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- Only trace amounts of stem rust developed over most of the U.S. in 1997.
- Wheat leaf rust was wide spread with yield losses of 3% or more in winter wheat from Oklahoma to South Dakota.
- Several new races of wheat leaf rust appeared in the southern Great Plains in 1997, putting resistance of some cultivars at risk.
- Oat crown rust in the north central states was less severe in 1997 than in 1996, partly because of limited infection on buckthorn.
- Barley stripe rust was severe in the Pacific Northwest for the third consecutive year.

Most of the small grains in the northern Great Plains are in good condition and near normal in plant maturity. Barley, oat and winter wheat harvest has begun in southeastern North Dakota and northeastern Montana.

Wheat stem rust. This year, wheat stem rust was found scattered in plots and fields throughout the lower Mississippi Valley wheat-growing area. In all of these areas, losses to wheat stem rust were light, but these fields did provide stem rust inoculum for susceptible wheats and barleys farther north.

During 1997, wheat stem rust overwintering sites were found in late April in central and east central Louisiana. For example, stem rust foci were scattered throughout a 40-acre field of CK 9835, while in varietal plots 60 miles away, the rust was so severe that much of the wheat in some plots was killed by stem rust. These sites in Louisiana were the only locations where wheat stem rust was found during rust surveys through the southeastern U.S., southern Oklahoma and northern Texas in the last week of April. This year no stem rust overwintering sites were found in south Texas, and in early May only traces of stem rust were reported in central Texas varietal plots. Stem rust development in Texas this year was less than normal.

In late May, traces of wheat stem rust were found in plots in northeastern Louisiana and northwestern Arkansas. During the second week in June, wheat stem rust foci one meter in diameter were found in southeastern Illinois and northwestern Kentucky fields. The next report of wheat stem rust in the soft red winter wheat area was in early July, in a nursery in south central Virginia.

In mid-July, traces of wheat stem rust were found in east central South Dakota check plots of highly susceptible spring wheat cultivars such as Morocco, and by the fourth week in July 40% severities were observed in other susceptible spring wheat lines. In mid-July, traces of stem rust were found in a plot of the susceptible spring wheat Max in east central North Dakota. The infections on Max were on the leaf sheaths and originated from spores that were rain deposited 7 and 14 days earlier. The stem rust infections in the northern plains this year may have originated from rust spores that were released from rusted soft red winter wheat fields in southern Illinois or the Ohio Valley area. No other potential sources of wheat stem rust spores were known to have existed at the time those infections occurred. This year there were few reports of stem rust in fields and nurseries and the number of stem rust collections received at the Cereal Rust Lab were 1/4 of normal.

Several factors delayed stem rust development in the northern plains: First, little stem rust overwintered in the southern U.S., second, hot dry weather in June limited infection, and third, stem rust resistance in the spring wheats remains highly effective in the northern Great Plains.

In mid-July, small foci of stem rust were found on winter wheat cultivars in the Palouse region of the Pacific Northwest. In late July, in late maturing cultivars like Eltan, stem rust was severe and will cause yield losses. Stem rust was severe in a few of the susceptible spring wheat cultivars in eastern Washington and northern Idaho and will cause lower grain weights in some fields.

To date, race Pgt-TPMK has been the only wheat stem rust race identified in 1997. Stem rust identifications were made from Arkansas, Illinois, Kentucky, Louisiana and Texas collections. This is the first time in the past 79 years that only one stem rust race has been identified from the U.S. rust collections.

Wheat leaf rust. Southern Plains - More leaf rust overwintered in the southern Great Plains this year than last year. In late November, leaf rust was found in many locations in Oklahoma and Texas. In mid-March, wheat leaf rust was heavier than normal in plots and fields of susceptible soft and hard wheats throughout southern and central Texas. By late March, leaf rust was unusually heavy in Oklahoma where it survived the winter (Fig. 1). During the first week in April, 60% wheat leaf rust severities were observed on lower leaves of susceptible cultivars in fields and nursery plots throughout southern and central Texas. Cool, wet conditions in many parts of Texas and Oklahoma during mid-April created good conditions for rust increase. In mid-April, 80% severities were reported on flag leaves of TAM 200, TAM 107 and 2163 at the central Texas nurseries. Leaf rust was more severe in the central Texas nurseries at McGregor and Temple than at the two southern nurseries, Beeville and Uvalde. In some fields of susceptible cultivars in central Texas, 40% severities were observed on the upper leaves at the soft dough stage, and losses to leaf rust occurred in these fields. During the last week in April, wheat leaf rust severities in north central Texas and southern Oklahoma fields ranged from trace to 2%, and in plots severities ranged from trace to 40%. Most commercial cultivars in Texas expressed susceptible reactions to leaf rust this year, which suggested that there were new races in the area. The preliminary wheat leaf rust race identifications in Table 1 has confirmed there has been a change in the race population of Texas this year. Resistance of the cultivars Big Dawg, Longhorn and Tomahawk held up fairly well. During the third week of May in north central Oklahoma, 60% wheat leaf rust severities were observed on the flag leaves of many of the cultivars growing in fields and plots. In north central Oklahoma varietal plots, cultivars like Karl 92, 2163 and Chisholm had 60% severity readings, while rust severities in cultivars like Custer, Jagger and 2137 were less than 5%. Estimated rust losses to leaf rust in Oklahoma this year were near 10%.

In mid-May, 20% leaf rust severity readings were observed on *Triticum cylindricum* (goatgrass) in western Oklahoma. This was the heaviest leaf rust observed on goatgrass in the last five years.

Central Plains - In mid-March, overwintered leaf rust was found in the southern tier of Kansas counties. In early April, where leaf rust overwintered in Kansas, rust pustules were found on the lowest leaves, and farther north in Kansas rust was found on the top two leaves. On April 12 and 13 in Kansas, frost damaged the head and stem but did not destroy all of the rust-infected leaves. Leaf development was set back somewhat by the freeze, but enough leaf rust still survived to cause significant losses in Kansas and provided inoculum for the wheat-growing areas farther north. In late April, leaf rust was found on flag leaves in extreme southern Kansas and rust progress was developing slower than expected because of the cool weather.

Leaf rust was found on flag leaves of wheat in the southern tier of counties of Kansas (excluding the far southwest) early in May. By mid-May, leaf rust severity on flag leaves in south central Kansas was as high as 40% in some fields of susceptible winter wheat cultivars. In plots in the same area, severities on the flag leaves ranged from 0 to 60%. In mid-May, leaf rust was also found on flag leaves throughout central and northern Kansas, but in those areas there was little rust on the lower leaves. The lack of rust on lower leaves indicates that the flag leaf infections came from spore showers from outside the region. From the timing of the infection, it appears that Texas was the most likely source of the spores. Leaf rust that overwintered on lower leaves of wheat in southern Kansas was slow to develop due to the cooler than normal night temperatures. In southern Kansas, the rust was late in moving to the flag leaves from which it could be spread farther north by wind. In mid-May, wheat in the west and south central areas of the state was under moisture stress. Overall, leaf rust was developing more slowly than expected. In late May, in south central Kansas fields, 80% leaf rust severities were common on the flag leaves of susceptible winter wheat cultivars where rust overwintered. In varietal plots in south central Kansas, leaf rust decimated most of the cultivars and the only cultivar showing some resistance was Big Dawg. Throughout northern Kansas, leaf rust development was slow. The cooler than normal night temperatures during the last part of May may have been one of the reasons why rust did not develop as fast as expected. By the second week in June, 10% leaf rust severities were observed in wheat fields in north central Kansas at soft dough. The estimated loss due to leaf rust in Kansas is 3.7%.

In late May, traces of leaf rust were observed in plots and fields in southern Nebraska. By the second week in June, 10% leaf rust severities were observed in wheat fields in south central Nebraska (Fig. 1). In early June, traces of leaf rust were observed on lower leaves of wheat in eastern Colorado. In late June, leaf rust severities ranged from trace to 80% on cultivars in south and west central Nebraska varietal plots. In southern Nebraska fields of susceptible cultivars, losses to leaf rust averaged around 5%.

Northern Plains - On June 2, trace amounts of leaf rust were found in south central and southeastern North Dakota winter wheat plots. Initial leaf rust development in the northern plains comes mainly from windborne spores from the south that are deposited with rains on wheat plots and fields in the north. During the second week in June, traces of leaf rust were found in southeastern South Dakota fields and varietal plots and in winter wheat varietal plots in east central Minnesota. Fields of susceptible winter wheat in central South Dakota had 50% to 80% leaf rust severities on flag leaves during the first week in July (Fig. 1). During the second week in July, 60% severities were observed in fields of winter wheat at the mid-dough stage in southeastern North Dakota. Losses to leaf rust in winter wheat in South Dakota could be as high as 10%, according to preliminary estimates. The rust infections in South Dakota probably originated from spore inoculum sources in Oklahoma and southern Kansas.

Varietal plots of susceptible spring wheat in east central South Dakota had 50% to 80% leaf rust severities in early July. Fields of spring wheat in eastern South Dakota and North Dakota had only traces of leaf rust due to their moderate to high levels of resistance to prevailing races. Although most of the spring wheat cultivars in the northern plains are resistant to leaf rust, some cases of higher than usual leaf rust severities have been reported. During mid-July, in

west central Minnesota and southeastern North Dakota, trace to 40% leaf rust severities were observed on flag leaves of commercial spring wheat cultivars in the late berry stage. In late July, trace to 10% severities were reported on spring wheat in northern North Dakota and northwestern Minnesota fields. Only light losses are expected, and most of those losses will be in late planted fields. In plots of susceptible spring wheats in west central Minnesota, east central South Dakota, and east central north Dakota, 60% leaf rust severities were reported on flag leaves in mid-July. As in South Dakota, some yield losses from leaf rust are expected in winter wheat in North Dakota. No rust was reported on durum wheat.

Southeast - In the southeast U.S., in late March, wheat leaf rust was severe in plots and fields of susceptible soft red winter wheat cultivars (Fig. 1). Leaf rust in the Southeast was much more severe than last year in early spring. The winter rainfall in southeastern U.S. was normal, creating favorable conditions for rust infection. In southern Louisiana, in early April, many of the cultivars that previously were resistant were showing significant rust development this year. During the last week in April, 60% severities on flag leaves were observed in plots and fields of susceptible soft red winter cultivars in the southeastern U.S. In southern Arkansas, during early May, leaf rust development on flag leaves was severe in many late-planted fields of susceptible cultivars. Cultivars most affected were Wakefield, Hazen, Jackson, Coker 9803, Hickory and Pioneer 2580. While the leaf rust epidemic in southern Arkansas was too late to cause major damage to the whole wheat crop, this is the most significant rust problem in several years in the state and caused damage in late-maturing fields. In late May, wheat leaf rust was severe in varietal plots and light in fields in the bootheel of Missouri, northeastern Arkansas and western Tennessee. Wheat leaf rust pustules were found on flag leaves during the first week in May in the coastal plain of South Carolina,. In mid-May, in the coastal plain of South Carolina, wheat leaf rust caused premature senescence of the state's predominant cultivar (Coker 9835).

Midwest - During the second week in June, trace leaf rust ratings were recorded on most of the wheat cultivars in southern Indiana plots, while 20% severities were recorded on a few susceptible lines. By early June, traces of leaf rust were reported in soft red winter wheat fields in southeastern Wisconsin, south central Michigan and northwestern Indiana. Losses will be light in this area since the rust was light and developed later than normal.

California - Leaf rust was light in wheat fields in the San Joaquin Valley during the third week in April and by late April, leaf rust was found throughout the Sacramento Valley fields. Since wheat leaf rust developed so late, rust losses were light throughout the state.

Northwest - In late May, wheat leaf rust was light in the Skagit Valley of western Washington. In early June, in eastern Washington, 1-2% severities were reported in some fields and leaf rust was also increasing in the Willamette Valley of western Oregon. In early July, wheat leaf rust was severe on susceptible fall planted and spring planted cultivars growing in varietal plots in the Skagit Valley in northwestern Washington and the Palouse region of eastern Washington and northern Idaho. In commercial fields in these areas, leaf rust developed late on the winter wheat and will only cause slight damage to the crop. Most of the spring wheat cultivars have adequate adult plant resistance to combat the rust. In late July, wheat leaf rust was increasing in spring wheat fields in the Palouse region of Washington and will decrease yields in late maturing susceptible wheat.

Northeast - By late May, in varietal plots in eastern Virginia, wheat leaf rust severities ranged from 10 to 50%. In mid-June, leaf rust was light in winter wheat fields in south central Pennsylvania. During the first week in July, light amounts of leaf rust were found in winter wheat fields and plots in central and western New York. Losses to leaf rust were very minimal in the northeastern U.S. in 1997.

The wheat leaf rust races identified so far in the 1997 survey are presented in Table 1. Race MBRL, which is virulent to Lr1,3,3ka,10,11,30, is the most commonly identified race this year

and also was the most common race for the last four years. So far, 20 races have been identified in Texas this year and of these, 4 were not identified in previous Texas surveys. Some races like MBNL, MBTL and MFDL have *Lr* 17 as part of their virulence package. *Lr*17 is part of the leaf rust resistance in Jagger which has been and will be grown on a large part of hard red winter wheat acreage next year.

TABLE 1. Wheat leaf rust races identified through July 31, 1997

PRT		Number of isolates by state									
code	Virulence formula[1]	AL	AR	CA	FL	GA	KS	LA	MS	OK	TX
CBGB	3,11					2					
MBBB	1,3								1		
MBBL	1,3,10	1	1	3							
MBBQ	1,3,10,18			9							
MBDL	1,3,10,17						1				
MBGL	1,3,10,11	2				1					
MBGQ	1,3,10,11,18			2							
MBNL	1,3,3ka,10,17										4
MBRL	1,3,3ka,10,11,30	14	12			5	3	4		1	10
MBRQ	1,3,3ka,10,11,18,30	6	2		2		4	16	3	1	
MBTL	1,3,3ka,10,11,17,30										1
MCBL	1,3,10,26										2
MCBQ	1,3,10,18,26			2							
MCDL	1,3,10,17,26										17
MCJL	1,3,10,11,17,26						1				
MCRL	1,3,3ka,10,11,26,30										3
MCRQ	1,3,3ka,10,11,18,26,30	5	5		3			9			1
MCTL	1,3,3ka,10,11,17,26,30										2
MDBL	1,3,10,24						2	2			6
MDGL	1,3,10,11,24	2									1
MDRL	1,3,3ka,10,11,24,30	8					1				13
MDRQ	1,3,3ka,10,11,18,24,30	1					8			3	
MFBL	1,3,10,24,26		3								2
MFDL	1,3,10,17,24,26										1
MFRL	1,3,3ka,10,11,24,26,30									1	
MFTL	1,3,3ka,10,11,17,24,26,30									1	
PNMQ	1,2c,3,3ka,9,10,18,24,30					4					1
TBBL	1,2a,2c,3,10				1	1					2
TDBL	1,2a,2c,3,10,24	1	2							1	12
TDRL	1,2a,2c,3,3ka,10,11,24,30	1									3
TFCL	1,2a,2c,3,10,24,26,30					1					
TFBL	1,2a,2c,3,10,24,26				2						2
TFGL	1,2a,2c,3,10,11,24,26										4
TGBL	1,2a,2c,3,10,16										1
TLGG	1,2a,2c,3,9,11,18	2				4		2			
Number of isolates		43	25	16	8	18	20	33	4	8	88

Number of collections 26 13 8 4 12 11 17 2 5 49

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

Wheat stripe rust. During late April, stripe rust was first found in the south central U.S. in a 50-acre field of Mason in northeastern Louisiana. The rust was severe and was found throughout the whole field. In mid-May in Arkansas, south of I-40, stripe rust was still active in many wheat fields because of the cool temperatures. Fungicides were sprayed in some fields to control the rust. In late May, traces of stripe rust were found in wheat fields in the bootheel of Missouri and western Tennessee. Generally, every year stripe rust is found in a few locations along the southern Mississippi Valley.

During the third week in March, wheat stripe rust was observed in California on a new variety, UC 1041, in the Yolo county plots and in the Davis campus nursery. By the second week in April, moderate stripe rust severities were reported in the San Joaquin Valley and traces were found in the Sacramento Valley of California. During the last week in April, in the Sacramento Valley of California, wheat stripe rust foci were found in fields of the fall-sown hard red spring wheat cultivar Express. During early May, traces of wheat stripe rust were found in wheat fields in the Sacramento Valley. Several entries in statewide hard red spring wheat nurseries showed susceptible reactions. There may be a race change occurring in California where wheat stripe rust appeared on cultivars which have had effective resistance since the mid-70s.

In late April, wheat stripe rust was observed in nursery plots in the Skagit Valley of western Washington on the lower leaves (20%) but not on the upper leaves. In late April, in the area west of Pascoe, stripe rust hot spots were found and rust became a problem in this area because crop maturity was delayed due to the cold spring. During the second week in June, stripe rust was very severe on many wheat cultivars in the Skagit Valley of western Washington. During the first week in July, wheat stripe rust was severe on susceptible fall planted and spring planted cultivars in northwestern Washington nurseries, but since most of the commercial cultivars in this region have good adult plant resistance to stripe rust, losses will be light. In mid-May, stripe rust was increasing in central Washington on hard red winter and club wheats. In mid-June, in the Palouse area of Washington, stripe rust ratings of 10-20% were found in wheat fields. In early July, wheat stripe rust was severe on susceptible winter wheat cultivars in the Palouse region of eastern Washington and northern Idaho, and in mid-July,wheat stripe was increasing in spring wheat fields in the Palouse region, but will not cause significant losses because the commercial soft white winter and spring wheats have good adult plant resistance to stripe rust.

In the first week in July, wheat stripe rust was found in overwintering centers in the Gallatin Valley of Montana. The stripe rust is expected to increase because of good moisture conditions and cool weather.

Oat stem rust. In mid-February, traces of oat stem rust were found in the nursery plots at Beeville in southern Texas. During the first week in April, hot spots of oat stem rust 0.5 m in diameter were found in southern Texas fields and nursery plots. Along the roadside in central Texas, traces of stem rust were observed on wild oat (*Avena fatua*). The rains during the first week in April were good for rust infection and the rust increased significantly. During the second week in May, oat stem rust was increasing rapidly in varietal plots in College Station. The Texas oat stem rust provided inoculum for areas farther north, but the lack of oat acreage in the central Great Plains tended to interrupt potential epidemics.

This year, by late March, stem rust was increasing in oat varietal plots in southern Louisiana where it generally can be found every year by early March. During the second week

in April, 50% oat stem rust severities were observed in varietal trial plots in southwestern Alabama. During the last week in April, overwintering centers of stem rust were found in an oat field in east central Louisiana and in oat varietal plots in southern Georgia, southwestern Alabama, southwestern Mississippi and central Louisiana. Severe oat stem rust was found in varietal plots and fields throughout central and northeastern Louisiana by mid-May. These locations provided oat stem rust inoculum for areas farther north.

In early May, oat stem rust was found in plots in the Sacramento Valley of California.

In mid-July, traces of oat stem rust were found in plots in east central South Dakota, central, and west central Minnesota. These were the first reports of oat stem rust in the U.S. since mid-May, when oat stem rust was found in fields and plots in Texas, Louisiana and Alabama. Much less oat stem rust has been found in the northern Great Plains the past three years than in previous years. The reduced amount of oat stem rust seems to be associated with a decline in oat production.

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 31, 1997

	Number of		Number of isolates per state		
State	collections	isolates	NA-10	NA-16	NA-27
Alabama	3	9			9
California	2	6	6		
Florida	4	12			12
Louisiana	5	15		7	8
Mississippi	2	6		3	3
Texas	13	35			35
Total	29	93	9	10	74

*Virulence formula (Avirulence/Virulence):

NA-10 1,4,8,9,13,16,a/2,3,15
NA-16 2,4,9,13,15,16,a/1,3,8
NA-27 9,13,15,16,a/1,3,8

Oat crown rust. By late February, crown rust was found in southern Texas plots and the rust was much more severe this year than last year. During the first week in April, crown rust was severe in southern and central Texas fields and plots. Sixty-percent severities were common on the most susceptible cultivars in nursery plots and in some cultivars, the rust was killing the host. In some fields in southern Texas, overwintering hot spots 3-m in diameter with 40-60% severities were observed. In late April, crown rust was severe in central Texas varietal plots, while in oat fields, severities were moderate(1-20%). The Texas oat crown rust inoculum is available for areas farther north, but the lack of oat acreage in the central Great Plains tends to interrupt potential epidemics.

In late March, severe crown rust was found in varietal plots in southern Louisiana. By mid-April, crown rust was severe (>80%) in oat varietal plots and moderate (1-20%) in oat fields. In plots in southwestern Alabama and central Louisiana, the rust was so severe it killed

some of the oats. This widespread crown rust development is equal to the rust development of the last three years in the southeastern U.S. Crown rust development in the southeastern U.S. has provided inoculum for areas farther north. In mid-June, traces of oat crown rust were found in oat fields in west central Indiana.

Crown rust pycnia appeared on buckthorns in St. Paul, Minnesota, on May 19. The infections apparently came from basidiospores released from germinating teliospores on infected straw during rains on May 7-8. Buckthorn bushes are the alternate host for crown rust and generally provide the initial spores for crown rust infections of the northern oat crop. In late May, aeciospores, which can infect oat, were found on buckthorn leaves in southern Minnesota and southern Wisconsin. In early June, moderate to severe aecial infections were found on buckthorn bushes in south central and southeastern Wisconsin. By June 17, 20% crown rust severities were observed on lower leaves of oats growing near the buckthorn bushes in the nursery on the University of Minnesota, St. Paul campus. By the second week in June, traces of crown rust were found in southern Wisconsin oat fields. Crown rust developed slowly due to cool weather in the northern oat-growing area. By June 30, crown rust infection was severe (50-80%) on susceptible oat cultivars near the buckthorn nursery on the University of Minnesota, St. Paul campus. In early July, light levels of oat crown rust were detected in a few fields in southern Minnesota, central Wisconsin, and south central Pennsylvania. During mid-July, crown rust severities ranged from trace to 10% in oat fields and trace to 40% on flag leaves in plots in west central and southern Wisconsin. In late July, oat crown rust severities ranged from trace to 60% in plots and trace to 10% in fields in northwestern Minnesota and northeastern North Dakota. The most severe crown rust was found where rust occurred early and conditions were conducive for rust development. Buckthorn growing in close proximity to oat fields provided the initial inoculum in these areas, i.e., southern Minnesota and southern Wisconsin.

In early June, aecial development was light on buckthorn bushes in eastern South Dakota. In early July, 10% crown rust severities were found on lower leaves of susceptible oat cultivars in eastern South Dakota varietal plots. During mid-July, crown rust severities ranged from trace to 5% in oat fields and trace to 40% on flag leaves in plots in eastern South Dakota and east central North Dakota. No crown rust was found in oat plots in central South Dakota. Lack of moisture in May and cooler than normal weather in early June delayed rust development, but warmer and rainy weather than normal in early July favored crown rust increase. Rainy weather, however, washed much of the inoculum off infected plants before spores could spread. This was one of the lowest levels of crown rust infections on buckthorn and oats in recent years in South Dakota.

Losses to crown rust were less severe than last year in the northern oat-growing area, with the latest planted fields suffering the most damage.

The incidence of virulence for 1997 crown rust isolates tested to date is presented in Table 3.

Barley stem rust. Traces of barley stem rust were first found this year on May 19 in barley plots in south Texas at Beeville. Limited amounts of barley are grown commercially in the southern states and stem rust on barley rarely occurs in this area. In mid-July, traces of barley stem rust were found on spring barleys in east central South Dakota plots. Less barley stem rust was found in the northern plains this year because nearly all barley cultivars are resistant to wheat stem rust race TPMK. Race QCCJ, which infects barley cultivars with the resistance gene *Rpg* 1, was not found in the southern U.S.

TABLE 3. Incidence of virulence in 1997 crown rust isolates tested to date (7/31/97)

	Per cent isolates virulent				
Differential	TX	LA	FL,MS,AL,GA	SC	CA
Pc14	91	89	88	73	86
Pc35	42	26	50	0	14
Pc36	2	68	44	82	43
Pc38	58	53	50	45	14
Pc39	48	42	38	9	43
Pc40	97	95	100	100	86
Pc45	12	5	25	0	86
Pc46	55	21	31	27	86
Pc48	9	0	19	0	57
Pc50	55	42	44	82	29
Pc51	97	74	5	9	29
Pc52	15	0	13	0	43
Pc53	0	0	0	0	0
Pc54	15	26	25	45	86
Pc55	45	42	31	9	43
Pc56	39	58	31	82	43
Pc57	45	16	6	0	43
Pc58	15	11	0	9	29
Pc59	30	37	19	0	14
Pc60	91	84	69	100	29
Pc61	76	89	100	100	29
Pc62	0	5	6	0	0
Pc63	36	32	25	9	14
Pc64	0	5	0	0	0
Pc67	36	68	13	73	57
Pc68	0	0	0	0	0
Pc70	55	37	44	36	29
Pc71	52	47	31	18	43
Total	33	19	16	11	7

Barley leaf rust. During the first week in April, trace to 10% leaf rust severities were observed on lower leaves of barley in southern and central Texas plots.

In late May, light amounts of barley leaf rust were reported in south central Pennsylvania and in the Skagit Valley of western Washington on winter barleys. By the second week in June, barley leaf rust was moderate to severe, and in early July, it was severe on susceptible fall-planted and spring-planted cultivars in varietal plots in the Skagit Valley.

In mid-July, trace - 40% barley leaf rust severities were observed in barley plots in west central Minnesota and northeastern South Dakota, but no leaf rust was found in fields.

This year, losses to barley leaf rust were light in the United States.

Barley stripe rust. In early March, "hot spots " of barley stripe rust were observed in nurseries and variety strip tests on the Davis, California agronomy farm. By the first week of April, barley stripe rust was severe on the Davis campus and Yolo county plots in California. During the second week in April, barley stripe rust was present in light to severe amounts in commercial fields in the San Joaquin Valley of California. In some fields, the infections were lighter than 1996, but in other fields, 20% severities were observed on flag leaves. It was observed that even under dry conditions, barley stripe rust increased. During late April, barley stripe rust was widespread in California's fall-sown spring barley crop. Some advanced lines that tested resistant last season are susceptible this season. Many of the commercial cultivars are extremely susceptible, while UC 603 exhibits a high level of tolerance. By early July, stripe rust on barley was appearing on spring-sown barley in the intermountain area of northeastern California. Eighty to 100% severities were reported in northeastern California nurseries, and in commercial fields, 100% severities were reported on flag leaves at the milk growth stage, which may lead to a 50% or more loss in yield. Many fields in this area were being sprayed with Folicur in order to control the rust. Except for northeastern California, total crop damage will be less than in 1996, since stripe rust onset was late this season, while crop development was earlier.

In early March, barley stripe rust was found in winter barley plots at Corvallis, Oregon. By late March, stripe rust pustules were found at low levels in susceptible varieties within a 16-m diameter circle of the original infected plots, and by mid-April, barley was heavily infected with stripe rust in winter trial plots at Corvallis. During the last two weeks in April, cool, wet weather slowed stripe rust development in winter barley plots, but in late May, barley stripe rust was increasing in spring barley plots at Corvallis.

In late April, 20% stripe rust severities were reported on lower leaves of barley, and by late May, stripe rust was severe on susceptible winter cultivars growing in the Skagit Valley of western Washington. By the first week in July, severe barley stripe rust was found on susceptible fall-planted and spring-planted cultivars growing in varietal plots in the Skagit Valley. In early July, light amounts of barley stripe rust were detected in the Palouse region of the Pacific Northwest.

In mid-July, 70% severities were observed in spring barley test plots in west central Idaho and traces in the northern tip of Idaho. Since the plants were in an advanced plant growth stage, the rust should not significantly affect the yield.

Barley stripe rust is now firmly established in California and the Pacific Northwest, where the climate is most favorable for its development. Losses to barley stripe rust occurred in fields throughout California and the Pacific Northwest.

Crown rust on barley. During the second week in July, 20% crown rust severities were observed in barley growing 15 meters from *Rhamnus* bushes in east central North Dakota. Barley crown rust was found in commercial fields throughout the Red River Valley. Crown rust reached 80% severity on susceptible barley cultivars planted in an east central South Dakota nursery. Light losses to barley crown rust occurred in barley fields growing in close proximity to *Rhamnus* bushes.

Rye stem rust. In late July, traces of rye stem rust were found in plots in central Minnesota.

Rye leaf rust. During the first week in April, 40% leaf rust severities were observed on the flag leaf in winter rye plots in central Texas. By the last week in April, in central and north central

Texas plots, rye leaf rust severities ranged from 1-5% on the flag leaves. Forty-percent leaf rust severities were observed on winter rye in fields in north central Oklahoma on May 19.

In a field of rye in southern Alabama, 20% leaf rust severities were observed on the flag leaves in late April. Rye leaf rust was found in a nursery in Plains, Georgia on May 13.

In late June, 40% rye leaf rust severities were reported in a plot in east central South Dakota. In late July, 5-50% rye leaf rust severities were observed in spring rye plots in central Minnesota and northeastern North Dakota.

Rye leaf rust was scattered throughout the U.S. in plots and fields and losses will be light in 1997.

Stem rust on barberry. During mid-May, aecial development was observed on common barberry (*Berberis vulgaris*) bushes (alternate host for stem rust) in south central Wisconsin. During the second week in June, aecial development was observed on barberry bushes in southeastern Minnesota.

Rust on other grasses. During the first week in April, severe crown rust was observed on ryegrass and severe leaf rust on little barley (*Hordeum pusillum*) in southern Alabama and Louisiana. During the first week in July, stem rust was found on quackgrass (*Elytrigia repens*) and redtop (*Agrostis alba*), which were growing within 30 meters of the common barberry in southeastern Minnesota.

This is the last issue of the Cereal Rust Bulletins for the 1996-97 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 the CRL web page (http://www.crl.umn.edu), email (markh@puccini.crl.umn.edu) and the post. As most universities and research facilities now have access to the 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 and possibly our web page. My username is davidl@puccini.crl.umn.edu.

- David Long

Fig. 1. Leaf rust severities in wheat fields in 1997