

Wheat Leaf Rust in the United States in 2021

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In 2021 wheat leaf rust caused by *Puccinia triticina*, was reported from 16 states. Incidence and severity levels were at low levels in 2021. Temperatures in the southern winter wheat regions were close to the long term averages from March to June. In southern Texas leaf rust was increasing at the end of March and was at high severity levels on susceptible cultivars by mid April. Leaf rust was present in fields in Oklahoma by mid April and was present in at low levels across the state by mid May. In Kansas, leaf rust was present at low levels in some areas by mid June. High levels of leaf rust were observed in plots in eastern Nebraska in early June. Leaf rust was widespread but at low severity levels in late May in the Coastal Plain and Tidewater region of eastern North Carolina in late May. In late May and June extremely hot and dry weather in the northern plains greatly restricted the infection and spread of leaf rust across the spring wheat region of Minnesota, South Dakota and North Dakota. The number of collections from this region was greatly reduced compared to previous years. Leaf rust was observed at very low levels in plots of susceptible cultivars throughout Minnesota in July. Leaf rust infections were not seen in any plots of the commonly grown spring wheat cultivars in northern and central Minnesota. Leaf rust was present at low levels in plots of winter and spring wheat in east central North Dakota in mid July.

In 2021 estimated losses due to leaf rust were highest in Pennsylvania at 5%, Oklahoma at 3%, 1% in Texas, and New York at 0.5%. Losses in all other states were at trace levels or no loss at all. The total estimated losses across the United States was 5,9315,260 bushels.

Races and virulence of *Puccinia triticina*

In 2021, 24 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 207 isolates were processed for race identification. Travel restrictions related to COVID19, and the extremely hot and dry weather in the northern Great Plains region reduced the number of collections received in 2021.

MNPSD was the most common race across the United States at 35.7% of all isolates. Isolates with this race designation were found at very high levels throughout the hard red wheat regions of the Great Plains and at low levels in the southeastern states and in Washington State. MNPSD is virulent to wheat lines with *Lr24*, *Lr37*, and *Lr39*. These genes are present in hard red winter wheat cultivars. MBDS was the second most common race at 23.2% of all isolates. This race was found at high levels throughout the Great Plains region. MBDS is virulent to wheat lines with *Lr37* and *Lr39*. MPPSD was the third most common race, at 19.3% of overall isolates. This race was found in the

same regions as MNPSD, in addition to the Ohio Valley region. MPPSD is virulent to wheat lines with *Lr24*, *Lr26*, *Lr37*, and *Lr39*. Races MNPSD, MBDS, and MPPSD, have been selected by the hard red winter wheat cultivar SY Monument that was widely grown in Oklahoma, Kansas, and Nebraska in 2021.

In the soft red winter wheat region of Area 1, MCTNB was the most common race. MCTNB and MBTNB have been the most common races in this region since 2013. The related races TBTNB and TCJTB, were also present in this region. All of these races have virulence to *Lr11*, which is present in many soft red winter wheat cultivars. MCTNB and TCJTB are also virulent to *Lr26*, which is also present in many soft red winter wheat cultivars.

Races MJBIG (found in Area 4 and Area 6) and MJMIG (found in Area 4) are virulent to *Lr16* and *Lr24*. Commonly grown hard red spring wheat cultivars such as Linkert have *Lr16*. Some hard red winter wheat cultivars also have *Lr16*.

A single isolate of race TNBJS and two isolates of TBBGS, which are virulent to *Lr21*, were present in Area 6. Many hard red spring wheat cultivars have *Lr21*. Races with virulence to *Lr21* have been very frequent in previous years surveys. The lower frequency in 2021 was due to most collections in this region coming from susceptible wheat cultivars, not the prevalent hard red spring wheat cultivars.

The complete listing of races found in the United States in 2021 is given in Table 1. The frequency of isolates with virulence to the individual *Lr* genes is given in Table 2. The complete listing of collections, host cultivars, date of collection, collectors, location of collections, and identified races are given in Table 3. Table 4 lists the most commonly grown cultivars grown in 2021 in the hard red winter wheat states of Oklahoma, Kansas, and Nebraska, and also the most prevalent hard red spring wheat cultivars in Minnesota and North Dakota. When possible the *Lr* genes were postulated based on infection type data to different races of *P. triticina* and also on molecular marker data obtained from testing of the SRPN and NRPN and the UHRSWN by USDA-ARS genotyping laboratories in Manhattan KS and Fargo ND.