



CEREAL RUST BULLETIN

Final Report
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Cereal Disease Laboratory

U.S. Department of Agriculture
Agricultural Research Service
1551 Lindig St, University of Minnesota
St. Paul, MN 55108-6052
(612) 625-6299 FAX (651) 649-5054
Mark.Hughes@ars.usda.gov

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- Wheat stem rust was generally neither severe nor widespread in 2016.
- Wheat leaf rust was widespread from the Great Plains to the east coast.
- Wheat stripe rust was very widespread, found in 31 states and 4 Canadian provinces.
- Oat stem rust was not widespread nor severe in 2016.
- Oat crown rust was severe in nurseries in Texas, Louisiana, South Dakota and Minnesota.
- Barley leaf rust was severe in nurseries in areas of Texas, Virginia and northwestern Washington.
- Thank you!

For original, detailed reports from our cooperators and CDL staff, please visit the [Cereal Rust Situation \(CRS\) reports page on the CDL website](#).

Wheat stem rust. Wheat stem rust was neither widespread nor severe in the U.S. in 2016 with the exception of Louisiana where stem rust was widespread near the end of the season. Wheat stem rust was only reported in Texas, Louisiana, Mississippi, Georgia, Illinois, Indiana, New York and Washington. Wheat stem rust was first reported in sentinel plots in extreme southern Texas the first week of March. Race QFCSC is the only race identified from collections processed to date. Race QFCSC was the most commonly identified wheat stem rust race in the U.S. the last decade.

Texas – Low levels of wheat stem rust (trace to 10% severity and <5% incidence) were found on Line E, Morocco spring wheat and Panola winter wheat in stem rust sentinel plots planted at Weslaco, and on barley used as windbreaks of watermelon production fields in Rio Grande valley in extreme southern Texas the first week of March. Stem rust on barley was found in nursery plots in Castroville in south Texas the last week of March. In early April stem was found on barley (20% incidence and 20% severity) in plots at Corpus Christi in southeastern Texas. Wheat stem rust was also found in a soft red winter wheat nursery near Wharton in southeastern Texas and at trace to low levels at Uvalde in southern Texas. On May 1, stem rust was found in a commercial field of the soft read winter wheat TV8861 in Hill County in north central Texas. The rust was not at high levels, the wheat ranged from soft to hard dough growth stages. There had been more rain than average in the area.

Louisiana – Wheat stem rust was at high levels and widespread in nurseries at Crowley in southwestern Louisiana by April 15. The plots ranged from mature to just past soft dough growth stage. In late April, wheat stem rust was found in a field of Progeny 870 in Red River Parish in northwestern part of the state. The stem rust incidence ranged from 20-80% with severities from 1-20%. Wheat stem rust was found across the state by the fourth week of May. As is typical, the wheat stem rust arrived late in the season. In nurseries at Crowley in south central Louisiana incidence and severity were high. Stem rust was at moderate



levels in nurseries at Jeanerette (south central) and Baton Rouge (southeastern) while at lower levels at Alexandria (central) and Winnsboro (northeastern). A commercial field of Progeny 870 in northwestern Louisiana was heavily infected with wheat stem rust and likely incurred significant yield loss.

Mississippi – A single stem infected with wheat stem rust was found on a susceptible cultivar in central Mississippi in late April.

Georgia – A single wheat stem rust collection was received from a nursery in Tift County in south central Georgia.

Illinois – Wheat stem rust was found on secondary growth in University of Illinois-Champaign/Urbana trial plots in east central Illinois on June 20. The rust was found on multiple plants in the plots with severities ranging from 5 to 20%. The wheat was at the soft dough stage.

Indiana – Wheat stem rust was found at trace levels in a winter wheat field in Blackford County in eastern Indiana the fourth week of June. The winter wheat was at milky ripe growth stage.

New York – Wheat stem rust was found in a nursery in Tompkins County in south central New York on July 15.

Washington – Wheat stem rust was found on one line in a nursery in the Palouse region of the state.

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

Wheat leaf rust. Wheat leaf rust was widespread from the east coast, to the Great Lakes States, and in the Great Plains from Texas to North Dakota in 2016 (see [wheat leaf rust observation map](#)). While wheat leaf rust was generally found at low to moderate levels, it did develop to significant levels in areas of the Great Plains and mid-Atlantic states.

Texas – Wheat leaf rust on the spring wheat cultivar Morocco had reached 85S with 100% incidence in sentinel plots at Weslaco in extreme southern Texas by early March. At Castroville and Uvalde in south Texas, wheat leaf rust was spreading in nurseries by March 2. Some spring wheat entries had reached 100S. By March 10, leaf rust was found throughout much of Texas from the Oklahoma border to the Gulf Coast, the exception being the Texas High Plains where no rust had been reported. Leaf rust was more prevalent than stripe rust at College Station and had spread uniformly in the nurseries by April 8. Virulence to *Lr39* had spread rapidly reaching 70S-90s on TAM 112 (*Lr39*) and Jackpot (*Lr39*) while Jagalene (*Lr24*) was around 40S and Bentley (*Lr21, Lr39*) was 70S-90S. The border and spreader rows had a high diversity of genotypes and they were at about 90S in the mid to higher canopy. Conditions were good for further rust development and growers were applying fungicides to protect yield potential. Wheat leaf rust was at moderate levels in Hill and Williamson Counties the first week of May and at light to moderate levels in Concho County in central Texas on May 5.

Oklahoma – Scattered leaf rust pustules were found around Stillwater in north central Oklahoma in early February. Leaf rust had overwintered in Oklahoma but had not increased to any great extent. By early March, leaf rust was active, but remained at low levels. Relatively high levels of leaf rust were observed on Endurance (*Lr1, 26?, +*) and other cultivars in southwestern part of the state by March 4. Low levels of leaf rust were found around the Stillwater area on lower leaves, indicating the rust most likely overwintered in central Oklahoma. Leaf rust at varying levels was found in north central and southwestern Oklahoma the third week of March. Wheat development was approaching Feekes 6-7. By the second week of April scattered leaf rust pustules were observed on lower leaves in the Stillwater area. The dry conditions were not conducive for further spread and development, however, rains in mid to late April allowed leaf rust to develop in the upper canopy. The rains were very beneficial to the winter wheat crop,



but with it came extended periods of dew conducive for rust development. Stripe rust was still active in the state, but with warmer temperatures wheat leaf rust development increased. By early May leaf rust had increased and was severe around Stillwater, but leaf rust developed to a lesser extent in northern Oklahoma. By the second week of May, leaf rust was predominant around Stillwater and was found at low levels in Major County (northwestern Oklahoma) and Kay County (north central Oklahoma).

Kansas – Wheat leaf rust was found in western and northwestern Kansas commercial fields and nurseries in Riley County in northeastern Kansas by March 18. Due to the mild winter the rust likely overwintered in the state. By April 1, the rust in the western counties was still active, but remained at low levels in most fields. Wheat in the state was jointing in much of the state and approaching flag leaf emergence in southeastern parts of the state. The crop was about 2-3 weeks ahead of average maturity. Leaf rust was found at multiple locations in central Kansas the second week of April. The rust was found on the lower leaves at trace levels in most plots. Incidences approaching 90% on lower leaves were observed in a few fields and plots in Reno and McPherson Counties in central Kansas. The severity was still low at <10% in most cases. The continued dry conditions in the state slowed the spread of rust. Rains in mid-late April allowed additional rust development. Low levels of wheat leaf rust were found in south central Kansas the second week of May, when wheat was in the grain filling growth stages.

Nebraska – Trace levels of wheat leaf rust were found in wheat fields in Nuckolls County in south central Nebraska on March 30. The rust was found in every field surveyed. Wheat leaf rust was found in Banner County in the Panhandle area the third week of April. No leaf rust was found in a survey of the southernmost tier of counties from southeast to west central Nebraska. Trace levels of wheat leaf rust were found in nurseries at Mead in southeastern Nebraska mostly on the lower leaves. Dry weather in early April limited leaf rust development. Rains in mid-late April were conducive for new rust development. The third week of May wheat leaf rust was found on triticale in plots at Lincoln. In nurseries in southeastern Nebraska at Lincoln and Mead leaf rust incidence was 100% with severities between 70-100%. Many flag leaves in plots at Lincoln had both wheat leaf rust and wheat stripe rust. Wheat leaf rust was the predominant disease in the Mead plots. With warming temperatures wheat stripe rust development in the state slowed while wheat leaf rust development increased.

Louisiana – Wheat leaf rust at less than 1% incidence, but high severity, in some areas, was found in plots at Alexandria in central Louisiana on March 1. Leaf rust likely overwintered in this area. Wheat leaf rust was spreading rapidly in the nursery at Baton Rouge in southeastern Louisiana by April 7. Conditions were favorable for increased leaf rust development. At Crowley in southwestern Louisiana, wheat leaf rust was at moderate levels on April 15. The plots ranged from mature to just past soft dough growth stage.

Mississippi – Wheat leaf rust was found in a commercial field in eastern Mississippi in early February. On March 23, leaf rust was reported on the soft red winter wheat cultivar Georgia Gore in a nursery at Canton in central Mississippi. By early April wheat leaf rust was being found throughout the wheat production areas in the state. Conditions were very conducive for rust development with continued rainfall and warm temperatures. The fourth week of April, wheat leaf rust was found at high incidence and light severity in Warren and Adams Counties in western Mississippi. By early May wheat leaf rust was the predominant rust found on wheat in the state. Conditions in the state were very favorable for rust increase. Due to wet conditions last fall, however, very little wheat was planted in the state.

Alabama – From Kira Bowen:

I only checked variety trials for rust, and a susceptible few varieties (Progeny and USG varieties) developed modest amounts of leaf rust in Southern and Central Alabama. No other rust was seen; no rust was seen in the variety trials in north Alabama.

Arkansas – Leaf rust was found in Desha and Jefferson Counties in southeastern Arkansas in early March.



North Carolina – Leaf rust was widespread and unusually early and at heavy levels across the Coastal Plain of North Carolina due to the warm winter.

Delaware – From Nathan M. Kleczewski: Common (leaf) rust was detected at low levels in Delaware after flowering, and likely had minor impacts on yield or grain quality.

Tennessee – Wheat leaf rust was found at very low incidence and severity in plots at Jackson in western Tennessee the fourth week of April.

South Carolina – Wheat leaf rust was found in fields of Pioneer 26R10 in Lee and Dillon Counties in northeastern South Carolina the second week of April. Wheat leaf rust was also observed on multiple cultivars in plots at Blackville in southwestern South Carolina.

Virginia – Some headrows in the nursery at Mt. Holly in eastern Virginia were heavily infected with wheat leaf rust from the bottom leaves to the flag leaves on May 2. At Warsaw, also in eastern Virginia, the lower leaves of susceptible cultivars were heavily infected. It is likely the infections at Mt. Holly and Warsaw occurred early in the season. Wheat leaf rust was moderately severe in plots at Holland in southeastern Virginia on May 12. In nurseries at Painter in the eastern shore region, leaf rust was prevalent and heavy on susceptible lines. Leaf rust was widely prevalent and severities had reached 90% in plots at Warsaw in eastern Virginia. Wheat leaf rust was widespread in nurseries at Blacksburg in western Virginia on May 28. Leaf rust on flag leaves of susceptible lines had reached around 90% severity

Georgia – Wheat leaf rust was found in four different nursery locations from south central to northwestern Georgia.

Kentucky – Wheat leaf rust was found in plots in western Kentucky in early May.

Illinois – Wheat leaf rust was found in plots in southern Illinois in early May.

Minnesota – Wheat leaf rust was found at trace to low levels in the hard red winter wheat NRPN yield plots at St. Paul in southeastern Minnesota on June 1. Uredinia were found on the lower leaves. On June 25, wheat leaf rust was observed in spring wheat plots at Fergus Falls in west central Minnesota. The cultivar Marshall (*Lr2a*, *Lr10*, *Lr34*) had moderate levels of severity on lower leaves, with uredinia starting to develop on flag leaves. Leaf rust was not seen on any other cultivar or breeding line in the nursery. Leaf rust was present at low to moderate levels in plots of spring wheat in south central Minnesota in mid July, and in plots in northwestern Minnesota at the end of July. The incidence of leaf rust varied across the different cultivars and breeding lines in the plots.

South Dakota – Low levels of wheat leaf rust were found on some winter wheat cultivars in nurseries at Volga in eastern South Dakota in late June. Winter wheat was at or beyond soft dough growth stage. The third week of July, wheat leaf rust was found at low incidence and severity on spring wheat in central South Dakota. Higher levels of wheat leaf rust were found on susceptible lines and cultivars in nurseries in northeastern and east central South Dakota. Spring wheat in all these areas ranged from milk to soft dough growth stages.

North Dakota – Wheat leaf rust was found in a winter wheat plot at Fargo in eastern North Dakota on June 8. Wheat leaf rust was present on spring wheat plots in east central, and northeast North Dakota the last week of July. Susceptible cultivars had high levels of leaf rust severity. Cultivars with combinations of effective leaf rust resistance genes had only trace levels of infection. Cultivars with *Lr21* (Faller, Prosper) had higher levels of rust severity in east central North Dakota.

Wisconsin – From Damon Smith:



Leaf rust was observed in one field in south central Wisconsin. We suspect that leaf rust was present in other fields, however, the amount of stripe rust in many varieties resulted in little leaf area for leaf rust to be readily observed.

Ohio – Wheat leaf rust was found at severities of 50-80% in Champaign, Clark, Ashland and Wayne Counties the fourth week of June. These were the highest severities found in a recent survey of the Ohio Valley.

New York – Very low levels of wheat leaf rust were found in nurseries at Aurora and Ithaca in central New York by late May.

Washington – Wheat leaf rust was found in a nursery at Mt. Vernon in northwestern Washington on June 2.

Ontario, Canada – From Albert Tenuta and Joanna Follings (OMAFRA):

Ontario 2015/16 seasonal summary – Albert Tenuta and Joanna Follings (OMAFRA)

Optimal fall planting conditions in 2015 resulted in approximately 1 million acres of winter wheat being seeded. Excellent weather conditions thru to November provided an opportunity for wheat to be well tillered before winter. The proportion of HRW acres dropped from 12% of the crop in the previous year to 10%. Soft wheat acreage jumped from 6% to 9% with soft red wheat making up the majority of the crop at 81%.

Winter wheat survival was excellent. March brought significant amounts of rainfall in some areas across the province leaving fields water logged. Once things began to dry up many growers were able to get red clover broadcasted into wheat; however, the dry weather conditions later in the season resulted in very thin stands. Very cool nighttime temperatures throughout March and April with no snow cover also resulted in purpling wheat throughout much of the province. Many growers were concerned about lodging risk as a result of the early planted crop but the cooler nighttime temperatures kept the wheat short and reduced lodging risk.

Leaf rust was observed late in the season and had minimal impact.

Wheat leaf rust races identified to date from 2016 collections.

Virulence code	Virulences	State	No. of isolates
BBBDB	14a	NC	1
MBDSB	1,3,17,B,10,14a	MS, TX	3
MBDSB	1,3,17,B,10,14a	TX	2
MBDSD	1,3,17,B,10,14a,39	KS, LA, TX	17
MBPSB	1,3,3ka,17,30,B,10,14a	LA, TX	11
MBTNB	1,3,3ka,11,17,30,B,14a	MS, NC, VA	23
MBTSB	1,3,3ka,11,17,30,B,10,14a	LA, MS	3
MCDSB	1,3,26,17,B,10,14a	TX	1
MCSD	1,3,26,17,B,10,14a,39	TX	1
MCPSB	1,3,26,3ka,17,30,B,10,14a	TX	1
MCTNB	1,3,26,3ka,11,17,30,B,14a	LA, MS, NC, TX, VA	11
MCTSB	1,3,26,3ka,11,17,30,B,10,14a	MS	2
MDTSB	1,3,24,3ka,11,17,30,B,10,14a	TX	1
MFGJG	1,3,24,26,11,10,14a,28	NC	1
MGPSB	1,3,16,3ka,17,30,B,10,14a	TX	2
MGPSD	1,3,16,3ka,17,30,B,10,14a,39	LA	1
MLDSB	1,3,9,17,B,10,14a	NC	1
MLSD	1,3,9,17,B,10,14a,39	NC, TX	2
MLPSD	1,3,9,3ka,17,30,B,10,14a,39	AR, KS, NC, TX	15



MMDSD	1,3,9,26,17,B,10,14a,39	TX	1
MMNSD	1,3,9,26,3ka,17,B,10,14a,39	TX	1
MMPSD	1,3,9,26,3ka,17,30,B,10,14a,39	KS, TX	9
MNDSD	1,3,9,24,17,B,10,14a,39	TX	1
MNPSD	1,3,9,24,3ka,17,30,B,10,14a,39	AR, KS, LA, TX	15
MPPSD	1,3,9,24,26,3ka,17,30,B,10,14a,39	TX	4
MPTSD	1,3,9,24,26,3ka,11,17,30,B,10,14a,39	TX	1
PBDQJ	1,2c,3,17,B,10,28,39	TX	1
PBJQJ	1,2c,3,11,17,B,10,28,39	KS	1
TBBGJ	1,2a,2c,3,10,28,39	TX	1
TBBGS	1,2a,2c,3,10,21,28,39	TX	2
TBNJJ	1,2a,2c,3,3ka,17,10,14a,28,39	TX	3
TBRKG	1,2a,2c,3,3ka,11,30,10,14a,18,28	VA	1
TBRKJ	1,2a,2c,3,3ka,11,30,10,14a,18,28,39	MS	1
TBTNB	1,2a,2c,3,3ka,11,17,30,B,14a	NC	4
TCRKG	1,2a,2c,3,26,3ka,11,30,10,14a,18,28	MS, NC, SC, VA	11
TCTKG	1,2a,2c,3,26,3ka,11,17,30,10,14a,18,28	SC	1
TCTNB	1,2a,2c,3,26,3ka,11,17,30,B,14a	NC	3
TCTSB	1,2a,2c,3,26,3ka,11,17,30,B,10,14a	SC	1
TDRJG	1,2a,2c,3,24,3ka,11,30,10,14a,28	MS	1
TDTSB	1,2a,2c,3,24,3ka,11,17,30,B,10,14a	AR, NC	2
TFBJJ	1,2a,2c,3,24,26,10,14a,28,39	TX	1
TLPSD	1,2a,2c,3,9,3ka,17,30,B,10,14a,39	TX	1
TNBGJ	1,2a,2c,3,9,24,10,28,39	KS, NC, TX	13
TNBJJ	1,2a,2c,3,9,24,10,14a,28,39	LA, TX	12
TNRJJ	1,2a,2c,3,9,24,3ka,11,30,10,14a,28,39	TX	1
Total			190

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

Wheat cultivar *Lr* gene postulation database. Please visit: [Leaf rust resistance gene postulation in current U.S. wheat cultivars](#)

Wheat stripe rust. Wheat stripe rust was very widespread across the U.S. in 2016, reported in 31 states and 4 Canadian provinces (see [wheat stripe rust observation map](#)). This was the widest distribution of stripe rust in the U.S. since 2010. In many areas the application of fungicides and use of resistant cultivars mitigated the heavy stripe rust disease pressure.

Pacific Northwest – From Xianming Chen:

In the Pacific Northwest of the United States (Idaho, Oregon, and Washington), stripe rust started much earlier than normal in most wheat growing areas due to the mild winter. Higher than normal precipitation from March to May and close to normal precipitation in June allowed stripe rust developed fast. The stripe rust season in the most wheat growing regions east of the Cascade Mountain range was very long, from early March to middle July, with active stripe rust pustules still on green plants of spring wheat in eastern Washington and northern Idaho in late July. Yield loss on highly susceptible varieties in experimental fields around Pullman, WA is estimated over 60% without fungicide applications. In commercial fields, stripe rust was generally under control by growing resistant varieties and widely using fungicides. The majority of wheat fields received fungicide application at the time of herbicide application, and many fields were



sprayed two times or even three times. Although stripe rust is severe, Pacific Northwest has a bumper harvest in 2016.

Florida – Wheat stripe rust was found in a nursery of the cultivar Quincy in Gadsden County in the northern Panhandle in late April.

Louisiana – Stripe rust at less than 1% incidence, but with high severity, was found in nurseries at Alexandria in central Louisiana on March 1. Stripe rust was also found in nurseries at Winnsboro in northeastern Louisiana. Stripe rust was still active in plots at Baton Rouge in southeastern Louisiana, but not at high incidences in most plots on April 7.

Mississippi – Several large stripe rust hot spots were found in nursery borders in Issaquena County in western Mississippi the fourth week of March. Stripe rust was found in a cover crop trial, but not the nursery at Stoneville in western Mississippi. On March 23, stripe rust was reported on the soft red winter wheat cultivar Georgia Gore in a nursery at Canton in central Mississippi. Severe stripe rust infection was found in a field of Beretta wheat in Bolivar County in northwestern Mississippi the last week of March. The wheat had just begun to head out and the farmer thought perhaps he had herbicide damage, but it was actually stripe rust. The rust was sporulating, however, telia were present as well. This was one of the worst infected fields Tom Allen has seen in his nine years. Several other wheat fields in the area had small stripe rust hot spots. By early May stripe rust development in the state had slowed considerably due to warmer temperatures. Telia were forming on old stripe rust infections. Due to wet conditions last fall, very little wheat was planted in the state.

Arkansas – Stripe rust was found in Desha, Jefferson and Woodruff Counties in southeastern and eastern Arkansas, respectively, by early March. Low incidences with a few hot spots were observed in Desha and Jefferson Counties.

Tennessee – Stripe rust was observed in a field in Madison County in western Tennessee the last week of March. By April 19 stripe rust was the predominant rust in nurseries at Jackson in Madison County

Kentucky – Stripe rust was confirmed in Lyon County in western Kentucky the second week of April. Stripe rust was widespread across western Kentucky in late April and early May.

Indiana – Stripe rust, at low incidence and severity, was confirmed in a commercial field in Posey County in southwestern Indiana the third week of April.

Illinois – Stripe rust was widespread across southern Illinois in early May.

Ohio – Stripe was confirmed in Circleville in southern Ohio on May 5. Cool and rainy conditions in the area were conducive for stripe rust development. Stripe rust was spreading across the state by the fourth week of May and was particularly severe in areas in the southwestern part of the state. This was the most widespread and severe stripe rust has been in the state in 13 years. Some growers applied fungicides.

North Carolina – Low to medium levels of stripe were observed in a few fields in Raleigh and Plymouth (northeastern North Carolina) and near Goldsboro in the central Coastal Plain in late March. The stripe rust near Goldsboro had been present for some time. Conditions had been conducive for stripe rust in the Mid-Atlantic area.

Virginia – A plot at Warsaw in eastern Virginia was found heavily infected with stripe rust the last week of March. This is very early for stripe rust to appear in the area. Stripe rust was observed at Suffolk in



southeastern Virginia and in Northampton County in the Eastern Shore the third week of April. Wheat stripe rust at trace levels was found in one headrow in a nursery at Mt. Holly in eastern Virginia on May 2. Stripe rust was widespread and at high levels of infection in some field tests at Warsaw in eastern Virginia. Wheat stripe rust was moderately severe in plots at Holland in southeastern Virginia on May 12. In nurseries at Painter, in the eastern shore region, stripe rust was prevalent and heavy on susceptible lines. Stripe rust was widely prevalent and severities had increased to 90% severity in plots at Warsaw in eastern Virginia. Wheat stripe rust was widespread in nurseries at Blacksburg in western Virginia on May 28, but had not yet reached high severities.

Maryland, Delaware – From Nathan M. Kleczewski:

Stripe rust entered the Southern portions of Maryland early this season, when plants were entering the flag leaf stage in Southern portions of the state. In addition, this season the region experienced a prolonged period of cool, wet weather that allowed stripe rust to develop and spread throughout the area on susceptible varieties. Stripe rust was detected throughout the Eastern shore of Maryland and Delaware, with significant impacts on yield and quality where susceptible varieties were planted, for example the variety Shirley, a commonly planted high-yielding variety, was extremely susceptible to this disease. In some cases, fungicide intervention was warranted.

Texas – Stripe rust was found on WB Cedar in plots at College Station in February, however, leaf rust was more prevalent in the nursery. Stripe rust was uniformly spreading in the lower canopy in nurseries at Castroville on March 2. Infections reached 70S and beyond on some lines. At Uvalde the stripe rust had progressed more. Stripe rust was found at low severities, but with incidence up to 90% on some lines in sentinel plots at Weslaco in extreme southern Texas the first week of March. By March 10, stripe rust was found throughout much of Texas from the Oklahoma border to the Gulf Coast, the exception being the Texas High Plains where no rust had been reported. Fungicides were being applied in commercial fields. Wheat stripe rust had spread uniformly in the lower canopy in plots at Castroville by April 8, but the rust development had slowed or stopped due to warming temperatures. The stripe rust was mostly confined to the lower canopy of susceptible cultivars but was found on flag leaves of very susceptible cultivars such as Redhawk. Stripe rust development in central and south Texas had slowed or stopped the second week of April. Stripe rust pressure was limited in southeastern Texas, but was significant in Dawson County in western Texas. In central Texas, stripe rust was still active in early May in plots in Concho County while in Hill and Williamson Counties stripe rust was no longer actively sporulating, but instead producing telia. With increasing temperatures leaf rust development was favored over stripe rust development in the state.

Oklahoma – Low incidences of stripe rust were found in the Stillwater area in early March. Rust was found on the upper leaves of the cultivar Pete, indicating the spores had blown in from the south. By the second week of March, stripe rust was more prevalent across the state. From a survey from central Oklahoma and southwestern Oklahoma the third week of March, stripe rust was found scattered across fields with some hot spots observed. In some fields no stripe rust was found. Some fields in southwestern Oklahoma were in need of rain. The fourth week of March stripe rust varied from low to high severity in central Oklahoma. By the fourth week of March stripe rust was active in many areas of the state, however, stripe rust did not become more severe in areas of central and north central Oklahoma and in some areas stripe rust telia developed. Stripe rust was still active and the most prevalent disease in the state the second week of April, but dry conditions had limited additional spread. Rain the fourth week of April was very beneficial to the winter wheat crop, but with it came extended dew periods conducive for rust development. Stripe rust was still active in the state, but with warming temperatures leaf rust development was favored. By April 29, stripe rust in southern Oklahoma was mostly at telia (overwintering) stage and uredinial development had mostly stopped. In central Oklahoma and around Stillwater more active stripe rust could be found. Stripe rust had yellowed or killed the leaves of susceptible cultivars not treated with fungicides in all areas.



Fungicide treated wheat had mostly green leaves. Stripe rust sporulation had mostly stopped in the Stillwater area, but a bit to the north and west stripe rust was still active at Lahoma and to a lesser extent Alva in early May. The effects of stripe rust in the area were dramatic on susceptible cultivars not treated with fungicides. As stripe rust development was winding down, wheat leaf rust increased and became severe around Stillwater. The second week of May stripe rust, at low levels, was still active in Major County in northwestern Oklahoma. Some wheat stripe rust was still actively sporulating in areas of northwestern Oklahoma on the third week of May, however, most wheat in the state, except for the Panhandle, no longer had leaves available for infection.

Kansas – Stripe rust was found at generally low levels in southern Kansas by March 18 and was most active in the southeastern part of the state. The winter wheat crop was about 3 weeks ahead of average development (near jointing in the northwest, about a week from flag leaf emergence in south central and southeast). By April 1, stripe rust had been reported in many counties in central and southeastern areas of the state. The stripe rust was at low levels on lower leaves in most fields with the exception of southeastern Kansas. Stripe rust continued to develop in central Kansas the second week of April. The rust was mostly limited to the lower leaves and occasionally mid canopy at trace levels. The incidence on the lower leaves of susceptible cultivars ranged from 1-30%. The dry conditions in the state slowed the spread of rust, but with recent rains conditions were more conducive for rust development. Stripe rust continued to be a concern in Kansas in mid-May. With recent rains stripe rust that was restricted to the lower canopy had now rapidly moved to the upper leaves on susceptible cultivars in central and eastern Kansas. Additionally, stripe rust has appeared in the northwestern and western part of the state at low levels. Many growers were applying fungicides to control the disease. Stripe was severe in many fields in the state not treated with fungicides. Severities had exceeded 80% in demonstration plots of susceptible cultivars in south central Kansas and had nearly reached 100% severity on flag leaves in plots in Ellsworth in central Kansas. The weather the third week of May was conducive for further stripe rust development and the risk of severe disease was high in northwestern and west central Kansas where low levels of stripe rust had been reported on flag leaves..

Nebraska – Trace amounts of stripe rust were found in a winter wheat field in Nuckolls County in south central Nebraska on April 8. Stripe rust was confirmed in several wheat fields in Banner County in the southern Panhandle. No rust was found in the southernmost tier of counties in the state when surveyed on April 12 and 13. A few stripe rust hot spots were found in plots near Mead in eastern Nebraska. Dry conditions over the previous two weeks had stopped rust development, but with recent rains rust development resumed. Very little disease was found in commercial fields in eight counties in southeastern and south central Nebraska when surveyed April 27-28. Significant levels of stripe rust were however found in nurseries at Lincoln, near Mead and near Clay Center in southeastern Nebraska. The highest levels were found in the nurseries near Clay Center where hot spots were scattered through the nurseries and 50% severities were found on some leaves. Recent conditions were favorable for development and spread of stripe rust. In early May, stripe rust was widespread, but mostly at low levels across southern Nebraska, including southern parts of the Panhandle. West central areas and the Panhandle were at highest risk to stripe rust development as temperatures were cooler, particularly at night and there had been moisture. While stripe rust was present in the eastern part of the state, it had not developed to the damaging levels experienced in 2015. Most fields surveyed in southeastern and south central part of the state generally had little or no disease on May 25. In south central Nebraska, however, stripe rust was found at low to moderate levels with several hot spots in Thayer County and was severe in one field in Nuckolls County. By early June, wheat stripe rust had increased significantly in all wheat growing areas in the state. Wheat stripe rust was severe and widespread in Cheyenne County in the Nebraska Panhandle. Winter wheat was just starting to head. In nurseries in southeastern Nebraska at Lincoln and Mead stripe rust incidence was 100% with severities between 70-100%. Many flag leaves in plots at Lincoln had both wheat leaf rust and wheat stripe



rust. Wheat leaf rust was the predominant disease in the Mead plots. With warmer temperatures stripe rust development in the state slowed considerably.

Colorado – Wheat stripe rust was found in Mesa County in western Colorado in early March. It appears the stripe rust overwintered there. There was heavy stripe rust disease pressure in the fall. This stripe rust was quite isolated from the eastern wheat production areas. Stripe rust was reported on the highly susceptible cultivar Ripper in the Prospect Valley northeast of Denver the fourth week of March. It seems plausible the stripe rust overwintered in the area. Stripe rust was still present in areas it was initially reported, Mesa County in western Colorado and Prospect Valley northeast of Denver, but dry conditions the second week of April prevented the rust from spreading. Stripe rust at low levels was also reported near Roggen and Stratton in northeastern Colorado. Stripe rust was still present in areas it was initially reported, but remained at low levels despite the cool, wet weather. Wheat stripe rust was found in many areas in the eastern part of the state by May 12. The rust was generally at low levels, but conditions were favorable for further stripe rust development. Stripe rust was slowly spreading in fields in Mesa County in western Colorado. By early June, stripe rust was now widespread across the state, but at generally low levels due to the application of fungicides. The cool, wet weather was conducive for stripe rust development, but the onset of warm, dry weather limited additional stripe rust development and spread.

Wyoming – In a survey of the winter wheat area of southeastern Wyoming, stripe rust was found in 18 of the 87 sites visited. Stripe was just beginning to appear and the disease pressure was highest in southeastern Goshen County and northern Laramie County. Several growers in the area had applied fungicides. The onset of warm, dry conditions limited further stripe rust development

South Dakota – Stripe rust was found in Hand County in central South Dakota on April 6. The rust was found on old, lower leaves and appears to have overwintered. Cool, rainy conditions were conducive for development and spread. On April 12, several winter wheat fields in central South Dakota were surveyed, but stripe rust was only found in the same field reported on April 6. Some of the leaves had telia present. Wheat stripe rust, ranging from trace to moderately severe, was observed in fields in Hutchinson County in south central South Dakota on May 13. Stripe rust was also reported in central and eastern South Dakota. Wheat in the state ranged from jointing to flag leaf emergence. Stripe rust was found in nearly all fields in eastern, central and western South Dakota scouted the fourth week of May. Stripe was just beginning to develop in most fields while some fields had moderate to severe levels. Active stripe rust was found in central and eastern South Dakota the third week of July.

North Dakota – Stripe rust was confirmed in nurseries at Fargo and at Hettinger in eastern and southwestern North Dakota, respectively, on May 23. The appearance of stripe rust in the state was about 10 days earlier than last year. By early June, stripe rust was found in winter wheat at Langdon in northeastern North Dakota and was also reported in commercial winter wheat fields in north central part of the state. Stripe rust had not yet been reported on spring wheat. By late June, stripe rust, at low incidence and severity, was beginning to appear on spring wheat and durum in the state. Favorable dews were conducive for stripe rust spread. Most spring wheat was flowering or in early kernel formation. High levels of stripe rust were found in a few winter wheat fields in southeastern North Dakota and yield will likely be impacted.

Minnesota – Wheat stripe rust was found in a winter wheat nursery at Lamberton in southwestern Minnesota on April 14. On the same day, stripe rust at trace prevalence and trace severity was found in winter wheat nurseries at St. Paul. The source of the stripe rust at St. Paul was not likely local as the above ground part of the winter wheat was killed in the winter during several periods without snow cover. The wheat was at tillering stage. Stripe was found on lower leaves of winter wheat in a commercial field in Norman County in northwestern Minnesota in late April. The area of the field with the stripe rust infection was protected by a



tree row and likely had additional snow cover to allow the rust to overwinter. No active sporulation was noted when the infection was found. Stripe rust was active in winter wheat plots at Lamberton in southwestern Minnesota the third week of May. Most winter wheat cultivars in nurseries at Lamberton had some wheat stripe rust, many with 100% incidence and some at relatively high severity by late May. Infections were beginning to appear on spring wheat. By late June the incidence and severity were at levels much lower than were found earlier on susceptible winter wheat. Wheat stripe rust was found at variable incidences and severities in winter wheat nurseries in central, south central and southeastern Minnesota in early June. The wheat was just heading. Stripe rust was still active in plots at St. Paul in southeastern Minnesota in late June despite the recent warm temperatures

Wisconsin – From Damon Smith:

Statewide, the major disease of winter wheat in 2016 was stripe rust caused by *Puccinia striiformis*. Stripe rust could be found in every field that was rated for disease. In the variety trials throughout the state, stripe rust hit some varieties very hard, causing significant damage and early defoliation. Many varieties performed well that had superior genetic resistance toward stripe rust.

New York – Wheat stripe rust was found throughout a winter wheat commercial field at Weedsport in central New York on May 27. The rust was found at all levels of the canopy, telia were also present. It seems likely the stripe rust overwintered in the field. The wheat heads were fully emerged, but not yet at anthesis. Stripe rust had only been observed at trace levels in the state the past decade until this year.

Michigan – A single wheat stripe rust infection was found on the nursery line MI14W0813 (TEMPLE / D6234) at East Lansing in early May. No other stripe rust foci were found at the location.

Alberta, Canada – Wheat stripe rust was found in winter wheat fields in Lethbridge and Olds in southern Alberta in late April.

Ontario, Canada – From Albert Tenuta and Joanna Follings (OMAFRA):

The milder winter conditions resulted in early stripe rust infections in the Midwest US and as expected by mid-May stripe rust was prevalent in most areas of southwestern Ontario. The amount of stripe rust in Ontario was unprecedented. Growers who selected tolerant varieties or applied a foliar fungicide were able to minimize stripe rust infection. However, growers that selected susceptible varieties and did not apply a foliar fungicide saw significant yield reductions.

Dry weather conditions were prevalent in many areas of Ontario with some areas seeing little to no rain since May which reduced FHB risk. Winter wheat harvest began in Essex County around July 1st and by mid-July was in full swing throughout much of the province putting harvest 10-14 days ahead of 2015. Winter wheat yields have exceeded expectations given the lack of rainfall. The dry conditions did however, impact winter wheat yields in very sandy or sand gravel bottom fields. Yields range from 60-80 bu/ac in very dry areas to 120 bu/ac in areas with adequate moisture. A record yield of 158 bu/ac was confirmed in the Chatham-Kent area. Yields as low as 45 bu/ac were reported in fields with severe stripe rust infestation in which susceptible varieties were grown and no application of a foliar fungicide. The quality of the crop has been excellent. Elevators and millers are reporting high protein, high falling numbers and very low fusarium/DON. Straw yields have also been very strong. See wheat leaf rust section for more info from Ontario.

Manitoba, Canada – Stripe rust was reported in a commercial winter wheat field in south central Manitoba in early June. Stripe rust, at 10% incidence and low severity, was found in a spring wheat nursery at Brandon in southwestern Manitoba in early July. The inoculum likely arrived two weeks previously. Spring wheat was at boot stage.



Saskatchewan, Canada – Stripe rust was found in nurseries at Swift Current and Outlook in southern Saskatchewan and in commercial fields at Kandahar also in southern Saskatchewan the fourth week of June. Stripe rust was severe and widespread at Swift Current while at Outlook severities reached 60-100% on some cultivars including AC Radiant that carries *Yr10* that was effective in the province until 2013. At Kandahar, stripe rust was found on the cultivar CDC Buteo and was limited to the lower leaves.

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

Oat stem rust. A few pustules of oat stem rust were found in a plot at Baton Rouge in southeastern Louisiana on March 4. Stem rust does not typically develop in the state to any extent until early April. Oat stem rust was widespread and susceptible lines had high severities in plots at Baton Rouge in southeastern Louisiana on April 7. Trace to 10% severity and <5% incidence of oat stem rust was observed on *Avena strigosa* (black oats) used as a green manure crop in Rio Grande Valley, Texas in mid-March. Oat stem rust had spread rapidly through the nursery at Castroville by April 8 and by mid-April had reached high incidence and severity levels. Oat stem rust was found in oat nurseries at Champaign in eastern Illinois on June 20. The severities ranged from 10 to 90% and the oat was at milky ripe growth stage. Oat stem rust at high incidence and low severity was found in plots at Beresford in southeastern South Dakota the third week of July.

Races found in collections from Texas in 2016 include TGB, TGN, TJN, TJJ, and TJS, and races from Illinois include TGN, TJJ, and TJS.

Oat stem rust map. Please visit: <http://www.ars.usda.gov/Main/docs.htm?docid=9757>.

Oat crown rust.

Louisiana – Oat crown rust was found at fairly high incidence, but low severity in susceptible spreader rows (Brooks) in plots at Baton Rouge in southeastern Louisiana on March 4. The plots ranged from not yet jointed to early flag leaf. Oat crown rust developed rapidly in late March and early April in plots at Baton Rouge. Susceptible cultivars and lines will realize 100% yield loss.

Texas – Oat crown rust up to 80S and 100% incidence was found on Marvelous oat in sentinel plots at Weslaco in extreme southern Texas on March 4. Oat crown rust at high incidence and high severity was found in winter oat plots at Corpus Christi in south Texas on March 30. Oat crown rust had spread rapidly through the nursery at Castroville by April 8.

Minnesota – Oat crown rust first appeared on oat in the Matt Moore Buckthorn Nursery at St Paul, Minnesota on June 1. The infections were from aecia on the common buckthorn in the nursery. The crown rust had spread throughout the spreader rows in the nursery by June 14. Telia were beginning to appear in the nursery by early July. Oat crown rust was severe on many cultivars in plots at Lamberton in southwestern Minnesota in late June. Telia, the overwintering stage, were appearing on the oat. Crown rust on oat was present in plots in northwest Minnesota in late July

Illinois – Oat crown rust was found in Champaign County in east central Illinois at 30-50% severity in late June.
Ohio – Oat crown rust at 1-5% severity was found in Wayne County in northeastern Ohio in late June.

South Dakota – High levels of oat crown rust were found in plots at Volga in eastern South Dakota in late June. Oat crown rust was found in plots at Aberdeen and Watertown in northeastern South Dakota and Volga the third week of July. The crown rust was most severe at Watertown and Volga.

Wisconsin – From Damon Smith:



Oat crown rust was observed in many oat fields that we visited. However, severity was low to moderate.

Oat crown rust has now been reported in Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, North Carolina, Virginia, Illinois, Ohio, South Dakota, Minnesota and Wisconsin.

Oat crown rust map. Please visit: <http://www.ars.usda.gov/Main/docs.htm?docid=9757>.

Barley leaf rust. Barley leaf rust developed to severe levels in plots in areas of Texas, Virginia and Washington.

Texas – Barley leaf rust was severe in hooded barley windbreaks in watermelon fields at McAllen in extreme southern Texas the second week of March. Barley leaf rust severities ranged from light to heavy in plots at Weslaco in extreme southern Texas in mid-late March. At College Station, barley leaf rust was found in plots the second week of March. Low levels of barley leaf rust were found in plots at Castroville in south Texas on March 29 and spread rapidly through the nursery by April 8 causing very severe damage to susceptible barleys. In plots in Burleson County barley leaf rust was at high levels by April 15, while last year there was virtually no leaf rust on the barley and moderate levels in 2014.

Virginia – Barley leaf rust was prevalent and heavy on susceptible lines in plots at Painter in the eastern shore region of Virginia by early May. At Warsaw in eastern Virginia, barley leaf rust was widely prevalent with increasing severities that reached 90% in plots.

Kentucky – Barley leaf rust was found on the winter barley cultivar Thoroughbred in plots in Caldwell County in western Kentucky in early May.

Alabama – Barley leaf rust was found on cultivars Thoroughbred and Charles in northeastern Alabama on May 12.

Minnesota – A few pustules of barley leaf rust were found on winter barley in plots at Lamberton in southwestern Minnesota the third week of May and by late May some barley cultivars had considerable barley leaf rust. Barley leaf rust was found in nurseries at St Paul in southeastern Minnesota on May 31.

New York – Very low levels of barley leaf rust were found in nurseries at Aurora and Ithaca in central New York by late May.

Nebraska – Barley leaf rust was found in a nursery at Mead in eastern Nebraska on June 9. Low levels of barley leaf rust were found on the 2 row malting barley Conlon in plots at Aurora in central New York on June 14.

Washington – Barley leaf rust was severe in plots at Mt. Vernon in northwestern Washington the second week of July.

Barley leaf rust was reported in Texas, Alabama Kentucky, North Carolina, Virginia, Nebraska, Minnesota and New York.

Barley leaf rust map. Please visit: <http://www.ars.usda.gov/Main/docs.htm?docid=9757>

Barley stripe rust. From Xianming Chen:

In contrast to wheat stripe rust, stripe rust was generally at low levels on barley. Barley stripe rust occurred in California, Oregon, Idaho, Washington, and Montana. A sample of stripe rust on barley was received from Minnesota in late July.

Barley crown rust – High levels of barley crown rust were found on *Elymus canadensis* near Vicksburg in western Mississippi the third week of May.



Rye stem rust – Stem rust was found on rye in nurseries at Wooster in northeastern Ohio on June 22. Severities ranged from 1 to 20%.

Thank you!

This is not only the final Cereal Rust Bulletin for 2016, it will be my final Cereal Rust Bulletin as I plan to retire in January 2017. I would like to thank all the tremendous cooperators who took the time to share their observations, provide state loss estimates and send us rust collections over the years. As we have often said, without your assistance the cereal rust surveys would be greatly diminished. It has been a real pleasure working with you all these many years.

My best regards to you all!

Mark Hughes
CDL

Cooperator	State	Cooperator	State	Cooperator	State
Kira Bowen	AL	Melissa Lim	MN	Mike Flowers	OR
Barton Fogleman	AR	Roger Caspers	MN	Nicole Anderson	OR
Gene Milus	AR	Ruth Dill-Macky	MN	Patrick Hayes	OR
Jason Kelley	AR	Sam Gale	MN	David Gunter	SC
Terry Spurlock	AR	Sam Stoxen	MN	Emmanuel Byamukama	SD
Bob Hamon	CO	Yue Jin	MN	Jay Culver	SD
Gordon Cisar	CO	Tom Allen	MS	Ruth Beck	SD
Kirk Border	CO	Mary Burrows	MT	Heather Marie Kelly	TN
Ned Tisserat	CO	Christina Cowger	NC	Amir Ibrahim	TX
Scott Haley	CO	Andrew Friskop	ND	B. Gerrish	TX
Wilma Trujillo	CO	Matt Breiland	ND	Bryan Simoneaux	TX
Nathan Kleczewski	DE	Bob Harveson	NE	Clark B. Neely	TX
Md Ali Babar	FL	Janelle Millhouse	NE	D. Hathcoat	TX
Alfredo Martinez	GA	Jennifer Rees	NE	Jackie Rudd	TX
Jerry Johnson	GA	Stephen Baenziger	NE	John Fenderson	TX
John Youmans	GA	Stephen Wegulo	NE	Ron French	TX
Jared Hobson	ID	Gary Bergstrom	NY	Russell Sutton	TX
Juliet Marshall	ID	M. Fulcher	NY	Xandra Morris	TX
Oliver Neher	ID	Mark Avery	NY	Carl Griffey	VA
Kiersten Wise	IN	Pierce Paul	OH	Hillary Mehl	VA
ZewdieAbate	IN	Aaron Henson	OK	Mark Vaughn	VA
Bob Bowden	KS	Art Klatt	OK	Neal Carpenter	VA
Doug Shoup	KS	Bob Hunger	OK	Wynse Brooks	VA
Erick De Wolf	KS	Brett Carver	OK	Patricia DeMacon	WA
Jon Appel	KS	Brian Olson	OK	Anmin Wan	WA
Carl Bradley	KY	Darrel McBee	OK	Kent Evans	WA
Allysson Lunos	LA	David Nowlin	OK	Kimberly Campbell	WA
Boyd Padgett	LA	G. Hill	OK	Mike Pumphrey	WA
Clayton Hollier	LA	Gary Strickland	OK	Tim Murray	WA
Kelly Arceneaux	LA	Greg Highfill	OK	Xianming Chen	WA
Stephen Harrison	LA	Heath Sanders	OK	Adrian Barta	WI
Trey Price	LA	J.Wes Lee	OK	Brian Mueller	WI



Andrew Wiersma	MI	Jeff Edwards	OK	Damon Smith	WI
Eric Olson	MI	Jen Olson	OK	David Long	WI
Martin Nagelkirk	MI	John Fellers	OK	William Stump	WY
Bruce Potter	MN	John Fenderson	OK		
Jakob Riddle	MN	Natalia Grachet	OK	Pam de Rocquigny	Manitoba, Canada
Jim Anderson	MN	Raymond Sidwell	OK	Tom Fetch	Manitoba, Canada
Jim Kolmer	MN	Rocky Thacker	OK	Santosh Kumar	Manitoba, Canada
Jochum Wiersma	MN	Stan Fimple	OK	Albert Tenuta	Ontario, Canada
Jordan Briggs	MN	Zack Meyer	OK	Dave Hooker	Ontario, Canada
Kun Xiao	MN	Chris Mundt	OR	Joanna Follings	Ontario, Canada
Madeleine Smith	MN	Clare Sullivan	OR	Barb Ziesman	Saskatchewan, Canada
Matt Rouse	MN	Larry Lutchter	OR	M. Vaughn	Saskatchewan, Canada

Our sincere apologies if by oversight we did not include someone in the list.

