 and 2012 on-farm cultivar trials, Gallatin and Geraldine were the slower germinators in the early period and had more seeds that germinated late (Tables 6-9). Amsterdam, Tradition and MT010160 scored the best overall in the two year summaries.

McNeal was used as comparison standard for evaluating the fall germination of 20 spring wheat cultivars from four on-farm yield trials. McNeal is known to have relatively high number of volunteer plants the spring following harvest. Volt and Jedd consistently had later germinating seeds for the four 2012 locations (Tables 10-13). Corbin, along with Duclair, Hank, Reeder and Choteau had earlier germinating seed in 2012. In the two year summary across seven locations, Volt and Jedd were in the top three at all locations for slower germinating seed. Corbin scored the best for early seed germination and had fewer delayed germinating seeds in the two year comparison.

Twenty four winter wheat cultivar/development lines, grown at four on farm locations, were evaluated for fall germination. Jerry, a generally later germinating cultivar, was used as the standard for data comparison. Jerry ranked in the top two at three locations for least seed germinated after 120 h in 10°C incubator and was sixth at the fourth location (Tables 18-21). Overland, Genou, WB-Quake, Judee, and Bearpaw consistently had a higher percent germinated seed after 120 h incubation, in the 2012 evaluations. In the two year multi-location summary tables, Tables 22, 23, 24, & 25, Jerry had the least germinated seed after 96-120 h and the most un-germinated seed after 168 h of incubation. Genou had the most seed germinated after 96-120 h and the fewest un-germinated seed after 168 h. CDC Falcon, Judee, WB-Quake, AP503CL2 and Bearpaw were other winter wheat entries that germinated well.

Summary:

2012 The post harvest dormancy evaluations show there are cultivars of barley, winter wheat and spring wheat that tend to have more early germinating seed or more later germinating seed than the mean of nursery. Also, there is a great deal of inconsistency in the dormancy levels of some cultivars. Barley, in general germinates about 24 h sooner than spring wheat and winter wheat when temperatures are 10°C to 15°C. In the early incubation period, 40% to 90% of the barley seeds germinate in the first 96 h of incubation with 1% to 10% germinating in the 168 h interval or later. Across all the spring wheat cultivars evaluated, 18% to 40% of the seed germinated in the first 96 to 120 h of incubation and 5% to 20% germinate in the 168 h interval or later. When summarized across all the cultivars entered, 45% to 60% of the winter wheat seed germinated in the first 96 to 120 h. However, the number of winter wheat seed that germinate late incubation, the 165 h interval or later, is similar to spring wheat at 4% to 20%.

Only barley cultivars and development lines will be evaluated in future fall dormancy evaluations in this project. The amount of delayed germinating spring wheat and winter wheat seed, suggest that there will typically be a high incidence of volunteer wheat plants the next growing season. Exceptions to the wheat generality might occur with some hard white wheat as was the case with MTW9420.

Funding Summary:

Expenditure information to be provided by OSP.

No other grant support was provided for this project. MAES funds provided salary for PI & RA.

MWBC FY2011 Grant Submission Plans:

It is planned to submit this project for funding consideration in the next fiscal year.

However, it will be limited to 2013 barley cultivar trials.

Table 1 2012 Fall germination of **barley** cultivars grown in 2012 on NTCC near **Moccasin, MT.**
 Exp: FD123670 Central Agricultural Research Center. Moccasin, Montana.

Cultivar /	seeds germinated seeds in 24h interval								total germinated seeds						
	Count hr:	72	96	120	144	168	192	mold/rot/dormant	240htg	72htg	96htg	120htg	144htg	168htg	192htg
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%	%
Geraldine	0	4	8	12	20	1	2	2	46.3	0.7	9.3	26.0	49.3	90.0	92.7
Gallatin	1	10	16	6	15	2	1	0	49.3	1.3	20.7	52.0	64.0	94.0	98.7
MT080279	1	10	18	12	7	1	0	1	49.0	2.7	22.7	58.7	82.7	96.7	98.0
Champion	3	9	14	16	6	0	1	1	48.0	6.0	24.0	52.7	84.0	96.0	96.0
Metcalfe	1	14	15	12	7	1	0	0	49.7	1.3	30.0	60.0	84.7	98.0	99.3
Haxby	3	12	15	11	8	1	1	0	48.7	5.3	30.0	59.3	80.7	96.0	97.3
Corad	1	14	17	11	6	0	0	1	49.0	2.7	30.7	64.0	86.0	97.3	98.0
Eslick	2	14	13	12	8	0	0	0	49.0	3.3	32.0	57.3	82.0	98.0	98.0
Tradition	5	15	13	15	2	0	0	0	49.3	10.0	39.3	66.0	95.3	98.7	98.7
Hockett	10	11	13	6	7	1	1	0	48.0	20.7	42.7	68.7	80.0	94.7	96.0
MT070158	5	17	12	11	5	0	0	1	49.3	10.0	44.0	67.3	89.3	98.7	98.7
Harrington	8	15	10	10	6	0	1	1	48.7	15.3	45.3	66.0	86.0	97.3	97.3
MT070159	10	14	14	8	3	0	1	0	48.7	19.3	46.7	75.3	90.7	97.3	97.3
CDC Cowboy	9	16	12	7	5	0	1	1	48.3	17.3	48.7	72.7	86.0	96.0	96.7
Lenetah	7	22	12	8	0	1	0	1	49.3	13.3	56.7	80.0	96.7	96.7	98.7
Lavina	4	26	11	6	2	1	0	0	49.7	8.0	60.0	81.3	93.3	98.0	99.3
Amsterdam	12	22	10	4	2	0	1	0	49.3	23.3	67.3	86.7	94.0	98.7	98.7
MT010160	25	13	5	4	1	0	0	0	49.7	50.7	77.3	88.0	96.0	98.7	99.3
mean	5.87	14.3	12.6	9.41	6.11	0.5	0.6296	0.5	48.85	11.74	40.41	65.67	84.48	96.7	97.7
P value	0.00	0.00	0.31	0.04	0.00	0.25	0.14	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.01
CV1	70.2	30.2	38.7	45.7	67.1	185.4	119.0	124.7	1.8	70.2	29.4	17.9	9.9	2.4	1.8
LSD(0.05)	6.84	7.19	ns	7.13	6.80	ns	ns	1.04	1.44	13.68	19.69	19.47	13.86	3.91	2.89

Placed in incubator: 7 Sep 2012 at 10° C Data File: BLYNT3SL. Seed Lab Incubator

Table 2 2012 Fall germination of **barley** cultivars grown in 2012 on NTCC near **Denton, MT.**
 Exp: FD123671 Central Agricultural Research Center. Moccasin, Montana.

Cultivar /	seeds germinated in 24h interval								total germinated seeds						
	/Count hr:	72	96	120	144	168	192	mold/rot/dormant	240	72	96	120	144	168	192
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%	%
MT070159	0	12	29	7	1	0	0	0.0	50.0	0.7	25.3	84.0	97.3	100	100
CDC Cowboy	1	14	14	16	4	0	1	0.0	49.3	2.0	30.0	58.0	90.7	98.0	98.7
Metcalfe	7	9	18	14	2	1	0	0.3	49.3	14.0	31.3	66.7	94.0	97.3	98.7
MT070158	1	16	19	13	1	0	0	0.3	49.7	1.3	33.3	71.3	97.3	98.7	99.3
Gallatin	5	13	24	6	1	0	0	0.3	49.3	9.3	36.0	83.3	96.0	98.0	98.7
Geraldine	4	14	22	7	2	0	0	0.0	49.7	8.7	36.7	80.7	95.3	98.7	99.3
Conrad	0	18	20	11	1	0	0	0.0	50.0	0.7	36.7	76.0	98.0	100	100
Harrington	4	15	16	11	5	0	0	0.0	50.0	8.0	37.3	68.7	90.7	100	100
MT080279	3	16	23	6	2	0	0	0.0	50.0	5.3	38.0	84.0	96.0	99.3	100
Hockett	1	19	13	8	8	1	0	0.3	49.3	2.0	39.3	64.7	80.7	96.7	98.7
Champion	1	21	19	9	1	0	0	0.0	49.7	1.3	43.3	80.7	98.0	99.3	99.3
Lavina	8	16	17	8	1	0	0	0.7	49.3	15.3	47.3	81.3	96.7	98.0	98.7
Eslick	13	12	18	5	1	0	0	0.0	49.7	26.0	50.7	86.0	96.0	98.7	99.3
Amsterdam	18	9	19	3	1	1	0	0.0	50.0	36.0	53.3	91.3	97.3	98.7	100.0
Haxby	18	9	13	8	2	0	0	0.0	49.7	36.7	54.7	80.7	96.0	99.3	99.3
Tradition	7	20	16	4	1	0	1	0.7	48.7	14.7	55.3	86.7	95.3	96.7	97.3
Lenetah	17	15	15	3	0	0	0	0.0	50.0	34.0	64.0	94.7	100	100	100
MT010160	6	31	10	1	0	0	0	0.0	49.7	12.7	75.3	96.0	98.7	99.3	99.3
mean	6.4	15.5	18.0	7.8	1.7	0.3	0.2	0.1	49.63	12.7	43.78	79.7	95.22	98.7	99.26
P value	0.01	0.02	0.10	0.03	0.31	0.59	0.81	0.78	0.35	0.01	0.04	0.07	0.19	0.13	0.35
CV1	107.0	39.1	34.4	62.2	175.9	188.6	216.8	326.7	1.2	107.0	36.7	16.9	6.7	1.5	1.2
LSD(0.05)	11.3	10.1	10.3	8.0	ns	ns	ns	ns	ns	22.6	ns	ns	ns	ns	ns

Placed in incubator: 7 Sep 2012 at 10° C Data File: BLYDNTSL.

Table 3 2012 Fall germination of **barley** cultivars grown in 2012 on NTCC near **Geraldine**, MT.
Exp: FD123672 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	seeds germinated in 24h interval								total germinated seeds							
	/Count hr:	72	96	120	144	168	192	mold/rotdormant	240htg	72	96	120	144	168	192	
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%	%	
Champion	6	14	16	8	4	2	0.7	0.0	49.3	11.3	39.3	71.3	86.7	98.7	95.9	
Geraldine	7	12	19	7	5	0	0.3	0.0	50.0	14.7	39.3	76.7	90.7	100.0	100.0	
Gallatin	3	18	20	6	2	0	0.0	0.3	49.3	5.3	40.7	81.3	94.0	98.7	100.0	
CDC Cowboy	3	19	19	5	3	0	1.0	0.0	49.3	5.3	43.3	82.0	93.3	98.7	99.3	
Hockett	3	21	19	4	2	1	0.0	0.0	49.7	6.7	48.7	86.7	94.0	99.3	98.0	
MT080279	4	25	17	4	0	0	0.0	0.0	50.0	7.3	57.3	92.0	100.0	100.0	100.0	
Harrington	14	15	12	6	1	0	0.3	0.0	48.3	28.0	58.7	82.0	94.0	96.7	100.0	
MT070159	2	27	16	2	2	1	0.3	0.0	49.7	4.0	58.7	91.3	94.7	99.3	98.7	
Eslick	4	25	15	4	1	0	0.3	0.0	49.7	8.7	59.3	89.3	96.7	99.3	100.0	
Metcalfe	6	24	14	5	1	0	0.0	0.0	49.3	12.7	60.0	87.3	96.7	98.7	99.3	
Conrad	6	24	16	3	0	0	0.0	0.0	50.0	12.7	60.7	93.3	100.0	100.0	100.0	
Amsterdam	20	11	11	5	2	1	0.3	0.0	49.7	40.7	62.7	84.7	94.0	99.3	98.7	
MT070158	1	31	18	0	0	0	0.3	0.0	49.7	1.3	62.7	98.0	98.0	99.3	99.3	
Haxby	28	4	6	4	5	2	0.0	0.0	50.0	56.7	65.3	77.3	85.3	100.0	95.3	
MT010160	8	29	10	2	1	0	0.3	0.0	49.7	16.0	74.0	94.7	98.0	99.3	100.0	
Lenetah	21	16	8	2	2	0	0.7	0.0	49.0	42.0	74.7	90.0	93.3	98.0	99.3	
Lavina	19	21	8	1	1	1	0.7	0.0	49.3	37.3	78.7	94.0	96.0	98.7	98.7	
Tradition	12	31	6	0	0	0	0.7	0.0	49.3	24.0	86.7	98.0	98.0	98.7	100.0	
mean	9.30	20.44	13.85	3.67	1.76	0.48	0.33	0.02	49.52	18.59	59.48	87.22	94.63	99.04	99.0	
P value	0.00	0.01	0.04	0.31	0.32	0.27	0.60	0.48	0.80	0.00	0.05	0.30	0.31	0.80	0.33	
CV1	88.0	39.5	42.9	98.6	135.6	220.7	167.2	734.8	1.8	88.0	28.9	13.6	6.7	1.8	1.9	
LSD(0.05)	13.57	13.40	ns	ns	ns	ns	ns	ns	1.45	27.13	ns	ns	ns	ns	ns	

Placed in incubator: 20 Sep 2012 at 10° C

Data File: BLYGRD2S.

Table 4 2012 Fall germination, **at 6°C**, of barley cultivars grown at three 2012 NTCC locations: Moccasin, Denton, and Geraldine, MT.

Exp: FD123600 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Moccasin					Denton					Geraldine				
	/Count hr:	120	144	168	192	216	120	144	168	192	216	120	144	168	192
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Conrad	0	1.3	11.3	65.3	97.3	0.0	3.3	25.3	84.0	99.3	0.0	4.0	61.3	96.7	
MT070159	0	1.3	13.3	78.7	99.3	0.0	3.3	25.3	84.7	99.3	0.0	5.3	65.3	90.7	
Lavina	0	1.3	25.3	78.7	98.7	0.0	4.0	34.7	87.3	99.3	0.0	5.3	66.0	97.3	
Haxby	0	2.7	21.3	70.0	95.3	0.0	6.0	25.3	74.7	96.0	0.0	2.0	40.7	98.7	
Metcalfe	0	0.0	11.3	63.3	100.0	0.0	4.0	44.0	90.7	97.3	0.0	8.7	76.7	98.7	
MT070158	0	5.3	33.3	83.3	96.7	0.0	11.3	38.7	90.0	98.7	0.0	2.0	65.3	100.0	
MT080279	0	1.3	12.7	71.3	98.7	0.0	25.3	58.0	92.0	99.3	0.0	0.7	50.0	99.3	
CDC Cowboy	0	4.7	30.7	86.0	95.3	0.0	7.3	26.0	84.0	93.3	3.3	15.3	58.0	97.3	
Lenetah	0	5.3	31.3	74.0	96.0	0.0	22.7	58.0	95.3	98.7	0.0	2.0	68.0	98.0	
Eslick	0	5.3	28.7	70.0	76.0	0.0	26.0	58.7	90.0	96.7	0.0	0.0	49.3	96.7	
Hockett	0	6.0	32.0	78.7	97.3	0.0	10.7	36.7	84.0	98.0	8.0	22.7	83.3	98.0	
Tradition	0	16.0	46.0	90.0	98.0	0.0	24.7	57.3	98.7	100.0	0.0	1.3	54.0	98.0	
Geraldine	0	4.0	14.0	62.0	94.7	0.0	35.3	76.7	98.7	99.3	0.0	4.7	63.3	97.3	
MT010160	0	14.7	43.3	84.7	96.0	0.0	12.7	40.7	92.7	99.3	4.0	18.0	84.7	99.3	
Champion	0	10.0	36.0	77.3	95.3	0.0	35.3	60.7	98.0	99.3	0.0	4.0	42.7	95.3	
Gallatin	0	1.3	17.3	68.0	95.3	2.0	50.0	78.7	93.3	100.0	0.0	4.7	55.3	96.0	
Harrington	0	7.3	28.7	70.0	98.0	0.7	18.0	51.3	95.3	99.3	10.0	38.0	89.3	98.7	
Amsterdam	0	17.3	52.0	78.7	96.0	0.0	13.3	46.0	86.7	97.3	19.3	46.7	90.0	94.7	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
mean		5.85	27.15	75.00	95.78	0.15	17.41	46.78	90.00	98.37	2.481	10.3	64.63	97.26	
P value		0.38	0.34	0.90	0.59	0.48	0.00	0.01	0.00	0.61	0.00	0.00	0.00	0.34	
CV1		149.9	73.5	24.9	9.9	570.6	73.4	38.1	7.2	3.2	138.0	83.2	14.7	3.6	
LSD(0.05)		ns	ns	ns	ns	ns	21.21	29.59	10.79	ns	5.68	14.22	15.77	ns	

Placed in incubator: 20Sep 2012 at 6C

Data File: BLYDNTG2.

Table 5 2012 Fall germination, at 6°C, of barley cultivars grown at three 2012 NTCC locations: Moccasin, Exp: FD123871 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	Seed germinated				Rank within date				
	/Count hr:	144	168	192	216	144	168 ^{1/}	192	216
	%	%	%	%	rank	rank	rank	rank	rank
Haxby	2.9	16.2	61.8	96.7	5.0	3.0	1.0	5.0	3.5
Conrad	1.6	13.6	70.2	97.8	2.0	1.0	3.0	10.0	4.0
MT070159	1.6	14.7	76.2	96.4	2.0	2.0	9.0	4.0	4.3
CDC Cowboy	5.1	24.0	76.0	95.3	6.0	7.0	8.0	2.0	5.8
Eslick	10.4	29.1	69.8	89.8	11.0	9.0	2.0	1.0	5.8
Metcalfe	1.3	21.3	76.9	98.7	1.0	4.0	10.0	15.0	7.5
Lavina	1.8	21.8	77.3	98.4	4.0	5.0	11.0	13.0	8.3
MT080279	8.9	23.8	71.1	99.1	9.0	6.0	4.0	18.0	9.3
Geraldine	13.1	31.8	74.7	97.1	14.0	12.0	7.0	7.0	10.0
Champion	15.1	33.6	72.7	96.7	16.0	13.0	6.0	5.0	10.0
MT070158	5.6	24.7	79.6	98.4	7.0	8.0	13.0	13.0	10.3
Lenetah	9.3	30.4	79.1	97.6	10.0	10.0	12.0	9.0	10.3
Hockett	8.2	30.4	82.0	97.8	8.0	10.0	15.0	10.0	10.8
Gallatin	17.1	33.6	72.2	97.1	18.0	13.0	5.0	7.0	10.8
Amsterdam	16.7	48.2	85.1	96.0	17.0	18.0	17.0	3.0	13.8
MT010160	10.4	34.0	87.3	98.2	11.0	15.0	18.0	12.0	14.0
Tradition	13.6	34.9	80.9	98.7	15.0	16.0	14.0	15.0	15.0
Harrington	11.8	39.3	84.9	98.7	13.0	17.0	16.0	15.0	15.3
mean	8.6	28.1	76.5	97.1					

Smaller ranking score indicate slower germination.

Data File: BLYDNTG2.

^{1/} >168 h sorted Larger to smaller number of seeds germinated in the 24 h interval.

Table 6 2012 and 2011 Barley cultivar early germination, ≤ 96 h, at 10°C incubation temperature. Exp: FD123670 Central Agricultural Research Center. Moccasin, Montana

Cultivar	2012				2011			2011	2 y 6 Loc
	NTCC	Denton	Geraldine	average	NTCC	Denton	SCF36	Average	Average
	%	%	%	%	%	%	%	%	%
Geraldine	9.3	36.7	39.3	28.4	49.3	88.6	90.4	76.1	52.3
Gallatin	20.7	36.0	40.7	32.4	79.6	82.7	89.1	83.8	58.1
Conrad	30.7	36.7	60.7	42.7	72.0	80.0	75.1	75.7	59.2
Haxby	30.0	54.7	65.3	50.0	43.0	88.5	89.0	73.5	61.8
Hockett	42.7	39.3	48.7	43.6	82.0	79.7	95.3	85.7	64.6
Harrington	45.3	37.3	58.7	47.1	75.2	84.7	89.8	83.2	65.2
Metcalfe	30.0	31.3	60.0	40.4	85.3	89.3	96.7	90.4	65.4
Tradition	39.3	55.3	86.7	60.4	83.9	84.7	90.7	86.4	73.4
Amsterdam	67.3	53.3	62.7	61.1	92.6	94.7	94.6	93.9	77.5
MT010160	77.3	75.3	74.0	75.6	70.7	90.7	94.5	85.3	80.4
mean	40.4	43.8	59.5	47.9	66.6	80.2	90.7	79.2	63.5

Table 7 2012 and 2011 Barley cultivar early germination, ≤ 96 h, at 10° C incubation temperature.
Exp: FD123670 Central Agricultural Research Center. Moccasin, Montana

Cultivar	2012 NTCC rank	2012 Denton rank	2012 Geraldine rank	2012 average rank	2011 NTCC rank	2011 Denton rank	2011 SCF36 rank	2011 Average rank	2 y 6 Loc Average rank
Gallatin	2	2	2	2.0	6	3	3	4.0	3.0
Geraldine	1	3	1	1.7	2	7	5	4.7	3.2
Conrad	5	4	6	5.0	4	2	1	2.3	3.7
Haxby	3	8	8	6.3	1	6	2	3.0	4.7
Harrington	8	5	4	5.7	5	4	4	4.3	5.0
Hockett	7	6	3	5.3	7	1	9	5.7	5.5
Metcalfe	4	1	5	3.3	9	8	10	9.0	6.2
MT010160	10	10	9	9.7	3	9	7	6.3	8.0
Amsterdam	9	7	7	7.7	10	10	8	9.3	8.5
Tradition	6	9	10	8.3	8	5	6	6.3	7.3

Table 8 2012 and 2011 Barley cultivar delayed germination (≥ 144 h) at 10° C incubation temperature.
Exp: FD123670 Central Agricultural Research Center. Moccasin, Montana

Cultivar	2012 Moccasin %	2012 Denton %	2012 Geraldine %	2012 Average %	2011 Moccasin %	2011 Denton %	2011 Mocc-Forage %	2011 Average %	2 yr 6 loc average %
Geraldine	46.8	4.0	9.3	20.0	6.1	1.5	0.7	2.8	11.4
Gallatin	35.1	2.7	4.7	14.2	2.9	2.0	0.0	1.6	7.9
Hockett	16.7	18.2	5.4	13.4	2.4	2.1	0.3	1.6	7.5
Haxby	17.1	3.4	14.7	11.7	7.0	1.5	1.5	3.3	7.5
Harrington	11.6	9.3	2.8	7.9	4.4	2.8	0.4	2.5	5.2
Metcalfe	14.8	4.7	2.0	7.2	1.6	2.2	0.7	1.5	4.3
Conrad	12.2	2.0	0.0	4.7	3.2	2.9	0.4	2.2	3.5
Amsterdam	4.7	2.7	5.4	4.3	0.7	0.0	0.0	0.2	2.2
MT010160	3.4	0.7	1.3	1.8	5.2	1.8	0.0	2.3	2.1
Tradition	3.4	2.1	0.7	2.0	0.4	2.0	0.4	0.9	1.5
mean	13.5	4.1	4.5	7.4	4.9	2.1	0.6	2.5	4.9

Table 9 2012 and 2011 Barley cultivar delayed germination (≥ 144 h) at 10° C incubation temperature.
Exp: FD123670 Central Agricultural Research Center. Moccasin, Montana

Cultivar	2012 Moccasin rank	2012 Denton rank	2012 Geraldine rank	2012 Average rank	2011 Moccasin rank	2011 Denton rank	2011 Mocc-Forage rank	2011 Average rank	2 yr 6 loc average rank
Haxby	3	5	1	3.0	1	8	1	3.3	3.2
Geraldine	1	4	2	2.3	2	8	2	4.0	3.2
Harrington	7	2	6	5.0	4	2	5	3.7	4.3
Hockett	4	1	3	2.7	7	4	7	6.0	4.3
Metcalfe	5	3	7	5.0	8	3	2	4.3	4.7
Gallatin	2	6	5	4.3	6	5	9	6.7	5.5
Conrad	6	9	10	8.3	5	1	5	3.7	6.0
Tradition	9	8	9	8.7	10	6	5	7.0	7.8
MT010160	10	10	8	9.3	3	7	9	6.3	7.8
Amsterdam	8	7	4	6.3	9	10	9	9.3	7.8

Table 10 2012 Fall germination of **spring wheat** cultivars grown in 2012 on NTCC near **Moccasin**, MT.
 Exp: FD129970 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	24h					mold/rot	dormant	192	total germinated seeds				
	/Count hr:	96	120	144	168				192	96	120	144	168
	#	#	#	#	#	#	#	sum	%	%	%	%	%
Mott	0	0	34	13	1	1.0	0.0	48.7	0.0	0.0	68.7	94.7	97.3
Volt	0	1	34	10	5	1.0	0.0	49.0	0.0	1.3	69.3	88.7	98.0
Kuntz	0	3	37	8	1	0.7	0.0	49.3	0.0	6.0	80.7	96.7	98.7
Jedd	0	5	25	14	3	3.0	0.0	47.0	0.0	9.3	60.0	88.7	94.0
SY Tyra	0	8	28	11	3	1.0	0.0	49.3	0.0	16.0	72.0	93.3	98.7
MT1053	0	8	18	15	5	3.0	0.0	46.7	0.7	16.7	52.7	83.3	93.3
AP604CL	0	8	29	10	2	0.7	0.0	49.0	0.0	16.7	74.7	94.7	98.0
Oneal	0	8	33	6	0	2.3	0.0	47.7	0.0	16.7	82.0	94.7	95.3
MT1008	0	10	31	5	4	1.0	0.0	49.7	0.0	19.3	81.3	92.0	99.3
WB Gunnison	0	11	32	2	2	2.3	0.0	47.7	0.0	22.7	86.0	90.7	95.3
IMICHT79	0	12	35	2	1	1.0	0.0	49.0	0.0	23.3	93.3	96.7	98.0
Hank	0	14	29	3	2	2.7	0.0	47.7	0.0	27.3	84.7	91.3	95.3
Outlook	0	14	31	4	1	1.0	0.3	49.0	0.0	27.3	88.7	96.0	98.0
Vida	0	14	16	12	6	2.3	0.0	48.0	0.0	28.0	60.7	84.0	96.0
McNeal	0	14	30	2	1	2.3	0.0	47.7	0.0	28.7	88.7	93.3	95.3
Choteau	0	15	31	3	1	0.0	0.0	50.0	0.0	30.0	91.3	98.0	100.0
Reeder	1	17	23	7	2	0.7	0.0	49.0	1.3	34.7	80.0	93.3	98.0
Duclair	0	19	23	2	2	4.0	0.0	45.7	0.0	37.3	84.0	87.3	91.3
Fortuna	1	19	24	1	1	3.0	0.0	46.7	1.3	40.0	88.7	91.3	93.3
Corbin	3	29	13	1	0	2.0	0.7	46.3	6.0	63.3	89.3	92.0	92.7
Mean	0.23	11.38	27.80	6.60	2.13	1.75	0.50	48.15	0.47	23.23	78.83	92.03	96.30
P-value	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.05	0.00	0.00	0.00	0.00	0.05
CV1	302.8	52.9	24.3	66.4	74.1	71.0	360.3	3.2	302.8	53.4	12.2	4.5	3.2
LSD(0.05)	1.17	9.95	11.14	7.24	2.61	2.05	0.30	ns	2.34	20.50	15.94	6.77	ns

Placed in incubator: 02 Nov 2012 at 10°C (50°F)

Data File: SPWNT12G.

Table 11 2012 Fall germination of **spring wheat** cultivars grown in 2012 on NTCC near **Denton, MT**.
 Exp: FD129971 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	24h					total germinated seeds							
	/Count hr:	96h	120h	144h	168h	288h	mold/rot	dormant	192htg	96htg	120htg	144htg	168htg
	#	#	#	#	#	#	#	sum	%	%	%	%	%
Volt	0	1	26	19	3	1.0	0.0	49.0	0.0	2.7	54.7	92.0	98.0
Jedd	0	3	24	21	2	1.0	0.0	49.3	0.0	6.0	53.3	95.3	98.7
Mott	0	3	36	8	2	0.7	0.0	49.7	0.7	7.3	79.3	96.0	99.3
McNeal	0	5	26	16	1	2.0	0.0	48.0	0.0	10.0	61.3	93.3	96.0
Oneal	0	7	30	11	1	0.7	0.0	49.3	0.7	14.7	74.0	96.0	98.7
Outlook	0	9	32	6	2	1.3	0.0	48.7	0.0	17.3	82.0	94.0	97.3
AP604CL	0	10	24	12	2	1.3	0.0	48.7	0.0	20.7	69.3	93.3	97.3
WB Gunnison	1	10	30	6	2	1.3	0.0	49.0	1.3	20.7	81.3	93.3	98.0
SY Tyra	2	9	23	16	2	0.0	0.3	51.3	3.3	22.0	67.3	98.7	102.7
Kuntz	1	11	31	5	1	1.0	0.0	49.0	1.3	22.7	84.7	95.3	98.0
IMICHT79	0	14	30	4	1	1.3	0.3	48.3	0.0	28.0	87.3	95.3	96.7
Vida	1	15	13	15	4	2.3	0.0	47.7	1.3	32.0	58.0	88.0	95.3
Reeder	0	16	17	11	5	1.0	0.0	49.3	0.0	32.7	66.0	88.7	98.7
MT1053	3	17	13	12	4	1.3	0.0	49.0	6.7	40.7	66.7	90.7	98.0
Choteau	1	19	24	4	1	1.7	0.0	48.3	2.0	40.7	88.0	95.3	96.7
Fortuna	0	22	17	7	2	1.0	0.0	49.0	0.7	45.3	79.3	94.0	98.0
Duclair	0	23	20	4	2	2.0	0.0	48.0	0.0	45.3	84.7	92.0	96.0
MT1008	1	24	19	3	2	0.7	0.0	47.7	1.3	48.7	86.7	92.0	95.3
Hank	1	23	16	4	3	2.3	0.0	48.0	2.7	49.3	81.3	90.0	96.0
Corbin	4	28	12	3	2	0.3	0.3	49.0	8.7	64.0	88.7	94.7	98.0
Mean	0.77	13.50	23.08	9.35	2.12	1.22	0.50	48.82	1.53	28.53	74.70	93.40	97.63
P-value	0.01	0.00	0.00	0.00	0.07	0.73	0.48	0.61	0.01	0.00	0.00	0.12	0.61
CV1	169.7	40.2	24.3	52.3	66.2	101.2	423.0	3.1	169.7	40.8	15.0	4.0	3.1
LSD(0.05)	2.15	8.96	9.26	8.08	ns	ns	ns	ns	4.30	19.26	18.56	ns	ns

Placed in incubator: 02 Nov 2012 at 10°C (50°F)

Data File: SPWDNTN2.

Table 12 2012 Fall germination of **spring wheat** cultivars grown in 2012 on NTCC near **Geraldine**, MT.
Exp: FD129972 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	24h					mold/rot	dormant	192htg	total germinated seeds				
	/Count hr:	96h	120h	144h	168h				288h	96htg	120htg	144htg	168htg
	#	#	#	#	#	#	#	sum	%	%	%	%	%
Volt	0	5	37	8	1	0.7	0.0	50.0	0.0	9.3	82.7	98.7	100
Jedd	0	10	22	12	2	2.0	0.0	46.3	0.0	20.0	64.7	88.7	92.7
MT1053	4	8	16	15	4	2.0	0.0	48.0	8.0	24.0	56.7	87.3	96.0
SY Tyra	1	11	29	8	1	0.3	0.0	49.7	2.7	24.0	82.0	98.0	99.3
Mott	1	11	34	2	1	1.0	0.0	49.0	2.7	24.7	92.0	96.7	98.0
Oneal	0	13	30	3	1	1.3	0.0	47.3	0.0	26.7	86.7	92.7	94.7
McNeal	0	14	27	7	1	1.3	0.0	48.7	0.0	27.3	82.0	95.3	97.3
AP604CL	1	14	26	9	2	0.3	0.0	50.0	1.3	28.7	80.7	98.0	100
Outlook	2	13	25	9	1	1.3	0.0	49.3	3.3	28.7	79.3	96.7	98.7
IMICHT79	0	16	31	2	1	0.7	0.0	50.0	0.0	32.0	93.3	98.0	100
Kuntz	2	15	29	2	1	0.7	0.0	48.3	3.3	32.7	90.0	94.0	96.7
WB Gunnison	0	17	28	1	1	2.0	0.0	47.3	0.0	34.7	90.0	92.7	94.7
MT1008	3	20	25	1	0	1.3	0.0	48.7	5.3	45.3	94.7	96.7	97.3
Vida	2	21	14	11	2	2.3	0.0	49.0	4.7	46.0	73.3	94.7	98.0
Reeder	2	24	16	6	1	0.0	0.0	49.3	4.7	52.7	84.7	96.0	98.7
Duclair	4	24	15	4	8	2.3	0.0	50.0	8.7	56.7	86.0	93.3	100.0
Hank	2	27	13	3	2	1.7	0.0	46.7	4.7	58.0	84.7	90.0	93.3
Choteau	4	27	15	2	0	1.7	0.0	48.7	8.7	62.0	92.7	96.7	97.3
Fortuna	3	32	11	2	0	1.3	0.0	48.3	6.0	69.3	92.0	96.7	96.7
Corbin	12	29	5	3	1	1.3	0.0	50.0	24.0	82.7	93.3	100.0	100
Mean	2.2	17.4	22.4	5.48	1.53	1.283	0	49.05	4.4	39.27	84.07	95.03	98.1
P-value	0.00	0.00	0.00	0.02	0.60	0.62	0.00	0.25	0.00	0.00	0.00	0.06	0.25
CV1	116.4	32.9	23.6	88.0	202.9	97.8	0.0	5.5	116.4	28.8	12.1	4.6	5.5
LSD(0.05)	4.23	9.48	8.73	7.98	ns	ns	0.00	ns	8.46	18.70	16.77	ns	ns

Initiation Date: 02 N Temperature: 10° C (50°F)

Data File:

SPWGRLD2.

Table 13 2012 Fall germination of **spring wheat** cultivars grown in 2012 on NTCC near **Ft. Benton, MT**.
 Exp: FD129976 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	24h					mold/rot	dormant	192htg	total germinated seeds				
	/Count hr:	96h	120h	144h	168h				192h	96htg	120htg	144htg	168htg
	#	#	#	#	#	#	#	sum	%	%	%	%	%
Volt	0	3	39	2	4	1.3	0.0	48.7	0.7	6.0	84.7	88.7	97.3
Jedd	0	11	33	1	2	1.7	1.3	46.7	0.0	22.7	88.0	89.3	93.3
Oneal	0	13	33	0	2	1.3	0.0	48.7	0.0	26.0	92.7	93.3	97.3
AP604CL	0	16	30	1	2	0.7	0.0	49.3	0.7	32.7	92.0	94.0	98.7
Mott	0	18	30	0	1	0.3	0.0	49.3	0.0	36.7	96.7	96.7	98.7
Outlook	0	19	28	1	1	0.3	0.0	49.7	0.0	38.7	94.7	96.7	99.3
SY Tyra	0	22	25	0	1	1.3	0.0	48.7	0.0	44.7	94.7	94.7	97.3
Kuntz	1	24	19	0	4	1.7	0.7	47.7	1.3	48.7	87.3	87.3	95.3
WB Gunnison	1	23	20	0	3	2.7	0.0	47.3	2.7	48.7	88.7	88.7	94.7
IMICHT79	1	24	22	1	1	1.7	0.0	48.3	1.3	50.0	93.3	94.7	96.7
Reeder	0	26	21	0	3	0.3	0.0	49.7	0.0	52.0	93.3	93.3	99.3
Vida	4	23	19	0	3	1.7	0.3	48.0	7.3	52.7	90.0	90.0	96.0
McNeal	0	27	19	0	2	0.3	1.0	48.7	0.0	54.7	92.0	92.7	97.3
Fortuna	0	29	18	0	2	0.3	0.0	49.7	0.7	58.7	94.7	94.7	99.3
Choteau	1	29	17	0	2	1.7	0.0	48.3	1.3	59.3	93.3	93.3	96.7
Duclair	0	30	14	1	3	1.7	0.7	47.7	0.7	60.0	88.7	90.0	95.3
Hank	1	29	15	0	2	2.3	0.0	47.7	2.7	61.3	92.0	92.0	95.3
MT1053	6	26	13	0	4	1.0	0.3	48.7	12.0	63.3	90.0	90.0	97.3
Corbin	3	32	11	0	3	0.3	0.7	49.0	6.0	70.7	92.0	92.0	98.0
MT1008	3	33	8	0	3	1.3	0.7	48.0	6.0	72.7	89.3	89.3	96.0
Mean	1.08	22.92	21.70	0.33	2.45	1.20	0.28	48.48	2.17	48.00	91.40	92.07	96.97
P-value	0.00	0.00	0.00	0.18	0.37	0.12	0.72	0.02	0.00	0.00	0.03	0.06	0.02
CV1	113.1	21.8	22.5	232.4	64.6	82.9	283.0	2.0	113.1	22.4	4.0	3.9	2.0
LSD(0.05)	2.03	8.24	8.07	1.28	2.62	1.64	1.33	1.63	4.05	17.77	6.01	5.89	3.27

Initiation Date: 15 Nov 2012

Temperature: 10° C (5 Data File: SPRWFTB2.

Table 14 Two year spring wheat cultivar post harvest early germinating seed counts.
Exp1299drm Central Agricultural Research Center. Moccasin, Montana

Exp: FD123875 Cultivar /Count hr:	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location
	Moccasin 120 h	Denton 120 h	Geraldine 120 h	FtBntn 120 h	Average	Moccasin 96 h	Denton 96 h	Geraldine 96 h	Average	2 year average
	%	%	%	%	%	%	%	%	%	%
Volt	1.3	2.7	9.3	6.0	4.8	5.5	10.1	6.0	7.2	5.8
Jedd	9.3	6.0	20.0	22.7	14.5	11.4	13.9	13.8	13.0	13.9
Oneal	16.7	14.7	26.7	26.0	21.0	6.7	10.8	15.2	10.9	16.7
Mott	0.0	7.3	24.7	36.7	17.2	10.7	39.1	14.7	21.5	19.0
McNeal	28.7	10.0	27.3	54.7	30.2	14.8	3.3	6.7	8.3	20.8
AP604CL	16.7	20.7	28.7	32.7	24.7	11.4	25.3	14.9	17.2	21.5
Outlook	27.3	17.3	28.7	38.7	28.0	22.8	13.8	4.1	13.6	21.8
SY Tyra	16.0	22.0	24.0	44.7	26.7	6.7	30.9	17.3	18.3	23.1
Kuntz	6.0	22.7	32.7	48.7	27.5	6.7	23.4	32.3	20.8	24.6
WB Gunnison	22.7	20.7	34.7	48.7	31.7	8.9	33.5	18.5	20.3	26.8
IMICHT79	23.3	28.0	32.0	50.0	33.3	6.0	31.0	23.5	20.2	27.7
Choteau	30.0	40.7	62.0	59.3	48.0	9.5	24.3	11.6	15.1	33.9
Reeder	34.7	32.7	52.7	52.0	43.0	43.3	20.9	7.3	23.9	34.8
Vida	28.0	32.0	46.0	52.7	39.7	25.6	48.4	23.3	32.4	36.6
Fortuna	40.0	45.3	69.3	58.7	53.3	18.8	17.3	16.7	17.6	38.0
Hank	27.3	49.3	58.0	61.3	49.0	34.3	36.0	23.9	31.4	41.5
Duclair	37.3	45.3	56.7	60.0	49.8	14.8	70.5	25.5	36.9	44.3
Corbin	63.3	64.0	82.7	70.7	70.2	30.0	30.3	51.1	37.1	56.0
Mean	23.2	28.5	39.3	48.0	34.8	16.45	26.2	18.1	20.2	28.5

Incubation temperature: 2012 - 10C , 2011 - 15C

Table 15 Two year spring wheat cultivar post harvest early germinating seed counts rank.
Exp1299drm Central Agricultural Research Center. Moccasin, Montana

Exp: FD123875 Cultivar /Count hr:	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location
	Moccasin 120 h	Denton 120 h	Geraldine 120 h	FtBntn 120 h	Average	Moccasin 96 h	Denton 96 h	Geraldine 96 h	Average	2 year average
	120htg	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
Volt	2	1	1	1	1.3	1	2	2	1.7	1.4
Jedd	4	2	2	2	2.5	9	5	6	6.7	4.3
Oneal	6	5	6	3	5.0	4	3	9	5.3	5.1
Mott	1	3	5	5	3.5	8	16	7	10.3	6.4
Outlook	12	6	8	6	8.0	14	4	1	6.3	7.3
SY Tyra	5	9	3	7	6.0	4	12	11	9.0	7.3
AP604CL	7	7	9	4	6.8	9	10	8	9.0	7.7
McNeal	15	4	7	13	9.8	11	1	3	5.0	7.7
Kuntz	3	10	11	8	8.0	4	8	17	9.7	8.7
IMICHT79	11	11	10	10	10.5	2	13	14	9.7	10.1
WB Gunnison	10	8	12	9	9.8	6	14	12	10.7	10.1
Choteau	16	14	18	15	15.8	7	9	5	7.0	12.0
Reeder	17	13	15	11	14.0	18	7	4	9.7	12.1
Fortuna	19	16	19	14	17.0	13	6	10	9.7	13.9
Vida	14	12	14	12	13.0	15	17	13	15.0	13.9
Duclair	18	17	16	16	16.8	11	18	16	15.0	16.0
Hank	13	19	17	17	16.5	17	15	15	15.7	16.1
Corbin	20	20	20	19	19.8	16	11	18	15.0	17.7

Incubation temperature: 2012 - 10C , 2011 - 15C

Least Desired Rank: 1.0 Desired Rank= 18 (quicker to germinate)

Table 16 Two year spring wheat cultivar post harvest delayed germinating seed (>168 hrs) counts.
Exp1299drm Central Agricultural Research Center. Moccasin, Montana

	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location
Exp: FD123875	Moccasin	Denton	Geraldine	FtBntn	Average	Moccasin	Denton	Geraldine	Average	2 year
Cultivar /Count hr:	> 168	> 168	> 168	> 168	> 168	> 168	> 168	> 168	> 168	Average
	%	%	%	%	%	%	%	%	%	%
Jedd	39.2	45.9	30.2	5.7	30.3	33.6	39.6	21.4	31.5	30.8
Vida	44.2	39.2	25.2	6.3	28.7	6.0	14.8	50.0	23.6	26.5
Volt	34.4	44.2	17.3	13.0	27.2	34.7	27.5	9.4	23.9	25.8
McNeal	9.5	36.1	15.8	5.5	16.7	47.0	29.3	23.6	33.3	23.8
Oneal	19.0	25.0	8.5	4.8	14.3	30.9	56.1	18.6	35.2	23.3
SY Tyra	33.1	34.4	17.4	2.7	21.9	39.9	17.6	8.0	21.8	21.9
Reeder	28.8	33.1	14.2	6.0	20.5	12.0	32.2	24.7	22.9	21.6
AP604CL	32.0	28.8	20.4	6.8	22.0	20.1	27.4	6.8	18.1	20.3
Outlook	15.8	15.8	19.6	4.7	13.9	24.2	21.9	21.1	22.4	17.6
WB Gunnison	15.3	17.0	4.9	6.3	10.9	34.9	15.2	6.2	18.8	14.3
Mott	36.1	20.1	6.1	2.0	16.1	20.7	6.8	6.7	11.4	14.1
Kuntz	20.1	13.6	6.9	8.4	12.3	8.7	26.9	9.4	15.0	13.4
Duclair	11.8	11.8	20.9	7.0	12.9	23.8	6.5	9.4	13.2	13.0
Fortuna	9.1	19.0	4.8	4.7	9.4	19.6	12.4	9.0	13.7	11.2
IMICHT79	9.7	9.7	6.7	3.4	7.4	15.4	21.9	6.7	14.7	10.5
Hank	17.0	15.3	9.3	3.5	11.3	8.1	8.0	10.9	9.0	10.3
Choteau	13.6	9.0	4.8	3.4	7.7	18.2	2.8	4.8	8.6	8.1
Corbin	9.0	9.5	9.1	6.1	8.4	2.0	6.8	2.1	3.6	6.4
Mean	18.1	23.5	14.3	5.3	15.3	21.0	18.3	13.9	17.7	16.3

Incubation temperature: 2012 - 10C , 2011 - 15C

Table 17 Two year spring wheat cultivar post harvest delayed germinating seed (>168 hrs) rank.
Exp1299drm Central Agricultural Research Center. Moccasin, Montana

	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location
Exp: FD123875	Moccasin	Denton	Geraldine	Ft.Benton	Average	Moccasin	Denton	Geraldine	Average	2 year
Cultivar /Count hr:	> 168	> 168	> 168	> 168	> 168	> 168	> 168	> 168	> 168	Average
	rank	rank	rank	rank	rank	rank	rank	rank	rank	rank
Jedd	3	1	2	7	3.3	5	2	4	3.7	3.4
Volt	5	2	8	1	4.0	4	5	9	6.0	4.9
Vida	2	3	3	7	3.8	17	12	1	10.0	6.4
McNeal	17	5	9	7	9.5	1	4	3	2.7	6.6
Reeder	9	6	10	7	8.0	14	3	2	6.3	7.3
AP604CL	7	8	6	7	7.0	10	6	13	9.7	8.1
SY Tyra	6	4	8	19	9.3	2	10	12	8.0	8.7
Oneal	11	9	13	16	12.3	6	1	6	4.3	8.9
Outlook	14	12	6	16	12.0	7	8	5	6.7	9.7
Kuntz	9	15	15	3	10.5	15	7	9	10.3	10.4
Duclair	15	16	4	7	10.5	8	17	9	11.3	10.9
WB Gunnison	14	12	19	7	13.0	3	11	16	10.0	11.7
Mott	5	10	15	20	12.5	9	15	14	12.7	12.6
Hank	14	15	13	16	14.5	16	14	7	12.3	13.6
Fortuna	19	11	19	16	16.3	11	13	11	11.7	14.3
IMICHT79	19	18	15	16	17.0	13	9	14	12.0	14.9
Corbin	19	18	11	7	13.8	18	16	18	17.3	15.3
Choteau	15	19	19	16	17.3	12	18	17	15.7	16.6

Incubation temperature: 2012 - 10C , 2011 - 15C

Least Desired Rank: 1.0 Desired Rank= 18

Table 18 2012 Fall germination/dormancy of winter wheat grown near NTCC Moccasin, MT.
 Exp: FD12387 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	germinated seeds per 24 h interval							total germinated seeds						
	\Count hr:	96	120	144	168	192	mold/rot	dormant	192	96	120	144	168	192
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%
Jerry	0	0	16	21	11	2.0	0.0	48.3	0.0	0.0	32.0	74.0	96.7	
Ledger	0	0	20	27	2	0.7	0.0	49.0	0.0	0.0	40.0	94.7	98.0	
Rampart	0	0	25	20	4	1.0	0.0	49.0	0.0	0.7	50.0	90.7	98.0	
MT08172	0	1	20	27	3	0.3	0.0	50.0	0.0	1.3	41.3	94.7	100.0	
CDC Falcon	1	0	29	13	1	0.7	0.0	45.3	2.0	2.7	61.3	88.0	90.7	
MTS0832	0	2	20	26	2	0.3	0.0	49.7	0.0	4.0	44.0	96.0	99.3	
MTS0808	0	2	25	22	0	1.0	0.0	49.0	0.0	4.7	54.0	97.3	98.0	
Accipiter	0	2	29	10	5	2.7	0.0	47.3	0.7	4.7	63.3	84.0	94.7	
Norris CL	0	3	22	22	1	2.3	0.0	48.0	0.0	5.3	49.3	93.3	96.0	
AP503 CL	0	3	26	16	4	1.0	0.0	49.0	0.0	6.7	58.7	90.0	98.0	
Pryor	0	3	28	17	1	1.0	0.0	49.0	0.0	6.7	62.7	96.0	98.0	
Jagalene	0	4	14	28	3	1.7	0.0	48.3	0.0	8.0	35.3	90.7	96.7	
Bearpaw	0	5	22	20	1	2.3	0.0	48.0	0.0	10.7	54.0	94.0	96.0	
Decade	0	7	21	17	3	2.0	0.0	47.7	0.0	13.3	56.0	90.0	95.3	
MTCL1077	0	7	20	21	2	0.3	0.0	49.7	0.0	14.0	53.3	96.0	99.3	
Yellowstone	2	6	27	10	2	1.7	0.0	48.0	3.3	16.0	70.7	91.3	96.0	
WB-Quake	0	9	23	16	2	0.7	0.0	49.3	0.0	17.3	63.3	95.3	98.7	
Judee	0	12	21	13	2	2.7	0.0	47.3	0.7	24.0	65.3	91.3	94.7	
Genou	2	14	26	4	2	0.3	0.0	49.3	4.7	33.3	86.0	94.7	98.7	
Overland	0	30	12	7	0	1.3	0.0	48.7	0.0	60.0	83.3	96.7	97.3	
Mean	0.3	5.6	22.3	17.9	2.5	1.30	0.00	48.50	0.57	11.67	56.20	91.93	97.00	
P-value	0.48	0.00	0.97	0.60	0.22	0.01	0.00	0.18	0.48	0.00	0.58	0.15	0.18	
CV1	392.7	73.9	55.7	69.4	143.3	68.8	0.0	3.2	392.7	66.6	46.1	8.4	3.2	
LSD(0.05)	ns	6.78	ns	ns	ns	1.48	0.00	ns	ns	12.85	ns	ns	ns	

Initiation Date: 5-Oct-12

Temperature: 10°C (50°F)

Data File: WWNTRC12.

Table 19 2012 Fall germination/dormancy of winter wheat grown near **Geraldine MT.**
 Exp: FD12387 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	germinated seeds per 24 h interval							total germinated seeds						
	\Count hr:	96	120	144	168	192	mold/rot	dormant	192	96	120	144	168	192
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%
MTS0832	0	3	35	7	4	1	0.3	49.0	49.0	0.0	5.3	75.3	90.0	98.0
Norris CL	0	4	36	6	2	1	0.0	48.7	48.7	0.7	8.7	81.3	93.3	97.3
MTS0808	0	6	35	7	1	0	0.0	50.0	50.0	0.0	12.7	83.3	97.3	100.0
Pryor	1	6	33	7	1	1	0.0	48.7	48.7	2.0	14.7	81.3	96.0	97.3
CDC Falcon	0	8	38	2	1	1	0.0	48.7	48.7	0.0	16.0	91.3	95.3	97.3
Jerry	2	8	30	8	1	1	0.0	49.3	49.3	3.3	18.7	79.3	96.0	98.7
Yellowstone	2	12	25	8	2	1	0.0	48.7	48.7	4.7	29.3	78.7	94.0	97.3
Rampart	4	11	30	4	1	1	0.0	49.3	49.3	7.3	30.0	89.3	97.3	98.7
Decade	1	15	29	3	1	1	0.0	49.3	49.3	2.0	32.7	91.3	96.7	98.7
Accipiter	0	17	26	4	1	1	0.0	48.7	48.7	0.7	35.3	87.3	94.7	97.3
Ledger	4	15	27	2	2	0	0.0	49.7	49.7	8.7	38.0	92.7	96.0	99.3
Jagalene	0	20	26	2	2	1	0.0	49.7	49.7	0.0	39.3	92.0	95.3	99.3
MT08172	0	21	18	7	3	0	0.0	49.7	49.7	0.0	42.7	78.7	93.3	99.3
MTCL1077	0	26	15	5	3	1	0.0	49.3	49.3	0.7	52.0	82.0	92.7	98.7
Genou	6	27	13	2	0	1	0.0	48.0	48.0	11.3	64.7	91.3	95.3	96.0
Judee	9	25	14	0	2	0	0.0	49.7	49.7	18.0	68.0	95.3	96.0	99.3
WB-Quake	1	33	12	2	2	1	0.0	49.3	49.3	2.7	68.0	92.0	95.3	98.7
Bearpaw	4	34	10	1	1	0	0.0	50.0	50.0	8.0	76.0	95.3	97.3	100.0
AP503 CL	10	31	7	0	1	1	0.0	49.3	49.3	20.0	82.0	95.3	96.0	98.7
Overland	3	42	4	0	1	0	0.3	49.7	49.7	6.0	89.3	98.0	98.0	99.3
Mean	2.40	18.18	23.20	3.87	1.58	0.63	0.33	49.23	49.23	4.80	41.17	87.57	95.30	98.47
P-value	0.00	0.00	0.00	0.16	0.17	0.07	0.48	0.23	0.23	0.00	0.00	0.15	0.44	0.23
CV1	123.7	27.8	24.2	107.0	82.1	96.9	533.1	1.6	1.6	123.7	28.7	11.2	3.4	1.6
LSD(0.05)	4.91	8.37	9.26	ns	ns	ns	ns	ns	ns	9.81	19.51	ns	ns	ns

Initiation Date: 19-Oct-12 Temperature: 10° C (50°F)

Data File: WWGRDL12.

Table 20 2012 Fall germination/dormancy of winter wheat grown near **Winifred MT**.
 Exp: FD12387 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	germinated seeds per 24 h interval							total germinated seeds						
	\Count hr:	96	120	144	168	192	mold/rot	dormant	192	96	120	144	168	192
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%
Jerry	0	2	29	15	2	2.0	0.0	0.0	48.0	0.0	4.0	62.7	92.0	96.0
Accipiter	0	5	37	5	1	1.7	0.0	0.0	48.3	0.0	10.7	84.7	94.0	96.7
Decade	0	6	33	3	1	1.3	0.0	0.0	44.0	0.0	12.7	78.7	85.3	88.0
MTS0832	0	14	28	4	3	0.7	0.0	0.0	49.3	0.0	28.0	84.7	93.3	98.7
Norris CL	0	14	30	3	2	0.7	0.0	0.0	48.7	0.7	28.0	88.0	93.3	97.3
Rampart	0	15	27	7	1	0.7	0.0	0.0	49.3	0.0	30.0	83.3	96.7	98.7
Ledger	0	17	26	6	0	1.0	0.0	0.0	49.0	0.0	33.3	86.0	97.3	98.0
Jagalene	0	22	24	2	1	0.7	0.0	0.0	49.3	0.0	44.7	93.3	96.7	98.7
Pryor	0	22	24	2	1	1.0	0.0	0.0	49.0	0.0	44.7	93.3	96.7	98.0
MTS0808	0	24	22	2	1	0.3	0.0	0.0	48.3	0.0	47.3	92.0	95.3	96.7
Yellowstone	2	23	16	6	2	0.7	0.0	0.0	49.0	3.3	50.0	81.3	94.0	98.0
MTCL1077	1	25	10	4	8	1.0	0.0	0.0	48.3	2.7	53.3	72.7	81.3	96.7
CDC Falcon	3	25	19	2	1	0.0	0.0	0.0	50.0	6.7	57.3	94.7	98.7	100.0
Judee	2	30	15	2	0	0.7	0.0	0.0	49.3	4.0	64.0	94.7	98.0	98.7
MT08172	1	33	11	1	3	0.7	0.0	0.0	49.3	1.3	68.0	90.0	92.0	98.7
Genou	2	34	12	1	0	0.3	0.0	0.0	49.3	4.0	71.3	96.0	98.0	98.7
Bearpaw	2	34	10	2	2	0.3	0.0	0.0	49.7	4.7	72.0	92.7	96.0	99.3
WB-Quake	0	38	9	1	1	1.0	0.0	0.0	49.0	0.7	76.7	94.0	96.0	98.0
AP503 CL	4	36	5	3	2	0.3	0.3	0.0	49.3	7.3	79.3	88.7	95.3	98.7
Overland	1	41	6	1	0	0.7	0.3	0.0	49.0	2.7	84.7	96.0	97.3	98.0
Mean	0.95	23.05	19.68	3.50	1.71	0.78	0.33	0.00	48.78	1.90	48.00	87.37	94.37	97.57
P-value	0.22	0.00	0.00	0.00	0.40	0.79	0.56	0.43	0.43	0.22	0.00	0.00	0.28	0.43
CV1	188.4	26.1	24.1	74.9	171.0	124.8	554.9	4.2	4.2	188.4	25.9	9.9	7.1	4.2
LSD(0.05)	ns	9.92	7.83	4.34	ns	ns	ns	ns	ns	ns	20.56	14.32	ns	ns

Initiation Date: 19-Oct-12 Temperature: 10° C (50°F)

Data File: WWWNF12.D

Table 21 2012 Fall germination/dormancy of winter wheat grown near **Belt** MT.
 Exp: FD12387 Central Agricultural Research Center. Moccasin, Montana.

Cultivar	germinated seeds per 24 h interval							total germinated seeds						
	\Count hr:	96	120	144	168	192	mold/rot	dormant	192	96	120	144	168	192
	#	#	#	#	#	#	#	#	sum	%	%	%	%	%
MTS0832	0	5	35	9	1	0.3	0.0	49.7	49.7	0.0	9.3	78.7	97.3	99.3
Jerry	1	7	25	13	4	0.7	0.0	49.0	49.0	1.3	15.3	64.7	90.7	98.0
CDC Falcon	1	16	28	3	1	0.7	0.3	49.0	49.0	2.0	34.0	90.7	96.7	98.0
Ledger	0	18	18	11	3	0.3	0.0	49.7	49.7	0.0	35.3	72.0	94.0	99.3
Norris CL	0	21	22	4	2	1.7	0.0	48.7	48.7	0.0	42.0	85.3	94.0	97.3
Accipiter	1	21	23	4	1	0.0	0.0	50.0	50.0	2.7	44.0	89.3	98.0	100.0
Yellowstone	1	21	17	7	3	0.0	0.3	49.7	49.7	2.0	44.7	79.3	93.3	99.3
MTS0808	2	23	20	3	1	1.0	0.0	49.0	49.0	4.0	49.3	88.7	95.3	98.0
Decade	0	26	17	4	2	0.3	0.0	49.7	49.7	0.0	52.7	87.3	95.3	99.3
Pryor	0	27	18	4	1	0.7	0.0	49.3	49.3	0.0	53.3	88.7	96.7	98.7
MT08172	3	25	13	4	2	0.3	0.0	48.0	48.0	6.7	57.3	83.3	91.3	96.0
Rampart	2	28	16	2	1	0.3	0.0	49.7	49.7	4.7	61.3	93.3	98.0	99.3
Jagalene	1	30	13	3	2	1.7	0.3	48.3	48.3	2.7	62.4	87.9	94.0	96.7
MTCL1077	1	30	13	3	2	0.3	0.0	49.7	49.7	2.7	62.7	89.3	94.7	99.3
Judee	4	28	17	1	1	0.3	0.0	49.7	49.7	7.3	63.3	96.7	98.0	99.3
Bearpaw	3	30	11	3	2	0.7	0.0	49.3	49.3	6.0	66.7	88.7	94.7	98.7
Genou	2	33	11	2	2	0.7	0.0	49.3	49.3	3.3	69.3	91.3	94.7	98.7
AP503 CL	3	34	9	1	2	1.3	0.0	48.7	48.7	5.3	72.7	90.7	92.7	97.3
Overland	1	35	8	2	1	1.0	0.0	48.7	48.7	2.7	73.3	90.0	94.7	97.3
WB-Quake	1	38	7	2	2	0.3	0.3	49.7	49.7	2.0	77.3	92.0	96.0	99.3
Mean	1.38	24.77	17.03	4.30	1.75	0.63	0.07	49.23	49.23	2.77	52.32	86.39	95.00	98.47
P-value	0.38	0.00	0.00	0.00	0.38	0.66	0.61	0.68	0.68	0.38	0.00	0.00	0.49	0.68
CV1	136.9	17.5	32.6	72.2	77.2	144.5	379.6	2.1	2.1	136.9	17.3	8.8	3.8	2.1
LSD(0.05)	ns	7.15	9.18	5.13	ns	ns	ns	ns	ns	ns	14.94	12.56	ns	ns

Initiation Date: 19-Oct-12 Temperature: 10° C (50°F)

Data File: WWGF12.DB

Table 22 Two year winter wheat cultivar post harvest early germinating, 96 to 120 hr, seed counts.
Exp: FD1238 Central Agricultural Research Center, Moccasin, Montana

Cultivar /Count hr:	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location
	Moccasin	Geraldine	Winifred	Belt	Average	Moccasin	Denton	Geraldine	Average	2 year
	120	120	120	120	Average	96	96	96	Average	Average
	%	%	%	%	%	%	%	%	%	%
Jerry	33.1	18.7	4.0	15.3	17.8	61.5	58.2	20.2	46.6	30.1
Decade	58.7	32.7	12.7	52.7	39.2	45.3	39.9	34.7	40.0	39.5
Ledger	40.8	38.0	33.3	35.3	36.9	55.3	44.3	53.9	51.2	43.0
MTS0832	44.3	5.3	28.0	9.3	21.7	87.9	79.2	50.4	72.5	43.5
Norris CL	51.4	8.7	28.0	42.0	32.5	62.4	52.1	75.2	63.2	45.7
Rampart	51.0	30.0	30.0	61.3	43.1	52.7	43.0	73.5	56.4	48.8
MTS0808	55.1	12.7	47.3	49.3	41.1	65.5	59.4	54.8	59.9	49.2
Accipiter	66.2	35.3	10.7	44.0	39.0	90.5	67.1	35.3	64.3	49.9
Pryor	63.9	14.7	44.7	53.3	44.2	69.4	76.3	35.3	60.3	51.1
Yellowstone	70.1	29.3	50.0	44.7	48.5	77.2	38.8	75.8	63.9	55.1
Jagalene	36.6	39.3	44.7	62.4	45.7	84.6	63.1	63.5	70.4	56.3
CDC Falcon	65.4	16.0	57.3	34.0	43.2	85.3	81.1	78.7	81.7	59.7
Bearpaw	56.3	76.0	72.0	66.7	67.7	25.0	48.7	80.0	51.2	60.7
Judee	68.3	68.0	64.0	63.3	65.9	73.1	38.9	92.0	68.0	66.8
WB-Quake	64.2	68.0	76.7	77.3	71.5	82.3	57.4	44.6	61.5	67.2
Genou	82.4	64.7	71.3	69.3	71.9	77.3	78.1	41.7	65.7	69.3
AP503 CL	59.9	82.0	79.3	72.7	73.5	76.3	57.1	67.7	67.0	70.7
Mean	57.4	41.17	48.00	52.32	49.7	67.12	58.42	54.5	60.0	54.1
P-value	0.00	0.00	0.00	0.00		0.000	0	0.00		
CV1	66.61	28.7	25.9	17.3		18.8	13.61	23.1		
LSD(0.05)	12.85	19.51	20.56	14.94		20.7	13.07	20.7		

Table 23 Two year winter wheat cultivar post harvest early germinating, 96 to 120 h, seed rank.
Exp: FD1238 Central Agricultural Research Center, Moccasin, Montana

Cultivar /Count hr:	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location
	Moccasin	Geraldine	Winifred	Belt	Average	Moccasin	Denton	Geraldine	Average	2 year
	120	120	120	120	Average	96	96	96	Average	Average
	rank	rank	rank	rank	rank	rank	rank	rank	rank	rank
Jerry	1	6	1	2	3	9	13	1	8	5
Decade	14	9	3	9	9	3	3	3	3	6
Ledger	1	11	7	4	6	6	5	13	8	7
Rampart	3	8	6	12	7	5	4	19	9	8
Norris (CL)	9	2	4	5	5	10	9	20	13	8
MTS0808	8	3	10	8	7	11	14	14	13	10
MTS0832	6	1	5	1	3	21	23	11	18	10
Accipiter	7	10	2	6	6	23	19	5	16	10
Pryor	11	4	9	10	9	13	20	6	13	10
Yellowstone	16	7	11	7	10	16	1	21	13	11
CDC Falcon	5	5	13	3	7	20	24	22	22	13
Bearpaw	13	18	17	16	16	2	7	23	11	14
Jagalene	12	12	8	13	11	19	17	16	17	14
Judee	18	16	14	15	16	14	2	24	13	15
AP 503 CL2	10	19	19	18	17	15	11	17	14	16
WB-Quake	17	17	18	20	18	18	12	9	13	16
Genou	19	15	16	17	17	17	22	8	16	16

Table 24 Two year winter wheat cultivar post harvest late germinating, > 168 h, seed counts.
Exp: FD1238 Central Agricultural Research Center. Moccasin, Montana

Cultivar /Count hr:	2012	2012	2012	2012	2012	2011	2011	2011	2011	7 Location 2 year Average
	Moccasin > 168	Geraldine > 168	Winifred > 168	Belt > 168	Average > 168	Moccasin > 168	Denton > 168	Geraldine > 168	Average > 168	
	%	%	%	%	%	%	%	%	%	%
Jerry	23.4	19.6	34.7	34.0	27.9	2.0	2.0	10.7	4.9	18.1
Yellowstone	4.9	19.2	17.0	20.1	15.3	2.7	12.0	4.0	6.2	11.4
MTS0832	3.4	23.1	14.2	20.8	15.4	6.0	1.3	8.0	5.1	11.0
Accipiter	11.3	10.3	12.4	10.7	11.2	5.3	3.3	11.3	6.7	9.2
Ledger	3.4	6.7	12.2	27.5	12.5	0.7	3.3	5.3	3.1	8.5
Decade	5.6	7.4	10.6	12.1	8.9	5.3	1.3	8.7	5.1	7.3
Pryor	2.0	16.4	4.8	10.1	8.3	4.7	0.7	10.7	5.3	7.1
Norris (CL)	2.8	16.4	9.6	12.3	10.3	3.3	1.3	2.0	2.2	6.8
Rampart	7.5	9.5	15.5	6.0	9.6	3.3	3.3	1.3	2.7	6.6
MTS0808	0.7	16.7	4.8	9.5	7.9	4.7	1.3	4.7	3.6	6.1
AP 503 CL2	8.2	3.4	10.1	6.8	7.1	2.0	1.3	4.7	2.7	5.2
Bearpaw	2.1	4.7	6.7	10.1	5.9	4.7	4.0	4.0	4.2	5.2
Jagalene	6.2	7.4	5.4	9.7	7.2	4.7	0.7	2.0	2.4	5.1
WB-Quake	3.4	6.8	4.1	7.4	5.4	4.0	3.3	4.7	4.0	4.8
CDC Falcon	2.9	6.2	5.5	7.5	5.5	4.7	1.3	0.7	2.2	4.1
Judee	3.5	4.0	3.9	2.7	3.5	3.3	5.3	4.7	4.4	3.9
Genou	4.1	4.9	2.3	7.4	4.7	3.3	3.3	1.3	2.7	3.8
Mean	5.2	11.1	22.0	12.3	12.7	3.7226	2.9454	5.5272	4.0	9.0

Table 25 Two year winter wheat cultivar post harvest late germinating, >168 h, seed counts.
Exp: FD1238 Central Agricultural Research Center. Moccasin, Montana

Cultivar /Count hr:	2012	2012	2012	2012	2012	2011	2011	2011	2011	2 Y Ave. 7 Location
	Moccasin > 168	Geraldine > 168	Winifred > 168	Belt > 168	Average > 168	Moccasin > 168	Denton > 168	Geraldine > 168	Average > 168	
	rank	rank	rank	rank	rank	rank	rank	rank	rank	rank
Jerry	1	2	1	1	1.3	19	14	3	12.0	5.9
Accipiter	2	10	7	10	7.3	5	9	1	5.0	6.3
MTS0832	14	1	5	4	6.0	3	18	7	9.3	7.4
Yellowstone	8	4	4	4	5.0	17	1	17	11.7	7.9
Decade	6	12	9	6	8.3	5	18	6	9.7	8.9
Ledger	11	15	7	2	8.8	22	9	11	14.0	11.0
Rampart	4	10	4	19	9.3	14	9	21	14.7	11.6
Pryor	18	6	17	10	12.8	8	23	3	11.3	12.1
Norris CL	16	6	9	6	9.3	14	18	19	17.0	12.6
Bearpaw	17	18	13	10	14.5	8	6	17	10.3	12.7
Jagalene	5	12	13	10	10.0	8	23	19	16.7	12.9
MTS0808	20	6	17	10	13.3	8	18	14	13.3	13.3
WB-Quake	12	15	17	16	15.0	11	9	14	11.3	13.4
Judee	10	18	17	20	16.3	14	2	14	10.0	13.6
AP503 CL	3	18	9	19	12.3	19	18	14	17.0	14.3
Genou	9	18	20	16	15.8	14	9	21	14.7	15.3
CDC Falcon	15	15	13	16	14.8	8	18	23	16.3	15.4