

'Warhorse' Winter Wheat

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 Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated 12/2015)

Warhorse is a solid-stemmed hard red winter wheat with improved yield potential (Tables 1, 2) relative to Genou and Rampart. Warhorse was developed by the Montana Agricultural Experiment Station and released to seed growers in 2013. Warhorse was derived from a composite of three F₁ crosses with a common parent, 'Nuplains'/MTS9862 (an experimental sawfly line) crossed to three Montana unreleased hollow- and solid-stemmed experimental lines. Warhorse is an awned, white-glumed, semi-dwarf (*Rht1*) wheat with medium maturity. Warhorse performs well in locations where sawfly cutting has occurred (Table 3). Stem solidness is similar to Bearpaw and Rampart (Table 3). Warhorse has average test weight and protein, and below average winter hardiness (Table 4). Warhorse is resistant to prevalent races of stripe and stem rust, but susceptible to leaf rust. Warhorse is a high PPO variety with average mill and bake properties (Table 5). Plant Variety Protection pending. To be sold by variety name only as a class of certified seed. Montana State University Research Fees due on seed sold. PVP, Title V has been issued (Certificate# 201400131).

Table 1. Yield of Warhorse vs. a set of recommended varieties, 2010-2015^{1/}

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman ^{2/}	3 Huntley ^{3/}	4 Moccasin ^{4/}	5 Conrad ^{5/}	5 Have ^{6/}	6- Sidney & Williston	
location-years	6	13	31	30	22	21	8	131
Warhorse	119.8**	70.8**	61.8	48.6	63.3*	51.7*	49.9*	60.2**
Decade	63.0	66.1*	64.9**	51.9**	65.5**	53.1*	55.8**	59.5*
WB-Quake	115.4*	66.8*	61.2	46.0	63.5*	52.3*	50.2*	59.4*
Judee	113.7*	68.8*	61.4	44.7	64.1*	53.5**	41.4	58.6*
Bearpaw	72.4	63.5	63.3*	48.9	62.7*	52.2*	51.0*	57.9
Rampart	94.0	62.8	55.6	39.9	57.9	48.6	44.3	53.1
Genou	70.6	58.2	55.6	42.5	59.8	50.6	47.0	53.0
LSD (0.05)	18.2	5.5	2.8	2.2	4.1	2.5	5.8	2.0

** = indicates highest value w ithin a column

* = indicates varieties w ith values equal to highest variety w ithin a column based on Fisher's protected LSD (p=0.05)

1/ = includes 2012-15 Saw fly , 2010-15 Intrastate and 2011-15 Off Station tests

2/ includes data from Dry Creek, Willow Creek

3/ includes data from Forsyth, Fort Smith, Hardin area, Hysham, Lodge Grass, Molt, Rapelje

4/ includes data from Belt, Denton, Geraldine, Winifred

5/ includes data from Choteau, Cut Bank, The Knees, Shelby

6/ includes data from Loma, Turner

Table 2. Warhorse: Yield Performance under Sawfly Pressure and % Sawfly Cutting (2010-2015)

Variety	Yield (bu/a)					Sawfly Cutting (%)				
	Havre	Loma	Turner	Willow Creek	Aver- age	Havre	Loma	Turner	Willow Creek	Aver- age
location-years	2	6	2	1	11	2	6	2	1	11
Bearpaw	68.4	52.6	38.1	34.6	51.2*	4	17*	12	2*	12
Decade	69.8	55.1	35.5	42.3*	53.0*	7	37	23	13	27
Genou	66.2	47.9	38.1	36.2*	48.4	11	19*	13	2*	15
Judee	72.6	54.3	38.2	39.4*	53.3**	5	19*	5*	2*	13
Rampart	62.7	48.3	33.1	29.7	46.4	5	11*	6*	1	8*
Warhorse	70.8	54.3	31.6	43.2**	52.2*	2	5**	2**	1**	3**
WBQuake	70.9	55.1	39.2	30.9	52.9*	3	14*	6*	2*	10*
LSD (0.05)	ns	ns	ns	8.5	3.9	ns	16	9	7	9

Table 3. Stem solidness ratings of Warhorse compared to other solid-stemmed varieties, (2011-2015)

Variety	Stem Solidness Rating (scale 5-25, higher = more solid)						Stem Solidness by location, 2010-2015				
	2015	2014	2013	2012	2011	2011-15	Bozeman	Conrad	Havre	Loma	Moccasin
location-years	7	8	8	8	4	35	9	5	9	3	9
Warhorse	22.0**	22.1**	22.0*	20.4*	21.5**	21.6**	20.1**	22.4**	22.6*	20.9	21.9**
Bearpaw	19.9	21.5*	21.7*	20.8*	21.0*	21.0*	19.0*	21.8*	22.5*	21.3	21.0*
Rampart	18.7	21.4*	22.1**	21.0**	21.0*	20.9	17.5	21.9*	23.0**	21.0	21.5*
Judee	19.3	20.8	21.0*	18.5	20.2*	19.9	17.4	21.1*	21.4	20.0	20.3
WB Quake	19.2	21.0	20.2	18.9	18.1	19.6	16.8	20.9	21.4	20.3	19.8
Genou	15.5	19.6	20.7	18.4	17.3	18.5	14.4	19.3	21.0	19.9	19.1
LSD (0.05)	1.9	1.0	1.2	1.2	1.7	0.7	1.7	1.4	1.1	ns	1.0

** = indicates highest yielding variety within a column

* = indicates varieties yielding equal to highest yielding variety within a column based on Fisher's protected LSD (p=0.05)

Table 4. Agronomic characteristics of Warhorse vs. a set of recommended varieties, 2010-2015^{1/}

Variety	Test	Winter	Heading date		Plant	Lodging	Protein	Saw fly	Stripe	Coleoptile
	weight	survival			height	%		cutting	rust	length
	lb/bu	%	Julian	Calendar	in		%	%	%	in
location-years	131	7	61		132	21	130	19	11	3
Bearpaw	59.1	48	164.9	14-Jun	30.5	23	13.3	8	52	3.0
Decade	59.1	61**	164.0	13-Jun	31.4	11*	13.3	19	61	3.1
Genou	59.3	44	165.8	15-Jun	34.4	27	13.5	10	51	4.1
Judee	59.7**	31	165.2	14-Jun	31.1	17*	13.4	8	13*	3.7
Rampart	59.5*	39	166.0	15-Jun	34.1	27	13.9**	5*	34	4.4**
Warhorse	59.3	48	166.3	15-Jun	30.8	10**	13.4	3**	11**	3.3
WBQuake	59.3	48	167.1	16-Jun	31.3	15*	13.0	7*	21*	2.7
LSD (0.05)	0.3	10	0.3		0.3	8	0.2	5	12	0.3

^{1/} = includes 2012-15 Saw fly , 2010-15 Intrastate and 2011-15 Off Station tests

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Table 5. Mill and bake characteristics of Warhorse vs. recommended varieties, 2010-2014

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield	protein	ash	tolerance	mix time	absorption	mix time	absorption	volume
			%	%	%	(1-6)	min	%	min	%	cc
location-years	29	29	29	29	29	29	29	29	29	29	29
Bearpaw	0.270	82.6	68.4*	11.6	0.41	3.4	4.6	61.0	7.5	71.1	1020
Decade	0.291	78.3	67.5	11.7	0.41**	4.9**	7.8	64.7**	16.8	75.2**	1071
Genou	0.308	79.8	68.5**	11.9	0.41*	4.0	5.6	63.3	12.1	73.4	1097
Judee	0.277	80.1	66.7	11.8	0.41*	4.1	5.5	61.7	8.6	71.8	1141**
Warhorse	0.263	92.1	67.3	11.8	0.43	3.3	5.0	61.9	7.1	72.2	1076
LSD (0.05)	0.020	2.1	0.6	ns	0.01	0.40	0.5	0.9	1.1	0.9	23

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^{1/} low is best for noodles