

'Warhorse' Winter Wheat

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 Small Grain QuickFacts: <http://plantsciences.montana.edu/FoundationSeed> (Updated 12/2014)

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 applied for (Certificate# 201400131).

Table 1. Yield of Warhorse vs. a set of recommended varieties, 2010-2014^{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 | 5 | 11 | 26 | 23 | 19 | 17 | 6 | 107 |
| Warhorse | 117.3** | 71.1** | 62.6 | 48.1 | 64.8* | 51.8* | 53.7* | 61.1** |
| Decade | 61.7 | 69.7* | 65.9** | 51.4** | 65.4** | 53.4* | 58.4** | 60.5* |
| WB-Quake | 113.0* | 67.4* | 62.6 | 45.9 | 65.2* | 53.1* | 52.6* | 60.2* |
| Judee | 111.3* | 70.0* | 62.0 | 44.8 | 65.0* | 54.3** | 45.4 | 59.8* |
| Bearpaw | 70.6 | 67.3* | 63.7* | 47.6 | 62.7* | 52.2* | 54.1* | 58.4 |
| Rampart | 92.6 | 64.0 | 56.3 | 39.6 | 59.0 | 48.5 | 47.3 | 53.9 |
| Genou | 71.7 | 61.8 | 56.0 | 42.3 | 59.6 | 50.6 | 46.8 | 53.7 |
| LSD (0.05) | 22.0 | 5.4 | 3.2 | 2.6 | 4.4 | 3 | 7.1 | 2.2 |

** = indicates highest value within a column

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

1/ = includes 2012-14 Saw fly, 2010-14 Intrastrate and 2011-14 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 North Havre, Loma, Turner

Table 2. Warhorse: Yield Performance under Sawfly Pressure and % Sawfly Cutting (2010-2013)^{1/}

| Variety | Yield (bu/a) | | | | | Sawfly Cutting (%) | | | | |
|-------------------|--------------|---------------|-----------|-----------------|---------------|--------------------|------------|------------|-----------------|--------------|
| | Havre | Loma | Turner | Willow Creek | Aver- age | Havre | Loma | Turner | Willow Creek | Aver- age |
| location-years | 2 | 5 | 2 | 1 | 10 | 2 | 5 | 2 | 1 | 10 |
| Judee | 72.6 | 56.4* | 38.2 | 39.4* | 54.3** | 5 | 23* | 5* | 2* | 14 |
| WBQuake | 70.9 | 57.4** | 39.2 | 30.9 | 53.8* | 3 | 17* | 6* | 2* | 10* |
| Decade | 69.8 | 56.8* | 35.5 | 42.3* | 53.7* | 7 | 44 | 23 | 13 | 29 |
| Warhorse | 70.8 | 56.3* | 31.6 | 43.2** | 52.9* | 2 | 6** | 2** | 1** | 4** |
| Bearpaw | 68.4 | 52.9* | 38.1 | 34.6 | 51.2* | 4 | 19* | 12 | 2* | 13* |
| Genou | 66.2 | 49.1 | 38.1 | 36.2* | 49.0 | 11 | 21* | 13 | 2* | 16 |
| Rampart | 62.7 | 48.6 | 33.1 | 29.7 | 46.4 | 5 | 13* | 6* | 1 | 9* |
| LSD (0.05) | ns | 6.7 | ns | 8.5 | 4.1 | ns | 18 | 9 | 7 | 9 |

1/ = limited saw fly cutting at Loma (2%) and Havre (4%) in 2014

Table 3. Stem solidness ratings of Warhorse compared to other solid-stemmed varieties, (2010-2014)

| | Stem Solidness Rating (scale 5-25, higher = more solid) | | | | | | Stem Solidness by location, 2010-2014 | | | | | |
|-------------------|---|---------------|---------------|---------------|---------------|---------------|---------------------------------------|---------------|---------------|------|---------------|---------------|
| | 2014 | 2013 | 2012 | 2011 | 2010 | 2010-14 | Bozeman | Conrad | Havre | Loma | Moccasin | Sidney |
| location-years | 8 | 8 | 8 | 4 | 5 | 33 | 8 | 5 | 8 | 3 | 8 | 1 |
| Warhorse | 22.1** | 22.0* | 20.4* | 21.5** | 21.2* | 21.5** | 19.5** | 22.2** | 22.5* | 20.9 | 21.9** | 23.2** |
| Bearpaw | 21.5* | 21.7* | 20.8* | 21.0* | 22.0** | 21.4* | 19.4* | 22.1* | 22.9** | 21.3 | 21.2* | 23.1* |
| Rampart | 21.4* | 22.1** | 21.0** | 21.0* | 19.5 | 21.1* | 18.7* | 22.0* | 22.9* | 21.0 | 21.2* | 22.8* |
| Judee | 20.8 | 21.0* | 18.5 | 20.2* | 18.9 | 19.9 | 17.4 | 21.0* | 21.2 | 20.0 | 20.1 | 22.8* |
| WBQuake | 21.0 | 20.2 | 18.9 | 18.1 | 19.5 | 19.7 | 17.1 | 21.4* | 21.4 | 20.3 | 19.2 | 21.4* |
| Genou | 19.6 | 20.7 | 18.4 | 17.3 | 16.3 | 18.8 | 15.5 | 19.2 | 21.0 | 19.9 | 19.2 | 19.2 |
| LSD (0.05) | 1.0 | 1.2 | 1.2 | 1.7 | 1.0 | 0.6 | 1.3 | 1.6 | 1.2 | ns | 1.2 | 2.6 |

** = indicates highest yielding variety w within a column

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

Table 4. Agronomic characteristics of Warhorse vs. a set of recommended varieties, 2010-2014^{1/}

| Variety | Test weight lb/bu | Winter survival % | Heading date | | Plant height in | Lodging % | Protein % | Sawfly cutting % | Stripe rust % | Coleoptile length in |
|-------------------|----------------------|----------------------|--------------|----------|--------------------|--------------|--------------|---------------------|------------------|-------------------------|
| | | | Julian | Calendar | | | | | | |
| location-years | 107 | 5 | 47 | | 108 | 20 | 106 | 16 | 8 | 3 |
| Bearpaw | 59.3 | 34 | 167.0 | 16-Jun | 30.4 | 23 | 13.5 | 9* | 54 | 3.0 |
| Decade | 59.3 | 50** | 165.9 | 15-Jun | 31.2 | 12* | 13.5 | 21 | 65 | 3.1 |
| Genou | 59.3 | 27 | 168.1 | 17-Jun | 34.3 | 27 | 13.7 | 11 | 55 | 4.1 |
| Judee | 59.8 | 27 | 167.3 | 16-Jun | 31.0 | 17* | 13.6 | 10 | 15* | 3.7 |
| Rampart | 59.7 | 26 | 168.0 | 17-Jun | 34.1 | 27 | 14.1 | 6* | 38 | 4.4 |
| Warhorse | 59.5 | 36 | 168.4 | 17-Jun | 30.6 | 10** | 13.6 | 3** | 14** | 3.3 |
| WBQuake | 59.5 | 35 | 169.5 | 19-Jun | 31.2 | 16* | 13.3 | 8* | 24* | 2.7 |
| LSD (0.05) | ns | 9 | 0.4 | | 0.4 | 9 | 0.2 | 6 | 13 | 0.3 |

^{1/} = includes 2012-14 Sawfly , 2010-14 Intrastate and 2011-14 Off Station tests

** = indicates highest value within a column

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

Table 5. Mill and bake characteristics of Warhorse vs. recommended varieties, 2010-2013

| Variety | PPO ^{1/} | Kernel hardness | Flour yield % | Flour protein % | Flour Ash % | Mixograph mix time min | Mixograph absorption % | Baking mix time min | Baking absorption % | Loaf volume cc |
|-------------------|-------------------|-----------------|------------------|--------------------|----------------|---------------------------|---------------------------|------------------------|------------------------|-------------------|
| | | | | | | | | | | |
| Bearpaw | 0.292 | 83.8 | 67.4 | 11.3 | 0.42 | 4.8 | 60.5 | 7.2 | 70.7 | 1008 |
| Decade | 0.309 | 79.3 | 66.3 | 11.5 | 0.41* | 8.4 | 64.8** | 17.0 | 75.2** | 1061 |
| Genou | 0.338 | 80.5 | 67.3 | 11.9 | 0.42* | 5.6 | 63.5 | 11.9 | 73.5 | 1092 |
| Judee | 0.296 | 80.0 | 65.3 | 11.6 | 0.42* | 5.8 | 61.3 | 8.6 | 71.3 | 1129** |
| Rampart | 0.294 | 82.1 | 67.7 | 12.3** | 0.42 | 6.0 | 63.5 | 12.3 | 73.7 | 1106* |
| Warhorse | 0.277 | 92.9 | 66.2 | 11.6 | 0.43 | 5.2 | 61.2 | 7.4 | 71.6 | 1062 |
| WBQuake | 0.342 | 78.9 | 69.1** | 11.6 | 0.41** | 5.5 | 61.9 | 9.8 | 71.8 | 1090 |
| LSD (0.05) | 0.023 | 2.3 | 0.7 | 0.3 | 0.01 | 0.5 | 1.0 | 1.3 | 1.0 | 26 |

** = indicates highest value w within a column

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

^{1/} low is best for noodles