As is typical, stripe rust severities up to 30% were observed on susceptible cultivars in nurseries at Mount Vernon in northwestern Washington the first week of April.

Stripe rust was found in a field of the soft white winter wheat cultivar Brundage in the Hazleton area of south central Idaho in late May. The stripe rust was mostly confined to flag leaves, and the wheat was just beginning to head. Stripe rust was readily found on Brundage in 2013, growers continue to plant the cultivar due to the high-yield potential. One pustule of stripe rust was found in a nursery near Moscow in northwestern Idaho on 21 May.

In areas of eastern and southern Idaho, stripe rust was found, but only the soft white winter wheat cultivars Brundage and WB 470 in late June and early July. Stripe rust was not found on the most susceptible spring wheat lines in the nursery at Idaho Falls nor in the spring wheat nurseries at Rupert and Aberdeen in southeastern Idaho in late June. By early July, stripe rust was found on the cultivar WB936 west of Idaho Falls. Warming temperatures limited stripe rust development.

In an early July, a survey of fields in the Palouse region of Washington and Idaho (Whitman and Spokane Counties in eastern Washington and Latah County in northwestern Idaho) found stripe rust in only one winter wheat field in Whitman County and one winter wheat field in Spokane County. One or two small hot spots (<1 foot diameter) with mixed resistant and susceptible reactions were found in the fields. Stripe rust was found in about 60% of the spring wheat fields in Whitman County and about 40% in Latah and Spokane Counties. When found in the spring wheat fields, the incidence was less than 1%. An estimated statewide loss of 3% in winter wheat was due to stripe rust in Idaho and a trace loss in Washington in 2014.

Montana. Wheat stripe rust was found on the cultivar Yellowstone in the Hardin area south central Montana in late May.

Alberta, Canada. Low to moderate levels of wheat stripe were found in commercial winter wheat fields and plots in the Beaverlodge area in west-central Alberta in early July.

Wheat stripe rust map. Please visit: http://www.ars.usda.gov/Main/docs.htm?docid=9757.

The 2014 stripe rust observation map can be found at: http://www.ars.usda.gov/SP2UserFiles/ad_hoc/36400500Cerealrustbulletins/2012wstr.pdf.

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2014 Spring Wheat Program.

Luther Talbert, Nancy Blake, Jamie Sherman, Hwa-Young Heo, Jay Kalous, Andrea Varella, and Afaf Nasseer.

Approximately 3.05 x 10^6 acres (1.24 x 10^6 hectares) of hard red spring wheat were seeded in 2014. The season was excellent up until an extended period of rain near crop maturity, which caused sprouting problems in a large portion of the spring wheat crop. For spring wheat, 2.99 x 10^6 acres (1.21 x 10^6 hectares) were harvested with an average yield of 36 bu/acre (2,419 kg/ha). Total harvested production was 107.6 x 10^6 bushels (2.93 x 10^6 metric tons). Leading spring wheat cultivars in Montana were Vida, Reeder, Choteau, and Mott. Vida, Choteau, and Mott all have some resistance to the wheat stem sawfly. A new cultivar named Duclair was grown on approximately 70,000 acres (28,350 hectares) in 2014. Major agronomic objectives for the program remain excellent yield potential in the harsh Montana environments and resistance to the wheat stem sawfly. End-use quality targets for all cultivars remain excellent bread-making properties, including selection for high grain protein, strong gluten, good water absorption, and large loaf volume.

Release of Egan hard red spring wheat.

The hard red spring cultivar **Egan**, with resistance to the orange wheat blossom midge (OWBM), was released in 2014 for impacted areas in western Montana. Egan, tested experimentally as CAP400, has the pedigree '(McNeal*5/Glupro)*2/3/(Reeder/BW-277, CAP19)//Choteau'. Egan also has a high grain protein gene introduced from the cultivar GluPro and, as such, has grain protein levels approximately 1 percentage point higher than other cultivars. Egan should be grown in a blend with an OWBM-susceptible cultivar (90% Egan : 10% susceptible) to lessen the possibility that the OWBM will overcome the resistance.

Publications.

Blake NK, Martin JM, Heo H-Y, Kephart KD, Lanning SP, and Talbert LE. 2015. Registration of near-isogenic lines for photoperiod response in hard red spring wheat. J Plant Reg 9:239-243 [doi:10.3198/jpr2014.12.0088crg].

Blake NK, Stougaard RN, Bohannon N, Weaver DK, Heo H-Y, Lamb PF, Nash D, Wichman DM, Kephart KD, Miller JH, Reddy GVP, Eckhoff JL, Grey WE, Lanning SP, Sherman JD, and Talbert LE. 2014. Registration of Egan wheat. J Plant Reg 8:298-302.

Rouse MN, Talbert LE, Singh D, and Sherman JD. 2014. Complementary epistasis involving *Sr12* explains adult plant resistance to stem rust in Thatcher wheat (*Triticum aestivum* L.). Theor Appl Genet 127:1549-1559.

Sherman JD, Martin JM, Blake NK, Lanning SP, and Talbert LE. 2014. Genetic basis of agronomic differences between a modern and a historical spring wheat cultivar. Crop Sci 54:1-13.

Sherman J, Nash DL, Lanning SP, Martin JM, Blake NK, Morris CF, and Talbert LE. 2014. Genetics of end-use quality differences between a modern and historical spring wheat. Crop Sci 54:1972-1980.

Sherman JD, Blake NK, Martin JM, Kephart KD, Smith J, Clark DR, Hofland ML, Weaver DK, Lanning SP, Heo H-Y, Pumphrey M, Chen J, and Talbert LE. 2015. Agronomic impact of a stem solidness gene in near-isogenic lines of wheat. Crop Sci 55:514-520.

Talbert LE, Sherman JD, Hofland ML, Lanning SP, Blake NK, Grabbe R, Lamb PF, Martin JM, and Weaver DK. 2014. Resistance to *Cephus cinctus* Norton, the wheat stem sawfly, in a recombinant inbred line population of wheat derived from two resistance sources. Plant Breed 133:427-432.

Association analysis of stem solidness and wheat stem sawfly (Cephus cinctus Norton) resistance in a panel of North American spring wheat germplasm.

A.C. Varella, D.K. Weaver, J.D. Sherman, N.K. Blake, H-Y. Heo, J. Kalous, S. Chao, M.L. Hofland, J.M. Martin, K.D. Kephart, and L.E. Talbert.

The wheat stem sawfly historically is a pest of major economic importance in wheat in the Northern Great Plains of North America. Limitations constraining traditional control measures have driven pest management efforts towards resistance breeding, so a better characterization of resistance genes will provide additional tools for breeders. An association mapping analysis for stem solidness and wheat stem sawfly resistance was conducted using a set of 244 elite spring wheat lines from 10 North American breeding programs. All lines were genotyped using the wheat 90K iSelect SNP assay and 25,728 polymorphic markers were detected. Field data were collected in three environments during four years of trials. Early and late stem solidness were shown to be associated with the solid stem QTL on chromosome 3B, but variation for early solidness also was affected by chromosomal regions on 1B and 5D. Despite the original expectation of having a single haplotype conferring solidness on the 3B locus, two lines from CIMMYT had haplotypes that differed from that of Rescue, the first solid-stemmed line developed in North America, which may indicate a different origin of the solid stem alleles in these lines. Previously identified QTL for resistance were confirmed, including QTL for heading date and stem cutting on chromosomes 1B and 4A, respectively. Potential sources of a novel resistance mechanism causing larval mortality were identified among the panel lines. Larval mortality was associated with QTL on chromosomes 2A, 3A, and 5B. Favorable alleles for stem solidness and other resistance traits are available within North American wheat germplasm. Thus, improvements in wheat stem sawfly management may be obtained using alleles that already exist in elite germplasm.

Publication.

Varella AC, Weaver DK, Sherman JD, Blake NK, Heo H-Y, Kalous J, Chao S, Hofland ML, Martin JM, Kephart KD, and Talbert LE. 2015. Association analysis of stem solidness and wheat stem sawfly resistance in a panel of North American spring wheat germplasm. Crop Sci [in press].

Impact of the D genome and quantitative trait loci on quantitative traits in a spring durum by spring bread wheat cross.

J. Kalous, J. Martin, J. Sherman, H-Y. Heo, N. Blake, S. Lanning, J. Eckhoff, S. Chao, E. Akhunov, and L. Talbert.

Tetraploid durum and hexaploid bread wheat diverged roughly 9,000 years ago creating two distinct gene pools. The unequal number of genomes between durum and bread wheat created a barrier inhibiting genetic flow, however, both species were cultivated in similar environments with similar production objectives.

Lanning et al. (2008) identified the cross between hexaploid Choteau and tetraploid Mountrail as producing a significantly high number of fertile hexaploid and tetraploid offspring. In this study, 205 'Choteau/Mountrail' recombinant inbred lines consisting of both hexaploid and tetraploid spring wheat were evaluated in Bozeman, and Sidney, MT, in 2012 and 2013, for a number of agronomic and end-use quality traits. Major QTL controlling seed size were identified on chromosomes 3B and 7A, with the positive allele originating in Mountrail. Additional positive alleles were identified in Mountrail that may prove valuable for introgression into spring bread wheat germplasm.

Reference.

Lanning SP, Blake NK, Sherman JD, and Talbert LE. 2008. Variable production of tetraploid and hexaploid progeny lines from spring wheat by durum wheat crosses. Crop Sci 48(1):199-202 [doi: 10.2135/cropsci2007.06.0334].

Publication.

Kalous J, Martin J, Sherman J, Heo H-Y, Blake N, Lanning S, Eckhoff J, Chao S, Akhunov E, and Talbert L. 2015. Impact of the D genome and quantitative trait loci on quantitative traits in a spring durum by spring bread wheat cross. Theor Appl Genet [in press].

2014 Winter Wheat Program.

Phil Bruckner, Jim Berg, Ron Ramsfield, and David May.

The winter wheat acreage for 2014 harvested in Montana was 2.24 x10^6 acres (0.91 x 10^6 hectares), averaging 41 bu/acre (2,755 kg/ha) with a total production of 91.8 x 20^6 bushels (2.50 x 10^6 metric tons). Leading cultivars were Yellowstone (19.8%), Judee (11.4%), Decade (10.5%), and Genou (6.6%). The winter wheat program emphasizes on-farm productivity characteristics and quality characteristics to compete in a global market place. Specific objectives include productivity, adaptation (cold tolerance, maturity, and stress tolerance), pest resistance (wheat stem sawfly, wheat streak mosaic virus, and stem rust), and dual-purpose end-use quality. End-use quality goals are high grain protein and gluten strength, high flour extraction and low ash content, good dough mixing and bread-baking quality, and superior noodle color and textural characteristics. Results from the 2014 Montana Winter Wheat Variety Test can viewed at http://plantsciences.montana.edu/crops/index.html

Release of Northern hard red winter wheat.

Northern hard red winter wheat has been approved for release in autumn 2015. Northern (previously tested under the experimental designation, MT0978) derives from a composite of two topcrosses made to the same 1999 F_1 population: '00X248, MT9982 (Yellowstone sib)//MTW0072/NW97151', and '00X249, MTW0047//MTW0072/NW97151'. Northern is an awned, white-glumed, hollow-stem, semi-dwarf hard red winter wheat. Northern has medium-late maturity, 169 days to heading from 1 January, similar to Yellowstone . Northern is semi-dwarf (*Rht1*) and medium-short (31.9 inches, n=56), similar to Jagalene and Decade and shorter than Colter and Yellowstone. Northern is resistant to the prevalent races of stem rust including Ug99 and stripe rust, but susceptible to leaf rust. In 56 location-years of testing in the Montana Winter Wheat Intrastate and Off-station Nurseries, the average yield of Northern (70.8 bu/acre) was similar to that of Yellowstone, Colter, and Jagalene, but greater than those of CDC Falcon, Decade, and Jerry. The test weight of Northern (59.8 lb/bu, n=56) is below that of Jagalene and similar to those of CDC Falcon, Colter, Decade, and Yellowstone. Grain protein content of Northern is medium to high, higher than those of CDC Falcon, Jagalene, and Yellowstone.

Based on experimental milling using a Brabender Automat Mill, the flour yield of Northern is medium to high with relatively high flour ash content and high flour protein. Northern has medium dough-mixing characteristics with moderate water absorption and a relatively short mixing time. Baking qualities of Northern are acceptable, with good loaf volume, similar to that of Yellowstone and other check cultivars. Northern has relatively low polyphenol oxidase (*PPO-A1b*) activity and average to good Asian noodle brightness (L24) and color stability. Northern carries the 2* subunit at the *Glu-A1* locus, the 7+8 subunits at the *Glu-B1* locus, and the 5+10 subunits at the *Glu-D1* locus. Northern does not carry either the T1BL·1RS or T1AL·1RS translocation. Northern may have potential for tortilla utilization based on the 2012 crop Wheat Quality Council evaluations and further testing of 2014 samples at Texas A&M.

Publications.

Berg JE, Hofer P, Davis ES, Stougaard RN, Kephart KD, Lamb PF, Wichman DM, Eckhoff JL, Miller JH, Nash DL, Grey WE, Jin Y, Chen X, and Bruckner PL. 2014. Registration of 'SY Clearstone 2CL' wheat. J Plant Reg 8:162-164 [doi: 10.3198/jpr2013.08.0048crc].

Berg JE, Lamb PF, Miller JH, Wichman DM, Stougaard RN, Eckhoff JL, Kephart KD, Nash DL, Grey WE, Gettel D, Larson R, Jin Y, Kolmer JA, Chen X, Bai G, and Bruckner PL. 2014. Registration of 'Warhorse' wheat. J Plant Reg 8:173-176 [doi: 10.3198/jpr2014.01.0001crc].

Berg JE, Wichman DM, Kephart KD, Eckhoff JL, Stougaard RN, Lamb PF, Miller JH, Nash DL, Grey WE, Johnston M, Gettel D, Larson R, Jin Y, Kolmer JA, Chen X, Bai G, and Bruckner PL. 2014. Registration of 'Colter' wheat. J Plant Reg 8:285-287.

Berg JE, Wichman DM, Kephart KD, Eckhoff JL, Stougaard RN, Lamb PF, Miller JH, Nash DL, Grey WE, Johnston M, Gettel D, Larson R, Jin Y, Chen X, and Bruckner PL. 2014. Registration of 'WB3768' wheat. J Plant Reg 8:288-90 [doi: 10.3198/jpr2014.03.0014crc].

Quantitative genetics, plant breeding, and small grain quality.

Jack Martin, Mike Giroux, Petrea Hofer, Alanna Schlosser, Andy Hogg, and Steve Hystad.

A small increase in amylose content may impact end product quality of wheat. The effect of elevated amylose content in durum wheat is not known. We surveyed 255 durum wheat accessions and found two genotypes that lacked the SGP-A1 protein. These genotypes were crossed to the cultivar Mountrail, an adapted durum genotype, to create populations segregating for the *SSIIa-Ab* null allele. Our goal was to determine the influence of allelic variation at the *SSIIa-A* locus on semolina properties and end-product quality using noodles as a test product. Amylose content increased 3% and cooked noodle firmness increased 2.8 g cm for the *SSIIa-Ab* class compared to the *SSIIa-Aa* class for the PI 330546 source but no change in either trait was detected between classes for the IG 86304 source. The *SSIIa-Ab* class had a 10% reduction in flour swelling compared to that of the *SSIIa-Aa* class for both crosses, Grain protein and semolina yield did not differ between *SSIIa-A* classes. The relationship between flour swelling power and noodle firmness did not differ between *SSIIa-A* allelic classes within a cross. The different results for amylose content and noodle firmness between these sources may be because the two sources of the *SSIIa-Ab* null mutation contributed different linkages to the segregating populations. Results show that the *SSIIa-Ab* allele could be used to produce durum-based products that are slightly more firm in texture. However, the effect of the *SSIIa-Ab* allele may depend on the source.

Publication.

Martin JM, Hogg AC, Hofer P, Manthey FA, and Giroux MJ. 2014. Impacts of *SSIIa-A* null allele on durum wheat noodle quality. Cereal Chem 91:176-182.