**Wheat Leaf Rust in the United States in 2020**

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## Occurrence

In 2020, leaf rust caused by *Puccinia triticina* was widespread at low to moderate levels of infection throughout the soft red winter wheat area of the southeastern states, the Ohio Valley and the hard red winter wheat and hard red spring wheat areas of the Great Plains. Throughout most of the wheat growing regions temperatures were much above average in March (NOAA). In April, temperatures were near average in the southern plains and southeastern region and cooler in the northern Great Plains and Ohio Valley. The temperatures in March and April allowed infections of *P. triticina* to increase and spread across the winter wheat regions. In June, temperatures were higher than normal in the Great Plains, southeastern states, and Ohio Valley, followed by average temperatures in July. The above average temperatures contributed to the spread of *P. triticina* across the spring wheat region of the northern Great Plains.

Leaf rust was observed in mid-March in southern Texas and became prevalent in the first week of April. Leaf rust was common across Oklahoma by early May, and was at moderate levels in Kansas in May. Leaf rust was observed in winter wheat plots in Nebraska, South Dakota in early June and in North Dakota in late June. In late July leaf rust was widespread on susceptible spring wheat plots in Minnesota and North Dakota, and at lower levels in plots of the regional cultivars. Leaf rust was also reported at various levels in Louisiana, Kentucky, Virginia, Wisconsin and Washington in 2020.

In Oklahoma losses due to leaf rust were estimated to be 5%, with losses of 2% in Texas and 2.8% in Kansas. Losses in the other states were estimated to be 1% or less. Overall estimated losses in wheat in the U.S. due to leaf rust in 2020 were 15 million bushels.

## Races and virulence of *Puccinia triticina*

In 2020, 36 races of *P. triticina* were identified in collections of leaf rust infected leaves that were sent to the USDA-ARS Cereal Disease Laboratory. A total of 260 isolates were processed for race identification. Travel restrictions due to COVID19 reduced the number of collections received in 2020. Race TBBGS was the most common race overall at 23.5% and was found almost entirely in the spring wheat region of Minnesota and North Dakota. TBBGS is virulent to *Lr21*, which is in some of the spring wheat cultivars in this region, and in addition has virulence to *Lr39,* which is in many hard red winter wheat cultivars.

Race MNPSD was the second most common race at 20.8% of all isolates. MNPSD was found in the soft red winter regions of the southeastern states, Ohio Valley, and the

winter and spring wheat region of the Great Plains. MNPSD and the closely related race MPPSD at 7.3% of all isolates, are virulent to the hard red winter wheat SY Monument, which is widely grown in Kansas and Nebraska. In addition, MNPSD and MPPSD are virulent to genes *Lr24*, *Lr39* and *Lr37* that are in many of the hard red winter cultivars. In the southeastern states, MBTNB and MCTNB were the most common races. MBTNB is virulent to *Lr11*, which is in many soft red winter wheat cultivars, and MCTNB is virulent to *Lr11* and *Lr26*.

In the Rio Grande Valley of Texas a large number of isolates were the durum leaf rust type race (BBBQD), which is avirulent to most leaf rust resistance genes in common wheat, but are highly virulent to durum wheat cultivars. These collections came from sentinel winter wheat plots for detection of virulent stem rust races. The durum type races are virulent to *Lr39* that is present in TAM 114, TAM 112, TAM 111, Winterhawk, and other commonly grown hard red winter wheat cultivars. The durum type races could potentially spread and infect some of the winter wheat cultivars, in addition to any winter durum crops.

Virulence to *Lr24* and *Lr39* are highest in the southern to mid Great Plains region. Virulence to *Lr11* and *Lr26* are highest in the southeastern states and Ohio Valley region. Virulence to *Lr18* was detected at low frequencies in all regions. Virulence to *Lr2a* and *Lr21* was highest in Minnesota and South Dakota and North Dakota.

The complete race frequency and virulence frequency to individual *Lr* genes are given in Table 1 and Table 2, respectively. Information on the individual collections, location, date, cultivar collected from, and race designations of the derived isolates are given in the Excel file.

The postulated leaf rust resistance genes in the ten most common hard red winter wheat cultivars in Texas, Oklahoma, and Kansas in 2020 are listed in Table 3. The postulated Lr genes in the ten most common hard red spring wheat cultivars in Minnesota and North Dakota in 2019 are listed in Table 4. When possible, an Lr gene was postulated.