

Winter Triticale variety release 2004.

The crop triticale was initially developed about 130 years ago with durum wheat X rye cross. The progeny of early crosses had a few desirable attributes, disease resistance and higher lysine content, along with several agronomic weaknesses. Some of the weaknesses included sterility and an associated high susceptibility to ergot, shriveled seed and an associated weak seedling, weak stem and late maturity. In spite of the array of weaknesses, some plant geneticist and agronomist persisted in their efforts to develop viable triticale. Recently, several spring triticale varieties have been developed. The development of winter types has become more prominent.

A casual assessment might conclude, "Why work on triticale? It is another cereal grain and we have more need of non-cereal crops in our annual crop rotations." This is a valid assessment. Triticale flours texture and flavors are different from wheat and barley thus has potential for markets other than those of hard red wheat and barley. Also, we have been provided access to breeding material without the cost of a breeder. A few MAES scientist have chosen to cooperate in the selection of triticale lines suited to Montana growing conditions. Early on it became apparent triticale may have good potential as a cereal forage crop. The MAES effort has been primarily focused on development of winter type triticale because there are several spring type triticale varieties available. Further, winter type annual crops are generally preferred from a time management standpoint. Many of Montana's Ag producers are both crops and livestock producers and have their peak workload in the spring.

The development of grain type winter triticale is at the stage material needs to be gotten into the hands of growers and innovators so they have material with which to develop products and markets. Because the specific markets are not developed the grain quality standards are unknown. Thus the selections being recommended for release as grain varieties were determined solely on agronomic performance. A crude preliminary baking test reviewed a wide range of flavors amongst the material being selected by MAES. Also, those being recommended for release as forage types are done so on forage production performance alone.

At the 2003 variety release meeting, a request was made for a determination if winter triticale would be classified as a specialty crop or would be considered a standard crop requiring 16 location years of data. This submission will be done under the assumption that it is specialty crop. No single triticale variety will be widely used because no single variety is widely adapted. Further, current grain markets will most likely be of the niche market class.

Winter Triticale variety release Motion 1:

Move winter triticale line **91T113-C12-5 (ID code KT 84 and TR01)** be released, by the Montana Agricultural Experiment Station, for grain production without PVP status. It is recommended that this variety be grown in environments with moderate winters, as its hardiness is similar or less than Rampart winter wheat. Foundation seed would be available the fall of 2005. 91T113-C12-5 had the greatest winter survival of several southern type winter triticale lines selected at Bozeman and evaluated in 1997 at Moccasin. It rank second in grain yield producing 4120 pounds per acre. It has consistently been one of the top grain producers in selection and evaluation nurseries planted at Moccasin, Huntley, and Bozeman, Montana and at Sheridan, Wyoming. This line has exhibited excellent genetic stability rarely having off-types or symptoms of out crossing and has good uniformity in plant height. It is a mid-tall line which is typically within 0 to 2 inches of the nursery mean and slightly taller than Tiber winter wheat. It does have good to excellent forage production potential, also. However, it has a bushy spike with relatively long awns that diminishes its attractiveness as cereal forage. Tables 1, 2, and 3 present yield performance summaries for the years 2003, 2002, and 2001 respectively. Table 4 presents a regression comparison of 91T113-C12-5 with evaluation nursery means and provides a projected yield relative to a nursery mean based on these past performances. Tables 5 and 5A provide some protein data. Tables 6 and 7 provide winter survival information.

Table 1 **2003 Winter triticale grain nursery multi-location mean yield.**
Exp WTG3 Montana & Wyoming Agricultural Experiment Station.

ID	Pedigree	Trt	Bozeman	Moccasin	Sheridan	Average
			lbs/a	lbs/a	lbs/a	lbs/a
K943	KT943112	21	5378	2341	4561	4093
KT119	K99SRT119	19	4917	2795	4543	4085
KT84	91T113-C12-5	4	6473	2755	2999	4076
KT0107	KT940872p8006	20	5197	2176	4756	4043
KT09	KW941531-6005	12	5793	2679	3620	4031
T35	KT941289	5	5753	2633	3478	3955
KT35	KT941256-8007	1	6055	2466	2999	3840
TR19	SR94721	18	4805	1966	4667	3813
KT991	KT991034	17	4769	2236	4366	3790
KT0111	KT941276-8004	15	5572	2382	3407	3787
WW1	Tiber	13	5101	2448	3631	3727
KT990	KT990174	11	4951	2666	3443	3687
KT3	KT941864-5002	3	5378	2466	3088	3644
KT0102	D98SRT99-3	14	5268	2025	3549	3614
KT0108	KT940874p8012	8	5557	1934	3141	3544
KT0109	KT940608p9029	9	5212	2357	2999	3523
KT0116	KT981146p9036	16	4619	2173	3461	3418
TR18	SR94719	2	5237	2073	2875	3395
KT0106	KT940608p9003	10	4812	2247	3106	3388
KT91	KT941776-5002	6	5299	2121	2744	3388
TD01	Trical 102	7	4177	1859	2957	2998
OVERALL MEAN =			5253	2323	3542	3706
CV (S/MEAN) % =			5.3	6.679	11.19	
LSD(0.05 by t)=			462	323.7	560.8	

Table 2 **2002** Multi-location grain yield performance of winter triticale.
 Exp SWTG Test locations Bozeman, Moccasin and Sheridan.

ID	Pedigree	Bozeman	Moccasin	Sheridan	Average
code		lbs/a	lbs/a	lbs/a	lbs/a
KT84	91T113-C12-5	5139	2472	1343	2985
KT25	92E005	4858	2459	1409	2909
K809	KW941531-6005	4352	2513	1151	2672
KT35	KT941256	4480	2516	1010	2669
KT32	KT941289	4437	2285	1121	2614
K940	KT943112	4465	2337	911	2571
WW	Tiber	4022	2392	1219	2544
KT119	K99SRT119	4098	2282	979	2453
KT27	KT940794	4247	2086	989	2441
K944	KT940874-8001,2,3,	4447	1932	932	2437
KT06G	99SRT6	4314	1920	977	2404
KT3	KT941864	3923	2342	880	2382
KT33	KT941776	3699	2331	997	2342
TR18	SR94719	3616	2237	962	2272
K950	KT941276-8004	3919	1969	803	2230
KT30	KT940874-8002	3576	1812	716	2035
Mean		4218	2243	1025	2495
CV		8.5	9.274	15.04	
LSD	0.05	4.28**	346.8	257	

Table 3 2001 Multi-location winter triticale variety trial grain yields.

Test locations Bozeman, Huntley, Moccasin, and Sheridan

ID	Cultivar/Line	Bozeman	Huntley	Moccasin	Sheridan	Average
		lbs/a	lbs/a	lbs/a	lbs/a	lbs/a
PI517194	Tiber (WW Check)	4804	2490	2750	1686	2932
TR18	SR 94719	5106	2260	2588	1616	2892
T34	Ugo	5280	2184	2542	1550	2889
TR01	91T113-C12-5	4593	2235	2842	1844	2879
KT3	KT941864-5002	5509	1916	2371	1676	2868
KT35	KT941256-8004	4715	2553	2493	1536	2824
KT33	KT941776-5002	4844	2365	2498	1516	2806
T37	RAH371-F93	4921	1808	2775	1682	2796
KT27	KT940794-8007	4890	2274	2529	1388	2770
T26	B0010	5260	1690	2587	1412	2737
TR 98	Frostat	5026	2126	2294	1108	2638
T35	RAH173-F93	4490	1726	2588	1706	2627
KT30	KT940874-8002	5262	1401	2409	1334	2601
KT119	K99SRT119 (white)	4092	1550	2654	1479	2444
KT103	K99SRT103	3917	1599	2229	1528	2318
KT25	KW940393W5001a	4404	2671			0
Average		4819.5	2052.9	1550	1550	2493
C.V.		11.7	40.8	9.246	9.246	
LSD (0.05)		ns	ns	465	238.9	

Table 4 Winter triticale yields of line 91T113-C12-5 yield, nursery mean and Tiber winter wheat.
Data collected from trials at Bozeman, Huntley, Moccasin, Sidney and Sheridan.

YEAR	Location	91T113-C12-5	Nursery	difference	Tiber
		Mean	Mean		lbs/a
		lbs/a	lbs/a	Lbs/a	lbs/a
1998	TRHN(Moccasin)	5171	4154	1017	4660
1999	Huntley (SWTR08)	4510	3821	689	4131
1999	Mocc Fallow (SWTR07)	3839	3856	-17	3394
1999	Mocc Recrop (SWTR70)	2583	2826	-243	2184
1999	Sidney (SWTR03)	3942	4404	-462	3517
1999	Bozeman SWTR01	7862	6891	971	5878
2000	Huntley (SWTR08)	3851	3357	494	2890
2000	Mocc SWTR70 Recrop	3045	2886	159	2159
2000	Bozeman SWTR01	7232	6178	1054	4985
2000	Winifred	2354	2265	89	1778
2001	Huntley (SWTR08)	2235	2053	182	2490
2001	Mocc SWTR07	2842	2536	306	2750
2001	Bozeman SWTR01	4593	4820	-227	4804
2001	TRHN (Moccasin)	3091	2848	243	2730
2001	TRWinSur Moccasin mound	2458	2520	-62	2057
2002	Mocc No-Till SWTR70 (SW1)	1570	1384	186	1433
2002	Mocc SWTR07	2472	2243	229	2392
2002	Bozeman SWTR01	5139	4218	921	4022
2002	Sheridan WTG	1343	1025	318	1219
2003	Bozeman SWTR01	6473	5253	1220	5101
2003	WCF03 Statewide NW7	3372	2578	794	
2003	Sheridan WTG03	2999	3542	-543	3631
2003	Moccasin SWTG07	2755	2323	432	2448
Average:		3727	3390	337	3212

Projections:

<i>Regression Statistics</i>	Y=1.130X - 98.7
Multiple R	0.966142
R Square	0.933430
Adjusted R Square	0.930404
Standard Error	453.724118
Observations	24

Nursery 91T113-C12-5	
Mean Yield	Yield
lbs/a	lbs/a
1500	1610
3750	4173
6000	6735

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regress	1	63505368.3	63505368.3	308.48	1.9748E-14
Resid	22	4529042.65	205865.58		
Total	23	68034411			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-98.71	232.610	-0.42436	0.6754
X Variab	1.1309	0.0644	17.56359	1.97E-14
			<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept			-581.12	383.69
X Variab			0.9974	1.2645

Table 5 2001 Winter triticale grain protein

Code	Variety	Boz	SARC	CARC	ave
TR 98	Frostat	15.0	16.8	17.8	16.5
T35	RAH173-F93	15.2	15.9	16.1	15.8
KT25	KW940393W5001a	14.8	16.8	17.3	16.3
KT103	K99SRT103	15.7	16.2	17.8	16.6
KT33	KT941776-5002	15.5	16.8	17.6	16.6
KT119	K99SRT119 (white)	15.5	15.9	15.7	15.7
PI517194	Tiber (WW Check)	16.2	17.5	17.9	17.2
TR18	Ugo Polish	16.1	17.9	17.9	17.3
KT3	KT941864-5002	14.5	15.6	17.5	15.9
TR01	91T113-C12-5	15.0	16.0	15.6	15.5
KT30	KT940874-8002	16.0	19.1	16.4	17.1

Table 5A 2003 Winter triticale protein on a dry seed basis.

Location:		Boz		Shrdn		Location:		Boz		Shrdn	
		%		%				%		%	
KT35	KT941256-8007	15.8	11.7	KT09	KW941531-6005	15.3	10.6				
TR18	SR94719	16.4	12.0	WW1	Tiber	17.6	13.6				
KT3	KT941864-5002	15.6	11.0	KT0102	D98SRT99-3	17.8	14.5				
KT84	91T113-C12-5	14.6	10.9	KT0111	KT941276-8004	17.8	13.5				
T35	KT941289	15.1	11.1	KT0116	KT981146p9036	17.9	11.8				
KT91	KT941776-5002	16.2	13.4	KT991	KT991034	16.5	13.8				
TD01	Trical 102	17.1	12.6	TR19	SR94721	16.7	13.5				
KT0108	KT940874p8012	17.6	12.5	KT119	K99SRT119	15.4	11.5				
KT0109	KT940608p9029	18.7	12.6	KT0107	KT940872p8006	15.7	11.8				
KT0106	KT940608p9003	17.4	12.0	K943	KT943112	16.2	12.2				
KT990	KT990174 white	15.0	11.4								
					average	16.5	12.3				

Table 6 2000 Winter Survival of Triticale. Seeded on west facing slope.
Central Agricultural Research Center, Moccasin, MT

	Stand 6/4/2001	STAND 4/30/2001	HEAD DATE
	%	plts/3'	d of Y
KT941256-8007	100	48	171
KT941864-5002	100	49	172
KW940393W5001a	100	54	166
B0010	100	46	176
RAH 371-F93	100	45	167
KT940794-8007	98	62	168
KT940874-8002	98	51	164
91T113-C12-5	98	52	163
SR94719	97	48	176
UGO	97	51	170
Frostat	95	28	170
RAH 173-F93	95	41	168
K99SRT103	90	47	166
KT941256-8006	90	48	171
K99SRT119 whitesd (3-7-00sding)	90	51	164
Tiber	80	59	175
Rampart	70	37	176

Table 7 . 2003 Statewide triticale winter survival at Williston.

Rating 0-9 with 0 being none survived

Entry	ID1	Variety or Line	2 reps
#			16-May
18	TR98	FROSTAT	4.8
13	FWW11	FW11	4.5
2	TR18	SR94719	4.3
8	KT0108	KT940874p8012	4.0
11	KT990	KT990174	4.0
20	KT0107	KT940872p8006	3.8
10	KT0106	KT940608p9003	3.5
9	KT0109	KT940608p9029	3.3
19	FRNK	Frank Spelt	3.0
3	KT3	KT941864-5002	2.8
6	KT91	KT941776-5002	2.5
15	KT983	KT98SRT30	2.5
17	WNTRNS	Winterness	2.5
5	T35	KT941289	2.3
21	K943	KT943112	2.3
4	KT84	91T113-C12-5	2.0
12	KT09	KW941531-6005	2.0
16	KT981	KT981146p9033	2.0
14	KT982	KT982022	1.8
7	TD01	Trical 102	1.5
1	KT35	KT941256-8007	1.3
Average			2.9
LSD (0.05)			1.5
C.V. (%)			25.4
P-value (Varieties)			0.0016

Nearest winter wheat checks rated: Morgan = 5.5, BigSky = 4.5, Rampart = 1.5