CEREAL RUST BULLETIN

Final Report

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From:

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- Wheat stem rust caused little damage to wheat in 1995, but stem rust on barley in the northern Great Plains was more severe in 1995 than in any year since 1991.
- Wheat leaf rust was widespread in winter wheat throughout the southern U.S. and caused an estimated loss of 5% in Kansas.
- Wheat stripe rust in the Pacific Northwest was effectively controlled by adult plant resistance in most varieties, although susceptible varieties were heavily infected.
- Oat stem rust in 1995 was largely confined to the southern states, where it caused some damage in Texas and Louisiana.
- Oat crown rust was severe throughout much of the southern U.S. and Upper Midwest in 1995; North Carolina, Pennsylvania, Ohio, and Saskatchewan reported unusually high levels of crown rust at locations where it was rarely seen in previous years.
- Barley leaf rust was found throughout the northern barley-growing area but severities were too low to affect yields.
- Barley stripe rust became firmly established throughout the Pacific Northwest.

Most of the small grains in the northern Great Plains are in good condition and near normal in maturity. Scab is severe in many western Minnesota and eastern North Dakota spring wheat fields. Losses will occur mainly in fields with rainfall at the anthesis growth stage. Barley and winter wheat harvests have begun in northeastern North Dakota and northeastern Montana.

Wheat stem rust. This year, wheat stem rust was found scattered in plots and fields throughout the southern Plains and the lower Mississippi 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.

During 1995, wheat stem rust overwintering sites were found in southern Texas, Louisiana, southwestern Georgia, northeastern Arkansas and southwestern South Carolina. During the last week

in March, traces of stem rust were found in winter wheat fields southwest of Houston, southeast of San Antonio and in a nursery at Beeville, Texas. Stem rust development in southern Texas and Louisiana was normal in 1995 but less than in 1993, the last year with significant wheat stem rust in the U.S. The year 1993 and other recent years with greater than average stem rust generally had warmer late winters and early spring weather with more rainfall than occurred in 1995. In mid-April, widespread stem rust (5% severities) was found in commercial fields of CK 9835 and Savannah in central Louisiana, and these fields were sprayed with Bayleton to stop further stem rust development. By late April, traces of stem rust were found in winter wheat plots from central Texas to southwestern South Carolina. In early May, wheat stem rust was severe on susceptible cultivars in southern and central Texas nurseries. During the second week in May, stem rust severities were light around the overwintering site in a field of CK9835 in northeast Arkansas. In mid-May, stem rust was light on susceptible cultivars growing in plots in northeastern South Carolina. The wheat stem rust that infected plots in a southwestern South Carolina nursery probably overwintered in a field of volunteer CK9835 growing in close proximity to the plots. During the third week in May, severe stem rust was found in a plot of Saluda in northwestern Arkansas and in a plot of Chisholm in southwestern Oklahoma. In late May, wheat stem rust was found in a wheat plot in southwest Missouri. During the second week in June, wheat stem rust foci were observed in fields of soft red winter wheat in southern Illinois and in wheat plots in southwestern Indiana at the soft dough stage. In the center of the foci, 40% severities were common; however, eight feet from the center only traces of rust were present. Stem rust spores apparently were deposited 4-6 weeks earlier, but expansion of the foci from sites of initial infections was restricted by frequent rains that kept the wheat canopy wet and prevented newly produced spores from being released and carried out of the canopy by wind currents. In mid-June, traces of wheat stem rust were reported in a west central Indiana nursery. Losses were negligible in the northern soft red winter wheat area.

During late June, 10% stem rust severities were found in northeastern and northwestern Kansas plots of McNair 701 at the hard dough stage. The hot dry weather in Kansas in late May and early June was not conducive to rust increase.

On June 19th, traces of wheat stem rust were found on the susceptible spring wheat cultivar Baart in southern Minnesota plots. In early July, traces of stem rust were found in a hard red winter wheat plot in southeastern North Dakota. In mid-July, traces of wheat stem rust were found in plots of the susceptible spring wheat Baart in east central South Dakota, southeastern North Dakota and west central Minnesota.

Several factors delayed stem rust development in the central Great Plains. First, stem rust overwintering north of Texas was less than normal. 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 to rust increase. In spite of this, sufficient quantities of stem rust spores spread from the central Great Plains to initiate stem rust foci in susceptible spring wheat plots in the northern Great Plains. Stem rust from these foci developed normally. Commercial spring wheats were not damaged

because their stem rust resistance is still highly effective.

In mid-July, traces of wheat stem rust were detected in wheat plots in eastern Washington but none was reported in fields.

To date, race Pgt-TPMK is the predominant stem rust race identified in 1995 as it was in 1994. Race Pgt-RCRS was not found in Texas in 1994, but this year it comprises almost 41% of the isolates identified from Texas (Table 1). Race Pgt-QCCJ (which infects barley with the T gene for resistance) was identified from stem rust collections made in wheat nurseries in central Texas and northwestern Arkansas.

TABLE 1. Wheat stem rust races identified through August 8, 1995

	Number of		Number of isolates of Pgt race*					
State	collections	isolates	QCCJ	QCCS	QFCS	RCMS	RCRS	TPMK
AR	3	9	3	6				
IL	3	9						9
IN	3	9						9
KS	1	3		3				
LA	4	11						11
MN	3	9	8					3
NC	1	3						3
NE	2	6						6
OK	1	1	1					
SC	1	3	3					
TX	13	32	3		3	3	13	10
VA	2	6						6

* Virulence formula:

QCCJ - *Sr*5,21,9g,17,9d,10

QCCS - Sr5,21,9g,17,9a,9d,10

QFCS - Sr5,21,8a,9g,17,9a,9d,10

RCMS - *Sr*5,21,7b,9g,36,17,9a,9d,10

RCRS - *Sr*5 ,21,7b,9g,36,9b,17,9a,9d,10

TPMK - *Sr*5,21,9e,7b,11,8a,9g,36,17,9d,10,Tmp

Wheat leaf rust. During the last week in March, leaf rust was widespread in winter and spring wheat fields throughout southern and central Texas. Rust severities on lower leaves ranged from 0 to 20% in fields and from 0 to 60% in nurseries, which was normal for this date (Fig. 1). Generally, leaf rust overwinters throughout southern Texas. In northern Texas fields and nurseries in late March, leaf rust was more severe than 1994. Lack of moisture in northern Texas delayed further leaf rust development, but by mid-April the rains had returned. In late April, leaf rust severities in southwestern Oklahoma wheat fields and plots ranged from traces to 20%. These represent normal rust severity readings for this area for late April. By mid-May, leaf rust severities in north-central Oklahoma wheat fields and plots ranged from traces to 40%.

In contrast to the 1993-94 winter, when little leaf rust overwintered in Kansas, normal amounts of rust overwintered in eastern and central Kansas in 1994-95, while overwintering was greater than normal in western Kansas. In some fields, scattered volunteer plants were found with significantly higher incidences of rust than the majority of the field. Because volunteer winter wheat plants normally emerge before the crop is planted, they tend to be more heavily rusted in the fall. Usually, the infections on volunteer plants do not survive the winter in Kansas. In mid-April, leaf rust was generally light in Kansas (Fig. 1), although a few locations were observed with heavier infections. Freezing temperatures in early April killed some infected leaf tissue in western Kansas, which delayed local rust buildup. In late April, a hard freeze in western Kansas and northwestern Oklahoma killed much of the leaf tissue where rust had developed. By the second week in May, leaf rust was increasing at a very slow rate throughout Kansas because the cool moist weather was not conducive to rust increase. The moist conditions kept the wheat canopy wet and created conditions whereby the spores remained within the canopy. Leaf rust was severe on the lower leaves of susceptible cultivars, e.g., Karl 92, but rust development on the flag leaves was light. During early June in central Kansas, rust severities ranged from greater than 60% to less than 10% in some fields a short distance apart. Losses varied with local conditions but some fields suffered significant losses in yield. In mid-June, hot dry weather in northern Kansas and southern Nebraska prematurely dried many wheat leaves, thereby slowing leaf rust development. In mid-June, in a wheat field in Rooks Co., Kansas, 80% severities were observed on goatgrass(*Aegilops cylindrica)* plants. The leaf rust loss estimate in Kansas in 1995 is 5%, which is significantly more than the 1% loss in 1994, but half the loss of 1993. During the third week in June 40-60%, severities were found on susceptible wheat cultivars in east-central Nebraska plots. In late June, in south-central Nebraska fields, the hot dry weather prematurely dried many leaves on wheat plants, but on the few remaining green flag leaves, 40% leaf rust severities were common. In this area, losses will vary with local conditions, but some fields suffered losses in yield of greater than 5%.

On April 28, the first pustules of leaf rust were observed in the northern Great Plains on green winter wheat leaves just breaking winter dormancy at the Rosemount, Minnesota nursery in east central Minnesota. Leaf rust was found on the winter wheat cultivar Roughrider in southeastern North Dakota fields on June 2, and on June 15 the incidence and severity (traces) were relatively unchanged. During the third week in June, in southern Minnesota plots, the susceptible cultivar Baart had 10% leaf rust severities on the lower leaves. During early July, 20-60% severities were observed in southeastern North Dakota winter wheat plots and fields at soft dough stage. Only traces were observed on lower leaves in spring wheat plots and fields at early milk growth stage. In mid-July, severities of trace-60% were common on flag leaves in east central Minnesota and eastern South Dakota winter wheat plots. In susceptible spring wheat plots, trace-20% severities were common. Due to resistance, only traces of leaf rust developed in commercial fields and therefore losses were minimal in spring wheats. No rust was reported on durum wheat.

In mid-June, leaf rust was detected on flag leaves of winter wheat in plots south of

Winnipeg, Canada. The infections were heavier than normal for mid-June.

In the southeast U.S., during late March leaf rust severities were generally light to moderate on susceptible southern soft red winter wheat in plots and fields (Fig. 1). The winter rainfall in these areas was above normal, creating favorable conditions for rust infection. Cool temperatures in January and February slowed rust development, but warm temperatures and moist conditions in March were favorable for rust buildup. By late April, light amounts of leaf rust were found on susceptible cultivars in nurseries and fields in eastern North Carolina. By early May, leaf rust severities were generally light to moderate on susceptible southern soft red winter wheat in plots and fields from northern Mississippi to southern South Carolina (Fig. 1). By the second week in May, leaf rust severities ranged from traces to 80% in wheat plots and fields at the soft dough stage in southeastern North Carolina. These rust-infected plants provided leaf rust inoculum for wheats farther north. In mid-June, the hot dry weather dried the leaves prematurely and thereby restricted rust development. This year throughout the southern soft red winter wheat there was an increase of rust on Northrup King/Coker 9835 which is grown on significant acreage. This signified an increase in races with virulence to *Lr*9 in this area since Coker 9835 has *Lr* 9 as part of its leaf rust resistance (Table 2).

In mid-June, trace to 40% leaf rust severities were observed in southern Illinois and southwestern Indiana soft red winter wheat fields and nurseries at the soft dough stage (Fig. 1). Farther north in the northern soft red winter wheat areas in northwestern Ohio, only traces of wheat leaf rust were found in fields and plots at the half-berry stage. In central Michigan, however, leaf rust was moderately severe by the second week in June, suggesting that leaf rust overwintered there. In mid-June, leaf rust was present in light amounts in winter wheat fields in eastern Wisconsin. During mid-June, traces of leaf rust were found in the lower canopy of winter wheat near Aurora in the Finger Lakes area of New York at the watery-ripe growth stage, suggesting that leaf rust may have overwintered there.

During the last week in June, the aecial stage of leaf rust was found on meadow rue (*Thalictrum fendleri*) growing in the Rio Grande National Forest in south-central Colorado. The form of leaf rust found has not been determined, but it is most likely a form that attacks some wild grasses, but not wheat.

In late April, leaf rust was light in plots and fields in the Sacramento Valley of California. By the first week in May, in the San Joaquin Valley of California, wheat leaf rust was widespread and severe on susceptible cultivars in fields and nurseries. During the first week in May, leaf rust was light in eastern Oregon and eastern Washington fields. By the third week In June, leaf rust severities as high as 80% were found in irrigated winter wheat at early dough stage in central Washington and severities were light to moderate in dry land wheat in central Washington and trace to light in the Palouse area of eastern Washington. In mid-July, in the Palouse area of Washington, 80% severities were observed on susceptible winter wheat cultivars growing in nurseries while in fields rust was less.

From collections made in south Texas in late March, leaf rust races MCD-10 virulent to *Lr*1,3,10,17,26; MBJ-10 virulent to *Lr*1,3,10,11,17; MBR-10 virulent to *Lr*1,3,3ka,10,11,30; MCR-10 virulent to *Lr*1,3,3ka,10,11,26,30; TFB-10 virulent to *Lr*1,2a,2c,3,10,24,26; TDG-10 virulent to *Lr*1,2a,2c,3,10,11,24; TLG-18 virulent to *Lr*1,2a,2c,3,9,11,18 and PNM-10,18 virulent to *Lr*1,2c,3, 3ka,9,10, 24,30 were identified (Table 2). The MCD-10 race was identified from a collection made from the cultivar Jagger. Last year race MBR-10 comprised 36% of the U.S. race population.

The wheat leaf rust races identified so far in the 1995 survey are presented in Table 2. There has been a increase in the number of races with *Lr* 26 as part of their virulence package. In 1994, five different races with *Lr* 26 virulence had been identified by mid-July, while eleven races with *Lr* 26 virulence have been identified in 1995. Race SBD (virulent on *Lr* 1,2a,2c,17) was identified from two *Triticum* (*Aegilops*) *cylindrica* collections made in southwestern Oklahoma. This is the same race identified from *T. cylindrica* collections in previous surveys. The interesting thing about this race is that it is avirulent on *Lr* 3 and 10 but it has not been identified from collections made from wheat in southwestern Oklahoma and northern Texas.

Wheat stripe rust. The first report of wheat stripe rust in the central U.S. was in early April in southeastern Arkansas. By mid-April, stripe rust was found in fields in central Arkansas and by the last week in April, traces of stripe rust were found in plots of southern soft red winter wheat cultivars in north central Texas. In mid-May, stripe rust was found in a field of CK9835 in northwestern Arkansas and in a plot of soft red winter wheat in south-central Kansas. During late June, wheat stripe rust was light in Bozeman, Montana plots. In early July, traces of wheat stripe rust were found in an irrigated winter wheat field in the panhandle of Nebraska. Stripe rust generally is inhibited at temperatures above 70 F, so in all cases in this area the disease stopped developing with the onset of hot weather and losses were minimal. Losses due to stripe rust in Kansas were at an all time high for the disease at 0.01 percent.

During mid-April, stripe rust was observed in northwestern Washington wheat fields and nurseries. In late April, 70% stripe rust severities were reported in some northwestern Washington wheat fields and nurseries, but losses were not significant in commercial fields with adult plant resistance. During the first week in May, light amounts of stripe rust were found in eastern Washington and eastern Oregon fields. Dry weather in late May retarded stripe rust development until late June. In early July, stripe rust was severe in plots of susceptible winter wheat in eastern Washington, but again stripe rust was not a problem in commercial fields with adult plant resistance.

In California, in late April, wheat stripe rust was light in San Joaquin Valley fields and Sacramento Valley plots. Stripe rust developed late and was less severe than normal for this area.

TABLE 2. Wheat leaf rust races identified through August 8, 1995

Race	Virulence formula	Number of isolates by state													
		AL	AR	CA	CO	FL	GA	IN	KS	LA	NC	OK	SC	TX	VA
CBG-10,18	3,10,11,18						2								
FBT-18	2c,3,3ka,11,17,18,30	1													
FCD-10	2c,3,10,17,26													2	
LBB-10,18	1,10,18											3			
LBL-10	1,10,11														1
LCG-10,18	1,10,11,18,26										5				
MBB-10	1,3,10			14											
MBG	1, 3, 11	6									1				
MBG-10	1,3,10,11	18	8	13		2	10			6	14	2	6	1	1
MBG-10,18	1,3,10,11,18						6								
MBJ-10	1,3,10,11,17											1		2	
MBR-10	1,3,3ka,10,11,30	14	12	1	1				3	2	3	6	1	12	
MCB-10	1,3,10,26			2										1	
MCD-10	1,3,10,17,26													2	
MCG-10	1,3,10,11,26			6											
MCH-10	1,3,10,11,26,30			2											
MCR-10	1,3,3ka,10,11,26,30	3									3	1		5	
MCR-10,18	1,3,3ka,10,11,18,26,30			3											
MDB-10	1,3,10,24								1			1		2	
MDG-10	1, 3, 10, 11, 24		1											1	
MDR-10	1,3,3ka,10,11,24,30											7		6	
MFB-10	1,3,10,24,26													1	
MGB-10	1,3,10,16													1	
PBG-18	1, 2c, 3, 11, 18												2		
PBJ-10,18	1,2c,3,10,11,17,18														1
PBR-10,18	1,2c,3,3ka,10,11,18,30		2					2							
PNM-10,18	1,2c,3,3ka,9,10,18,24,30		2												
PNR-10	1,2c,3,3ka,9,10,11,24,30	2												2	
TBG	1,2a,2c,3,11	1													
TBG-10	1,2a,2c,3,10,11												1	3	
TDB-10	1,2a,2c,3,10,24													2	
TDG-10	1,2a,2c,3,10,11,24		1											7	
TFB-10	1,2a,2c,3,10,24,26										1	1		7	
TFG-10	1,2a,2c,3,10,11,24,26	3										1			
TLG-18	1,2a,2c,3,9,11,18	6				2	4				7	3	4	2	
No. of isolates		54	26	41	1	4	22	2	4	8	34	26	14	59	3

Oat stem rust. Oat stem rust was observed in varietal plots in southern Louisiana in late February. In general there was less oat stem rust and development was slower in this area than last year because of the cool conditions in February and early March. Even though the rust developed later than normal, the rust still destroyed some of the southern Louisiana oat plots. During the last week in June, 2% oat stem rust severities were observed in a northeastern Indiana nursery.

During the last week in March, oat stem rust overwintering sites (trace to 20% severities) were

found in varietal plots in nurseries at Beeville and Temple, Texas and in a field 50 miles southwest of San Antonio. In the last week of April, trace to 20% severities were reported in oat plots in central and north-central Texas. Traces of oat stem rust were also found in central Texas fields and on wild oat (*Avena fatua*) plants growing along the roadside. By the first week in May, oat stem rust was severe in north-central Texas plots. The amount of rust in this area was greater than in 1994, but within the normal range for stem rust development on oats in Texas. The relative lack of oat acreage in the central Great Plains tends to interrupt potential epidemics of oat stem rust farther north unless stem rust is extremely severe in southern Texas.

The first detection of oat stem rust in the northern central plains this year was during the first week in July when traces of oat stem rust were found on wild oat (*Avena fatua*) plants growing alongside the road in southeastern North Dakota. In mid-July, traces of oat stem rust were found in plots in east central Minnesota, but no rust was found on a disease survey throughout eastern South and North Dakota. Much less oat stem rust was found in the northern Great Plains this year than in previous years. The reduced amount of oat stem rust seems to be associated with a decline in oat production. Oat acreage in the United States is projected to be the lowest since records began in 1866. Losses to oat stem rust were minimal in the northern oat-growing area this year.

Race NA-27, virulent to *Pg*-1,2,3,4, and 8, remains the predominant race of the oat stem rust population (Table 3). The other races identified so far in 1995 are NA-16 which is virulent to *Pg*-1,3,and8, and NA-5 which is virulent to *Pg*-3 and 15.

TABLE 3. Oat stem rust races identified through August 8, 1995

	Number of		Number of isolates of NA race*		
State	collections	isolates	NA-5	NA-16	NA-27
AR	1	3			3
CA	2	6	6		
GA	1	3			3
LA	1	3			3
TX	59	164		25	139

Oat crown rust. During the last week in March, severe crown rust was observed in many southern Texas nurseries and fields. In some fields south of San Antonio, 40% severities were common, while in late maturing cultivars in southern Texas nurseries, the rust was so severe it stunted the plants. The severe and widespread crown rust was comparable to last year's severe rust development in the southern area

of the U.S.

In late March, crown rust levels were much higher than normal in the southeastern U.S. oat-growing area. In varietal plots crown rust was severe (>40%) while in oat fields, severities were moderate (1-20%). In mid-April, in southeastern U.S. varietal plots crown rust was severe (>80%), while in oat fields severities were moderate (1-20%). In late April, in southeastern U.S. varietal plots, crown rust killed the most susceptible cultivars. By the first week in May, crown rust severities ranged from traces to 90% in oat plots at soft dough from east central North Carolina to central Louisiana. This was the most severe crown rust ever observed in this large an area in the Southeast. In northern Alabama, southern Tennessee, and northern Arkansas, however, crown rust infection was light in mid-May. The warm temperatures and moisture in the southeast were conducive for rust development. These southern areas of infection provided inoculum for the limited acreage of northern oats emerged by mid-May.

For the first time in the past 12 years crown rust was observed in the oat nursery at Wooster, Ohio. By mid-June, severities ranged from traces to 90% on the flag leaf. Also for the first time in 35 years, crown rust was severe in the oat nursery near University Park in central Pennsylvania.

During the third week in May, oat crown rust was just beginning to appear on oats adjacent to buckthorn, the alternate host in the St. Paul, Minnesota nursery. This was about 2 weeks later than normal. By mid-June, oats growing near the buckthorn nursery at St. Paul were severely infected. During the third week in June, trace to 10% crown rust severities were found on lower leaves in southern Minnesota oat plots. During early July, trace to 60% crown rust severities were found on the flag leaves in oat plots in east-central Minnesota. In early July, crown rust was light in southern Wisconsin but severe in eastern South Dakota. In mid-July, trace-20% crown rust severities were found on oat flag leaves throughout the eastern Dakotas, southern Minnesota and southern Wisconsin fields. 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. In mid-July, only traces of crown rust were recorded in northwestern North Dakota plots. By early August, 20% severities were observed on flag leaves in the northwestern North Dakota plots and in an irrigated nursery in northeastern Montana. In early August, sixty-percent severities were common on wild oats (*Avena fatua*) in northwestern Minnesota. Crown rust losses were severe in late planted oats in Minnesota and the Dakotas.

In early June, heavy aecial infections were observed on buckthorn bushes in the area around Saskatoon, Canada. However, only traces of crown rust were observed in plots by August 8. In mid-June, oat spreader plots in a buckthorn nursery in southern Ontario were heavily infected with crown rust.

During the second week in May, crown rust was light in oat fields at late milk stage in the Central Valley of California. During the third week in May, 60% crown rust severities were in observed in

Davis, California oat plots.

The incidence of virulence for 1995 crown rust isolates tested to date is presented in Table 4.

Barley crown rust. Light crown rust infections were found this year in east central and southwestern Minnesota plots.

Barley stem rust. In late April, traces of stem rust were found in a barley plot in north-central Texas. Limited amounts of barley are grown commercially in the southern and central plains states and generally only traces of stem rust are found in this area. In early July, barley stem rust was reported for the first time in the northern barley-growing area as traces were found in a southeastern North Dakota field. Traces of barley stem rust were also found on wild barley (*Horde jubatum*) growing alongside a road in southeastern North Dakota. In early August, trace-10% severities were common in fields and plots in northeastern North Dakota and northwestern Minnesota. This is the most barley stem rust that has been reported in the last five years in this area. This year barley stem rust will cause losses in late-planted fields.

Barley leaf rust. By the last week in March, severe leaf rust caused by *Puccinia hordei* was observed on barley plots in south Texas. During the last week in April, 20% barley leaf rust severities were observed in central Texas plots and traces in north-central Texas plots. Leaf rust is generally a minor barley disease in the southern plains.

In early June, leaf rust was severe on barley in southeastern Nebraska plots. By the third week in June, 20% severities were found in east-central Nebraska plots and traces in southern Minnesota plots. During mid-July, light barley leaf rust (<10%) was found in southern and west central Minnesota plots and in a field in central Minnesota. By early August, trace-5% severities were common in barley fields and plots in northeastern North Dakota and northwestern Minnesota. Severities up to 40% on individual leaves were found within fields in northeastern North Dakota. There is more barley leaf rust in this area than in the last three years.

In mid- May, leaf rust was found on barley near Jackson in western Tennessee. By the first week in June, barley leaf rust severities were greater than 5% in central Michigan fields.

In early May, near Guelph, Ontario, Canada, secondary spread of barley leaf rust was starting where rust overwintered in plots. In early June, barley leaf rust was severe on some winter barleys in a nursery in southern Ontario.

During the third week in May, barley leaf rust was severe on barley growing in Davis, California plots.

This year in the U.S., losses to barley leaf rust were minimal.

TABLE 4. Incidence of virulence in 1995 oat crown rust isolates tested to date (8-8-95)

Differential	Percent of isolates virulent		
	AL, FL, GA	LA	TX
Pc 14	77	73	81
Pc 35	82	75	44
Pc 36	36	32	43
Pc 38	14	18	24
Pc 39	9	8	22
Pc 40	86	77	93
Pc 45	5	7	6
Pc 46	36	45	57
Pc 48	9	0	0
Pc 50	32	21	43
Pc 51	77	79	78
Pc 52	9	0	0
Pc 53	0	1	0
Pc 54	23	36	10
Pc 56	27	32	38
Pc 57	14	26	18
Pc 58 TAM-O-301	32	46	14
Pc 59 TAM-O-312	55	74	17
Pc 60 Coker 227	86	78	82
Pc 61 Coker 234	86	70	79
Pc 62	0	1	0
Pc 63	9	8	21
Pc 64	0	10	3
Pc 67	32	44	76
Pc 68	0	3	0
Pc 70	10	12	19
Pc 71	9	10	24
H548	5	1	0
Dane	5	3	6
WI X4361-9	5	7	1
TAM-O-386R	0	4	16
TAM-O-393	0	5	3
Mitchell	89	73	82
No. of isolates	22	73	68

Barley stripe rust. In late March, traces of stripe rust on barley were reported in nursery plots in Uvalde and Beeville, Texas and in a field 30 miles southwest of San Antonio, Texas. During the second week in May, stripe rust was found on green flag leaves in barley plots in the San Joaquin Valley of California. This year in the Sacramento Valley, California barley nurseries, stripe rust was much more widespread because of the cooler than normal conditions. In late May, barley stripe rust was found in western Oregon and western Washington plots. The rust was scattered throughout the plots and in one instance there was a hot spot where the rust severities reached 80%. Greenhouse tests confirmed this was barley stripe rust on barley. In early June, in the Skagit Valley of Washington, 10% severities were found in some barley plots. In early July, severe barley stripe rust was reported in fields in the Klamath Valley of south central Oregon and light severities in south central Idaho fields. In mid-July, light barley stripe rust was found scattered throughout the nurseries at the Pullman, Washington experiment station. This was the most barley stripe rust ever seen at this location.

In 1995, barley stripe rust was reported from Texas to Washington. The first report of barley stripe rust ever being found in the U.S was in the spring of 1991 in southern Texas. Barley stripe rust now seems firmly established in the Pacific Northwest, where the climate is most favorable for its development. This is a perfect example of a disease finding its niche and increasing at a fast rate over a large area.

Rye stem rust. In late April, traces of rye stem rust were reported in central Texas plots. In early August, 1% stem rust severities were reported in a rye plot in west central Minnesota.

Rye leaf rust. During the last week in March, 40% rye leaf rust severities were observed in plots and fields in southern Texas. In the last week of April, trace to 5% severities of rye leaf rust were found in fields and plots in north-central Texas. During the third week of May, in two north-central Oklahoma rye fields, 40% leaf rust severities were observed. In early May, 20% severities were found on winter rye in south-central Kansas.

During early May, traces of leaf rust were found on winter rye plots at Rosemont, Minnesota. In mid-June, winter rye in a southeastern North Dakota field was heavily rusted (20-40% severity), suggesting the rust overwintered, while rye in fields 5 miles away were free of rust. During the first week in July, 60% rye leaf rust severities were observed on winter rye flag leaves and 10% severities were observed on spring rye flag leaves in east central Minnesota varietal plots. In mid-July, 20% rye leaf rust severities were observed in southern and west-central Minnesota plots of the spring rye cultivar Prolific.

Crown rust on Buckthorn. As of May 15, no aecial infections were found on buckthorn bushes growing on the University of Minnesota St. Paul campus. In normal years, crown rust aecia appear in

late April in St. Paul. The abnormally cool spring delayed bud break of buckthorns until early May and, apparently, also delayed germination of crown rust teliospores. Aecial infections on buckthorn were heavy in northern Iowa and southern Minnesota this year, but light in Wisconsin and Illinois. Aecial infections varied from light to heavy in North Dakota. In early June, aecia were found on buckthorn bushes in Winnipeg, Canada. For the first time in recent years, aecia were found on barberry at Saskatoon, Canada.

Stem rust on Barberry. During the first week in June, the aecial stage of stem rust was found on common barberry (*Berberis vulgaris*) bushes in southeastern Minnesota and south-central Wisconsin in Dane County. During the last week in June, rust aecia were found on leaves of barberry (*Berberis fendleri*) bushes growing along a trail in the Rio Grande National Forest in south-central Colorado. The rust has not been positively identified yet. It is probably not stem rust, but more likely is a species limited to wild grasses.

Rust on Grasses. During the last week in April, light amounts of stem rust were observed on fescue in north-central Texas. Also, during the last week in April, crown rust was found on ryegrass and fescue and leaf rust on little barley (*Hordeum pusillum*) in southern Georgia. During the third week in July, severe (65% severity) stem rust was found on quackgrass (*Agropyron repens*) that was growing within 100 yards of the common barberrry (*Berberis vulgaris*) in southeastern Minnesota.

This is the last issue of the Cereal Rust Bulletin for the 1994-95 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). 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.

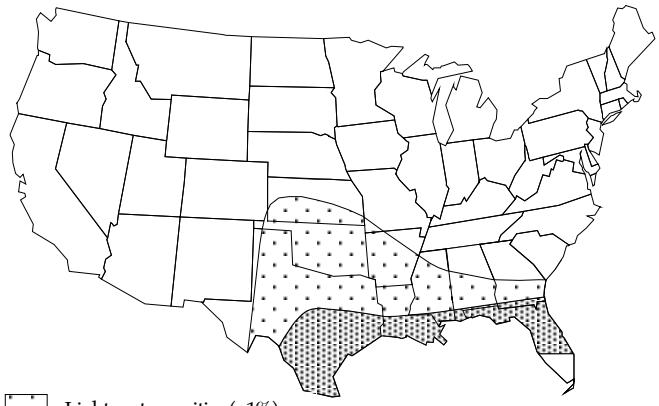
As you no doubt know, all Federal Government agencies are reviewing their program priorities. If you feel that this publication and the related activities of the Cereal Rust Lab are important to you, you can help us by calling the USDA, ARS Midwest Area Director, Dr. Richard Dunkle, 1815 N. University Street, Peoria, IL 61604, phone# 309-681-6602 (Internet address: !A03ADMWA@ATTMAIL.COM). Dr. Dunkle will be glad to discuss how you can make your feelings known in Washington.

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

- David L. Long

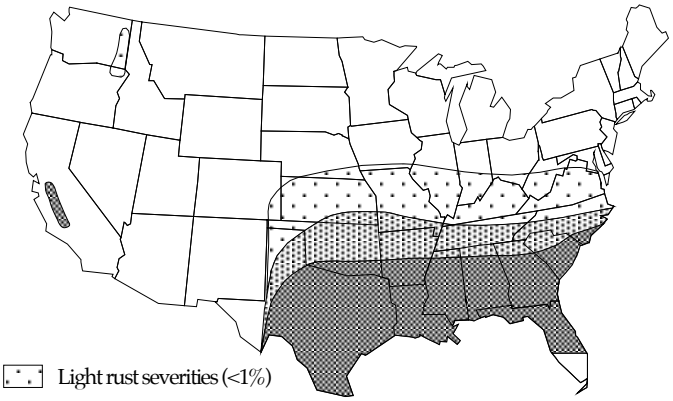
Fig. 1. Leaf rust severities in wheat fields in 1995

Leaf rust severities in wheat fields on April 4, 1995



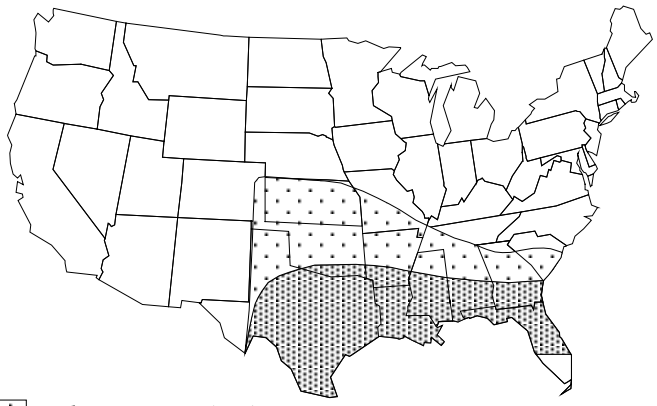
Light rust severities (<1%)
Moderate rust severities (1-20%)

Leaf rust severities in wheat fields on May 16, 1995



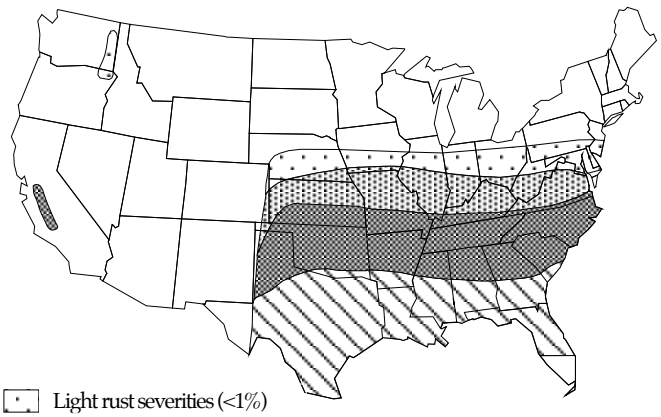
Light rust severities (<1%)
Moderate rust severities (1-20%)
Heavy rust severities (>20%)

Leaf rust severities in wheat fields on April 18, 1995



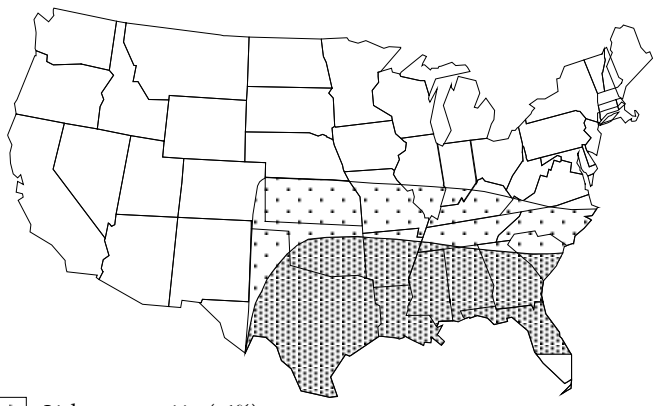
Light rust severities (<1%)
Moderate rust severities (1-20%)

Leaf rust severities in wheat fields on June 6, 1995



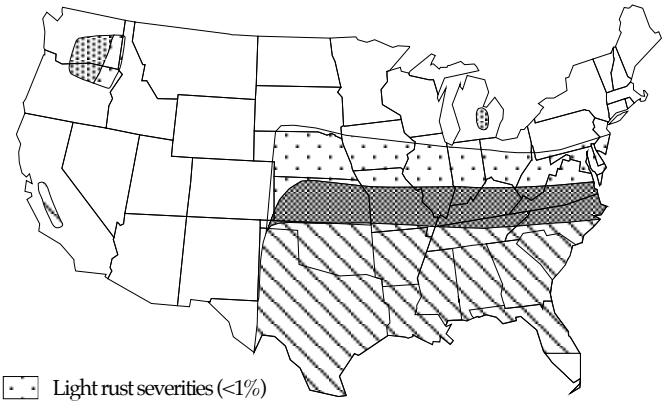
Light rust severities (<1%)
Moderate rust severities (1-20%)
Heavy rust severities (>20%)
Crop mature

Leaf rust severities in wheat fields on May 2, 1995



Light rust severities (<1%)
Moderate rust severities (1-20%)

Leaf rust severities in wheat fields on June 20, 1995



Light rust severities (<1%)
Moderate rust severities (1-20%)
Heavy rust severities (>20%)
Crop mature