CEREAL RUST BULLETIN

Issued by:

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- Wheat stem rust incidence and severity was generally low throughout the US this year and was not reported from Canada.
- Wheat leaf rust was widespread this year with observations in seventeen US states and one Canadian province.
- Wheat stripe rust was widespread this year with observations in twenty-seven US states and four Canadian provinces. Disease infections were persistent and reached high severity in many locations.
- Oat stem rust and oat crown rust were observed particularly early this year and were widespread across the Plains, Southeast, and Midwest Areas.
- Barley leaf and stem rusts were rarely observed, though high infection foci were reported for both rusts.
- Rust on barberry was reported this summer in southern Minnesota and southern and eastern Wisconsin.
- *Thank you to all cooperators for rust reports and collections!*

For original, detailed reports from our cooperators and CDL staff, please visit the Cereal Rust Situation (CRS) reports page on the CDL website or click the CRS link found throughout the bulletin.

Wheat stem rust. In general, stem rust incidence and severity was low this year. This season, wheat stem rust was observed in seven US states across the Plains Area (Texas), the Southeast Area (Arkansas, Georgia, Louisiana), the Mid-Atlantic Area (Virginia), and the Midwest/Ohio Valley (Illinois and Indiana). The first observations were made in the Plains Area and the Southeast Area in early spring (April), followed by an isolated observation in the Mid-Atlantic Area in May, and scant observations throughout the Midwest/Ohio Valley in June. Race QFCSC was identified from samples collected in all locations. Race QFCSC has been the most prevalent wheat stem rust race in the US over the past decade.

Plains Area. Across the Plains, wheat stem rust was only observed in Texas this year. Unlike in recent years, cereal gains used in agricultural windbreaks in the lower Rio Grande Valley were stem rust free this spring. Rust infections were likely prevented this season due to persistent drought in the region. However, wheat stem rust was observed starting in early April in central Texas. On April 9 wheat stem rust was first observed in a single plot in Castroville with a disease incidence of 20% and disease severity up to 80% in rusted plants. The high disease severity within the plot and a lack of stem rust in the surrounding plots suggested that this was likely an overwintering focus. By mid April, stem rust was observed in sentinel plots far from this site on susceptible 'Morocco.' In early April, scouting was also performed in Corpus Christi on wheat nearing full maturity, but no stem rust was observed.

Southeast Area. Stem rust was observed in Louisiana, Georgia, and Arkansas this year. Stem rust was observed earlier than usual throughout these states, but most rust infections were fairly contained. A combination of rust and poor weather conditions affected crop production in parts of the region.

Louisiana – Wheat stem rust was first reported at a research station in southern Louisiana (Crowley) on April 17. In mid May during a survey trip throughout Louisiana, wheat stem rust was collected from agricultural research stations in Baton Rouge and Winnsboro. The disease was at low incidence, but moderate severity across all surveyed sites.

Georgia – Wheat stem rust was found earlier than usual in southwestern Georgia (Plains) research fields towards the end of April. The infection persisted and reached high severity by harvest time in late May. In addition to rust damage, widespread vernalization issues and late frost damage negatively affected wheat production.

Arkansas – Stem rust was observed at low incidence in experimental breeding plots in Southeast Arkansas (Rohwer) in late April, remarkably earlier than observed in previous years. The disease severity was very high, but was specific to a single variety. In mid May wheat stem rust was also observed at trace levels (low incidence, low severity) at an agricultural research station in Mariana, north of the previous observations.

Mid-Atlantic Area. A single, isolated and early, observation of wheat stem rust was reported in coastal Virginia (Painter) on May 10. Further disease progression was not reported.

Midwest Area and Ohio Valley. Wheat stem rust was only observed in Illinois and Indiana this year. All observations came from a single survey trip conducted by USDA-ARS Cereal Disease Laboratory staff between June 12-16 along a route from St. Louis, Missouri extending northeastward through Illinois, Indiana, and Ohio, and into southeastern Michigan. Stem rust was observed in Illinois and Indiana on wheat nearing maturity. In Illinois, wheat stem rust was observed in two research fields within a single town (Champaign). Wheat stem rust was also observed at multiple locations in Indiana (a research field in Vincennes and two private fields in Miami County). All infections in Illinois and Indiana were at low incidence and low to moderate severity.

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

Wheat leaf rust. This year, leaf rust was observed in seventeen US states and one Canadian province (Ontario). Wheat leaf rust was widespread throughout the US with observations reported from the Plains Area (Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota), Southeast Area (Louisiana, Mississippi, Georgia), Mid-Atlantic (Virginia), Midwest/Ohio Valley (Minnesota, Illinois, Indiana, Ohio, Michigan), and the Pacific Northwest (Washington, Idaho). The first observations were in Texas and Louisiana in February and wheat leaf rust was observed in Oklahoma and Kansas by the beginning of April. In the latter half of April, leaf rust infections were found throughout the southern Great Plains and the Southeast. In early to mid May, leaf rust continued to develop in the Plains Area and in the Southeast region. New observations were also reported in May in the Mid-Atlantic. The first observations of leaf rust in the Midwest Area were in early June. Wheat leaf rust was also reported in the Ohio Valley and Plains Areas in early June. In July, new observations of wheat leaf rust were reported in the Midwest Area, the Plains Area, and the Pacific Northwest. In Canada, an overwintering focus was observed near Toronto in late April and persisted through the spring in southern Ontario.

Plains Area. Wheat leaf rust was present throughout the Great Plains. The first observations were made early in the season (February) in Texas and the disease spread quickly into Oklahoma and Kansas by the beginning of April. Further development in the northern Great Plains states progressed with crop maturity. Infections persisted in the region until harvest. Higher incidence and severity was observed in some areas compared to previous years.

Texas – By mid February, wheat leaf rust was observed in research plots and in some farm fields throughout southeast Texas. In the third week of March leaf rust was at moderate to high severity within the mid canopy of plots at Castroville in south-central Texas. In early April wheat leaf rust was at high severity on susceptible cultivars such as TAM 112 with Lr39 at Castroville. While wheat leaf rust developed slowly in southern Texas this year, it progressed to high severity in some areas as crops neared maturity. Wheat leaf rust incidence was notably higher in Castroville this season in comparison to previous years. In addition, significant telia development was observed on both leaves and leaf sheaths of select varieties by late April in Corpus Christi.

Oklahoma – In late March, wheat leaf rust was observed at low incidence and severity in experimental plots and fields near Oklahoma City, Stillwater, and Enid. In early April, wheat leaf rust was present in plots at Stillwater and Perkins. In mid to late April, leaf rust remained the predominant disease on wheat in Oklahoma and heavy infection was observed in some plots in Lahoma (northern Oklahoma, west of Enid). Mixed infections of leaf rust and stripe rust were also observed on wheat around Stillwater. In the last week of April, active leaf rust was observed in southwestern (Altus) and central (Apache and Chickasha) Oklahoma, which contributed to significant flag leaf damage in conjunction with other fungal and viral infections. Late spring snowfall in the far western panhandle may have caused damage or delay to the crop. On May 5, leaf rust was severe on wheat in central Oklahoma (near Stillwater and further west) and covered greater than 60% of flag leaf area in unsprayed susceptible varieties. On May 15, wheat in the central region was reported at the soft to medium dough stages and flag leaves were mostly gone due to severe leaf rust infection (Kingfisher, El Reno). Further north, maturity lagged behind in the full kernel to milk stages and green flag leaves remained on resistant varieties (Lahoma, Alva, Cherokee). In late May, leaf rust was still active in the Oklahoma panhandle and the crop was reported as at or near maturity across the state.

Kansas – In the first week of April, wheat leaf rust was reported at low levels in fields in south-central Kansas. In the latter half of April, infection progressed to upper leaves in select locations in Rice and Cowley Counties. On May 6, leaf rust was reported at low levels in central Kansas, but was spreading in some cases to the upper canopy. In addition, several reports confirmed that leaf rust was present in the west-central and northwestern counties by early May. Infection in the upper canopy as crops neared grain filling increased the risk of yield loss in several locations.

Nebraska - In an early May survey across 200 miles of southern fields near the Kansas border, leaf rust was only observed at trace levels in two south-central locations (Harlan and Webster counties). However, by early June, as plants neared maturity, wheat leaf rust had developed to severe levels across untreated fields in south-central and eastern counties.

North Dakota – On June 21, wheat leaf rust was observed at low incidence within the mid-canopy in spring wheat research plots at Fargo. On July 18, leaf rust was reported at increasing levels in spring wheat variety trails in the eastern part of the state. In addition, during a survey trip conducted by Cereal Disease Laboratory personnel at the end of July, leaf rust was observed in east-central and central North Dakota at moderate to low levels. Observations indicated that wheat cultivars with Lr21 (e.g. Glenn, Prosper, and Faller) had the highest leaf rust severity. Leaf rust was at lower severity levels in the other cultivars. Leaf rust susceptible cultivars Max and Baart had 40-80% severity.

South Dakota – On a late June survey trip (June 27-29) through southwestern Minnesota and east-central South Dakota, wheat leaf rust was observed at low incidence in nursery plots at a few locations. Stripe rust was the most prevalent rust in this area and leaf rust was less frequent in most nurseries visited. However, a higher prevalence of leaf rust was observed in Volga nursery plots on winter wheat.

Southeast Area. Wheat leaf rust was reported in Mississippi, Louisiana, and Georgia this season. The initial report was in January in Mississippi. By early April, leaf rust was observed in Georgia, though disease incidence was very low across the state this year. Wheat leaf rust was also observed early in Louisiana and by mid May it was found at moderate to high severity across eastern experimental fields.

Mississippi – Wheat leaf rust was observed in January and persisted throughout the state through the spring. Wheat leaf rust was the main cereal disease in southern Mississippi this year.

Louisiana – By the end of February widespread wheat leaf rust infections were observed in experimental plots in Winnsboro, LA. In early April wheat leaf rust was also observed in experimental plots in southern Louisiana and increased in severity through mid April. Wheat leaf rust persisted throughout the state and, by mid May, a survey of the eastern part of the state reported wheat leaf rust infections ranging between 20-80% severity in agricultural stations from Baton Rouge to Winnsboro.

Georgia - Wheat leaf rust disease pressure was low in commercial fields across the state. However, leaf rust was observed in the western part of the state in early to mid April (Plains and Griffin; reported May 4).

Mid-Atlantic Area. This year, the only reported observations of wheat leaf rust were in eastern Virginia (Painter). On May 10, it was reported that wheat leaf rust was widespread and severe in this region.

Pacific Northwest Area. This year, the only reported observations of wheat leaf rust in the Pacific Northwest were in early July from the Palouse region (including Whitman County, Washington and Latah County, Idaho) and western Washington. In the Palouse region, leaf rust was found at very low incidence and low severity on winter wheat experimental and commercial fields near Farmington, WA and Potlatch, ID. In western Washington, wheat leaf rust was observed at low incidence and severity in experimental nurseries (Mount Vernon).

Midwest Area and Ohio Valley. Wheat leaf rust was observed in Illinois, Indiana, Minnesota, Michigan, and Ohio. The first observation of wheat leaf rust in the region was on June 1. Trace to low levels of wheat leaf rust was observed on lower leaves of susceptible winter wheat cultivars in St. Paul, Minnesota experimental plots. In a mid-June survey trip covering a route from St. Louis, MO through Illinois, Indiana, Ohio, and into southeastern Michigan, wheat leaf rust was the most prevalent disease observed. Leaf rust was found at low to moderate incidence and severity in eleven out of seventeen fields surveyed in this region. The highest incidence and severity was observed in research plots in Vincennes, IN (Knox County), Champaign, IL (Champaign County), and Wooster, OH (Wayne County). Low levels of wheat leaf rust was also observed across Michigan on wheat in the grain-filling maturity stages. In contrast, wheat leaf rust was rarely spotted on a late June survey trip through western Minnesota and throughout South Dakota (see Plains Area observations). However, wheat leaf rust was observed in southwestern Minnesota nursery plots (Lamberton) during this survey. In a subsequent survey trip in late July, wheat leaf rust was observed at low levels (10-20% severity on susceptible cv. Thatcher, trace to 5% severity on other cultivars) in northwest Minnesota research plots.

Wheat leaf rust races identified to date from 2017 US collections.

Race	State	Virulence formula	No. of isolates
MBDSB	TX	1,3,17,B,10,14a	3
MBDSD	CA, LA, NC, TX	1,3,17,B,10,14a,39	12
MBPSB	TX	1,3,3ka,17,30,B,10,14a	4
MBPSD	MS, TX	1,3,3ka,17,30,B,10,14a,39	6
MBTNB	GA, MS, VA	1,3,3ka,11,17,30,B,14a	10
MCDSB	TX	1,3,26,17,B,10,14a	1
MCDSD	CA	1,3,26,17,B,10,14a,39	1
MCPSB	TX	1,3,26,3ka,17,30,B,10,14a	2
MCPSD	TX	1,3,26,3ka,17,30,B,10,14a,39	1
MCTNB	GA, MS, NC, VA	1,3,26,3ka,11,17,30,B,14a	14
MDBBG	OK	1,3,24,28	1
MDPSD	LA	1,3,24,3ka,17,30,B,10,14a,39	4
MFPSD	TX	1,3,24,26,3ka,17,30,B,10,14a,39	2
MLPSD	LA, TX	1,3,9,3ka,17,30,B,10,14a,39	4
MMDSD	TX	1,3,9,26,17,B,10,14a,39	1
MMPSD	LA, TX	1,3,9,26,3ka,17,30,B,10,14a,39	2
MNPSD	LA, MS, OK, TX	1,3,9,24,3ka,17,30,B,10,14a,39	12
MPDSD	TX	1,3,9,24,26,17,B,10,14a,39	1
MPPSD	LA, OK, TX	1,3,9,24,26,3ka,17,30,B,10,14a,39	16
TBBGS	KS, OK, TX	1,2a,2c,3,10,21,28,39	7
TBRKG	MS, TX	1,2a,2c,3,3ka,11,30,10,14a,18,28	4
TCGKG	MS	1,2a,2c,3,26,11,10,14a,18,28	1
TCRKG	KS, MS	1,2a,2c,3,26,3ka,11,30,10,14a,18,28	2
TCTNB	NC	1,2a,2c,3,26,3ka,11,17,30,B,14a	1
TDPSB	TX	1,2a,2c,3,24,3ka,17,30,B,10,14a	1
TDRKG	OK	1,2a,2c,3,24,3ka,11,30,10,14a,18,28	1
TFBJQ	KS	1,2a,2c,3,24,26,10,14a,21,28	1
TFTSB	MS, TX	1,2a,2c,3,24,26,3ka,11,17,30,B,10,14a	44
TNBGJ	TX	1,2a,2c,3,9,24,10,28,39	6
TNBJJ	LA, OK, TX	1,2a,2c,3,9,24,10,14a,28,39	5
TNPSD	TX	1,2a,2c,3,9,24,3ka,17,30,B,10,14a,39	1
TNRJJ	MS, OK	1,2a,2c,3,9,24,3ka,11,30,10,14a,28,39	2
Total			173

Canada. Wheat leaf rust was only reported from southern Ontario this year. On April 29 wheat leaf rust was first found by a grower in winter wheat fields northwest of Toronto (Bruce County; bordering Lake Huron) on variety WB425. This isolated case was likely a result of an overwintering focus enabled by high snow cover. On May 5, leaf rust was observed at low levels across southern Ontario. On May 15, leaf rust remained at trace levels in southern Ontario.

Wheat leaf rust collection 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

2016 wheat leaf rust survey summary and results are now available.
Please visit: Wheat leaf rust race survey results.

Wheat stripe rust. As in recent years, wheat stripe rust was the most commonly reported cereal rust threat this year and was widespread throughout the US and Canada. Wheat stripe rust was reported in 27 states (Arizona, Arkansas, California, Colorado, Delaware, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Montana, Nebraska, North Carolina, North Dakota, New York, Oklahoma, Oregon, South Dakota, Tennessee, Texas, Virginia, Washington, and Wisconsin) and four Canadian provinces (Alberta, Manitoba, Ontario, and Saskatchewan). Wheat stripe rust was observed into late November 2016 throughout the Plains and Pacific Northwest Areas and Canada, including reports from Colorado, Nebraska, Oklahoma, Oregon, Washington, and Alberta, Canada. Evidence of overwintering foci were observed in the Pacific Northwest, the Midwest, and in Canada, likely a result of snow coverage and otherwise conducive weather conditions in these regions this winter. Meanwhile, dry conditions in Texas resulted in lower disease pressure early in the season, though wheat stripe rust was still observed at low incidence in early spring in Texas and Louisiana. In general, disease pressure was relatively mild this year in the Southeast and Mid-Atlantic Areas, but was widespread and persistent throughout the Plains Area and Pacific Northwest. In early to mid May, the disease persisted and spread through the northern Plains, Pacific Northwest, and Mid-Atlantic Areas. Continued persistence was observed in the northern Plains, the Pacific Northwest, and across Canada into late summer.

Pacific Northwest Area. This year, wheat stripe rust was observed across Washington, Oregon, and Idaho. Snow cover and otherwise conducive weather conditions provided the potential for overwintering of rust spores throughout the region. In early March, evidence for overwintering of stripe rust was observed in Washington and Oregon. By April, wheat stripe rust was widespread in Washington and Oregon and the first observations were received from Idaho. The disease continued to develop in May throughout the region. In June, winter wheat was nearing maturity and stripe rust was mostly under control in fungicide-treated fields. Widespread use of resistant varieties in many fields also helped to reduce disease pressure. However, stripe rust was developing rapidly on susceptible spring wheat varieties in the area. In early to mid July, winter wheat was at maturity and spring wheat was at boot to milk stages. In commercial fields, stripe rust was kept mostly under control through use of resistant varieties and fungicide treatments.

Washington – In early March, evidence of overwintering of late fall 2016 stripe rust infection was observed on winter wheat in Lincoln and Adams counties. Active stripe rust was observed on freshly greening winter wheat in Walla Walla research plots and nearby commercial fields. By April, stripe rust was widespread in eastern Washington. Stripe rust was found in 80% of 70 fields checked with the most activity in Walla Walla, WA where areas of 100% incidence and over 40% severity were observed. In May, weather and field conditions remained conducive to further spreading of stripe rust throughout southeastern Washington. On May 1, wheat stripe rust was observed in variety trials in southeastern Washington (Walla Walla). In early May, wheat stripe rust was also observed on susceptible varieties (up to 40% severity) of winter wheat in northwestern Washington (Skagit County) where the crop was at late tillering to jointing stages. Stripe rust was found at high incidence with very low to high severity across fields in central and east-central Washington (Grant, Douglas, Lincoln, and Whitman counties) where the crop was at early tillering to jointing stages. Severe stripe rust foci were found in some fields in this area, but in general active rust pressure was low and restricted to the lower leaves. On May 18, stripe rust was observed at

high severity on susceptible varieties in east-central (Lind; 90%) and southeastern (Walla Walla; 100%) nurseries. In southeastern Washington commercial fields, stripe rust was under control aside from a few foci in Garfield County. On June 15, wheat stem rust was observed at 100% severity on susceptible checks in east-central research fields on spring wheat that had passed the flowering stage. In early July wheat stripe rust remained active in both commercial and experimental fields in the Palouse Region (Washington and Idaho neighboring counties). In Pullman, WA, stripe rust reach 100% on susceptible spring wheat varieties in experimental plots. In nearby commercial fields, stripe rust was kept under control (<1% incidence, 10% severity) due to cultivar selection and early fungicide use. Hot and dry conditions were preventing further development and spread of the disease. At the same time in western Washington, wheat stripe rust also reached 100% severity on susceptible varieties in experimental plots of spring wheat.

Oregon – Possible overwintering and otherwise conducive weather conditions early in the spring enabled early wheat stem rust development in the state. In March, shortly following the earliest reports in southeast Washington, stripe rust was observed in eastern Oregon (Lexington County). Wheat stripe rust was also observed in variety trials in northeastern Oregon (Hermiston and Pendelton-Ruggs). The disease persisted at high incidence and severity in these trials through April and wheat stripe rust was generally widespread in eastern Oregon. Stripe rust was found in 80% of 70 fields checked with the most activity Pendleton, OR, where areas of 100% incidence and over 40% severity were observed. Additional observations were made in eastern Oregon at variety testing locations (Wasco and Sherman Counties) as well as in a commercial field in Sherman. In early May, wheat stripe rust was observed in the southern Willamette Valley on several susceptible varieties in variety trials. It was also observed in commercial fields in the northern part of the Willamette Valley. By mid May, stripe rust was under control in commercial fields near the Washington border.

Idaho – Stripe rust was reported in late April from multiple locations throughout the state. It was observed in Parma (northwest of Boise near the Oregon border) on lower and middle leaves, in south-central Idaho (Twin Falls County) on ‘Everest’ on middle to younger leaves, and in southeastern Power County on ‘SY Ovation,’ also on younger leaves. In early May the crop was reported at early jointing to late tillering stages and weather conditions favored further spreading of rust diseases. By May 18, wheat stripe rust was mostly under control in fungicide treated commercial fields near the southeastern Washington border (Nez Perce and Latah counties). However, in early July active wheat stripe rust was observed in both commercial and experimental fields in the Palouse Region.

Southeast Area. This year, wheat stripe rust was observed in Louisiana, North Carolina, Mississippi, Tennessee, and Georgia. A warm, wet winter provided conducive conditions for early rust development in parts of the region. Though wheat stripe rust infections were widespread and persistent from early February through May, it does not seem to have been a major problem in commercial fields this year. More damage resulted from poor-vernalization and late frost.

Louisiana – A warm and wet winter resulted in premature development of oat and wheat in Louisiana and early progression of rust diseases. In early February, wheat stripe rust was first reported in Winnsboro, LA research plots and the disease was widespread by the end of the month. By mid to late April, wheat was at or near maturity for many varieties and wheat stripe rust was reported to have caused minimal crop damage.

North Carolina – On February 28, an isolated incidence of wheat stripe rust was observed on a known susceptible variety 'Southern States 8404' in a single field in southern North Carolina. No other observations were received this year from the state.

Mississippi – In mid to late April, stem rust was commonly observed in wheat fields in the western and delta regions of the state. However, it was noted that wheat stem rust was hard to come by and that wheat acreage appears to be down compared to previous years.

Tennessee – In the first week of April, low to moderate wheat stripe rust was observed on soft red winter wheat in western Tennessee (Haywood County). Infection quickly spread throughout several counties in western Tennessee.

Georgia – Wheat stripe rust was observed in early spring in research fields across the state (Plains, Tifton, and Green County). The weather was generally not conducive for rust development, which prevented rust epidemics this year. However, poor-vernalization and a late frost caused significant damage to the fields.

Mid-Atlantic Area. This season, wheat stripe rust was observed in Delaware, Maryland, Virginia, and New York. The first observations were made in the coastal Virginia and surrounding states (DelMarVa region) in the early spring. In late spring, wheat stripe rust was also observed in the Finger Lakes region and across western New York. In general, low severity was reported across the region.

Delaware, Maryland, and Virginia – The first observation of wheat stripe rust in the area was in late March near the eastern shore of Virginia. In early April, wheat stripe rust was confirmed in southern Delaware. Due to incidence in the aforementioned locations, stripe rust was suspected in southern Maryland and was confirmed by mid April near the Delaware boarder in Preston. In early May, wheat stripe rust was reported as severe in coastal Virginia (Painter). Wheat varieties Dyna-Gro Shirley and Dyna-Gro 9600 were reported as highly susceptible to wheat stem rust.

New York – In late May, wheat stripe rust was first observed in Yates County on soft red winter wheat variety Erie. Heavy rust concentrated in lower canopy foci around the field suggests that this was an overwintering site. Stripe rust was also observed in Genesee County winter wheat fields and additional reports indicate widespread infection, albeit at low levels, across western New York.

Plains Area. Wheat stripe rust was widespread this year across the entire region with observations in Texas, Oklahoma, Kansas, Colorado, Nebraska, South Dakota, Montana, and North Dakota. Observations began in early February in Texas. Weather was conducive for persistence and spreading of the disease throughout the season.

Texas – In early February, stripe rust was reported at low incidence throughout central and southern Texas, mainly in highly susceptible border plots of research fields. By late February, stripe rust was also observed in Uvalde, but infection slowed throughout March as temperatures increased and additional observations were not made prior to harvest.

Oklahoma – Wheat stripe rust was observed early and persisted across the state throughout the spring. Wheat stripe rust was first observed in late March in south-central experimental plots (near Ardmore). By early April, telia was found in southwest Oklahoma and active stripe rust was found on wheat in the central region (near Hennessey). In late April, stripe rust was observed in the north-central part of the state (near Stillwater), but was not as widespread as wheat leaf rust in that same area. In early May, both active and inactive stripe rust was observed in central Oklahoma fields (west of Stillwater) and in north-central nurseries (Lahoma). Reports in mid May indicated that stripe rust contributed to significant flag leaf damage in central Oklahoma, though leaf rust remained more prevalent. Co-infection of both rusts was occasionally observed on the same leaves.

Kansas – In Kansas, wheat stripe rust was first observed in early April on the susceptible cultivar, 'Everest,' in the southeast portion of the state bordering Oklahoma (Montgomery County). Wheat stripe rust spread quickly in the region and was observed in seven additional counties near the Oklahoma-Kansas border within days of the first observation. By late April, wheat stripe rust was widespread throughout Kansas with observations across many central, southern, and southeastern counties. The disease became most severe in the southeastern counties (Allen, Crawford, Cherokee, Cowley, Labette, Montgomery) where infection progressed to the upper leaves. In early May, the range of infection expanded into the northwest and west-central portions of the state. In the central portion of the state, disease severity remained low and infection was restricted to the lower leaves.

Colorado – Though wheat stripe rust was reported in late fall 2016, it did not seem to overwinter. Stripe rust was not observed in fields until early to mid-May.

Nebraska – In mid April, wheat stripe rust was found in a probable overwintering focus in the northern part of the Nebraska panhandle (Sheridan County). By late April, stripe rust was also reported at moderate to high incidence in fungicide trial plots in southeast Nebraska (Lancaster County) affecting leaves throughout the entire canopy. Severity was observed at trace to 10% for a majority of leaves, though some were scored at greater than 50% severity. Just north of this location in Mead, wheat stripe rust was not found, but low levels of stripe rust were reported in south-central Nebraska (Nuckolls County). In the first week of May a survey performed along 200 miles of wheat fields in southern Nebraska bordering Kansas found active wheat stripe rust at trace levels in a majority of the fields surveyed. In mid June, wheat stripe rust was observed at severe levels in south-central and eastern Nebraska in untreated fields.

South Dakota – In early May, low incidence and low severity of wheat stripe rust was observed in a single winter wheat field in Hand County. At that time, wheat stripe rust was absent from five neighboring counties surveyed to the west of Hand County (Hyde, Hughes, Sully, Stanley and Lyman Counties). However, by mid May, stripe rust was observed at low incidence and severity in southern and east-central counties (Hand, Tripp, Brookings, and Union). On June 1, stripe rust was also observed in fields across nearby Codington and Clark counties. Severe infection was observed in portions of these fields. In a late June survey trip conducted by the USDA-ARS Cereal Disease Lab (June 27-29) through east-central South Dakota on a route through Volga, Miller, Selby, Aberdeen, Groton, Watertown, and Aurora, wheat stripe rust was found in most locations aside from Aberdeen. Wheat stripe rust was observed at high incidence in a majority of the fields surveyed.

Montana – In early May, an overwintering focus was observed in southwestern Montana (Bozeman) concentrated in the lower canopy. Stripe rust was also present in south-central Montana (Big Horn and Yellowstone counties).

North Dakota – In late May, a low incidence of wheat stripe rust was observed in a northwestern North Dakota field planted with old bin run seed. By mid June, stripe rust was observed at low incidence on winter wheat across the state including fields in western (Dunn County), northeastern (Langdon), southeast (Fargo), and central (Carrington) locations. By mid July, wheat stripe rust was observed in spring wheat variety trails in eastern North Dakota on wheat at or nearing maturity.

Midwest Area. Wheat stripe rust was observed this year in Wisconsin, Kentucky, Indiana, Minnesota, and Michigan. Wheat stripe rust was first observed in the Midwest in an unprecedented overwintering focus in south-central Wisconsin in March, spread to southeastern and central portions of the state by April, and achieved epidemic levels on susceptible winter wheat varieties by late May. Wheat stripe rust was also reportedly widespread in Minnesota and Michigan, but severe infections were not observed. Isolated observations were reported in Kentucky and Indiana.

Wisconsin – The first observations of wheat stripe rust were reported in March from southern Wisconsin (Sharon, WI). Active stripe rust in this area so early in the season indicates an unprecedented overwintering of stripe rust in the region. In mid April, wheat stripe rust was found on a known susceptible variety ‘Pro Seed 420’ in a winter wheat production field north of Madison (Arlington, WI). It is suspected that this was an overwintering focus similar to the March observations further south. Furthermore, stripe rust was reported in nearby Kenosha County. By late May, winter wheat was reported at or near heading across the state and wheat stripe rust infection was nearing epidemic levels on susceptible winter wheat varieties. Severe infection was observed on L2 leaves and was increasing in severity on flag leaves (20%+). However, nearby fields planted with more resistant varieties avoided infection.

Kentucky – In mid April, wheat stripe rust was observed in a western Kentucky field where most wheat was at or near heading. Additional reports were not received from Kentucky this year.

Indiana – In late April, wheat stripe rust was reported at low incidence and low severity on wheat at or near heading in the far southwestern part of the state (Posey County). Additional reports were not received from Indiana.

Minnesota – In mid May, trace levels of stripe rust was observed on winter wheat in St. Paul experimental plots. In late May, stripe rust was observed at high severity in Lamberton and was also detected in St. Paul NRPN winter wheat experimental plots. By early June, infection in St. Paul test plots progressed to low to moderate severity on flag leaves of hard red winter wheat varieties Jerry, WB Matlock, and AC Broadview.

Michigan – Wheat stripe rust was widespread across the state this year, but infections were not as severe as last year. In early May, an isolated observation was reported in a commercial field. Otherwise, most observations were made in untreated experimental plots in June at heading where susceptible varieties were reported to have infection levels of 5-10% of flag leaf area.

Canada. Wheat stripe rust was observed across four Canadian provinces this year (Alberta, Manitoba, Ontario, Saskatchewan). An early report was received from an overwintering focus in Alberta in mid April followed by later reports in July. Wheat stripe rust was also observed in fields across Southwestern Ontario in early May and persisted through June. Low severity was observed in Manitoba fields in late May/early June that persisted through early July. Final observations were reported from south-central Saskatchewan in mid July.

Alberta - On April 13, an early, isolated observation of wheat stripe rust was made at the Lethbridge research station in Alberta, Canada on winter wheat. Symptoms indicated that the rust had overwintered from last fall. Later in the season, wheat stripe rust was observed in the upper canopy of susceptible wheat varieties within Beaverlodge research plots on July 5 and 13. It is suspected that the inoculum arrived by wind from southern Alberta or the US Pacific Northwest.

Ontario – In early May, wheat stripe rust was found at very low incidence on the known susceptible winter wheat variety 25R46 in a grower's field (Essex County). By mid May stripe rust was found on 25R46 across several counties in southern Ontario (Essex, Oxford, Elgin, and Bruce Counties) as well as on an experimental line in a winter wheat nursery in Chatham-Kent County. The infection continued to spread and increase in severity across Southwestern Ontario through June.

Manitoba – In late May/early June, stripe rust was observed at low severity on winter wheat variety CDC Falcon in fields near Austin (135 km west of Winnipeg). Symptoms indicated that this infection was likely due to an overwintering focus. In July, wheat stripe rust was also observed at low incidence (5%) and moderate severity (25%) on spreader rows containing 'Morocco' wheat in a Brandon, Manitoba experimental stem rust nursery. Several distinct foci were observed in the nursery and the inoculum was suspected to have arrived by wind from the US. The infection was reportedly much higher than average for late July, likely due to highly favorable weather conditions this season.

Saskatchewan – On July 8, wheat stripe rust was observed at low incidence and severity in south-central Saskatchewan. Stripe rust was present at trace levels in one winter wheat field near Davidson, SK, but was absent from Outlook, SK differential lines.

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

Oat stem rust. Similar to 2016, oat stem rust was observed unusually early this year. Throughout the season, oat stem rust was observed in the southern Plains (Texas), Southeast Area (Arkansas, Georgia, Louisiana, Missouri), and the Midwest Area/Ohio Valley (Illinois, Indiana). Collections were sent to the Cereal Disease Laboratory for race typing from Texas, Louisiana, Arkansas, Indiana, Illinois, Wisconsin, Minnesota, North Dakota, and Idaho. Races TGN and TJS were identified from samples collected in Texas, Louisiana, and Arkansas. These races are virulent on *Pga*. Race typing is underway for the remaining samples.

Southeast Area. The earliest observations this season were made in northeast Louisiana (Winnsboro) in late February, far before the typical arrival in April. Oat stem rust infections persisted throughout April and reached high severity in Baton Rouge by mid April. This widespread and severe infection contributed to severe lodging in northern experimental plots as reported on May 12. In a mid May survey extending from Baton Rouge, Louisiana north through Louisiana, Arkansas and into southern Missouri, oat stem rust was observed at several locations. Samples were collected in Louisiana (Baton Rouge, Winnsboro) and Arkansas (Marianna) from agricultural research sites. Disease severity was high at all locations. Concurrently, oat stem rust was observed in Plains, Georgia research fields.

Plains Area. In March, there were a few observations of oat stem rust in southern Texas (Uvalde, Castroville, Corpus Christi). Otherwise, observations were not reported from elsewhere in the Plains.

Midwest/Ohio Valley. In a survey of the Ohio Valley conducted by the Cereal Disease Lab in mid June (12-16th), oat stem rust was found in two Illinois research fields (Champaign; low incidence, high severity) and in an Indiana grower's field (Tippecanoe County, south of Lafayette; low incidence, moderate severity).

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

Oat crown rust. Oat crown rust was observed this season across the Southeast (Louisiana, Mississippi, Georgia), the Plains (Texas, South Dakota), and the Midwest Area/Ohio Valley (Minnesota, Illinois, Indiana). Oat crown rust was reported particularly early in the Southeast and southern Plains Areas due to early crop development. Observations began in February in the South and extended through July in the upper Midwest. Notably, oat crown rust contributed to significant crop damage in the Southeast as summarized below.

Southeast Area. Oat crown rust was observed this season in Louisiana, Mississippi, and Georgia. The disease developed early in the region and caused particularly severe damage in Louisiana and Georgia.

Louisiana – Crown rust hit oats hard in Louisiana this year, which contributed (along with severe oat stem rust infection) to lodging in experimental plots in north Louisiana. A warm winter resulted in early development of oats, reportedly 3 weeks ahead of schedule. Associated rust infections also developed unusually early. Oat crown rust was observed in mid February in the South (Baton Rouge) and spread quickly to the Northeast (Winnsboro) by late February. Observations from a mid-May survey trip conducted by the Cereal Disease Lab indicated that oat crown rust remained active through the spring in Baton Rouge and Winnsboro. At that time, disease severity was high (50-100%) at both locations. Races TGN and TJS were identified from samples collected in Louisiana.

Mississippi – During a mid April survey, oat crown rust was observed in the eastern part of the state (Hattiesburg and Newton), but was not found in the central and western surveyed areas (Jackson or Stoneville).

Georgia – Oat crown rust was observed at high incidence from early in the growing season and contributed to severe damage and crop loss in central Georgia.

Plains Area.

Texas – This year, oat crown rust affected coastal (Corpus Christi) and inland (Uvalde) southern Texas crops. In early March, variable, yet widespread oat crown rust infection was reported in Corpus Christi. In late March, widespread and severe infection was also reported in Uvadale on oats at or near heading. Notably, oat crown rust continued to develop through April in Corpus Christi including late development on varieties that appeared to have early resistance. High levels of telia was observed in the upper canopy (including flag leaves) in Corpus Christi plots in the latter half of April. Races TGN and TJS were identified from samples collected in Texas.

South Dakota – This year, oat crown rust was observed throughout east-central and southeast parts of the state. In early June, oat crown rust was first reported on select differential lines in Beresford on June 8. Late June observations indicated development of oat crown rust on differential lines in experimental plots in Brookings. In addition, during a late June survey trip through east-central South Dakota (conducted by the Cereal Disease Lab June 27-29), oat crown rust was observed in Volga.

Midwest Area.

Minnesota – Weather conditions and diligent plot maintenance presented ideal conditions to achieve vigorous plant growth and uniform oat crown rust pressure across the St. Paul experimental buckthorn nursery. On May 9, Pycniospores were observed in the nursery. By June 7, susceptible spreader rows were flecking and spores began to show. By late June, oat crown rust was observed in the lower canopy of experimental plots. At the time of scoring, trace amounts of rust was observed on resistant varieties, while high severity was observed on susceptible lines. In addition to observations in St. Paul experimental plots, oat crown rust was observed in southwestern Minnesota (Lamberton) on the way to a South Dakota survey trip (conducted by the Cereal Disease Lab June 27-29).

Illinois – During a mid June survey trip across the Ohio Valley (conducted by the Cereal Disease Lab June 12-16), oat crown rust was observed at low to moderate incidence and severity in Illinois research plots (Champaign).

Indiana – During the same mid June survey trip, oat crown rust was also observed at low to moderate incidence and severity in a grower's field in Tippecanoe County, south of Lafayette.

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

Barley leaf rust. Few observations of barley leaf rust were received this season, though infection foci reached high severity. Observations were limited to early spring reports from three Mid-Atlantic states (Delaware, Maryland, Virginia) and from the Pacific Northwest (Washington).

Mid-Atlantic Area. This year, barley leaf rust was first observed in mid-April throughout southern Maryland and Delaware. By early May, reports indicated heavy and widespread infection in eastern Virginia. New virulence to barley leaf rust resistance gene *Rph5* was detected in Virginia.

Pacific Northwest Area. In mid May, barley leaf rust was found in a few fields in Walla Walla County, Washington at high incidence and moderate to high severity (40-100%) on the winter variety Maja. According to Dr. Xianming Chen, this is an unprecedented observation of barley leaf rust in the Pacific Northwest Area east of the Cascade Range.

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

Barley stripe rust. This year, barley stripe rust was observed in five US states across the Pacific Northwest (California, Idaho, Oregon, and Washington) and the Plains Area (North Dakota), as well as in two Canadian provinces (Alberta and Saskatchewan). Most observations noted low levels of infection, though moderate to high severity was reported in parts of the Pacific Northwest.

Pacific Northwest Area. Barley stripe rust was first reported in mid May at low levels across Washington nurseries (Mount Vernon, Lind, and Walla Walla). By mid May, barley stripe rust was observed in Washington winter wheat nurseries at low levels in several locations (Mount Vernon, Lind, and Walla Walla). Unusually wet weather led to the most severe barley stripe rust epidemic in the past two decades with uniform infection (severity up to 40%) of susceptible varieties in Lind by mid June. In early July, barley stripe rust was reported at low to moderate levels in the Palouse Region (Washington/Idaho) experimental fields and at very low levels in commercial fields in Latah County, Idaho. In western Washington, barley stripe rust was more severe (up to 60% severity) than in the eastern part of the state, though for the region it was much lower than previous seasons.

Plains Area. Barely stripe rust was also observed in July at low incidence and severity in growers' fields in the northeastern part of North Dakota. Rust was found on flag leaves and flag-1 leaves.

Canada. Scant observations of barley stripe rust were reported from Canada this season. In early July, an isolated observation of barley stripe rust present at trace levels was reported from south-central Saskatchewan. On July 21, trace levels of barley stripe rust was also observed in susceptible research plots in Beaverlodge, Alberta.

Barley stem rust. Barley stem rust was not reported this season.

Rust on barberry. In May, rust infections (pycnial stage) on common barberry (*Berberis vulgaris*) were first observed in southern Minnesota. By early June, rust infections (pycnial and aecial stages) were observed on common barberry in southern Minnesota as well as in eastern and southern Wisconsin. Past studies indicated that these infections were of *Puccinia graminis* f. sp. *secalis*, the special form that infects rye and Triticeae grasses. Moderate to heavy aecial infections were observed on *Berberis* x 'Tara' Emerald Carousel (an ornamental barberry hybrid) in several locations in the Twin Cities metro area. The rust on this barberry hybrid is likely of *Puccinia pseudostriiformis* (formerly *P. striiformis* f. sp. *poae*) that causes stripe rust on Kentucky bluegrass (*Poa pratensis)*. Collections were made for race typing and analysis is underway.

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Sincerely,

Katie L. Liberatore, Ph.D.

Research Molecular Biologist/Postdoctoral Associate

Cereal Rust Bulletin, editor-in-chief

USDA-ARS Cereal Disease Laboratory

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Sam Gale	Arkansas; Louisiana; Missouri
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James Buck	Georgia
Benjamin Lopez	Georgia
Alfredo Martinez	Georgia
John Youmans	Georgia
Stephen Harrison	Louisiana
Allyson Lunos	Louisiana
Boyd Padgett	Louisiana
Tom Allen	Mississippi
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Heather Marie Kelly	Tennessee

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Andrew Friskop	North Dakota
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John Fellers	Oklahoma
Emmanuel Byamukama	South Dakota
Paul Richter	South Dakota
Jakob Riddle	South Dakota
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MIDWEST AREA & OHIO VALLEY

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