CEREAL RUST BULLETIN

Report No. 9

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From:
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Most of the small grains in the northern Great Plains are in good condition and near normal in maturity. Scab is severe in western Minnesota and eastern North Dakota spring wheat fields and losses will occur in areas that had significant rainfall but the overall loss will be less than last year. Barley and winter wheat harvest has begun in southeastern North Dakota and northeastern Montana.

Wheat stem rust. During 1994, wheat stem rust overwintering sites were found in southern Texas and Louisiana. During the last week in March, traces of stem rust were found in a field of Mit wheat located southwest of Houston, Texas. Rust collected from this field was identified as race Pgt-QCCJ. Stem rust in southern Texas and Louisiana was less severe in 1994 than in 1993. In March, 1994 moisture conditions (less rainfall and fewer dews) and cool nighttime temperatures (less than 40 F) were not favorable for rust development. In late April, in central Texas and southern Louisiana traces of stem rust were found in wheat plots. During late May, light amounts of wheat stem rust were observed in north central Texas plots at harvest. By the first week in May, 5% stem rust severities were observed throughout the state of Louisiana. By the third week in May, light amounts of wheat stem rust were scattered throughout the lower Mississsippi Valley wheat growing area. In all of these areas losses to wheat stem rust were minimal, but these fields and plots did provide stem rust inoculum for susceptible wheats and barleys farther north.

In early June, traces of stem rust were observed on McNair 701 (susceptible host) in a south central Kansas plot. By the third week in June, a focus of 10% wheat stem rust severity was found in a northwestern Kansas plot of McNair 701 and traces of stem rust were found on Karl. The hot dry weather in late May and early June in Kansas was not conducive for rust increase.

In mid-July, traces of stem rust were found in plots of the winter wheat Norstar and the susceptible spring wheat Max in southeastern North Dakota. In late July, traces of stem rust were found in plots in west central Minnesota and central and northwestern North Dakota. Commercial spring and durum wheat cultivars in this area have a high level of stem rust resistance, so losses to stem rust were negligible.

Stem rust development throughout the Great Plains was less than normal because less rust overwintered. Then cool dry conditions in late winter in the southern Plains and hot dry weather in late May and early June in the central Plains were not conducive for rust increase.

Traces of wheat stem rust were first reported in the northern soft red winter wheat area in west central Indiana and east central Illiniois in mid-June but losses were negligible, because the crop was close to harvest.

In late July, in west central Colorado severe stem rust was found on the cultivar Stephens at harvest time. This was the first time wheat stem rust was found at this location on the western slope of the Rockies.

In early July traces of wheat stem rust were first reported in a eastern Washington plot but none was reported in fields.

Race Pgt-TPMK was identified from collections made in southern Texas and Louisiana in early spring. Pgt race QCCJ, which infects barley, was identified from collections made in southern Texas in early spring.

Wheat leaf rust. In late March, wheat leaf rust was widespread but less severe than normal in fields and plots across southern Texas (Fig. 1). Generally, leaf rust overwinters throughout southern Texas. Later planting (December), lack of moisture, and cool temperatures are factors other than resistance which restricted the rust development.

In some north central Texas fields, leaf rust overwintered and by late March severe rust was noted on the lower leaves. The lack of moisture in April delayed further leaf rust development throughout most of Texas. By the last week in April only light leaf rust was found on flag leaves in fields and plots in north central Texas and southwestern Oklahoma. By the third week in May, 20% leaf rust readings were observed on flag leaves in few fields in north central Oklahoma and 1% leaf rust severities were observed on flag leaves of Triticum cylindricum (Aegilops cylindrica) across central and western Oklahoma. Losses to wheat leaf rust were light in the southern Plains this year.

The amount of leaf rust that overwintered in Kansas during 1993-94 was the least observed in the past 15 years. Cool weather in late March and early April was not conducive for rust development. In early April the freezing temperatures in western Kansas killed leaf tissue that was infected with rust, thus delaying the local rust build up. By early May traces of leaf rust were found in central Kansas. In a field of Karl, in central Kansas, a few pustules were found on flag leaves but none was found on lower leaves which meant the rust developed from spores blown into the field from an external source. In the long distance spread of rust, the spores are typically brought down with rain and deposited on leaves. During the third week in May, traces of leaf rust were found on flag leaves in plots and fields throughout central, south central and southwestern Kansas. Leaf rust was much lighter in this area than last year because very little leaf rust overwintered, temperatures were cooler than normal in the

early spring, and moisture was less than normal. In northern Kansas, final leaf rust severities were light because dry hot conditions pushed the crop to quick maturity.

In early June, leaf rust was light in southern Nebraska fields on the flag leaves at late milk stage. During the third week in June, trace to 20% leaf rust sevrities were observed in winter wheat fields in south central Nebraska and southeastern South Dakota. Damage varied with local conditions but some fields suffered losses in yield.

During late June, traces of leaf rust were observed in spring wheat fields in west central Minnesota, and 10% severities were found in plots of the susceptible cultivar Baart in southern Minnesota and southeastern North Dakota. Most of the infections were on the lower leaves. During late June in southeastern North Dakota winter wheat plots, trace-5% severities were observed at 1/4 berry stage. In early July, severities of 5-60% were common on flag leaves in plots of susceptible winter wheat in east central Minnesota and southeastern North Dakota. In late July, in susceptible spring wheat plots, 40% severities were common, while in fields only traces were noted in the northern Great Plains. Due to resistance, only traces of leaf rust developed and therefore losses were minimal in the spring wheat. No rust was reported on durum wheat.

During early April, leaf rust severities were generally light throughout Louisiana (Fig. 1). During November to January, the temperatures were cooler than normal, which didn't allow the rust to increase as during the winter of 1992-93. No leaf rust was found in southern Louisiana CK 9877 plots, in contrast to last year when rust was severe in these plots. In mid-April, severe leaf rust was reported in susceptible plots in southern Louisiana and light amounts of leaf rust were found in east central Arkansas fields. By late May, in northeastern Arkansas leaf rust severities ranged from traces to 50% in plots and traces to 10% in fields. These rust infected plants provided leaf rust inoculum for susceptible wheat farther north.

From southern Missisippi to southern Georgia winter rainfall was above normal creating favorable conditions for rust infection, however, cooler than normal temperatures in November slowed rust establishment and very little development occurred in the coldest months of December and January. By early April, leaf rust severities were generally light on susceptible southern soft red winter wheat in plots and fields from southern Mississippi to southern Georgia. Then drier than normal conditions and cool temperatures slowed leaf rust spore production and movement in much of this area. By the first week in May, leaf rust severities ranged from traces to 90% in wheat plots and fields at the soft dough stage from the Florida panhandle to east central Louisiana. Throughout the southern soft red winter wheat area, leaf rust losses were light except for a few isolated cases.

In mid-June, in the northern soft red winter wheat area, traces of leaf rust were observed in fields and traces to 10% in nurseries at soft dough stage. This was much less leaf rust than normal for this area because of drier than normal conditions, no rust overwintering which was related to later than normal fall planting and less inoculum arriving from the south.

TABLE 1. Wheat leaf rust races identified through August 1, 1994.

Prt code	Virulence formula[1]	Number of isolates by state														
		AL	AR	CA	FL	GA	IN	KS	LA	MN	MS	NC	OK	TN	TX	VA
FBR-10,18	2c,3,3ka,10,11,18,30											1				
MBB-10	1,3,10	1		1		1					1					
MBG-10	1,3,10,11	12	20	6	3	16	2		6			2	3	4	6	2
MBR	1,3,3ka,11,30		2													
MBR-10	1,3,3ka,10,11,30	9	9	1	1	4		7	7	1	5	3	8		13	
MCB-10	1,3,10,26			10							2					
MCD-10	1,3,10,17,26			2											2	
MCG-10	1,3,10,11,26			3				1								
MDB-10	1,3,10,24										1				1	
MDG-10	1,3,10,11,24														1	
MFB-10	1,3,10,24,26					1			2						10	
MGD-10	1,3,10,16,17														2	
MLM-10	1,3,3ka,9,10,30														1	
PBR-10,18	1,2c,3,3ka,9,10,18,24,30	4														1
PNM-10,18	1,2c,3,3ka,9,10,18,24,30	1	1						1							
TBD-10	1,2a,2c,3,10,17														2	
TBG-10	1,2a,2c,3,10,11								2						3	
TDB-10,18	1,2a,2c,3,10,18,24		8						1	1			4			1
TDG-10	1,2a,2c,3,10,11,24		2						1		2		1		12	
TFB-10	1,2a,2c,3,10,24,26												2		16	
TLG-18	1,2a,2c,3,9,11,18	1				2									2	
Number of isolates		28	42	23	4	24	2	8	20	2	11	6	18	4	71	4
Number of collections		15	24	16	2	12	1	4	10	1	6	3	9	2	40	2

[1] Near isogenic resistances evaluated: *Lr* 1,2a,2c,3,3ka,9,10,11,16,17,18,24,26,30

In early July, light leaf rust was found on winter wheat in central and western New York. In these areas losses to wheat leaf rust were minimal.

In late April, light amounts of wheat leaf rust were found in the Central Valley, California. By mid-May, leaf rust was widespread and severe on susceptible cultivars in fields and nurseries. By the

fourth week in May, leaf rust had increased to severe levels in plots and fields in the Sacramento Valley of California. In these areas in California wheat leaf rust losses occurred in fields of susceptible TABLE 1. cultivars. By early June, severe leaf rust was observed in plots at Corvallis, Oregon and light rust was found in the Pullman, Washington area. In early July, light leaf rust was found on winter wheat in the Gallatin Valley in Montana.

From preliminary tests (Table 1) three new races were identified MCG-10, MDG-10 and MLM-10. As in the previous 3 years race MBG-10 was the predominate race identified from the southern soft red winter wheat area. Races MBR-10 and TDG-10 were more widespread and more common than in previous surveys.

Wheat stripe rust. In late March, 5% severities were observed on the soft red winter wheat cultivar Coker 9835 in the Uvalde nursery in southern Texas. High temperatures retarded further development in this nursery. There were no reports of wheat stripe rust being found this year in the southern Mississippi River Valley wheat growing area.

During the second week in April, traces of wheat stripe rust were found in the Davis, California nurseries. During the last week in April, wheat stripe rust was found in nurseries in the Central Valley, California. By the second week in May, severe wheat stripe rust was found in San Joaquin and Sacramento Valley plots in California. Stripe rust was more widespread in California than the last two years.

During mid-April, significant amounts of stripe rust were observed in northwestern Washington wheat plots. Severities of 80% were found on the most susceptible lines in the Mount Vernon nursery. By late May, stripe rust was severe in northwestern Washington plots and in some fields which were susceptible to stripe rust. In eastern Washington, stripe rust was light this year which was due to lower than normal rainfall and higher than normal springtime temperatures.

During the first week in July, traces of wheat stripe rust were found in the Gallatin valley in Montana.

Oat stem rust. Light amounts of oat stem rust were found in southern Texas oat plots in mid-April and north central Texas plots in late May. This year in Texas, oat stem rust development was less than normal which relates to the dry conditions.

Oat stem rust was detected in the central plains on June 21 in north central Kansas plots and in a field in southwestern Nebraska. In early July, trace amounts of oat stem rust were found in oat fields in west central Wisconsin. In mid-July, traces of oat stem rust were found in fields in central Minnesota and northeastern South Dakota and in plots in east central Minnesota and east central South Dakota. During the last week in July, light amounts of oat stem rust were found in plots in west central and northwest Minnesota and traces in central Minnesota fields. Trace to 5% severities were observed in

wild oats (*Avena fatua)* plants growing in a field in northcentral North Dakota. This year oat stem rust developed late in the northern oat growing area and losses were light except for late maturing fields.

Early oat stem rust development in southern Louisiana was less than last year on the same date. Infection was light in southern Louisiana oat nurseries in early April, but it increased rapidly after that. During the last week in April, oat stem rust was severe on susceptible cultivars in southern Louisiana and southern Alabama nurseries. Although the oat stem rust developed very late, it still destroyed most of the oat variety trials in southern Louisiana nurseries. During the first week in May, 5% stem rust severities were observed in oat plots in Quincy, Florida and Fairhope, Alabama at the hard dough stage. By the third week in May, light amounts of oat stem rust were found in southwestern Georgia and northwestern Mississippi nurseries. Stem rust severities were lower in fields than in nursery plots. This year oat stem rust was found in as many locations in the Southeast as in a normal year but losses were light since the rust developed so late in oat fields.

During the last week in July, light amounts of oat stem rust were found in plots in west central and northwest Minnesota and traces in fields in central Minnesota. Trace to 5% severities were observed in wild oats (*Avena fatua)* plants growing in a northcentral North Dakota field. Losses to oat stem rust were minimal in these areas.

Light amounts of oat stem rust were found in the Central Valley, California plots in late April.

Race NA-27, virulent to Pg-1,-2,-3,-4 and -8 remains the predominant race of the oat stem rust population (Table 2).

TABLE 2. Oat stem rust races identified through July 18, 1994.

State	Number of collections	Number of isolates	Number of isolates of race NA-5	NA-16	NA-27
Alabama	3	9			9
California	1	3	3		
Florida	4	12			12
Louisiana	3	9		3	6
Mississippi	1	3			3
Texas	7	21		9	12
Total	19	57	3	12	42

Oat crown rust. During the last week in March, crown rust was severe in nurseries and traces were found in fields in southern Texas. During the last week of April, light amounts of crown rust were observed in central Texas plots. This widespread rust development and severities were comparable to last year in this area.

In mid-April, oat crown rust was increasing rapidly in Louisiana plots. During the last week in April, rust severities ranged from trace to 30% on susceptible oat cultivars growing in nurseries from southern Georgia to southern Louisiana. By the first week in May, crown rust severities ranged from traces to 70% in oat plots at soft dough from the Florida panhandle to east central Louisiana. During the third week in May, traces of crown rust were found in east central Mississippi and northeastern Arkansas plots.

During the third week of May, oat crown rust was beginning to appear on oats adjacent to buckthorn, the alternate host, in the St. Paul, MN nursery. In early June, crown rust was light on oats in southern Wisconsin and southern Minnesota. During the third week in June, trace to 10% crown rust severities were found on oat plots in northcentral Kansas and southern Minnesota and east central South Dakota plots and fields. Most of the infections were on the lower leaves. In mid-July, trace-10% severities were found on oat flag leaves throughout the eastern Dakotas, southern Minnesota and southern Wisconsin fields. In east and west central Minnesota and east central South Dakota plots, 80% severities were observed. By late July, severe crown rust was found in northeastern North Dakota and northwestern Minnesota. Crown rust was severe and widespread this year. The most severe rust was found in fields where rust occurred early and conditions were conducive for rust development. Buckthorn growing in close proximity to oat fields provided some of the initial inoculum in these areas, i.e. southern Wisconsin and southern Minnesota. Buckthorn bushes appear to be common in southeastern South Dakota and may contribute to oat crown rust in that area. Crown rust was also found on three other hosts *Avena fatua* (40% severity), *Hordeum jubatum*(30% severity) and *Agropyron repens*(20% severity) in eastern North Dakota. This year light to moderate losses to crown rust occurred throughout the northern oat growing area.

Among the 32 oat crown rust isolates from Texas that have been tested, 31% were virulent on *Pc*38, 16% on *Pc*39, and 13% on *Pc*68. A high proportion of the isolates collected from breeder's nurseries were virulent on TAM-0-386, but only 16% were virulent on the resistant selection, TAM-0-386R. From the same nurseries, 13% of the isolates were virulent on TAM-0-393. No virulence was found in Texas for *Pc*45, *Pc*48, *Pc*52, or *Pc*62.

Barley stem rust. The first report of barley stem rust was during the third week in June when traces were found in plots in southwestern Nebraska. During mid-July, traces of stem rust were found in southeastern North Dakota plots and north-central South Dakota and central and southeastern Minnesota fields. Traces of stem rust were found on wild barley (*Hordeum jubatum)* growing in a northeastern South Dakota roadside ditch in mid-July. In late July, traces of barley stem rust were found in southeastern and central North Dakota fields and in east central North Dakota and west central Minnesota plots. Losses to barley stem rust were light this year because low levels of stem rust inoculum arrived late in the season when the barley crop was near maturity.

Barley leaf rust. By the last week in March, severe leaf rust caused by *Puccinia hordei,* was observed on barley plots in southern Texas. Limited amounts of barley are grown commercially in the southern and central Plains states and barley leaf rust often is not found in these areas.

During the last week in April, light leaf rust was observed in southwestern Georgia and northeastern South Carolina barley plots.

By the last week in April, barley leaf rust was severe in Central Valley, California nurseries.

By late May, barley leaf rust was light in eastern Virginia plots where the rust had been artificially inoculated. No evidence of overwintered leaf rust was found in this area, which is unusual. During mid-June, 10% leaf rust severities were reported in plots in central Kentucky.

In mid-July, traces of barley leaf rust were found in commercial fields in east central South Dakota and central and northeastern North Dakota. This year in the U.S. losses to barley leaf rust were minimal.

Barley stripe rust. In mid-April, light amounts of barley stripe rust were found in border rows in southern Texas plots.

During the last week in April, barley stripe rust foci were observed in a nursery in the San Joaquin Valley, California. During the second week in May, stripe rust was increasing and was more widespread than last year in San Joaquin Valley, California. Rust also was found in Davis, California plots. It has not determined whether this is barley stripe rust or wheat stripe rust on barley. Stripe rust was also reported in barley plots near Logan, Utah. Barley stripe rust this year was less widespread this year than in 1993.

Rye stem rust. By late July, rye stem rust was found in plots in central North Dakota, west central and northwestern Minnesota. In the Minnesota plots 10% severities were observed. This is the most severe rye stem rust that has been observed in the past 5 years.

Rye leaf rust. During the last week in March, 40% rye leaf rust severities were observed in plots and fields in southern Texas. By the first week in May, rye leaf rust was increasing in southern Georgia fields and nurseries. By the third week in May, in two north central Oklahoma rye fields, 5% leaf rust severities were observed. In late May, trace amounts of leaf rust were found on lower rye leaves in east central Minnesota plots and south central Wisconsin fields. During the third week in June, severe leaf rust (20% severities on lower leaves) were observed in winter rye fields in east central South Dakota. In mid-July, 30% rye leaf rust severities were observed in a southeastern Pennsylvania field and traces were found in northwestern North Dakota plots. Rye leaf rust was widespread throughout the U.S. but losses to the disease were light.

Crown rust on Buckthorn. In early May, uniform light aecial infections were found on buckthorn (alternate host for crown rust) bushes in southeastern Minnesota. During late May, moderate infections of aecia were observed on buckthorns throughout southern Wisconsin and southern Minnesota. By early June, light to moderate aecial infections were reported on buckthorn in west central Minnesota, southeastern North Dakota and northeastern South Dakota. In late June, aecial development was heavy on buckthorn in Minnesota. Spread from buckthorn to oats occurred the last two weeks in June.

Stem rust on Barberry. In early May, the aecial stage of stem rust was observed on *Berberis vulgaris* bushes in Dane County in southern Wisconsin. By early June, traces of stem rust were found on bushes in three locations in Dane County. During the first week in June, the aecial stage of stem rust was found on barberry bushes in southeastern Minnesota.

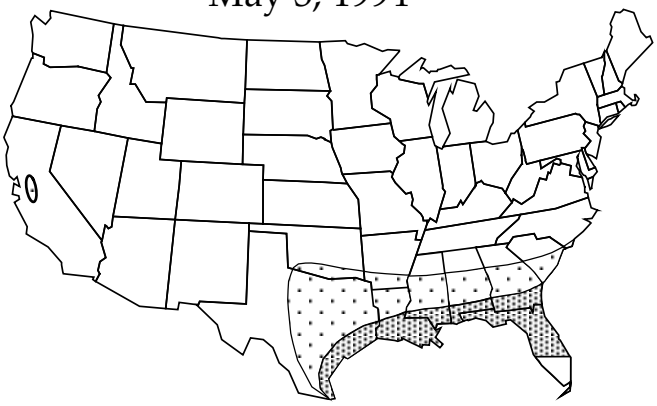
This is the last issue of the Cereal Rust Bulletin for the 1993-94 growing season. I would like to thank all of those who helped with the bulletin this year, especially Mark Hughes who coordinates its distribution through e-mail (markh@puccini.crl.umn.edu) and the post. As most universities and research facilities now have access to Internet we would like to use this system for exchanging information. Any reports of rust that you find in your area will be appreciated and this information will be added to the CRB. My user name is davidl@puccini.crl.umn.edu.

Your comments on any aspect of the Cereal Rust Bulletin are welcome.

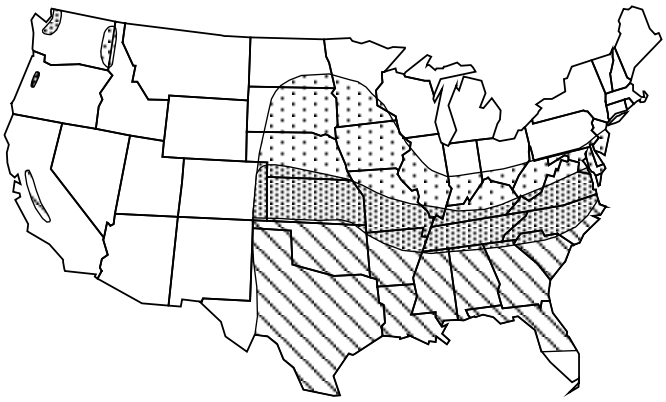
David L. Long

Fig. 1 Leaf rust severities in wheat fields in 1994

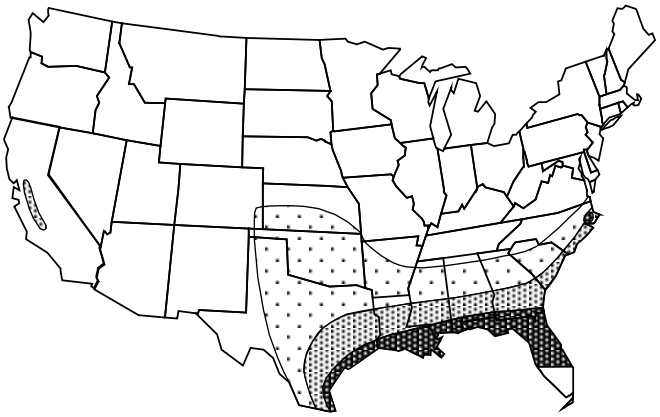
May 3, 1994



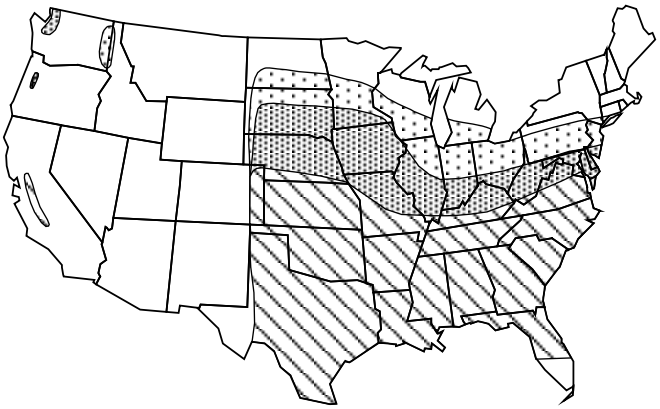
June 14, 1994



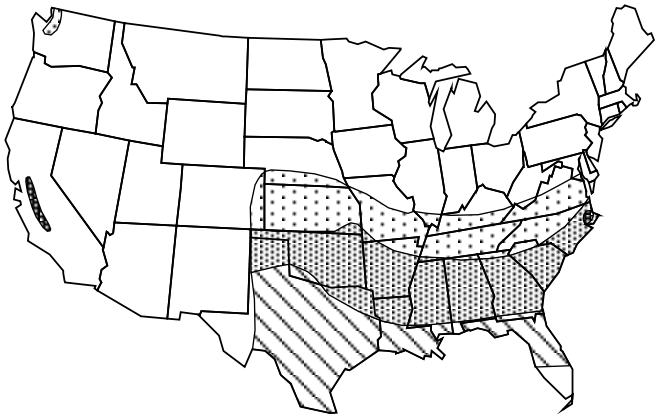
May 16, 1994



June 28, 1994



May 31, 1994



Light rust severities (<1%)

Moderate rust severities (1-20%)

Heavy rust severities (>20%)

Crop mature