CEREAL RUST BULLETIN

Report No. 8

July 21, 1999

Issued by:

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- Stem rust was common on wheat, barley and oat in the northern Great Plains.
- Wheat leaf rust in the upper Midwest was more severe than in the last 20 years.
- Oat crown rust was lighter than normal throughout the upper Midwest.
- Barley stripe rust was light in the Pacific Northwest.

Wheat stem rust. In 1999, wheat stem rust severities were generally light in varietal plots and fields throughout the southern U.S. During mid-May, a few late maturing wheat varieties were heavily rusted with stem rust in southern Louisiana nursery plots. In late May, severe stem rust was observed during harvest on late maturing susceptible wheats in central Texas wheat plots. Wheat stem rust development was much lighter than normal in 1999 throughout the southern U.S.

During the first week in June, stem rust foci were found on the cultivar Mit, and traces of rust were found scattered on other cultivars such as Onaga and 2174 in south central Kansas nurseries. In mid-June, wheat stem rust was light on susceptible cultivars, *e.g.*, Onaga, throughout central and north central Kansas plots. In late June, trace-10% severities of stem rust were observed at the hard dough stage in north central Kansas and south central Nebraska fields, but losses were negligible. Wheat stem rust developed late in the Central Plains. Most of the cultivars were early maturing and therefore escaped the stem rust. The stem rust infected areas in the Central Plains provided spores for susceptible wheats farther north.

In late June, foci of wheat stem rust, 1 meter in diameter at 10% severity, were found in plots of the susceptible spring wheat Baart in south central and west central Minnesota and in plots of winter wheat cultivars, *e.g.*, 2137, in central and east central South Dakota. In much of the central and northern Great Plains, the temperatures were near normal and moisture was ideal for the spore infection process to occur. During the second week of July, stem rust severities of 5-80% were reported in a winter wheat field of 2137 in central South Dakota. A significant yield loss to stem rust occurred in this field. In other fields in central South Dakota, trace to 20% severities were observed, but incidence was low. In mid-July, trace to 20% severities were observed in winter wheat plots in east central South Dakota and southeastern North Dakota. By mid-July, check plots of highly susceptible spring wheat cultivars such as Baart had 20% stem rust severities in south central Minnesota and east central South Dakota and traces of stem rust were found in southeastern North Dakota. In late July, 30% severities were reported on Baart in north central North Dakota plots.

Stem rust was unusually prevalent in the Northern Plains this year. The number of stem rust samples received at the Cereal Disease Lab this year was twice as great as in recent years. The increased severity of stem rust in the Northern Plains can be attributed to the large amount of inoculum produced on winter wheat cultivars, *e.g.* 2137, farther south in the Central Plains, and to the temperature and moisture, which were ideal for stem rust infection in the Northern Plains this year. If current spring wheat cultivars were susceptible to stem rust, a serious epidemic with substantial yield losses would have occurred.

In mid-June, light stem rust was found in wheat plots in southwestern Virginia.

To date, races Pgt-QCCJ, QCCS, QFCJ, QFCS, and RCRS have been identified from collections made in the southern U.S. (Table 1). The increased frequency of race QCCJ could represent a significant race shift in the wheat stem rust population. The QCCJ race is virulent on barley cultivars with the *Rpg*1 (T) gene for resistance. RCRS was the most commonly identified race in

1998.

Table 1. Wheat stem rust races identified through July 30, 1999

Pgt race	Virulence formula	TX	LA
QCCJ	5,21,9g,17,9d,10	3	
QCCJ	5,21,9g,17,9d,10	3	
QCCJ	5,21,9g,17,9d,10		3
QCCS	5,21,9g,17,9a,9d,10	2	
QFCJ	5,21,9e,7b,17,9d,10	1	
QFCS	5,21,8a,9g,17,9a,9d,10	1	
RCRS	5,21,7b,9g,36,9b,17,9a,9d,10	1	
RCRS	5,21,7b,9g,36,9b,17,9a,9d,10	3	
RCRS	5,21,7b,9g,36,9b,17,9a,9d,10	3	
Number of isolates		14	3
Number of collections		6	1

Wheat leaf rust. Southern Plains - During mid-March, wheat leaf rust severities ranged from traces on flag leaves to 60% on the lower leaves of cultivars in nursery plots throughout southern Texas (Fig. 1). For example, plots of Custer had traces of leaf rust, but Karl 92 had 60% severities. Commercial wheat fields in southern Texas had rust severities ranging from traces to 20% on the lowest leaves. In southern Texas, rust increased on the lower leaves when moisture was abundant, but rust increase farther up the plant was limited because of dry weather. In southern Texas, in early April, leaf rust was severe on spring wheats like Norm (30%).

In central Texas during early April, leaf rust was much more severe and widely distributed than normal in wheat fields and plots. The mild winter and moist conditions in February and March contributed to the rust development in much of this area. In mid-April, leaf rust severities of 80% were observed in central Texas plots of TAM-107. During the last week in April, wheat leaf rust severities in north central Texas and southern Oklahoma ranged from trace to 80% in plots, and in fields where rust overwintered, severities were as high as 70% on flag leaves. Leaf rust was more severe than last year in this area.

During November in Oklahoma, leaf rust was severe on some of the commonly grown cultivars. However, a hard freeze in mid- to late December, followed by dry conditions through January and early February, eliminated this leaf rust in many of these fields. By early March leaf rust was less severe, since most of the rusted leaves died without the rust spreading to the younger leaves because of the dry weather in February. In late March, moist conditions allowed rust to increase and provided inoculum for the wheat-growing areas farther north.

During the last week in April, wheat leaf rust severities in southern Oklahoma ranged from trace to 80% in plots, and in fields where rust overwintered, severities were as high as 70% on flag leaves. Leaf rust is more severe than last year in this area. These areas provided rust inoculum for wheat grown in Kansas and Nebraska.

By the third week in May, leaf rust was severe in plots and light in most fields in north central Oklahoma. In plots in north central Oklahoma, 60% severities were reported on flag leaves of susceptible cultivars such as Chisholm, Karl 92, and Jagger. However, severities of less than 2% were observed on cultivars like 2163 , Custer, and Tomahawk. Rust was severe in some fields in central Oklahoma where wheat was planted early, which allowed fall infection and overwintering of leaf rust.

During the last week in April, traces of leaf rust were found on *Triticum cylindrica (Aegilops cylindrica)* plants growing along the roadside in north central Texas. The pathotype (race) generally identified from these collections normally does not infect the commonly grown wheat cultivars. By the third week in May, leaf rust severities ranging from 10 - 40% were observed on *Triticum cylindrica* plants growing alongside the road in north central Oklahoma. **Central**

Plains - In Kansas, the fall of 1998 was long and warm with frequent rains which allowed for the buildup of leaf rust on susceptible varieties. The winter was relatively mild but a cold snap in late December killed many of the leaves. By early March, overwintered leaf rust was found in northwestern and northeastern Kansas, but overwintering was generally light and localized. Cool weather in late April and early May slowed rust development. In early May, traces of leaf rust were found on the flag leaves of susceptible wheat cultivars in fields in the southern half of Kansas. During the third week in May, in a south central Kansas nursery plot, 40% leaf rust severities were reported on the flag leaves of susceptible cultivars (*e.g*., TAM 107). Severities of 10% were found on flag-1 leaves in fields of the cultivar Jagger in southeastern Kansas in mid-May. In some central Kansas fields, the flag leaves were clean, but the flag-1 leaves had leaf rust severities of trace to 5%. The northward development of leaf rust was slow into the Great Plains states because of the cooler than normal weather and moist conditions which kept the spores within the crop canopy. However, with the advent of better weather conditions for spore increase, during late May, trace to 80% severities were reported in south central Kansas nurseries. In fields in the same area, 20% severities were observed on flag leaves of susceptible cultivars like Jagger, but on most of the other cultivars severities were much lower. In north central Kansas, 20% severities were observed on the lower leaves.

In early June, only traces of leaf rust were found in eastern Colorado. The leaf rust is less than in prior years, partly because less acreage of the common susceptible cultivar TAM 107 is being grown. By mid-June in the central plains, 80% leaf rust severities were common on susceptible cultivars such as TAM 107 from southeastern Colorado to north central Kansas. Leaf rust developed late, but still managed to kill the flag leaves of susceptible cultivars during the soft dough stage throughout much of this area.

This year the overall estimated loss due to leaf rust in Kansas was 3.4%, which is below the 10 year average of 5%, but above last year's estimate of 2.5%. Yield losses were estimated from fungicide plot data, cultivar surveys, cultivar disease ratings and disease surveys. Several varieties such as Big Dawg, Custer, Dominator, Heyne, and Jagger showed significant loss of resistance compared to last year in most Kansas plots.

During the first week in June, traces of leaf rust were found in a southeastern Nebraska winter wheat nursery. By mid-June, leaf rust was light in many fields in southern Nebraska and severe

in some fields of susceptible cultivars where rust had been infected early in the spring or where rust overwintered.

Northern Plains - In late May, traces of leaf rust were found in winter wheat plots in Brookings, South Dakota. Growth stages ranged from emergence of flag leaf to late boot. On May 27, traces of leaf rust were observed on the lower leaves of the winter wheat cultivar Norstar in a southeastern North Dakota plot. On June 3, trace to 1% severities were found in a plot of the winter wheat Roughrider in east central Minnesota. Traces of rust were also observed on other winter wheat cultivars. The rust development in the northern Great Plains states probably originated from rust spores that were deposited with rain in mid-May. This rust development was earlier than normal. During the first week in June, 5-30% severities were reported in a winter wheat nursery and traces in spring wheat fields in southeastern South Dakota. By mid-June, 20% severities were observed on the flag leaves of susceptible winter wheats and 30% on lower leaves of susceptible spring wheats in east central South Dakota. Leaf rust developed faster in this area than last year.

During the final week in June, leaf rust severities ranged from trace to 60% on flag leaves of susceptible winter wheat cultivars in central and eastern South Dakota plots and fields. Winter wheat flag leaves dried up quickly because of heavy leaf rust infection throughout South Dakota and southern Minnesota. The rust infections in South Dakota and Minnesota probably originated from inoculum sources in Oklahoma and northern Texas. During the final week in June, leaf rust severities of 10% were reported on the flag leaves and 60% severities on lower leaves of susceptible spring wheat cultivars, *e.g.*, 2375, in plots in southwestern and west central Minnesota. In fields, severities ranged from trace to 10% on the lower leaves of spring wheats in western Minnesota and northeastern South Dakota. This year, leaf rust is more severe and concentrated in the Upper Midwest than it has been in the last 20 years. Abundant inoculum from the south has been deposited with the frequent rains, and weather conditions favored infection. The spring wheat cultivars currently grown are more susceptible than those in previous years.

By mid-July, 40% severities were common on flag leaves of spring wheat cultivars, *e.g.*, Oxen, growing in plots in west central Minnesota. In spring wheat fields, 20% severities at the early berry stage were common throughout west central Minnesota and east central South Dakota. By late July, 40% severities were reported in spring wheat cultivars in a northeastern Montana nursery and 10% in spring wheat fields in north central North Dakota. This year, yield losses to leaf rust are expected in both winter and spring wheats in the Northern Plains.

Southeast - In February, heavy rainfall in Louisiana did not allow the rust spores to move up the plants and therefore rust development was limited. By mid-March, wheat leaf rust was increasing in plots of southern soft red winter wheat cultivars in southern Louisiana.

In much of the southeastern U.S., dry weather through March and some of April was a limiting factor in rust development. In mid-April, leaf rust was severe in plots of susceptible southern soft red winter wheat cultivars within approximately 75 miles of the Gulf Coast, and some cultivars that previously were resistant showed significant rust development this year. During the last week in April in the southeastern U.S., severities of 60% were observed in plots of susceptible

soft red winter cultivars, while in fields, 1% severities were common on the flag leaves. The drier and cooler than normal conditions during the last part of April slowed the rust development. Due to the low relative humidities during the last half of April, there was little dew formation which is needed for rust infection to occur. Therefore, the numbers of spores released as inoculum were lessened for areas farther north. This year losses to leaf rust in the southeastern soft red winter wheat area were less than normal.

During mid-April, traces of leaf rust were found in southern Arkansas. By the third week in May, leaf rust was heavier than normal in Arkansas. Wheat in the southern part of the state was too mature for rust to cause much loss. In northern Arkansas (north of I-40), losses occurred in fields that were later than normal in maturity. This area provided a source of inoculum for areas to the north. In some fields in this area, leaf rust development was stopped by severe Septoria infection of leaves. In mid-April, 40% severities of leaf rust were found on wheat in east central South Carolina plots.

Midwest - By the first week in June, 20-30% leaf rust severities were observed on susceptible wheat cultivars at the late milk stage of development, in southwestern Indiana and western Kentucky plots. Leaf rust severities of 40% were observed in wheat fields at full berry stage in northeast Missouri on June 7 and severities in plots in the area ranged from trace to 40%.

By the second week in June, 40% leaf rust severities were reported in plots of susceptible wheat cultivars from northeastern Missouri to northeastern Indiana. In fields of the susceptible cultivar Clark in southern Illinois, 80% rust severities were common during the second week in June. In plots and fields in places like east central Indiana, 20% severities were noted on only 10% of the wheat plants, because there was not enough dew or rainfall in late May to allow the infection process to occur and, therefore, rust did not spread from wheat plants infected earlier.

During the third week in May, traces of leaf rust were reported in south central Michigan. Leaf rust (low to moderate incidences and low severities) were found in southwest Michigan fields by June 8. The infections were predominantly on the lower leaves. **East -** During the last week in May, 80% leaf rust severities were observed on susceptible winter wheat cultivars in eastern Viriginia plots and traces of rust were found on wheat in west central New York fields. This year leaf rust was not a problem in the eastern U.S. because conditions were so dry rust infection could not occur.

California - In early May, 20% leaf rust severities were reported on wheat lines growing in a nursery in the northern Sacramento Valley. By mid-May, late infections of wheat leaf rust occurred throughout the Central Valley, but because the infections were so late, losses were minimal. Disease levels were much lower this year than in previous years because of the cool spring and a cold spell in late December, which killed some of the early rust-infected wheat.

Pacific Northwest - By the third week in May, leaf rust was just starting to show in nurseries in western Oregon, but none was found in commercial fields. In eastern Oregon, wheat leaf rust was light because of the cool dry May.

During mid-April, leaf rust was light in wheat plots in the Skagit valley of western Washington.

Because of the cool dry May, leaf rust increased at a slow rate in the state of Washington. By the second week in June in western Washington plots, 50% severities were reported on winter wheats and traces on the springs. In mid-June, traces of leaf rust were found on spring wheats in eastern Washington plots. By late June, wheat leaf rust was increasing on spring wheats in the Mount Vernon area of western Washington. In early July, traces of leaf rust were found in eastern Washington and northern Idaho fields. In mid-July, leaf rust was increasing on spring wheats in western Washington. Leaf rust was very light east of the Cascades in Washington. The cool dry conditions in early spring were not conducive for leaf rust to develop and losses were light this year in the Pacific Northwest.

The wheat leaf rust races identified so far in the 1999 survey are presented in Table 2. Most of the identified races were from collections made in Texas in early spring, and again, as in previous years, there is a large diversified population of races. Table 2. Wheat leaf rust races identified through July 30, 1999

		Number of Isolates by State								
Code	Virulence Formula	AL	CA	FL	GA	KY	LA	MS	SC	TX
CCRQ	3, 26, 3ka, 11, 30, 10, 18						2			
FCGQ	2c, 3, 10, 11, 18, 26				2					
MBDL	1, 3, 10, 17									2
MBGL	1, 3, 10, 11		2					4		2
MBGQ	1, 3, 10, 11, 18							1		
MBHL	1, 3, 10, 11, 18, 30	2						2		
MBRL	1, 3, 3ka, 10, 11, 30	6		4	2		3			3
MBRQ	1, 3, 3ka, 11, 18, 30	4			2		1			4
MCDL	1, 3, 10, 17, 26									16
MCRL	1, 3, 3ka, 10, 11, 26, 30							1		
MCRQ	1, 3, 3ka, 10, 11, 18, 26, 30	23		6			2	3		
MCTL	1, 3, 3ka, 10, 11, 17, 26, 30	2								2
MDBL	1, 3, 3ka, 24							1		
MDRL	1, 3, 3ka, 10, 11, 24, 30						2		2	11
MFBL	1, 3, 10, 24, 26					2				1
MJDL	1, 3, 10, 16, 17, 24									1
MJTL	1, 3, 3ka, 10, 11, 16, 17, 24, 30							1		
PCRQ	1, 2c, 3, 3ka, 10, 11, 18, 26, 30						1			
TBBL	1, 2a, 2c, 3, 10									1
TBRL	1, 2a, 2c, 3, 3ka, 11, 30			3						
TCRL	1, 2a, 2c, 3, 3ka, 10, 11, 26, 30					2				1
TCRQ	1, 2a, 2c, 3, 3ka, 10, 11, 18, 26, 30								2	
TFBL	1, 2a, 2c, 3, 10, 24, 26						2			
TFBQ	1, 2a, 2c, 3, 10, 18, 24, 26						4			
TFRL	1, 2a, 2c, 3, 3ka, 10, 11, 24, 26, 30									11
TLGG	1, 2a, 2c, 3, 9, 11, 18	2					4			
No. of Isol.		39	2	13	6	4	21	13	4	55
No. of Coll.		20	1	7	3	2	13	7	2	30

Wheat stripe rust. The first report of stripe rust this year in the central part of the U.S. was in a south central Kansas nursery, during the last week in May. Wheat stripe rust foci were found in some plots like 2137 and rust traces were scattered throughout the central and southern parts of the state. Where this rust originated from is anybody's guess, since this was the first report this year of stripe rust being found in the central part of the U.S. Last year light amounts of wheat stripe rust were scattered from the lower Mississippi Valley north to east central Minnesota. In Kansas, the cool spring weather allowed development of stripe rust, but the hot temperatures of early June disrupted further development and losses were negligible.

During the third week in June, traces of stripe rust were found in east central Colorado fields. Normally, stripe rust is found at higher elevations in Colorado, *i.e*, San Luis Valley (7,500 ft) or front range of the Rockies (~5,000 ft).

In early June, light amounts of stripe rust were observed in wheat plots in west central Indiana.

During mid-April, wheat stripe rust was severe in a field in the Sacramento Valley of California. In other fields, in the same area, severe rust was expressed in small foci. By the first week in May, wheat stripe rust was increasing in the Sacramento Valley in California, where temperatures remained relatively cool. Disease foci readings ranged from 1 to 80% severities in fields of the fall-sown hard red spring wheat cultivars Express and RSI 5, the predominant cultivars grown in the Sacramento Valley. During the third week in May, because of the cool weather, wheat stripe rust was continuing to increase in fields in the Sacramento and San Joaquin Valleys in California. Yield losses were low because in most of the fields the rust was late in developing and the wheat was grain filling when the infection began.

In mid-April, wheat stripe rust severities of 30% were reported on susceptible winter wheat lines in the Skagit valley nursery in western Washington. In late May in western Oregon nurseries, wheat stripe rust was starting to show, but none was found in commercial fields. During the last week in May, 80% wheat stripe rust severities were reported on susceptible winter wheat lines in northwestern Washington plots at the boot stage. In mid-June, on spring wheats, 60% severities were observed in western Washington. Wheat cultivars with adult-plant resistance continued to provide durable resistance in farmers' fields. Stripe rust foci of 60% severity were found in winter wheat plots in eastern Washington, but the foci were few in number. The dry fall and cool dry May led to the low rust severities, but the rains in mid-June improved conditions for rust buildup. By late June, wheat stripe rust was increasing on spring wheats in the Pacific Northwest, but rust losses were minimal, since most of the cultivars have high temperature, adult plant resistance. During mid-July, 100% stripe rust severities were reported on susceptible spring wheat cultivars in the Mount Vernon area of western Washington. In mid-July, wheat stripe rust was increasing in spring wheat fields in the Palouse region of Washington, but the adult plant resistance of commercial cultivars minimized losses.

In early July, significant amounts of wheat stripe rust were reported in nurseries in the Bozeman area of Montana. **Oat stem rust.** On March 15, twenty-percent oat stem rust severities were found on volunteer plants growing around the edges of a non-cultivated field in south Texas. Last year in the same field, the oat plants were destroyed by stem rust. No other oat stem rust was found on oat fields within the immediate area of these infections. By late April, oat stem rust

had killed some of the cultivars growing in plots in a south Texas nursery. In mid-May, severe stem rust severities were reported on some lines in central Texas.

In early April, oat stem rust was found in southern Louisiana nurseries. By April 20 stem rust was severe in the Baton Rouge plots and had killed 50% of the lines. This was the most oat stem rust that had been observed in these plots in the last 10 years. During the last week in April, oat stem rust severities ranged from 1 to 20% in oat plots in central Louisiana and traces in southern Alabama. In general, oat stem rust development was less prevalent than last year throughout the southern U.S. Oat acreage is minimal from Texas to southern South Dakota. In 1999, the next report of oat stem rust was during late June, when traces of rust were found in a commercial field in central Nebraska.

By mid-July, trace to 20% severities of oat stem rust were reported in plots and fields from south central Minnesota to central North Dakota. The 20% severities represented foci of oat stem rust in plots throughout the Northern Plains. In mid-July, traces of oat stem rust were reported in northeastern Montana plots and 60% severities in east central North Dakota plots. The widespread distribution of oat stem rust in the Northern Plains this year was unexpected, because stem rust was less prevalent than normal on oats in the southern U.S., which is the source of inoculum for northern states. In 1999, light losses to oat stem rust will occur in some fields in the Northern Great Plains.

From oat stem rust collections made in Texas, Alabama and Louisiana, the common pathotype NA-27 was identified.

Oat crown rust. During mid-March, crown rust was severe in southern Texas plots and fields. Foci of sixty-percent severity were common on the most susceptible cultivars in nursery plots. In southern Texas oat fields, rust severities ranged from 1 to 20%; on average, rust development was equal to last year.

In mid-April, crown rust was severe from central Texas through southern Louisiana to the panhandle of Florida. During mid-April, 30-50% crown rust severities were observed on susceptible oat plots in Baton Rouge, Louisiana and Fairhope, Alabama. By late April, crown rust was severe in plots of susceptible cultivars and light in commercial fields in the southern U.S. These southern areas provided some inoculum for areas farther north. In mid-May, 70-80% severities were observed on susceptible oat cultivars like Simpson growing in the Blackville, South Carolina area (southwest SC). However, at Florence (east central) and Clemson (northwest) South Carolina, no crown rust was found. In mid-June, traces of oat crown rust were found in fields and plots in northern Kansas and northeastern Indiana at the full berry stage.

By late April, pycnial infection was noted on buckthorn bushes in southeastern Minnesota and in the St. Paul buckthorn nursery. At St. Paul, most of the pycnia were found along the edge of the nursery, rather than where the oat telial straw was located. Therefore, the first pycnia observed may have been forms that infect grasses rather than oat. The pycnia development was later than normal this year in the St. Paul nursery. This suggests that the release of basidiospores peaked later this year, relative to the development of the buckthorn leaves which were 7-10 days behind last year.

By the fourth week of May, there was abundant crown rust infection on buckthorn at St. Paul, but no uredinia were found on oats in the buckthorn nursery. The first pycnia appeared on the buckthorn in mid- to late April, but the main flush of new pycnia did not appear in the buckthorn nursery at St. Paul until the second week of May. Most of the new infections had few aeciospores. Cool weather delayed development of aecia. Scattered pustules of crown rust were found on oats in the buckthorn nursery at St. Paul on June 4. This was four weeks later than last year, but close to normal for most years. By mid-June, oats in the buckthorn nursery in St. Paul, Minnesota, had moderate crown rust infection on lower leaves, but little or no rust had appeared on the upper leaves. In late June, 60% severities were observed in oat plots in south central Minnesota, while in fields 1-5% severities were found on the lower leaves. During mid-July, crown rust severities ranged from 0 to 20% in oat fields and trace to 60% on flag leaves in plots in west central Minnesota.

In early May, heavy infections of pycnia and some early stages of aecia were observed on buckthorns at Brookings, South Dakota. By the fourth week in May, buckthorns in east central South Dakota were severely infected with crown rust. In late May, aeciospores were released from crown rust-infected buckthorn bushes growing in Fargo, North Dakota. The infections were moderate and most likely from other grasses as there are no oats in the area. By late June, crown rust had developed very slowly at the Brookings, South Dakota nursery and trace to 20% severities were observed on lower leaves of susceptible cultivars at the early milk growth stage. During mid-July, crown rust severities ranged from 0 to 20% in oat fields and trace to 60% on flag leaves in plots in northeastern South Dakota. On wild oat (*Avena fatua)*, rust severities ranged from trace to 20% severity throughout eastern South Dakota.

In mid-July, traces of crown rust were seen in the nursery at Fargo, North Dakota. By late July, 40% severities were observed in plots and 5% in fields in northern North Dakota. This year, throughout the upper Midwest, crown rust was lighter than normal and covered a smaller area because of the cooler than normal weather this spring, which decreased the amount of infections from buckthorn, the alternate host of oat crown rust. This year, losses to crown rust in northern oat-growing areas were light. **Barley stem rust**. The first report of barley stem rust in 1999 was in early July in west central Minnesota where traces of stem rust were found on the 2-row barley Hypana. Limited amounts of barley are grown commercially in the southern states and stem rust on barley rarely occurs in this area.

In early July, trace to 50% severities were reported on 6-rowed barley in a north central South Dakota field. By mid-July, traces of stem rust were common on both 2 and 6-rowed barleys growing in plots and in fields in the southern part of the Red Valley of the North. In late July, 40% severities were observed in plots in northeastern North Dakota and traces in plots in northeastern Montana. Most of these barley rust infections are probably due to the increase in the QCCJ stem rust race which has been identified in Texas and Louisiana as described in the wheat stem rust section. The stem rust development in barley was more significant than in the recent years but still losses will be minimal.

In mid-July, trace to 10% stem rust severities were reported on wild barley (*Hordeum jubatum*) plants growing alongside the roadway in eastern South Dakota. This was the most extensive stem rust observed on wild barley in this area in the last 5 years.

Barley leaf rust. In mid-March, traces of leaf rust were observed on lower leaves in a few barley plots in southern Texas. In late April, traces of barley leaf rust were found on cultivars growing in nurseries in central Texas.

In early May, traces of barley leaf rust were found in the Skagit Valley of western Washington. During late May, barley leaf rust was increasing on the winter barleys and traces were found on the spring barleys in northwestern Washington. During the third week in June, barley leaf rust severities of 50% were reported on susceptible winter barleys in western Washington. Rust was just starting to increase on spring barleys. No barley leaf rust was reported in eastern Washington.

In late June, severities of 20% were reported on the lower leaves in spring barley plots in east central Nebraska and traces in plots in west central Minnesota. In mid-July, trace to 10% leaf rust severities were observed in barley plots in south central Minnesota, east central South Dakota and southeastern North Dakota.

Losses to barley leaf rust were light in the U.S. this year.

Stripe rust on barley. In mid-April, barley stripe rust severities of 80-100% were reported in susceptible plots on the University of California-Davis agronomy farm. By early May, barley stripe rust was observed in nurseries in the Sacramento and San Joaquin Valleys of California at severities of 80-100%. Barley stripe rust development was much less than last year in California.

In mid-April, severities of less than 1% were noted on barley lines in the Skagit Valley nursery of western Washington. Crop maturity was delayed, but the cooler than normal conditions also delayed rust development. By the third week in May, foci of stripe rust were found in barley plots at Corvallis, Oregon. By mid-June, in the Pacific Northwest, stripe rust on barley was much less than last year. In western Washington, 30% severities were observed on susceptible barley cultivars, while in eastern Washington no stripe rust on barley was found. The dry fall and cool dry May, which is the critical month for rust development, were not conducive for the disease. In late June, barley stripe rust was increasing on susceptible cultivars in western Washington, while only traces were found in plots in eastern Washington. There is much less stripe rust than last year throughout the Pacific Northwest. In mid-July, stripe rust on barley was increasing in the Pacific Northwest, but there was much less rust than last year. Losses to stripe rust on barley will be significantly less than last year in the Pacific Northwest.

Barley stripe rust was virtually non-existent in Idaho this year,with the exception of a severely diseased field of spring barley in eastern Idaho.

In early July, trace amounts of stripe rust were reported in the Bozeman area of Montana.

Barley crown rust. Moderate levels of aecial infection were observed on buckthorn in the barley crown rust nursery in Fargo, North Dakota, the week of May 24. In mid-June, infection on barley was light. By late July, crown rust was severe on barley in plots at Fargo.

In mid-June, a few pustules of barley crown rust were seen on winter rye in southeastern South Dakota plots.

Rye leaf rust. During mid-March, rye leaf rust foci with 10% severities were found on leaves of winter rye in southern Texas. In late April, 10% severities were observed on flag leaves in rye fields in southern Alabama and central Texas. Rye leaf rust had developed late in plots in southern Georgia and caused minimal losses.

During the third week in May, 20% leaf rust severities were observed in rye fields in north central Oklahoma.

By the last week in May, traces of rye leaf rust were found in a field in south central Wisconsin. In early June, 10% severities were observed on the lower leaves of winter rye in southeastern South Dakota plots.

In mid-June, 10% leaf rust severities were reported in rye fields in northeastern Indiana.

By the fourth week in June, 20% severities of leaf rust were found on lower leaves of spring rye in plots in southern and west central Minnesota. By mid-July, 60% severities were observed on the flag leaves of spring rye in west central Minnesota plots.

In 1999, rye leaf rust was scattered throughout the U.S. but only caused light losses. **Rye stem rust.** During late April, traces of rye stem rust were found in a field in central Texas. This was the only report of rye stem rust in the U.S. in 1999.

Stem rust on barberry. In late April, the pycnia stage of wheat stem rust was found on barberry leaves in southeastern Minnesota and the aecia stage was found at two locations in south central Wisconsin on the common susceptible barberry (*Berberis vulgaris)*. In mid-June, a few aecial infections were observed on common barberry bushes in south central Wisconsin.

Other grasses. In mid-July, 10% crown rust severities were common on *Elytrigia* (Agropyron) *repens* (quackgrass) in eastern and central North Dakota.

This is the last issue of the Cereal Rust Bulletins for the 1998-99 growing season. I would like to thank all of those who helped with the bulletin this year, especially Mark Hughes (markh@umn.edu) who coordinates its distribution through the CDL web page (http://www.cdl.umn.edu), email and the post. Any reports of rust that you find in your area will be appreciated and this information may be added on our web page. - David Long (davidl@cdl.umn.edu)

Fig. 1. Leaf rust severities in wheat fields in 1999