



# CEREAL RUST BULLETIN

Issued by:

**Cereal Disease Laboratory**

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- Wheat stem rust was reported only from Texas in 2021.
- Wheat leaf rust was observed in sixteen states across the U.S. and was generally at low incidence and severity.
- Wheat stripe rust was severe in most of the Plains states and western Washington.
- Oat crown rust was severe in Louisiana and widespread in New York.
- Oat stem rust was found in Texas, Florida, and Minnesota.
- There were a few reports of barley leaf rust in 2021.
- High barley stripe rust pressure occurred in nurseries in Washington.
- Rye leaf rust was frequently found in New York.
- Rust on barberry was reported from Wisconsin and Minnesota.
- *Thank you to all our 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](#).

**Wheat stem rust.** On April 15, a few pustules of stem rust were found on susceptible cultivar McNair 701 in the wheat breeding nursery at Castroville, Texas. Race QFCSC was identified from the stem rust sample collected. Wheat stem rust was not reported elsewhere this year.

**Wheat stem rust and oat stem rust races identified to date from 2021 collections.**

| Race  | State | Host                  | Cultivar | Disease         |
|-------|-------|-----------------------|----------|-----------------|
| QFCSC | TX    | Soft red winter wheat | Unknown  | Wheat stem rust |
| TJS   | TX    | Oat                   | Unknown  | Oat stem rust   |
| SGD   | TX    | Oat                   | Big Mac  | Oat stem rust   |
| TGN   | MN    | Oat                   | Unknown  | Oat stem rust   |
| TGN   | MN    | <i>Avena strigosa</i> | CI2524   | Oat stem rust   |

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



**Wheat leaf rust.** Wheat leaf rust was reported from sixteen states across the U.S. and was generally at low incidence and severity. In many wheat-growing regions, especially the Northern Plains and Midwest, record-setting heat accompanied by dry weather in late spring into summer prevented rust infection or development and resulted in low leaf rust. In other parts of the Plains, moderate to high leaf rust was observed on susceptible varieties. Disease spread was reported in the South and Northeast but at low severity or with the rust progressing when plants were maturing. Only a few collections of wheat leaf rust were received from the Pacific Northwest region.

*Texas* – Lower levels of wheat leaf rust, compared to the previous years, were observed on susceptible varieties in Castroville, College Station, and Uvalde on March 12. The disease began to progress towards the end of March, and virulence to *Lr24* varieties was more compared to either *Lr39/41* or *Lr21*. At the Castroville rust evaluation nursery, disease severity on lines carrying *Lr24* was rated 70S and on *Lr39/41* 30S. By April 17, leaf rust had spread uniformly across the wheat nursery, and severity and incidence had reached 100% on susceptible lines such as Jagalene. Wheat leaf rust was found in the trials at Wharton and had moved to the middle canopy in the small grain trials at McGregor.

*Oklahoma* – Wheat leaf rust was found in a demonstration trial around Stillwater (north-central OK) in late January before the severe winter weather. Leaf rust was not reported elsewhere across the state at that time. By the end of March, leaf rust was observed in more trials around Stillwater and near Perkins. Wheat fields in Major, Dewey, and Blaine counties in northwestern and western OK were scouted on April 13. Seven out of the twenty-two fields scouted had isolated leaf and/or stripe rust. The flag leaf was emerging at the time of the survey. The southwestern part of the state was hot and dry and hence, not favorable for foliar diseases. Wheat tours in the mid to the third week of May covered El Reno (Canadian County), Cherokee (Alfalfa County), Lahoma (Garfield County), Kingfisher (Kingfisher County), Alva (Woods County), Buffalo (Harper County), Morris (Okmulgee County) in central, north-central, south-central, northwestern, and eastern Oklahoma. Diseases observed at these locations varied widely. Light foliar diseases and no rust was observed at Cherokee, Alva, and Buffalo. Leaf rust was found in Kingfisher, Morris, El Reno, Lahoma, and around Stillwater. At the time of tours, wheat growth stages ranged from kernels just forming to fully formed. Scattered and low levels of leaf rust increased across the state.

*Kansas* – In early May, wheat leaf rust at low incidence and severity was found in Riley, Wabaunsee, Pratt, and Kingman counties, and several other counties by mid-May. Disease progression was reported in June but at low levels in most areas of the state. Moderate levels of the rust were observed near McPherson in central Kansas. The disease reached 10 – 20% severity on susceptible varieties such as T158 and Larry.

*Nebraska* – On June 1, heavy leaf rust was observed in trial plots at Havelock Farm in Lincoln, Lancaster County, southeast Nebraska. Flag leaves of susceptible varieties were covered with rust pustules, and entire plots appeared brown from leaf rust. Leaf rust was also found in Nemaha and Seward counties.

*South Dakota* – Moderate levels of leaf rust were observed in some winter wheat varieties and breeding lines in the trials at Hughes and Brookings Counties. The field in Hughes County was irrigated once, which provided some moisture for leaf rust development. Winter wheat ranges from soft dough to turning color growth stages at that time. Many wheat fields across the state were stressed by the prolonged hot and dry weather conditions. Thereby, many wheat fields visited in June were with little to no rust diseases. No rust was reported in spring wheat in the 2021 growing season. Some wheat fields were harvested for hay due to heat and drought stress.

*North Dakota* – Leaf rust was present at trace to low levels on some winter wheat and spring wheat cultivars in the NDSU research plots in east-central North Dakota during a survey trip made by a USDA-ARS Cereal Disease Laboratory scientist.

*Minnesota* – Leaf rust was observed at trace level in plots of susceptible winter wheat in St. Paul, Ramsey County, on June 3. The disease was found only on the susceptible cultivar Morocco at low to moderate levels during the cereal rust survey at the University of Minnesota Southern Research Center, Waseca, on July 7. Wheat fields scouted at the

University Northwest Research Center, Crookston, had no rust on Thatcher (a very susceptible variety) and just a trace on Morocco. No rust was observed in the spring wheat plots. The combination of prolonged hot and dry weather with a lesser amount of rust spores from the South limited rust diseases on wheat crops in Minnesota and the Dakotas.

*Ohio* – A wheat leaf rust sample was received at the Cereal Disease Laboratory from Seneca County in Ohio.

*Colorado* – Ten field trial sites across Colorado were visited during the State Wheat Field Days in June. Low levels of leaf rust were observed in several fields in the eastern counties of the state. Most of these fields were co-infected with both leaf rust and stripe rust.

*Washington* – Five collections of wheat leaf rust were received at the Cereal Disease Laboratory from Skagit County in Washington.

*Louisiana* – Wheat leaf rust was first reported in April, seen at several nurseries, and progressed rapidly. There were no additional reports from the state.

*Georgia* – Five collections of wheat leaf rust were received at the Cereal Disease Laboratory from Pike and Sumter counties in Georgia.

*North Carolina* – A collection of winter wheat USG3209 with severe leaf rust was received at the Cereal Disease Laboratory from Plymouth, NC, on July 6. Plots of this susceptible cultivar were rated 90S in late May. Widespread but moderate wheat leaf rust was reported from the Coastal Plain and Tidewater regions of the state.

*Virginia* – During a state wheat disease survey made in the second week of May, light wheat leaf rust was found on susceptible variety Massey in a disease nursery at Painter in the eastern part of the state. In general, there was little to no disease in the wheat fields visited. On May 25, leaf rust was observed at 90% severity and 60% incidence on different lines in the Virginia variety trial at Warsaw in the northern part of the state. The high disease pressure occurred late in the season and probably has little to no effect on yield.

*Maryland* – Three collections of wheat leaf rust were received at the Cereal Disease Laboratory from Howard and Queen Anne's counties in Maryland.

*New York* – Wheat leaf rust was seen in many fields across the state at moderate incidence but low severity. The disease developed late in the growing season and probably will have little to no effect on yield. Different varieties including Medina and NY11013-10-15-1312 white winter wheat, Erie, and Pioneer 25R40 soft red winter wheat were infected with leaf rust. Neither stripe rust nor stem rust was reported from New York this year.

**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](#)

**Wheat stripe rust.** Stripe rust was severe in most of the Plains states and western Washington. Unusually high stripe rust pressure was observed in Oklahoma. Despite the high temperature and drought conditions, severe stripe rust was reported from Nebraska and South Dakota. In the South, severe wheat stripe rust was reported only from Louisiana and was the most prevalent rust disease in the state. Stripe rust was present in the Midwest and did not pose any concern. Wheat stripe rust was reported from fifteen states in 2021: Washington, Oregon, California, Colorado, Louisiana, Texas, Oklahoma, Kansas, Nebraska, South Dakota, Minnesota, Mississippi, Arkansas, Tennessee, and Ohio.

*Texas* – In March, stripe rust was found in the lower to the middle canopy of varieties such as Patton in the small grain trials at McGregor and Greenville, and in an agronomy farm near College Station. In contrast, wheat stripe rust was not active in the rust evaluation nurseries at Castroville and Uvalde.

*Oklahoma* – Stripe rust was observed in trials around Stillwater and Perkins (both in Payne County) in late March. On April 13, seven out of the twenty-two wheat fields scouted in Major, Dewey, and Blaine counties had isolated stripe rust. The disease incidence and severity increased rapidly from low and scattered rust in early April to high incidence and severe infection by the third week of April. In north-central Oklahoma, severe stripe rust was observed on susceptible variety Pete around Stillwater and on an unknown variety near Lamont (Grant County). A high incidence of stripe rust was found in research plots near Carrier in Garfield County. A remarkable observation was the uniform and widespread stripe rust across a nine-acre increase field with variety Triumph 64 near Perkins. According to Bob Hunger, infection was so severe that most of the field foliage appeared yellowish-orange due to the rust spores. This level of uniform and severe infection was probably due to the overwintering of *Puccinia striiformis* in the field. Fungicide was applied to protect the remaining green leaves, but most of the leaf tissues were damaged by the pathogen. This underlines the importance of field scouting for early disease detection and timely application of fungicide in controlling stripe rust, especially on susceptible varieties. A wheat tour was made on April 27 – 30 to Walters (Cotton County), Altus (Jackson County), and Apache and Chickasha (Caddo County) in south-central, southwestern, and central OK, respectively. Stripe rust was the most prevalent foliar disease at all locations visited except at Altus, where the weather was dry and did not favor foliar diseases. In early May, severe stripe rust was reported from trials at Tipton in Tillman County. The rust was observed in wheat heads on a field near Chattanooga. Bob stated that over the years, he seldom sees stripe rust on wheat heads, and it is indicative of severe infection in that area. In contrast, few foliar diseases were seen during the field survey to Afton, Kildare, Lamont and Homestead in Ottawa, Kay, Grant, and Blaine counties, respectively. At the wheat tours made in the third week of May, stripe rust was the prevalent foliar disease at Kingfisher, Morris, El Reno, Lahoma, and around Stillwater.

*Kansas* – In April, stripe rust was at a low incidence and restricted to the lower leaves in most of the fields visited during a state wheat field survey. By early May, the disease was widespread and reported in 46 counties, out of which infection had progressed to the upper canopy in sixteen counties. Infection of flag leaves is a contributing factor to yield losses. The cool wet weather in many counties at that time favored stripe rust spread and development. Noticeable stripe rust damage was observed in research plots and untreated fields during the wheat tour across south-central KS on May 27. Susceptible varieties such as Everest, WB4269, and SY Benefit were almost defoliated by the rust. Varieties with intermediate resistance to stripe rust such as WB Grainfield, SY Monument, and LCS Chrome were rated 20 – 40% severity. Resistant varieties T158, Doublestop CL Plus, SY Rugged, Larry, TAM114, and Joe remained effective against the fungus population in the 2021 growing season. Many growers applied fungicide to control stripe rust in their commercial fields.

*Nebraska* – Trace to low level of stripe rust was first reported on May 10 from wheat research plots at Havelock Farm in Lincoln, Lancaster County. In the last week of May, the disease incidence and severity were low in wheat fields scouted in Cheyenne, Saunders, Lincoln, Keith, Deuel, Kimball, Banner, Morrill, and Lancaster counties. Some of these growers' fields were treated with fungicide to control the fungus. Wheat growth stages ranged from flag leaf emerging to heading. By June 1, stripe rust in the research plots at Havelock Farm in Lincoln had progressed rapidly from trace level observed on May 24 to severe infection of flag leaves on susceptible varieties. Stripe rust was reported from nineteen counties in the state at that time. Wheat disease surveys were conducted in Perkins, Red Willow, Cheyenne, Banner, Box Butte, and Deuel counties during the third week of June. Stripe rust disease pressure was high in the state variety trial at Deuel County but was moderate at the High Plains Ag Lab field in Cheyenne County. There was no foliar disease observed in the state variety trial at Banner County. Some wheat varieties at this location were severely drought-stressed. Some fields in the Panhandle area were treated with fungicide to control stripe rust, and disease in untreated fields was retarded by the high temperature and drought. Although the heat and dry weather significantly slow down rust development, these conditions do not eliminate the infection that occurred when conditions for infection and disease development were favorable. The infected wheat fields in Cheyenne and Deuel Counties were perfect examples. Stripe rust infection was observed in these fields shortly after the torrential rain in that region in late May, according to Stephen Wegulo.

*South Dakota* – Low levels of stripe rust were observed in a few fields in Brookings County during the wheat fields scout across the state in the first week of June. Winter wheat growth stages ranged from boot to flowering. The weather conditions were dry and hot, thus retarding stripe rust development. By June 28, severe stripe rust occurred in a variety trial at Brookings County despite the high temperature and dry weather conditions. The Extension Plant Pathologist, Emmanuel Byamukama, speculated the possibility of heat-tolerant *P. striiformis* isolates on the field and sent samples for testing. Low levels of stripe rust were reported from a winter wheat research field at Hughes County.

*Minnesota* – Wheat stripe rust was found on a single leaf of SY Ingmar spring wheat in Yellow Medicine County on May 18. Several infection foci of stripe rust were observed in winter wheat plots in St. Paul, Ramsey County, on June 3. Disease severity at the infection foci was up to 50%. Infected leaves were on the mid to upper canopy, indicating recent infection from an external source of inoculum. Traces of stripe rust was found in a spring wheat plot nearby.

*Colorado* – Wheat stripe rust was present in sixteen counties across eastern Colorado during the wheat fields visit in the third week of June. The disease incidence and severity were low in most counties, but moderate severity was observed in Lincoln County. However, the flag leaves were not infected at the time of the survey.

*Washington* – Wheat fields in Whitman, Adams, Lincoln, Grant, Garfield, Columbia, Walla Walla, Franklin, and Douglas counties in eastern WA were scouted on March 9, but stripe rust was not found. In similar surveillance made on February 26, 2020, active stripe rust was seen in a commercial field and a rust nursery in Lincoln and Walla Walla counties, respectively. At a follow-up visit on April 15, stripe rust was found on lower leaves of susceptible checks in nurseries near Walla Walla. At this location, the disease started about seven weeks later compared to the previous year. Winter wheat fields in seven counties, Whitman, Adams, Lincoln, Grant, Douglas, Columbia, and Garfield surveyed on May 12, were mostly dry. Of all the commercial fields visited, inactive stripe rust pustules were found in one wheat field in Garfield County. Stripe rust hotspots were observed in irrigated breeding nurseries at Central Ferry in Garfield County. In contrast, stripe rust was hard to find in a non-irrigated germplasm screening nursery near Pullman in Whitman County. Only a spot with stripe rust on a few low leaves was seen. This was the first observation of stripe rust in the Palouse region. At this location, stripe rust appeared about a week later and at lower incidence compared to the previous year. Stripe rust in the experimental fields around Pullman did not progress. According to Xianming Chen, it was the lowest stripe rust level seen at that time of the growing season in the Pullman area over the past years. As usual, stripe rust was severe in the wheat nurseries at Mount Vernon in Skagit County, western WA. By the end of May, the disease had reached 80% and 100% severity on susceptible spring and winter wheat varieties, respectively.

*Louisiana* – A wheat stripe rust hotspot was first observed on January 27 in a breeding nursery in Winnsboro, northern LA. By February 2, stripe rust was found in three additional locations and was spreading across the state. On March 15, Stephen Harrison reported unusual severe wheat stripe rust in southern LA that he had never seen. He stated that wheat stripe rust was the most prevalent rust disease in Louisiana. Some growers sprayed their fields for stripe rust control.

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

### Oat crown rust.

*Texas* – Eight collections of oat crown rust were received at the Cereal Disease Laboratory from Brazos and Bexar counties in Texas. Disease severity and incidence ranged from trace to 80%.

*South Dakota* – A low incidence of oat crown rust was observed on June 10 in the advanced yield trials at Volga in Brookings County. On June 23, high oat crown rust was found on one variety in a commercial field in Brookings County. The plants with severe rust were by the shelterbelt, which prevented direct heat and provided extended dew periods leading to needed moisture for crown rust development. The plants of the same variety in non-shelterbelt on the same field had no crown rust. Elsewhere, low levels of oat crown rust were observed.

*Minnesota* – On June 3, a crown rust infection was observed on oat in the buckthorn nursery at St. Paul. The disease appeared earlier this year than in the past years. However, the high temperature and drought conditions experienced throughout June hampered the disease development. Crown rust incidence and severity were <1% in the oat fields at the University of Minnesota South Research Centers in Lamberton and Waseca.

*Louisiana* – An oat crown rust pustule was first spotted in the oat yield nursery at Baton Rouge in south Louisiana on January 14. The early appearance of crown rust is not uncommon at this location. Oat plants were tillered but have not jointed at that time. Crown rust continued to spread, and by mid-April, the disease was severe on susceptible genotypes.

*Georgia* – Two collections of oat crown rust were received at the Cereal Disease Laboratory from Sumter County in Georgia.

*New York* – Oat crown rust was widespread across the state but not a problem in growers' fields. Disease incidence and severity at Homer in Cortland County ranged from 20 – 80%. Unfortunately, crown rust continued to infect oat varieties resistant to *Puccinia coronata* in the past years. Crown rust samples on Hayden, Steuben, and SD11946 varieties were received at the Cereal Disease Laboratory.

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

### Oat stem rust.

*Texas* – A trace level of stem rust was observed in the oat nursery at College Station on April 15. By the end of April, the disease incidence and severity ranged from 20 – 80% on Big Mac cultivar, but moderate on Gerard 224 and trace on HR population. Races TJS and SGD were identified from the rust samples received at the Cereal Disease Laboratory.

*Minnesota* – On July 29, oat stem rust was observed at moderate incidence but high severity on spring oat and black oat (*Avena strigosa*) in the St Paul nursery. Rust samples collected from both hosts were determined to be race TGN.

*Florida* – A sample of oat stem rust on Rdny-Pg4, a spring oat variety, was received at the Cereal Disease Laboratory from Alachua County.

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

### **Barley leaf rust.**

*Minnesota* – Substantial barley leaf rust was observed on experimental plots of spring barley in St. Paul. Usually, barley leaf rust does not reach levels this high on spring barley in Minnesota.

*Ohio* – Select experimental winter barley lines were infected by barley leaf rust.

*Washington* – In late May, barley leaf rust was found on a few varieties in winter nurseries at Mount Vernon.

*Oregon* – Barley leaf rust was observed in the organic systems/naked barley breeding project.

*New York* – Barley leaf rust was frequently seen but at low severity on different varieties, including Quest and Excelsior Gold.

**Barley stripe rust.** Low levels of barley stripe rust were observed on susceptible varieties in the winter nurseries at Mount Vernon, Washington in mid-April. By the end of May, the rust had developed up to 80% severity on susceptible winter barley and 40% on spring barley in the cereal nurseries at Mount Vernon. Barley stripe rust was also reported from California and Oregon.

**Rye leaf rust.** Low severity but moderate incidence levels of rye leaf rust were observed in variety nurseries in Ithaca, New York. The disease was found in different varieties such as winter rye Brasetto and Hazlet.

**Rust infections on barberry.** Moderate to heavy aecial infections on common barberry were observed in Door and Manitowoc counties in Wisconsin and light infection in southeast Minnesota. The rye stem rust pathogen, *Puccinia graminis* f. sp. *secalis*, were identified from the aecial samples from barberry.

**Thank you!**

This is the final Cereal Rust Bulletin for 2021. We, members of the CDL, would like to thank our collaborators for timely observations, disease updates, and sample collections for race typing. The annual Cereal Rust Survey and Cereal Rust Bulletin wouldn't have been possible without our collaborators' assistance, and we look forward to continued collaboration. The names of those who worked with us and their corresponding states where observations and collections were made are listed below. We apologize if you are a submitter, and by oversight, we did not include your name.

Sincerely,  
Oluseyi Fajolu, Ph.D.  
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USDA-ARS Cereal Disease Laboratory.

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