

'Warhorse' Winter Wheat

Phil Bruckner and Jim Berg, Winter Wheat Breeding Program, Montana State University
 Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated 12/2016)

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). 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, 2010-2016^{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	7	15	39	35	28	28	10	162
Warhorse	120.8	70.8	60.1	51.2	64.8	55.9	48.7	61.3
Judee	114.4	68.5	58.9	47.1	68.0	56.8	43.2	60.0
Decade	56.6	64.1	63.5	53.0	68.1	55.6	55.3	59.9
WB-Quake	115.7	66.9	58.3	47.7	65.6	57.3	49.4	59.9
Bearpaw	64.4	61.2	60.2	50.4	64.2	53.3	49.7	57.3
Rampart	90.7	62.4	52.9	42.0	60.6	52.0	45.5	53.9
LSD (0.05)	19.0	5.0	2.4	2.2	3.8	3.0	5.2	1.9

bold = indicates highest value within a column
bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)
 1/ = includes 2012-16 Saw fly , 2010-16 Intrastate and 2011-16 Off Station tests
 2/ includes data from Dry Creek, Willow Creek
 3/ includes data from Billings, Forsyth, Fort Smith, Hardin area, Hysham, Lodge Grass, Molt, Rapelje
 4/ includes data from Belt, Denton, Geraldine, Highwood, Winifred
 5/ includes data from Choteau, Cut Bank, The Knees, Shelby
 6/ includes data from Carter, Gildford, Loma, Turner

Table 2. Warhorse Yield Performance under Sawfly Pressure and % Sawfly Cutting (test average cutting ≥10%) and % Sawfly Cutting (2010-2016)

Variety	Yield bu/a	Sawfly cutting %
location-years	13	13
Judee	58.9	15
Decade	56.9	28
WBQuake	56.3	12
Warhorse	55.2	3
Bearpaw	53.3	12
Rampart	48.8	10
LSD (0.05)	5.0	9

bold = indicates highest value within a column
bold = indicates varieties with values equal to highest variety within a column based on Fisher's Protected LSD (p=0.05)

Table 3. Stem solidness ratings of Warhorse compared to other solid-stemmed varieties, (2012-2016)

	Stem Solidness Rating (scale 5-25, higher = more solid)						Stem Solidness by location, 2012-2016				
	2016	2015	2014	2013	2012	2012-16	Billings	Bozeman	Conrad	Havre ^{1/}	Moccasin
location-years	11	7	8	4	4	34	1	8	4	14	7
Warhorse	21.4	22.0	22.1	21.4	19.3	21.4	24.6	20.0	21.9	21.7	21.9
Bearpaw	20.6	19.9	21.5	22.2	20.4	20.8	23.9	18.6	20.8	21.7	21.2
Rampart	20.6	18.7	21.4	22.0	20.4	20.5	24.4	17.1	21.4	21.5	21.6
Judee	19.8	19.3	20.8	21.1	17.9	19.9	23.4	17.4	21.0	20.5	20.2
WBQuake	20.3	19.2	21.0	20.5	17.5	19.9	24.7	17.1	20.9	20.6	20.5
Loma	17.7	17.2	21.1	20.1	17.3	18.6	23.0	16.4	17.9	19.9	18.5
LSD (0.05)	0.8	1.8	1.1	ns	1.6	0.6	ns	1.7	1.4	0.9	0.9

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

1/ includes Carter, Gildford, and Loma

Table 4. Agronomic characteristics of Warhorse vs. a set of recommended varieties, 2010-2016^{1/}

Variety	Test	Winter	Heading date		Plant	Lodging	Protein	Saw fly	Stripe	Coleoptile
	w eight lb/bu	survival %	Julian	Calendar	height in	%	%	cutting %	rust %	length in
location-years	161	7	75		163	27	159	22	14	3
Bearpaw	58.8	48	163.3	12-Jun	31.0	25	13.1	8	57	3.0
Decade	59.1	61	162.6	12-Jun	31.7	16	13.1	19	62	3.1
Judee	59.8	31	163.8	13-Jun	31.4	20	13.2	10	14	3.7
Rampart	59.5	39	164.4	13-Jun	34.7	28	13.7	7	36	4.4
Warhorse	59.4	48	164.8	14-Jun	31.3	11	13.2	2	12	3.3
WBQuake	59.4	48	165.7	15-Jun	31.6	19	12.9	9	24	2.7
LSD (0.05)	0.3	10	0.3		0.3	8	0.1	5	10	0.3

1/ = includes 2012-16 Saw fly , 2010-16 Intrastate and 2011-16 Off Station tests

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Table 5. Mill and bake characteristics of Warhorse vs. recommended varieties, 2010-2015

Variety	PPO ^{1/}	Kernel hardness	Flour			Mixograph			Baking		
			yield %	protein %	ash %	tolerance (1-6)	mix time min	absorption %	mix time min	absorption %	volume cc
location-years	35	35	35	35	35	35	35	35	35	35	35
Bearpaw	0.275	82.5	68.6	11.6	0.42	3.4	4.5	60.8	7.2	71.0	1011
Decade	0.287	76.9	67.5	11.7	0.41	4.9	8.5	64.8	18.5	75.5	1066
Judee	0.277	79.9	67.0	11.9	0.41	4.1	5.7	61.7	9.2	71.8	1142
Warhorse	0.264	91.9	67.5	11.9	0.43	3.4	5.1	62.0	7.6	72.4	1069
LSD (0.05)	ns	1.8	0.5	ns	0.01	0.30	0.6	0.8	1.5	0.8	23

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1/ low is best for noodles