CEREAL RUST BULLETIN

Report No. 1
April 9, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

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Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

Adequate moisture during late winter and early spring has resulted in good small grain growth throughout most of the area from southern Georgia to Texas. Dry conditions persist in the Texas plains. In central Texas, many winter wheat nurseries were destroyed by cold weather in late December. Crop maturity is near normal in the soft red winter wheat growing area adjacent to the Gulf Coast but is variable and generally a week late in southern and central Texas. In Kansas and Oklahoma, most of the wheat crop is in good condition with minimal winter injury. Spring-sown small grains have been planted in a few fields in the northern grain-growing area during the past week. In northeastern Washington and northern Idaho much of the crop was winterkilled and is being reseeded to spring small grains.

Wheat stem rust - In southwestern Georgia, stem rust overwintered in soft red winter wheat plots throughout the nursery at Plains. Old pustules were found near the base of the plants. More recent infections were sporulating on the flag leaves by late March. No stem rust was observed in southern Texas last week in commercial fields or in McNair 701 trap plots at Beeville and Victoria.

Wheat leaf rust - Leaf rust severity is generally light in southern Texas fields and confined mainly to the lower leaves. However, a few fields with moderate severities were observed west of Corpus Christi, Texas (Fig. 1). The rain that fell last week should facilitate a rapid increase and spread of leaf rust. The most susceptible lines at mid-dough stage in the nurseries in southern Texas have high severities (80%). In northern Texas rust is also severe on susceptible lines in nurseries, but fields are lightly infected.

In 1991, leaf rust overwintered in southeastern and central Kansas and southwestern Arkansas. Surveys in the past two weeks found rust light in fields in southern Kansas and Arkansas. Leaf rust is severe on susceptible cultivars in southern Arkansas plots. Leaf rust development is generally later than usual throughout these two areas. Races Prt MBG-10, TBG-10, MFB-10, TFB-10, and PLM-10,18 were identified from 14 rust collections made in late January from a nursery in southwest Arkansas. Prt PLM-10,18 and TFB-10 races were not identified from this area in 1990.

Leaf rust is severe in fields and plots within 75 miles of the Gulf Coast from Louisiana to Georgia. In southern Georgia severe leaf rust was observed in fields of Fla 302 and CK 9766 at the early jointing stage. Fla 302 has resistance genes Lr10,+ and CK 9766 has Lr2a,9,+. Fungicides were applied to many fields in southern Georgia; losses will be significant in many unsprayed fields.

Wheat stripe rust - Stripe rust was observed in a wheat field near Walla Walla, Washington during the last week in March. There have been no reports of stripe rust in the Louisiana-Arkansas area this year.

Stripe rust urediniospores are very vulnerable to heat and do not survive long at warm temperatures; therefore, if shipment of collections for race identification is delayed their viability will be poor. Please send rusted green leaves (10 or more) as soon as possible after collecting to: Dr. Roland Line, USDA-ARS, 361 Johnson Hall, Washington State University, Pullman, WA 99164-6430.

Oat stem rust - Traces of oat stem rust were found in southern Texas fields during the first week in April. This amount of stem rust is near normal for early April. Wild oats (Avena fatua) growing along a roadside east of San Marcos, Texas, had 20% stem rust severities on 90% of the plants. Stem rust was not observed in Texas oat nurseries; this is probably due in part to the late planting date for these nurseries.

Oat stem rust was severe in southern Louisiana nurseries by the last week in March. This area may provide inoculum for the oat-growing areas to the north.

Oat crown rust - Crown rust was widespread and increasing on susceptible cultivars throughout the southeastern U.S. from the Florida Panhandle to southern Louisiana during the first week in April. Crown rust is generally light in southern Texas oat fields although it is more widespread than normal. Wild oats (Avena fatua) were found at a site east of San Antonio with 90% severity on 10% of the plants.

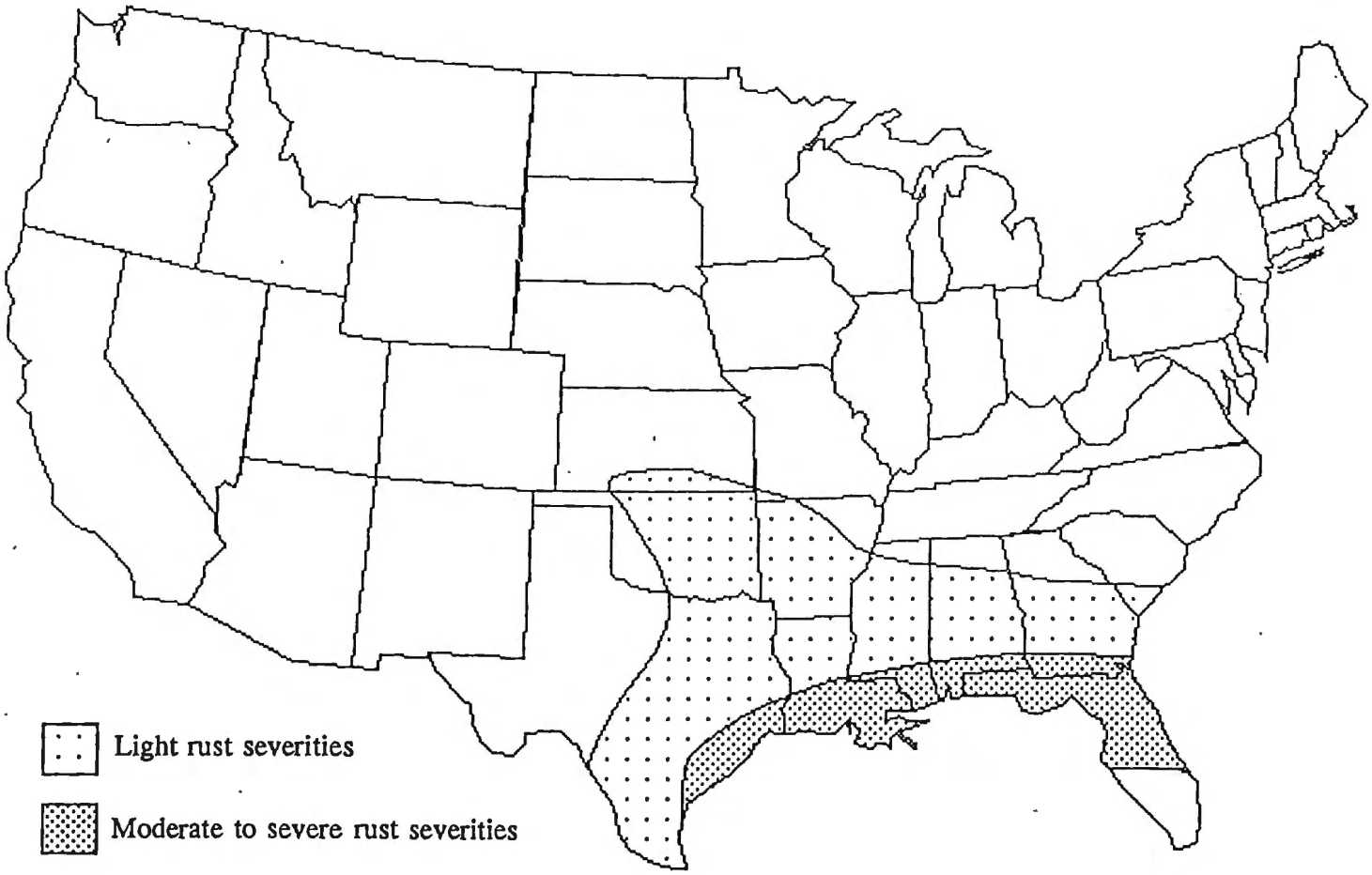
Barley stem rust - As of April 8, no stem rust has been reported on cultivated barley in the U.S. Limited amounts of barley are grown commercially in the southern states and winter barley was winterkilled in central Texas nurseries.

Barley leaf rust - Leaf rust overwintered in a southwestern Virginia nursery. By the last week in March, the bottom leaves of the plants were dead while the upper leaves were severely infected. No leaf rust was found on winter barley in nurseries in southern Texas but leaf rust severities on little barley (Hordeum pusillum) ranged from 10-50% during the first week in April. This rust is probably Uromyces hordeinus and is not likely to infect cultivated barley.

Rye rusts - No rye stem rust has been reported in the U.S. this year, which is normal. Rye leaf rust was observed in a single field south of San Antonio, Texas, with 80% severity and near 100% incidence. Traces of leaf rust were observed in a nursery at Giddings, Texas.

Stripe rust on barley - Stripe rust was reported in barley plots in Monterrey, Mexico during the last week in March. At this time we do not know whether this is Puccinia striiformis f. sp. tritici, which normally attacks wheat, or P. striiformis f. sp. hordei, which is a serious pathogen of barley. Only the most susceptible barley cultivars are attacked by P. striiformis f. sp. tritici and losses are usually light. On the other hand, P. striiformis f. sp. hordei is virulent on all commercial cultivars in North America and results in severe losses in barley. Puccinia striiformis f. sp. hordei was introduced in Mexico about 1987. If the stripe rust at Monterrey is P. striiformis f. sp. hordei, this is the closest occurrence to the U.S. ever reported. See the chapter by R. W. Stubbs in Vol. II of "The Cereal Rusts," Academic Press, 1985 for more information.

Fig. 1. Wheat leaf rust severities (4/9/91)



CEREAL RUST BULLETIN

Report No. 2
April 23, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

Ph. 612-625-6299

The winter-sown small grain crops in the United States are generally in good condition from the central Great Plains to Pennsylvania. Small grain seeding in the northern plains was slowed by cool wet weather last week but was still ahead of average.

Wheat stem rust - Light amounts of stem rust were found in southern Texas nursery plots at Beeville on Pioneer 2157 and at Uvalde in a plot of McNair 701 during the third week in April. Stem rust was widespread but light in plots of soft red winter wheat in southern Louisiana in mid-April. In the nursery at Plains, Georgia, stem rust is severe. The recent increase of susceptible cultivars grown in southern Georgia has resulted in an increase in stem rust overwintering and thereby the potential for disease development.

Wheat leaf rust - Rust is severe on susceptible soft red winter wheat cultivars from the coast of South Carolina through the southern half of Louisiana and into Texas (Fig. 1). The crop in much of the northern winter wheat area is greening up and leaf rust inoculum from the south may soon be infecting susceptible cultivars to the north.

Wheat leaf rust overwintered on susceptible cultivars in central North Carolina and by the third week in April, wheat at heading stage had 3-5% severities on flag leaves. Leaf rust is increasing from overwintering sites in eastern and southern Kansas, southern Arkansas and in Virginia. No leaf rust has been reported in Indiana, New York or Tennessee.

Leaf rust is increasing in the northern Texas wheat-growing area on susceptible cultivars in nurseries and fields. Recent dew periods and rain should allow for a rapid increase of leaf rust.

Wheat stripe rust - Stripe rust on wheat was found in the Mount Vernon area of Washington during the third week in April. There have been no reports of stripe rust on wheat in the Great Plains this year.

Oat stem rust - Light amounts of oat stem rust were found throughout southern Texas fields, while no rust was found in northern Texas during mid-April. In a nursery at Baton Rouge, Louisiana, 90% of the oat cultivars were destroyed by stem rust. The only other oat stem rust reported was in plots at Tifton, Georgia.

Oat crown rust - Crown rust was widespread and increasing on susceptible cultivars from central North Carolina to northern Texas by the third week in April. In southern Texas oat fields, rust was light to moderate, while in central Texas much of the oat foliage and thereby the rust was destroyed by cold weather during the winter.

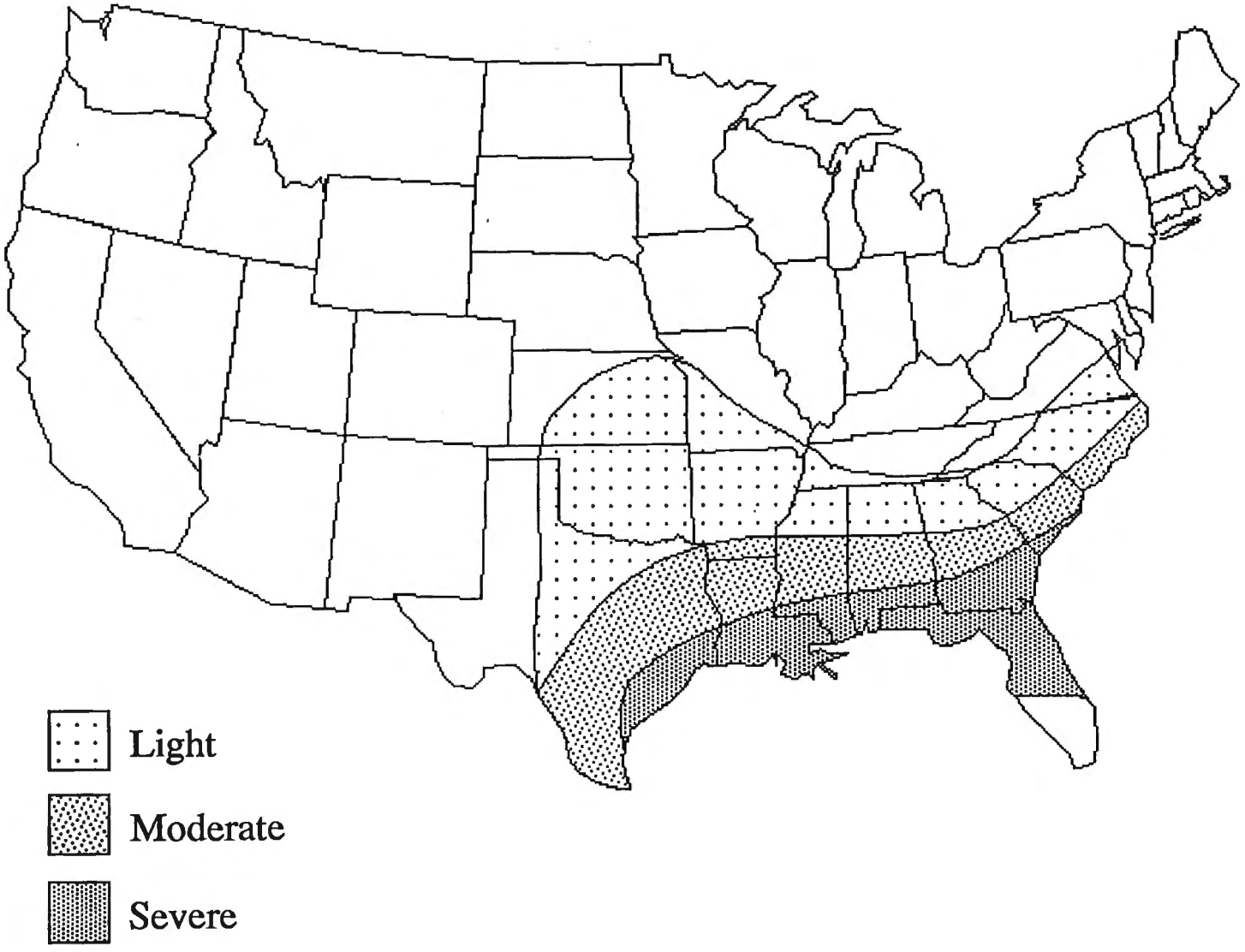
Barley stem rust - The first report of barley stem rust in 1991 was in southern Texas plots at Uvalde during the third week in April. Stem rust also occurred on McNair 701 wheat which is resistant to Pgt-QCC. Therefore, we believe that the stem rust on barley may not be Pgt-QCC.

Barley leaf rust - Leaf rust overwintered in a central North Carolina nursery. By the third week in April the upper leaves were severely infected. Leaf rust continues to increase in Virginia where it overwintered. No leaf rust has been reported in the Great Plains.

Rye rusts - No rye stem rust has been reported in the U.S. this year. There have been no rye leaf rust reports except those reported in southern Texas in the last bulletin.

Stripe rust on barley - Stripe rust was reported in barley plots in Uvalde, Texas during the third week in April. These plots are flood-irrigated and the weather has been cooler than normal which has provided good conditions for stripe rust infection. At this time we do not know whether this is Puccinia striiformis f. sp. tritici, which normally attacks wheat, or P. striiformis f. sp. hordei, which is a serious pathogen of barley. Tests are underway to determine the forma specialis of these stripe rust collections.

Fig.1. Wheat leaf rust severities (4/23/91)



CEREAL RUST BULLETIN

Report No. 3
May 7, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Ph. 612-625-6299

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The majority of the winter-sown small grain crop throughout the U. S. is in good condition. However, in western and south central Kansas, where moisture has been short wheat is rated poor. Wheat harvest started in southern Texas during the last full week in April. In the spring cereal area, the cool wet conditions in the past week have slowed seeding.

Wheat stem rust - Stem rust was severe in soft red winter wheat plots in central and northwestern Louisiana by late April. Stem rust in the plots at Plains, Georgia, is the most severe observed in the last five years.

Traces of stem rust were found in a hard red winter wheat field in central Texas on April 25. No wheat stem rust was found in northern Texas stem-rust susceptible wheat plots during the last full week in April.

Wheat leaf rust - Rust is severe on susceptible soft red winter wheat cultivars from eastern Texas and the Gulf states up to central North Carolina (Figure 1). In the northern soft red winter area, light amounts of leaf rust were found on susceptible cultivars in plots in east central Illinois, west central Indiana and south central Pennsylvania during the first week in May.

Leaf rust is increasing in hard red winter wheat fields in southwestern Oklahoma where it overwintered. Recent dew periods and rain provide favorable conditions for a rapid increase of leaf rust.

Through the first week in May, leaf rust has not been found in the Pacific Northwest.

Preliminary data of the 1991 wheat leaf rust survey are shown in Table 1. The initial identifications show a diverse population and all of the virulence combinations were found last year in the U. S.

Wheat stripe rust - There have been no reports of stripe rust on wheat in the Great Plains this year. The stripe rust situation in the Pacific Northwest has not changed since the last bulletin.

Oat stem rust - Oat stem rust was found throughout fields in central Texas, while no rust was found in northern Texas during late April. In nurseries in central and northwestern Louisiana, light amounts of oat stem rust were found. Oat stem rust was reported severe in plots in southern Georgia during the last week in April.

Oat crown rust - Crown rust was increasing on susceptible cultivars from north central Texas to central North Carolina by late April. In southern Mississippi plots, many of the susceptible cultivars were killed by crown rust.

Barley stem rust - With the exception of the Uvalde, Texas, report in the last bulletin, no stem rust has been observed on barley.

Barley leaf rust - The only reports of leaf rust (Puccinia hordei) on cultivated barley was in Virginia and North Carolina. In late April, leaf rust (Uromyces hordeinus) was found on little barley (Hordeum pusillum) growing along the roadside in northeastern Louisiana.

Stripe rust on barley - There have been no new reports of stripe rust on barley since the last bulletin. The initial collections were virulent on Morocco wheat, but none has been virulent on the barleys evaluated.

Rye rusts - No rye stem rust has been reported in the U. S. this year. Light amounts of rye leaf rust were found in southern Georgia plots during late April and in southern Texas in early April.

Barberry rust - During the last week in April pycnial infections were observed on Berberis vulgaris bushes in Dane Co., Wisconsin.

Fig. 1. Wheat leaf rust severities (5/7/91)

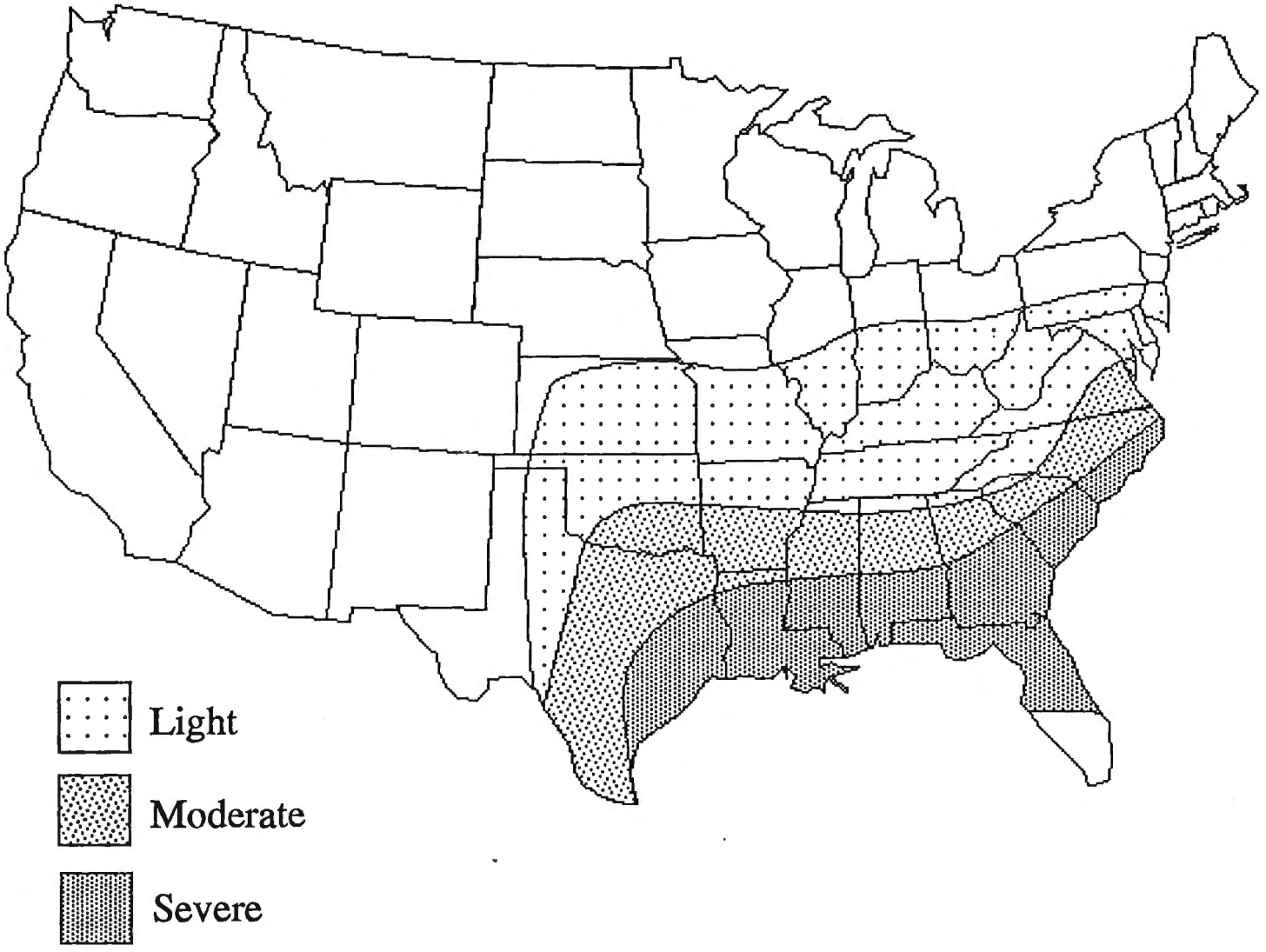


Table 1. Preliminary data of the 1991 wheat leaf rust virulence survey.

Prt code[1]	Virulence formula[2]	Number of isolates per state			
		AR	GA	LA	TX
KBG-10	2a,2c,3,10,11	1			
MBG	1,3,11			2	
MBG-10	1,3,10,11	6			
MDB-10	1,3,10,24	2			
MFB-10	1,3,10,24,26	3			
PLM-10	1,2c,3,3ka,9,10,30	3			
PLR-10,18	1,2c,3,3ka,9,10,11,18,30		2		
TBG-10	1,2a,2c,3,10,11	4	1		
TCB-10	1,2a,2c,3,10,26				2
TFB-10	1,2a,2c,3,10,24,26	2			
Number of isolates		21	3	2	2
Number of collections		14	2	2	2

[1] Prt code: See Phytopathology 79:525-529.

[2] Differentially resistant single-gene lines tested: Lr1,2a,2c,3,3ka,9,10,11,16,17,18,24,26,30.

CEREAL RUST BULLETIN

Report No. 4
May 21, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

Ph.: 612-625-6299

The majority of the winter-sown small grain crop throughout the U. S. is in good condition. However, in Kansas, Oklahoma and the High Plains of Texas where moisture has been short, wheat has been cut for hay or grazed. Small grain harvest has started in north central Texas and along the Gulf Coast. Much of the southern Oklahoma crop is in the dough stage. Winter wheat development in the central plains is one week ahead of normal maturity. The crop generally is less than 24 inches in height. Spring cereal seeding is nearly completed in the northern small grain area.

Wheat stem rust - During the past week, 20% wheat stem rust severities were observed in a southwestern Oklahoma field near Lawton and in another field near Burkburnett in north central Texas (Fig. 1). In other fields in the same area and along Highway 183 to Coldwater, Kansas, trace-1% severities were observed (Fig. 1). Trace-2% severities occurred on 2157, Stallion, Quantum 574 and a few other lines in demonstration plots in these areas. Plots of Triumph 64, TAM 101 and TAM 107 were rust free; however, there were traces of stem rust in a few fields of TAM 101 and TAM 107. Stem rust in Oklahoma and Texas is 60 miles further west than normal, which may result in heavier than normal inoculum densities in northwestern Kansas, the Nebraska panhandle and the western Dakotas. By mid-May, stem rust was present in demonstration plots across southern Kansas and in northwestern Arkansas plots. This is about normal distribution of stem rust for mid-May; however, the severity is much greater than normally seen.

Wheat stem rust has virtually destroyed the south central Georgia nursery at Plains. In the wheat fields in the same area, rust was light, but 50 miles north of this location no stem rust was observed.

Wheat leaf rust - In the Great Plains in mid-May, leaf rust severities ranged from traces in northeastern Kansas to severe in southwestern Oklahoma (Fig. 2). Losses have occurred in fields where leaf rust overwintered in southwestern Oklahoma. Leaf rust has not increased as rapidly as normal, which was primarily due to dry weather and perhaps the hotter than normal temperatures. If recent rains continue, leaf rust could become severe in northern Kansas, but losses should be light as the crop is in the berry stage. Leaf rust is light in central and northern Kansas, except for scattered fields in which it overwintered.

In the past two weeks traces of leaf rust were found in fields as far north as south central Wisconsin and south central Michigan (Fig. 2). Leaf rust did not overwinter in these northern locations.

In the eastern soft red winter wheat area from southeastern Arkansas to eastern Virginia, leaf rust is severe in fields and on susceptible cultivars in nurseries. This area is providing exogenous inoculum for the areas farther north.

Leaf rust was found in the Willamette Valley in Oregon by mid-May. The lack of leaf rust overwintering locations can be attributed to the severe winterkill of wheat in the Pacific Northwest.

Leaf rust severities on goatgrass (Aegilops cylindrica) growing alongside wheat fields and in roadside ditches throughout southern and central Oklahoma ranged from traces to 100% on flag leaves. Severities are somewhat less than in recent years.

Preliminary data of the 1991 wheat leaf rust virulence survey are shown in Table 1. The earliest identified collections have shown a high incidence of Lr24 virulence in the southern Texas leaf rust population.

Wheat stripe rust - There have been no reports of stripe rust on wheat in the Great Plains this year. Since the last bulletin, stripe rust has increased slowly in the Mount Vernon area in the state of Washington.

Light amounts of stripe rust were found on wheat lines in nurseries in the Sacramento Valley of California and on triticales in a nursery in the Willamette Valley of Oregon.

Oat stem rust - Oat stem rust has now spread northward into Parsons Co. demonstration plots in southeastern Kansas. No stem rust was observed in western Oklahoma last week. Severity of oat stem rust is lighter in the southern plains than normal. Stem rust race NA-27 was identified from collections made on oats and wild oats (Avena fatua) in south Texas in late March.

Oat crown rust - Traces of crown rust were found in demonstration plots in southeastern Kansas and on wild oats in southwestern Oklahoma during mid-May. Oats in southeastern U. S. fields and plots where crown rust was severe are now mature or harvested. Apparently, little rust has spread northward from this area.

During mid-May, heavy aecial development was observed on buckthorns (alternate host) growing in southern Wisconsin and southeastern Minnesota, an area from which oat crown rust spread in 1990. Aecial spores from buckthorn can infect some grass species as well as oats. Infections on buckthorns remote from fields with oats last year are probably infected with the crown rust forms that attack Poa pratensis (bluegrass) and Agropyron repens (quackgrass) and not oats. The first pycnial infections of the season were observed in the St. Paul, Minnesota, buckthorn nursery May 10.

Barley stem rust - During mid-May, barley stem rust was found at one site in an eastern Virginia nursery and now is increasing on susceptible cultivars throughout the nursery. This infection probably is not due to overwintering rust. The stem rust collection from barley at Uvalde, Texas and some of the isolates from wheat at Plains, Georgia, were avirulent on McNair 701, leading us to believe that this rust race is Pgt-QCC. Additionally, in western Oklahoma 2157 was often rusted at sites where Triumph 64 and TAM 101 were rust-free. These two cultivars are resistant to Pgt-QCC, but susceptible to Pgt-TNM which is the primary race found on wheat; 2157 is one of only a few common wheat cultivars susceptible to Pgt-QCC.

Barley leaf rust - Leaf rust on barley is increasing rapidly on cultivars in Virginia and North Carolina where it overwintered. In a barley nursery in the Sacramento Valley of California, 20% leaf rust severities were observed the first week in May. No barley leaf rust has been found in the Great Plains.

Stripe rust on barley - There have been no new reports of stripe rust on barley since the last bulletin. The collections from Uvalde, Texas are virulent on Morex barley but not on Lemhi or Morocco wheat. This leads us to believe it is barley and not wheat stripe rust. As of yet we do not have the differential cultivars to determine if it is race 24.

Rye rusts - No rye stem rust has been reported in the U. S. this year. Rye leaf rust at 90% severity level was observed in a west central Oklahoma field. Distribution and incidence of rye leaf rust is near normal for this date but the severity is greater than normal.

Table 1. Preliminary data of the 1991 wheat leaf rust virulence survey.

Prt code[1]	Virulence formula[2]	Number of isolates per state				
		AR	GA	LA	TX	KS
FBR-10,18	2c,3,3ka,10,11,18,30			1		
KBG-10	2a,2c,3,10,11	1			2	
MBG	1,3,11			2		
MBG-10	1,3,10,11	6	2	2		2
MDB-10	1,3,10,24	2			12	
MFB-10	1,3,10,24,26	3		1	8	
PLM-10	1,2c,3,3ka,9,10,30	3				
PLR-10,18	1,2c,3,3ka,9,10,11,18,30		2			
TBB-10	1,2a,2c,3,10				3	
TBG-10	1,2a,2c,3,10,11	4	1	1	1	
TDB-10	1,2a,2c,3,10,24					1
TCB	1,2a,2c,3,26				1	
TCB-10	1,2a,2c,3,10,26				2	
TFB-10	1,2a,2c,3,10,24,26	2				
TBJ-10,18	1,2a,2c,3,10,11,17,18			1		
Number of isolates		**21**	**5**	**8**	**29**	**3**
Number of collections		14	3	6	19	2

[1] Prt code: See Phytopathology 79:525-529.

[2] Differentially resistant single-gene lines tested: Lr1,2a,2c,3,3ka,9,10,11,16,17,18,24,26,30.

Fig. 1. Wheat stem rust in southern plains (5/21/91).

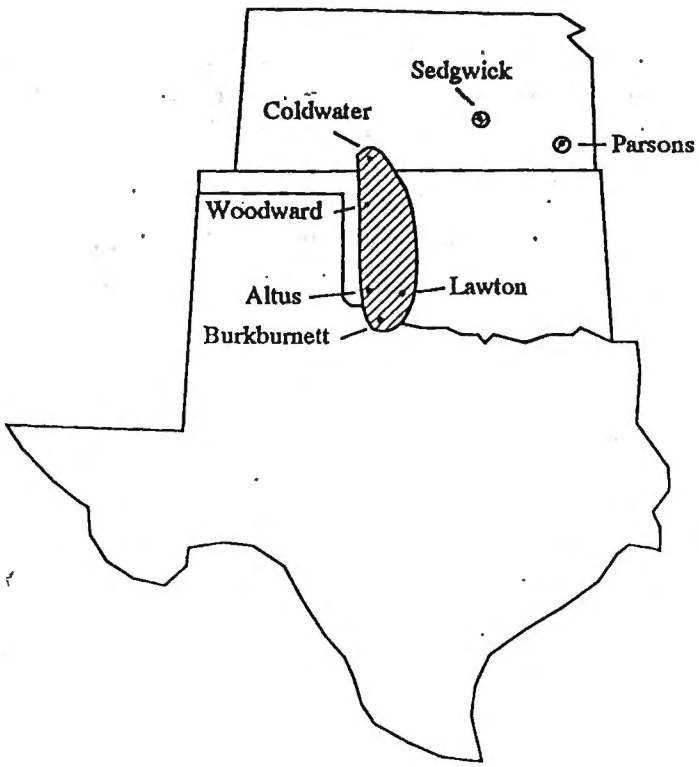
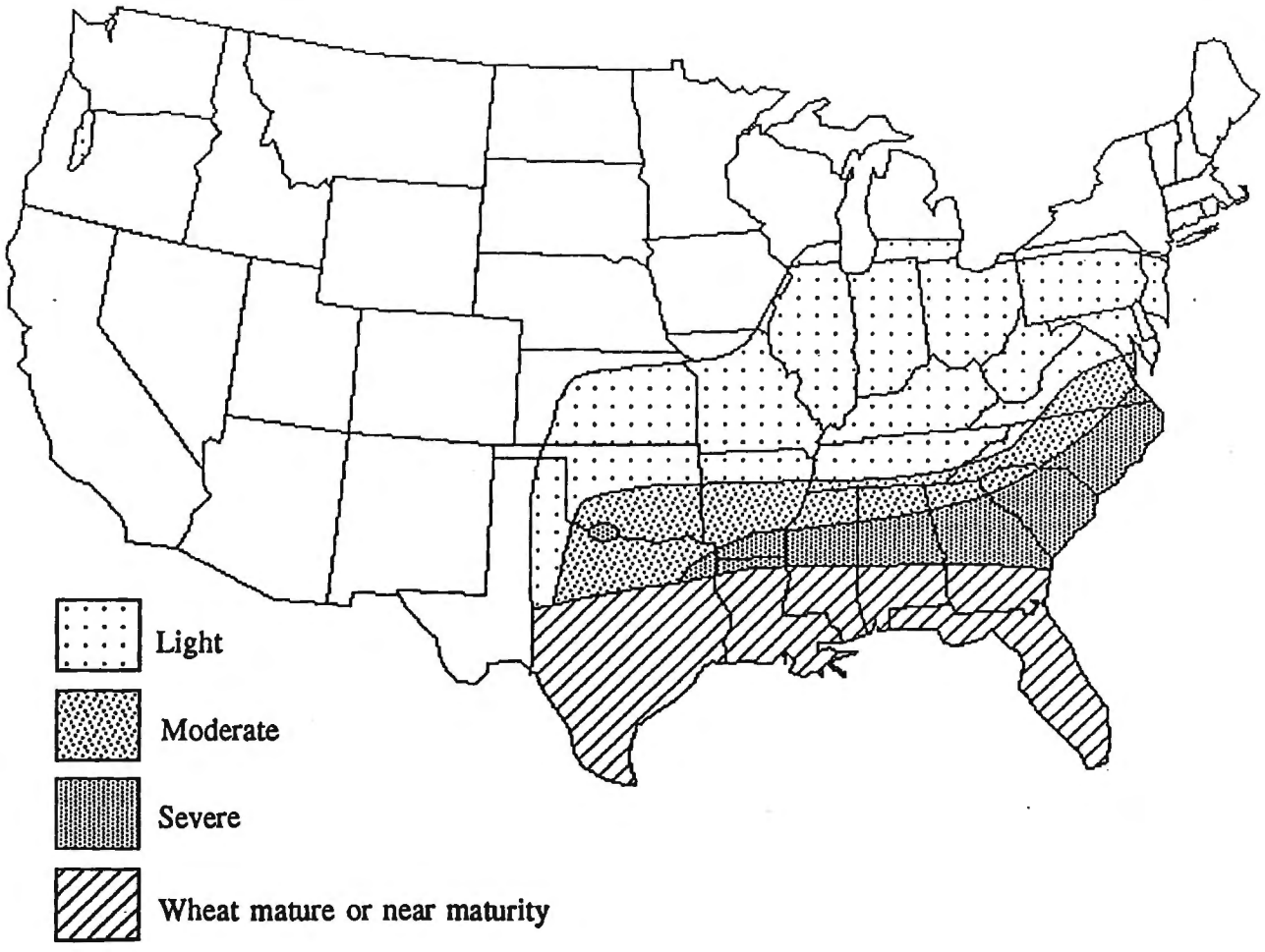


Fig. 2. Wheat leaf rust severities (5/21/91).



CEREAL RUST BULLETIN

Report No. 5
June 4, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Ph.: 612-625-6299

Issued By:
AGRICULTURAL RESEARCH SERVICE
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(In cooperation with the Minnesota Agricultural Experiment Station)

The small grain harvest is in full swing along a line from central Georgia to northern Texas. The first fields have been cut in south central Kansas and eastern Virginia. The Kansas and northern Oklahoma crop is one to two weeks ahead of normal development. The condition of the crop in the northern Great Plains is good with near normal maturity. Adequate to surplus moisture is present throughout the spring cereal area this year, except for the northern area of the Red River Valley of the North.

Wheat stem rust - During the past week, traces of wheat stem rust were found scattered in McNair 701 plots at Manhattan, Kansas in northeastern Kansas (probably Pgt-TPM). Plots of 2157 (susceptible to both Pgt-TPM and QCC) were lightly rusted (10-15% incidence) across the northern tier of Kansas counties, from Republic to Norton. Highest severities occurred in Russell (4%) and Smith counties. In southern Kansas fields, near maturity trace to 1% severities occurred. Stem rust is more widely spread than last year in the central Great Plains when it developed from a point source in south central Kansas. Although severities may be slightly less than last year, conditions have been favorable for rust infection since mid-May and the disease should continue to increase rapidly for the next two weeks. Inoculum has been present for the past two weeks in the central plains and the storms moving northward probably carried and deposited spores over the spring grain area. In the previous 60 years, the average dates of first stem rust detection have been:

Southeastern Nebraska - 6/11
Southeastern South Dakota - 6/30
Southeastern Minnesota - 6/18
East central North Dakota - 7/04

Frequent rains with warm (60-65°F) nights are very favorable for spore deposition and infection. The stem rust races identified from the south so far this year are avirulent on the recommended spring bread and durum wheats. Several centers of stem rust were found in a southern Illinois field (St. Clair Co.). Rust has been here at least three generations (21 to 42 days). No wheat stem rust was observed this past week in the northern parts of Mississippi, Alabama and Georgia.

The initial wheat stem rust collections made in southern Texas in early April have been identified as race Pgt-HFL while in southern Georgia the common race Pgt-TPM was identified.

Wheat leaf rust - In the Great Plains in late-May, leaf rust severities ranged from traces in northwestern Minnesota, southeastern North Dakota and eastern South Dakota winter wheat plots to 80% in plots of susceptible cultivars in north central Kansas (Fig. 1). Leaf rust increased rapidly in Kansas production fields during the past two weeks and traces now exist in east central Nebraska. Advanced maturity will limit losses except for late fields and the most susceptible cultivars, where some losses will occur.

In the eastern soft red winter wheat area, from eastern Missouri through southern Illinois and Indiana to central Pennsylvania, leaf rust is increasing on susceptible cultivars. However, severe Septoria glume blotch and scab are killing many of the leaves first. During mid-May overwintering, leaf rust was found in a demonstration plot in Cayuga Co. in western New York, but rust development since that time has been slowed by hot dry weather. Leaf rust is severe in the Willamette Valley in Oregon. Elsewhere in the Pacific Northwest, the winter killing of wheat has limited the rust and most of the host. The first observation of leaf rust on spring wheat was on the susceptible cultivar Baart in southeastern Minnesota.

Preliminary data of the 1991 wheat leaf rust virulence survey are shown in Table 1. The first isolates have revealed a higher incidence of virulence to Lr24 and 26 in southern Texas than last year on the same date.

Wheat stripe rust - Stripe rust increased slowly in northeastern Oregon and southeastern Washington during late May. Wheat stripe rust has not been reported in the Great Plains this year.

Oat stem rust - Severity of oat stem rust is lighter in the southern plains than normal. At this time, the northern limit of oat stem rust is southeastern Kansas.

Oat crown rust - Crown rust was severe on plots of oats from northern Mississippi through northern Georgia during late May. Traces of crown rust are present in southeastern Kansas. There have been no reports of crown rust farther north in the eastern U. S.

During mid-May, crown rust was found in south central Wisconsin fields; this is two weeks earlier than normal. In southeastern Minnesota, crown rust was first observed last week at severities up to 5%. The inoculum for these infections was probably aeciospores. During late May, heavy aecial development was observed on buckthorns (alternate host) growing in south central Wisconsin to southeastern North Dakota. As stated in our last bulletin, aecial spores from buckthorn can infect some grass species as well as oats. Infections on buckthorns remote from fields with oats last year are probably of crown rust forms that attack Poa pratensis (bluegrass) and Agropyron repens (quackgrass).

Barley stem rust - During late May, traces of barley stem rust were found in a field in Saline Co. and in Harvey Co. plots in central Kansas. Stem rust is also present in Virginia on winter barley plots at maturity. Race Pgt-QCC was identified from collections made in mid-April in plots at Uvalde, TX. This is the wheat stem rust race that caused losses in the spring-sown barleys in the northern Great Plains in 1990. Stem rust could appear on barley in the northern plains within the next two weeks.

Barley leaf rust - Traces of barley leaf rust were first found in the Great Plains in the Harvey Co. plots in central Kansas. Severities of 100% were observed on many of the susceptible barleys growing in plots in Virginia and North Carolina where it overwintered. Barley leaf rust is unusually severe from North Carolina to Virginia. The leaf rust is especially virulent this year.

Barley stripe rust - So far, stripe rust has been found only at the nursery at Uvalde, Texas. As the southern barleys are rapidly maturing and temperatures in the northern plains are warm (80°F day and 60+°F night), there is little likelihood for stripe rust to become widely established in the spring barleys.

Rye stem rust - Stem rust pustules were found on winter rye stems in a small area in a Sauk Co. field in south central Wisconsin. This rye field is in a location where Berberis vulgaris (barberry) bushes have been known to occur.

Rye leaf rust - Rye leaf rust was severe in Sauk Co. fields in south central Wisconsin during mid-May. This is three weeks earlier than normal; this probably means the rust overwintered in these fields. Leaf rust is light in southeastern Minnesota on winter ryes, but has not yet appeared on spring-sown rye.

Barberry rust - The initial aecial collections made from Berberis vulgaris bushes in April in Dane Co., Wisconsin were not viable, or not of rusts capable of attacking small grain cereals. Mature aecia were present on barberry by the last week of May in southeast Minnesota.

Table 1. Preliminary data of the 1991 wheat leaf rust virulence survey.

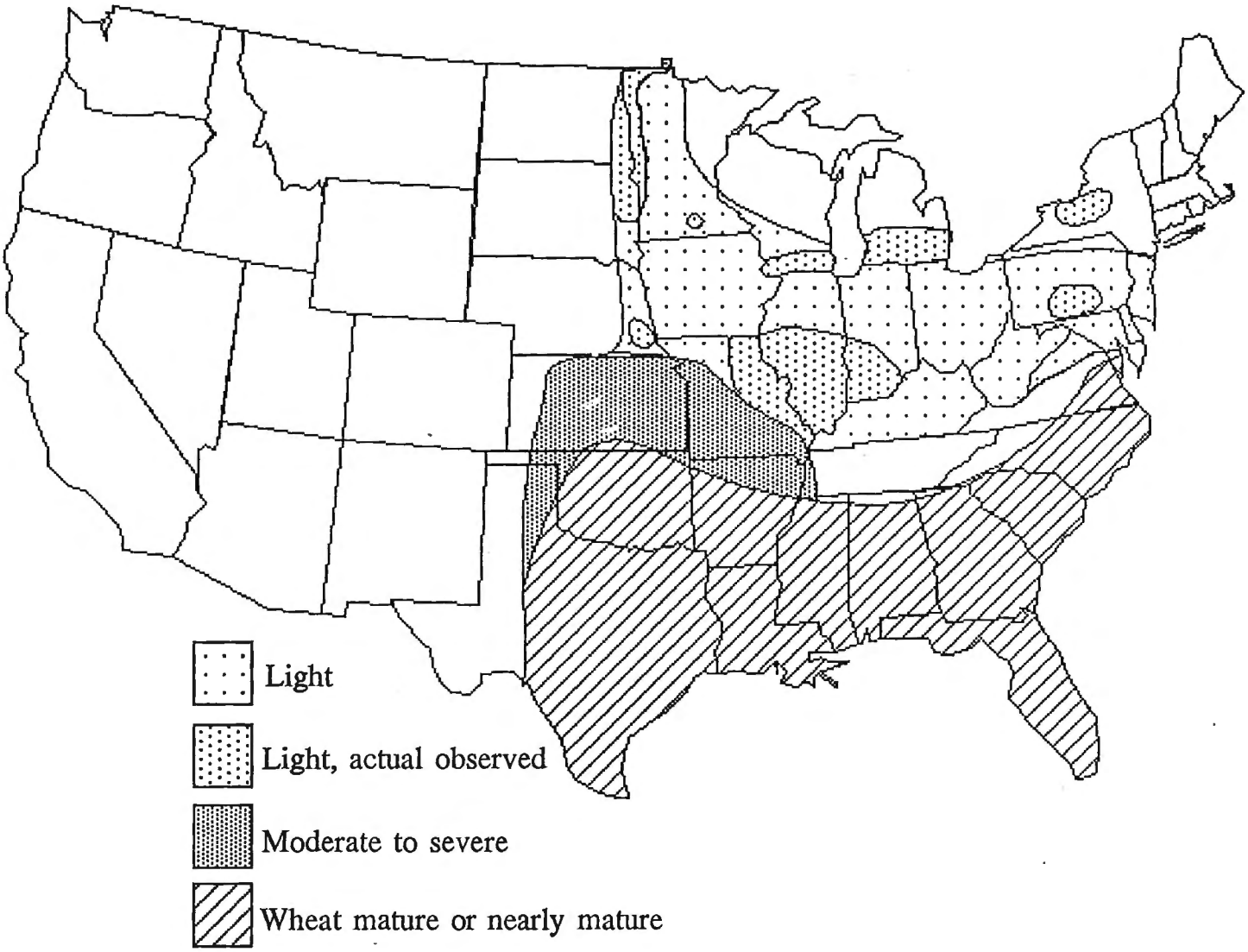
Virulence		Number of isolates per state				
Prt code[1]	formula[2]	AR	GA	LA	TX	KS
FBR-10,18	2c,3,3ka,10,11,18,30			1		
KBG-10	2a,2c,3,10,11	1			6	
MBG	1,3,11			2		
MBG-10	1,3,10,11	6	2	2	1	5
MDB-10	1,3,10,24	2			18	
MFB-10	1,3,10,24,26	3		1	17	
PLM-10	1,2c,3,3ka,9,10,30	3				
PLR-10,18	1,2c,3,3ka,9,10,11,18,30	2				
TBB-10	1,2a,2c,3,10				4	1
TBG-10	1,2a,2c,3,10,11	4	1	1	9	2
TDB-10	1,2a,2c,3,10,24				1	1
TCB	1,2a,2c,3,26				1	
TCB-10	1,2a,2c,3,10,26				2	
TFB-10	1,2a,2c,3,10,24,26	2			1	
TBJ-10,18	1,2a,2c,3,10,11,17,18			1		
Number of isolates		21	5	8	60	9
Number of collections		14	3	6	40	5

[1] Prt code: See Phytopathology 79:525-529.

[2] Differentially resistant single-gene lines tested: Lr1,2a,2c,3,3ka,9,10,11,16,17,18,24,26,30.

Bruce Hitman, long-time technician at the Cereal Rust Laboratory, passed away on May 22. Bruce was in charge of spore and germplasm increase and distribution.

Fig. 1. Wheat leaf rust severities (6/3/91)



CEREAL RUST BULLETIN

Report No. 6
June 18, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Tel.: 612/625-6299

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The small grain harvest is starting along a line from southern Ohio to northern Kansas. Wheat yields in southern Illinois and southern Indiana will be low because of Septoria leaf blotch and Fusarium head scab. In the northern Great Plains, most of the spring-sown small grains are in good condition and most are ahead of normal crop development.

Wheat stem rust - Stem rust is more widely spread in the northern Great Plains than it was at this time last year. The first detection of stem rust was 1-2 weeks earlier than normal in most of the northern locations where observations were recorded (Table 1). Recent rains and warm (60-65°F) nights have been favorable for spore deposition, infection and increase in most of the northern Great Plains. In the past two weeks, traces of stem rust were found scattered in winter wheat plots from southeastern Nebraska to east central North Dakota. Stem rust is found across Kansas and Colorado to the Rockies. Most cultivars in plots in Kansas were lightly rusted (less than 1% severity). The exception is cultivar 2157 (susceptible to both Pgt-TPM and QCC), which had 50% severity in one north central Kansas location. In east central Minnesota, stem rust ratings ranged from trace-20% (probably Pgt-TPM) in a McNair 701 plot, and traces of stem rust are present in plots of the spring wheat cultivar Baart across southern Minnesota.

Table 1. First date of wheat stem rust detection in 1991.

Area	1991	60 year average
East central North Dakota	6/06	7/04
Southeast Nebraska	6/11	6/11
Southeast Minnesota	6/11	6/18
Southeast South Dakota	6/12	6/30

Wheat plants growing along the roadside in northwestern Illinois had traces of stem rust during the first week of June, as did fields in south central Wisconsin and plots in west central Indiana.

The stem rust races identified from the southern U.S. this year are avirulent on the recommended spring bread and durum wheats. Thus, losses should be light in commercial fields, but rust will be severe in plots of susceptible cultivars.

Table 2. Wheat stem rust races identified through June 14, 1991.

State	Number of collections	Number of isolates	Pgt-race HFL	Pgt-race QCC	Pgt-race TPM
AR	1	3			3
GA	17	36			36
LA	5	15		3	12
TX	3	6	6		

Wheat leaf rust - During the second week of June, leaf rust severities in the Great Plains ranged from traces in spring wheat plots in southeastern North Dakota to severe (80% severities) in northeastern Colorado (Fig. 1). Advancing maturity of wheat has limited leaf rust development in north central Kansas.

In the soft red winter wheat region, leaf rust severities ranged from 80% in some southern Illinois, Indiana and Michigan fields to traces in western New York, southern Michigan, Pennsylvania and southeastern Wisconsin fields (Fig. 1). Wheat yield losses due to rust in southern Illinois will be limited because Septoria nodorum killed much of the leaf tissue and scab has destroyed many of the heads. In northwestern Ohio, 60% severities were observed in a few susceptible fields where the rust overwintered, while in nearby fields only traces of stem rust were found. In the Pacific Northwest, leaf rust is increasing slowly because of the cooler than normal weather and the small amount of initial inoculum.

Wheat stripe rust - Stripe rust is increasing in fields and plots in the Pullman and Mount Vernon, Washington areas. Cultivars susceptible in the seedling stage are the bread wheat cultivar Stephens and the club wheats Moro and Tres. When the temperature increases, adult plant resistance is expressed in many of the Pacific Northwest wheats. Wheat stripe rust has been reported at Fort Collins, Colorado; this is the first stripe rust on wheat reported east of the Rockies this year.

Oat stem rust - Traces of oat stem rust were found in west central Kansas. Plots in southeast Nebraska had 10% severity with 20% incidence. Traces of stem rust occurred in east central Wisconsin, the northern limit of oat stem rust at this time. In a nursery in the Sacramento Valley of California, the cultivar Swan had 30% stem rust severity during the first week in June.

Oat crown rust - Crown rust was severe in southern Wisconsin oat fields during the second week in June. Severity decreases gradually to the west across Minnesota. Susceptible plots in south central Minnesota had 60% crown rust severity, while commercial fields had moderate severity. To the south and north of this area, crown rust is generally light or absent. An oat field in east central Nebraska had 10% severity of crown rust on 100% of the plants.

The severe outbreak of oat crown rust in southern Wisconsin and Minnesota this year appears to be related to the severe aecial infection observed earlier on buckthorn bushes (the alternate host). Buckthorns growing close to the oat fields can be an important source of inoculum for local epidemics.

Barley stem rust - Stem rust was virulent on all of the cultivars in spring barley plots at Salina, Kansas evaluated on June 12. Traces of stem rust were reported in spring barley plots in southern Minnesota and southeastern North Dakota during the second week in June. These plots were just starting to head, and Robust (possesses the T-gene) and Hypana (lacks the T-gene) had equal amounts of rust. More rust was present on Baart, a wheat, which is susceptible to Pgt-QCC and lacks the pre-heading resistance of barley. Prolific rye was rust-free indicating the absence of rye stem rust, which is virulent on most barleys. Thus, the rust on barley is likely P. graminis f. sp. tritici race Pgt-QCC. Traces of stem rust were found on Hordeum jubatum (wild barley) plants growing along the roadside from northwestern Iowa to east central Nebraska. Pustules were found on H. pusillum plants growing along fields in Saunders Co., Nebraska and Republic Co., Kansas. Both of these species are susceptible to Pgt-QCC. H. jubatum also is susceptible to other races of wheat stem rust and to rye stem rust.

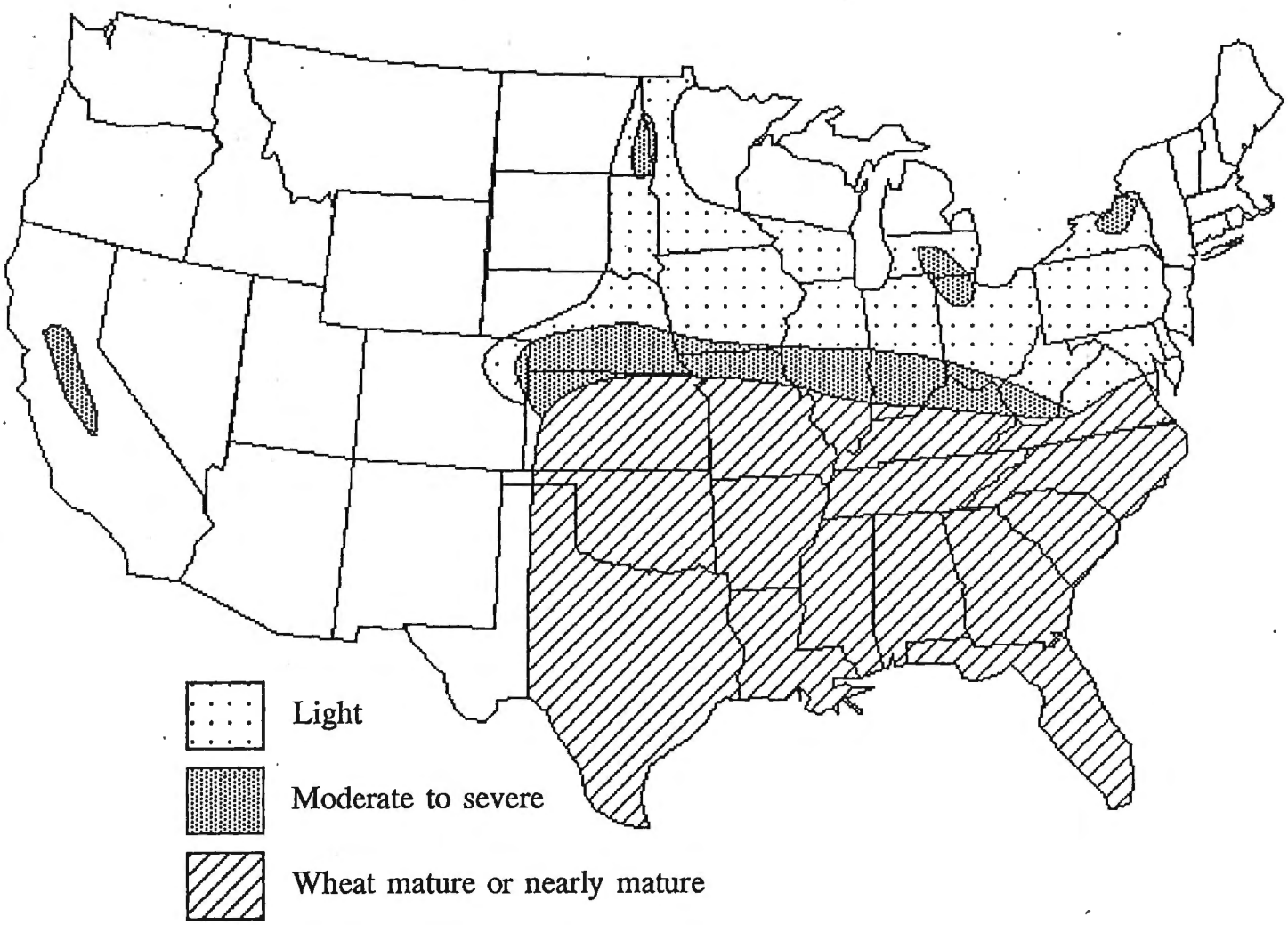
Barley leaf rust - Traces of leaf rust were found on barleys in southern Minnesota nurseries during early June. On June 6, a field of Excel barley in southeast North Dakota had a 40% leaf rust severity in a ten-foot wide strip along a row of trees, but 100 feet from the trees only traces of rust were found. The trees likely modified the environment, probably enhancing the initial infection period.

Rye stem rust - Stem rust was found on winter rye in a field in Crossville Co. in southeastern Illinois. Little rye stem rust has been found in the United States, continuing the trend of the past 10 years.

Rye leaf rust - Plots of winter rye in southern Minnesota had 5-40% leaf rust severities during the second week in June. The fungus generally overwinters on rye. Currently, leaf rust is just appearing in trace amounts on spring ryes.

Other grasses - Traces of stem rust were found on Aegilops cylindrica (goatgrass) in central Kansas on June 12. Uromyces hordeinus is common in Kansas on H. pusillum. This rust does not attack cultivated barleys and has Nothoscordum bivale (yellow false garlic) as its alternate host. An unknown leaf rust was collected from H. jubatum in Seward Co., Nebraska. Throughout most of the northern plains, this is the year to collect most any rust, as conditions for rust have been optimal.

Fig. 1. Wheat leaf rust severities (6/18/91)



CEREAL RUST BULLETIN

Report No. 7
July 2, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Tel.: 612/625-6299
Fax: 612/649-5054

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

The small grain harvest has begun in fields from western New York to southeastern South Dakota. In the northern Great Plains, most spring-sown small grains are in good condition and ahead of normal crop development.

Wheat stem rust - By the last week in June, wheat stem rust severities of trace-40% were found in plots of susceptible spring and winter wheat cultivars from east central North Dakota to southeast Minnesota. By the third week in June, the cultivars 2157 and Quantum 542 in plots in north central and northwestern Kansas had 20% stem rust severity. This is the second consecutive year of such widely distributed wheat stem rust. Stem rust appeared earlier than normal throughout this area in 1991 because the spring was warmer and wetter than normal and because inoculum to the south was more abundant than normal.

The stem rust races identified from the southern U.S. this year (Table 1) are avirulent on the recommended spring bread and durum wheats. Thus, losses should be light in commercial fields of these wheats, but rust will be severe in plots of susceptible cultivars.

Table 1. Wheat stem rust races identified through July 2, 1991.

State	Number of		Pgt-race			
	collections	isolates	HFL	TPM	QCC	QFC
AR	1	3		3		
GA	13	39		39		
KS	15	37		12	18	7
LA	5	15		12	3	
OK	13	37		1	25	11
TX	4	12	6		6	

Wheat leaf rust - By late June, leaf rust severities in the Great Plains ranged from 80% in winter wheat fields in south central South Dakota to traces in spring wheat fields in east central North Dakota. Durums in north central North Dakota had trace to 20% severities at heading stage. During the third week in June, wheat along the northern border of Nebraska had 60% leaf rust severity at the three-quarter berry crop stage. This level of rust will result in a significant yield loss (10-20%).

In the northern part of the soft red winter wheat region (Illinois to New York), early crop maturity limited leaf rust development. The warm weather dried the flag leaves except in a few locations, as in northwestern Indiana where plots with adequate moisture had 80% severity. Weather in the Northeast has been hot and dry for the past few weeks, so little rust is expected to develop there. In eastern Washington and northern Idaho, leaf rust is increasing rapidly, and the crop is 2-3 weeks behind normal development.

Table 2. Preliminary data of the 1991 wheat leaf rust virulence survey.

Prt code[1]	Virulence formula[2]	Number of isolates per state								
		AL	AR	FL	GA	IN	KS	LA	TX	VA
FBR-10,18	2c,3,3ka,10,11,18,30							1		
KBG-10	2a,2c,3,10,11		1						7	
MBB-10	1,3,10	1								
MBG	1,3,11					1		2		
MBG-10	1,3,10,11	9	6	2	2		5	5	1	1
MDB-10	1,3,10,24	1	2						21	
MFB-10	1,3,10,24,26		3					1	18	
MFG-10	1,3,10,11,24,26								1	
PBG-10	1,2c,3,10,11									
PLM-10,18	1,2c,3,3ka,9,10,18,30		3							
PLR-10,18	1,2c,3,3ka,9,10,11,18,30				2					
TBB-10	1,2a,2c,3,10						1		5	
TBG-10	1,2a,2c,3,10,11	1	4	1	1		2	1	7	
TBJ-10,18	1,2a,2c,3,10,11,17,18							1		
TCB	1,2a,2c,3,26								1	
TCG-10	1,2a,2c,3,10,11,26								2	
TDB-10	1,2a,2c,3,10,24						1			
TDD-10	1,2a,2c,3,10,17,24								1	
TFB-10	1,2a,2c,3,10,24,26		2						1	
TFG-10	1,2a,2c,3,10,11,24,26	1								
TLG-18	1,2a,2c,3,9,11,18									1
Number of isolates		13	21	3	5	1	9	11	65	2
Number of collections		8	15	2	3	1	5	7	40	2

[1] Prt code: See Phytopathology 79:525-529.

[2] Differentially resistant single-gene lines tested: Lr1,2a,2c,3,3ka,9,10,11,16,17,18,24,26,30.

Wheat stripe rust - Stripe rust is increasing in fields and plots in eastern Washington and northern Idaho where the weather has been cool and moist. Hot weather predicted for this week should ensure the expression of the adult plant resistance which is widely used. During the last week in June, traces of stripe rust were found in plots at Bozeman, Montana.

Oat stem rust - Traces of oat stem rust were found in a southeastern Minnesota plot, which is the northern limit of oat stem rust at this time. Yield losses to stem rust in the northern oat-growing area are expected to be light.

Oat crown rust - Severe crown rust (60% severity) has been observed in fields from central Wisconsin to west central Minnesota. The northward spread has been light to this date. As stated in previous bulletins, much of this severe outbreak of crown rust can be related to the severe aecial infection observed earlier on buckthorn bushes. Severe losses due to crown rust (20-40%) will occur in much of southern Minnesota and Wisconsin. Late fields in the northern areas of these states still could be severely damaged.

Barley stem rust - During the last week in June, traces of barley stem rust were found in each field surveyed in the Red River Valley. Hot spots with 30% severity occurred in a southeastern North Dakota field. Losses are possible in late planted fields in this area. In plots just at the heading stage in west central Minnesota, Robust (possessing the T-gene) and Hypana (lacking the T-gene) had equal amounts of rust. In these plots, more rust was present on Baart, a wheat, which is susceptible to Pgt-QCC and lacks the pre-heading resistance of barley. Prolific rye was rust-free, indicating the absence of rye stem rust, which is virulent on most barley cultivars. Thus, the rust on barley is likely P. graminis f. sp. tritici race Pgt-QCC. Wild barley (Hordeum jubatum) growing near rust-infected winter wheat plots in south central Nebraska had 40% stem rust severity, while nearby susceptible winter wheats had 10%. Collections from these barleys were made and race identification is in progress at the Cereal Rust Lab. Pgt-QCC was common on wheat in Oklahoma and Kansas (Table 1). Pgt-QFC, also found on wheat in Oklahoma and Kansas, is avirulent on barley with T-gene resistance. The isolates from barley and Hordeum jubatum from Kansas, Nebraska, Minnesota, and North Dakota are avirulent on McNair 701, indicating that the races are most likely Pgt-QCC.

Barley leaf rust - During the last week in June, light infections of barley leaf rust were found in plots from east central South Dakota to northwestern Minnesota. Barley leaf rust has increased more slowly than normal in South Dakota and Minnesota following the early disease onset. Barley plots in south central Nebraska had 90% leaf rust severity at heading stage during the first week in June.

Rye stem rust - The only report of rye stem rust this year was in a rye field in Crossville Co. in southeastern Illinois. Two collections of stem rust on Agropyron repens near barberry bushes in southeastern Minnesota were received.

Rye leaf rust - Leaf rust severities of 5% were observed on rye in plots in east central Minnesota during the last week in June.

CEREAL RUST BULLETIN

Report No. 8
July 16, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

Tel.: 612-625-6299
Fax: 612-649-5054

The winter wheat harvest has begun in scattered fields from east central South Dakota to western New York. Most of the spring-sown small grains in the upper midwest are in good condition and crop development is near normal.

Wheat stem rust - Stem rust at 2% severity was found in winter wheat fields in north central South Dakota at the mid-dough growth stage during the second week of July; traces were found in North Dakota. Since most of the winter wheat in these areas is near maturity, losses will be light. Foci of 30% severity were observed in winter wheat plots in northwestern North Dakota and northeastern Montana during the second week in July. Foci of 40% severity were found in plots of susceptible winter wheat cultivars in southeastern North Dakota, while 150 miles to the north only traces of rust were found. Traces of stem rust have been found also on winter wheats in Washington.

By the second week in July, wheat stem rust severities in plots of susceptible spring wheat cultivars at early berry growth stage ranged from 20% in west central Minnesota to traces in South Dakota, North Dakota and Montana. In the same area, no stem rust was found in spring wheat fields. The commonly grown spring and durum wheats are resistant to stem rust, so no significant losses are expected. In Washington, stem rust could still develop on spring wheat which is maturing very late this year.

Table 1. Wheat stem rust races identified through July 2, 1991.

State	Number of		Pgt-race			
	collections	isolates	HFL	TPM	QCG	QFC
AR	1	3		3		
GA	15	45		45		
KS	25	64		11	37	16
LA	5	15		12	3	
OK	23	69			53	16
TX	7	21	6		13	2

Wheat leaf rust - By the second week in July, leaf rust severities in winter wheat fields ranged from 90% in northeastern North Dakota to 20% in northeastern Montana. Plots of susceptible winter wheat had slightly less leaf rust; severities at mid-dough stage ranged from 70% in northeastern North Dakota to 10% in northwestern North Dakota. This level of rust will result in yield loss of 2 to 5% in some of the most severely infected fields. All of the major cultivars grown in this area are susceptible to leaf rust.

Only traces of leaf rust were reported in spring wheat fields over most of the area from north central South Dakota to west central Minnesota. However, 20% severities were reported in a few fields in this area. For example, the cultivar Marshall in a field in north central South Dakota and in a nursery in east central South Dakota had 20% severity at the early milk growth stage. Higher than normal leaf rust severities (up to 60%) were observed on fields of Marshall in the Red River Valley. This greater than normal leaf rust severity on Marshall may indicate the development of a new virulent race. Plots of susceptible spring wheat from west central Minnesota to northwestern North Dakota had 40% leaf rust severities at the early dough stage. Since most of the spring wheat cultivars in the Great Plains are resistant to leaf rust, losses will be light.

The spring wheats in the Palouse area of the Pacific Northwest had light amounts of leaf rust during the second week in July.

Plots of spring durums in northeastern South Dakota had 20% severities on susceptible cultivars while only 1% severities were reported in northwestern North Dakota plots. In the same locations, 20% severities were reported on two triticale cultivars. Since most of the commercial durums and triticales are resistant to leaf rust, losses will be nil.

Wheat stripe rust - On late maturing cultivars in the Walla Walla area of Washington, stripe rust losses will be light because of the late onset of the rust, and because the most widely grown cultivar Stephens is resistant. In the Mount Vernon area, losses of 10% are possible on the late developing cultivars; stripe rust is generally severe in this area.

Oat crown rust - Severe crown rust occurred in northeastern South Dakota and east central North Dakota fields. However, in central South Dakota, the crown rust severities are light. In areas where rust is severe on commercial oats, it is also severe on the wild species (Avena fatua). However, in North Dakota and northern Minnesota, crown rust prevalences and severities are much higher on wild oats than commercial oats. Severe crown rust that developed in southern Wisconsin did not spread into northern Wisconsin in more than light amounts. Oats in central Iowa this year were severely rusted with inoculum that arrived from other areas, possibly southeastern Minnesota or southwestern Wisconsin.

Barley stem rust - During the second week in July, barley stem rust severities ranged from 0.1 to 20% in fields and nurseries surveyed from western Minnesota to northeastern Montana. The most severe rust and currently the only area where significant damage has occurred is in the Cass, Richland and Traill counties of southeastern North Dakota and Clay and Polk counties of Minnesota. A few late fields in northeastern North Dakota potentially could be damaged. Overall losses are light, but a few growers will have 10% loss in yield. Losses in grain plumpness, the important measure for malting quality (and thus prices), occur at much lower rust severities and is more widespread.

Severities ranged from 0.1 to 40% on wild barley (Hordeum jubatum) growing along roadsides from west central Minnesota to central North Dakota. This grass is susceptible to wheat and rye stem rust and serves as a host for race Pgt-QCC which is virulent on all commercial barley cultivars.

Barley leaf rust - Although leaf rust started very early, disease development has been slow, probably for a number of reasons. Heavy infections of Helminthosporium and powdery mildew will destroy the leaves before leaf rust becomes severe in late planted fields. Currently only traces of leaf rust exist, and this is primarily in eastern North Dakota.

Rye stem rust - In mid-July, rye stem rust severities ranged from 0.1 to 5% in plots of the susceptible cultivar Prolific in east central and northwestern Minnesota. Traces of rye stem rust were found in winter rye fields in south central Wisconsin during mid-June.

Rye leaf rust - Leaf rust severities ranged from 5 to 20% in winter rye plots in northeast South Dakota and northeast North Dakota during the second week in July. A 40% leaf rust severity was observed in a plot of the susceptible cultivar Prolific in west central Minnesota on June 8.

Other diseases - The hot humid weather that existed during part of the summer has resulted in unusually high levels of many diseases. Scab is very severe in west central Minnesota and southeastern South Dakota. Tan spot severities of 30% are common across North Dakota on both spring bread and durum wheats. Bacterial leaf spots are moderate to severe in the southern Red River Valley of Minnesota and North Dakota. Septoria nodorum is moderately severe throughout southern Minnesota.

CEREAL RUST BULLETIN

Report No. 9
August 6, 1991

From:
CEREAL RUST LABORATORY
U. S. DEPARTMENT OF AGRICULTURE
UNIVERSITY OF MINNESOTA, ST. PAUL 55108

Issued By:
AGRICULTURAL RESEARCH SERVICE
U. S. DEPARTMENT OF AGRICULTURE
(In cooperation with the Minnesota Agricultural Experiment Station)

Tel.: 612/625-6299
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The small grain harvest has progressed into all areas of the northern United States. Much of the winter wheat, spring oats and barley has been harvested and the spring wheat harvest is in full swing.

Wheat stem rust - During 1991, stem rust overwintering sites were found on susceptible cultivars in southern Louisiana and southwestern Georgia. By late April, stem rust was severe in these plots, but none was found in susceptible plots in northern Texas. By mid-May, stem rust was found at 20% severities in fields in southwestern Oklahoma and north central Texas and at trace amounts in demonstration plots in southern Kansas and northwestern Arkansas. In late May, plots of 2157 (susceptible to both Pgt-TPM and QCC) were lightly rusted (10-15% incidence) across the northern tier of Kansas counties. Stem rust was more widely spread than last year in the central Great Plains where it developed from a point source in south central Kansas. Although severities in the central Great Plains were slightly less than last year; conditions were favorable for rust infection in May and the inoculum which was carried northward was deposited over the spring grain area during late May.

By early June, stem rust was present across Kansas and Colorado to the Rockies. Most cultivars in plots in Kansas were lightly rusted (less than 1% severity). The exception was 2157 which had 50% severity in a north central Kansas location. By the third week in June, the cultivars 2157 and Quantum 542 in north central and northwestern Kansas plots had 20% stem rust severities. This is the second consecutive year that stem rust has been so widely distributed in Kansas. Stem rust appeared earlier than normal throughout this area in 1991 because the spring was warmer and wetter than normal and because inoculum (race Pgt-QCC) to the south (Table 1) was more abundant than normal.

During the first week in June, several centers of stem rust (20% severities) were found in southern Illinois fields. Traces of stem rust were found in northwestern Illinois, south central Wisconsin fields and west central Indiana plots.

The first detection of stem rust was 1-2 weeks earlier than normal in most of the northern Great Plains locations. During this time the rains and warm (60-65 F) nights were favorable for spore deposition, infection and increase in the northern area. By the last week in June, wheat stem rust was found at severities of trace-40% in plots of susceptible spring and winter wheat cultivars from east central North Dakota to southeast Minnesota. By the second week in July, foci of 30% severity were observed in winter wheat plots in northwestern North Dakota and northeastern Montana. Foci of 40% severity were found in plots of susceptible winter wheat cultivars in southeastern North Dakota, while in northeastern North Dakota only traces of rust were found. Since most of the winter wheat in these areas was near maturity, losses were light. By the last week in July, stem rust was as high as 60% severity on susceptible spring wheat cultivars in northeastern North Dakota plots, but no stem rust was found in spring wheat fields in northern North Dakota. The commonly grown spring and durum wheats are resistant to stem rust, so no significant losses are expected this year.

Wheat stem rust developed slowly in the Pacific Northwest and was light on susceptible winter and spring wheats by late July.

As shown in Table 1, four Pgt races have been identified from 196 collections from wheat in the U.S.A. this year. Race Pgt-QCC was the predominant race identified so far this year (56%), compared to 67% of the isolates in 1990. Pgt-TPM, the common race from 1974-1989, comprised 26% of the isolates identified so far this year and 13% in 1990.

Wheat leaf rust - In 1991 by early April leaf rust was severe on the most susceptible lines in southern and northern Texas plots, but light on commercial cultivars in fields. Early spring rains created conditions favorable for rust increase throughout Texas and Oklahoma. In southwestern Oklahoma, where the rust overwintered, 60% severities were reported in late April, while in adjacent fields only traces were present. By mid-May, leaf rust severities ranged from traces in northeastern Kansas to severe in southwestern Oklahoma. Leaf rust did not increase as rapidly as normal, primarily because of dry weather and the hotter than normal temperatures. However, in late May, leaf rust increased rapidly in Kansas production fields with traces found into east central Nebraska. The estimate from Kansas is for 7% loss to leaf rust in wheat.

By mid-June, leaf rust severities in the Great Plains ranged from traces in spring wheat plots in southeastern North Dakota to severe (80%) in northeastern Colorado. By late June, leaf rust severities in the Great Plains ranged from 80% in winter wheat fields in south central South Dakota and northern Nebraska to traces in spring wheat fields in east central North Dakota. By the second week in July, leaf rust severities in winter wheat fields ranged from 90% in northeastern North Dakota to 20% in northeastern Montana. Plots of susceptible winter wheat had slightly less leaf rust; severities at mid-dough stage ranged from 70% in northeastern North Dakota to 10% in northwestern North Dakota. This level of rust resulted in yield loss of 2 to 5% in some fields. All of the major winter wheat cultivars grown in this area are susceptible to leaf rust. Only traces of leaf rust were reported in spring wheat fields over most of the area from north central South Dakota to west central Minnesota, although 20% severities were reported in a few fields. Fields in north central South Dakota and nurseries of the cultivar Marshall in east central South Dakota and northwestern North Dakota had 20% severities. Plots of susceptible spring wheat from west central Minnesota to northwestern North Dakota had 40% leaf rust severities at the early dough stage. Since most of the spring wheat cultivars in the Great Plains are resistant to leaf rust, losses were light.

By the second week in July, plots of spring durums in northeastern South Dakota had 20% severities on susceptible cultivars while only 1% severities were reported in northwestern North Dakota plots. Plots of triticale cultivars in the same locations had 20% severities. Since most of the commercial durums are resistant to leaf rust, losses were nil.

In the soft red winter wheat area, 80% leaf rust severities were common during early April in wheat fields and plots within 75 miles of the Gulf Coast from Louisiana to Georgia. Some of the most severe rust was in fields of Fla 302 and CK 9766 in southern Georgia where losses occurred. In the eastern U.S.A., leaf rust overwintered at sites in central North Carolina and eastern Virginia. In the northern soft red winter area, light amounts of leaf rust were found by early May on susceptible cultivars in plots in east central Illinois, west central Indiana and south central Pennsylvania. By early June, leaf rust severities ranged from 80% in some fields of susceptible cultivars in southern Illinois and Indiana to traces in fields in western New York, southern Michigan, and southeastern Wisconsin. Wheat yield losses due to leaf rust were limited from southern Missouri to southern Ohio because Septoria nodorum killed much of the leaf tissue and scab destroyed many of the heads. In the northern part of the soft red winter wheat region (Wisconsin to New York), early crop maturity limited leaf rust development.

In the Pacific Northwest, leaf rust was lighter than normal by mid-June because of abnormally cool weather and the small amount of initial inoculum, which was attributed to the severe winterkill of wheat. When the temperatures in this area warmed in July, leaf rust increased rapidly, but losses were minimal because of the advanced crop maturity.

Preliminary data on frequency of leaf rust races indicate that races MDB and MFB were most common in Texas. Both are virulent on cultivars with Lr24 as well as Lr1, 3 and 10; MFB is also virulent on Lr26. Races MBG and MBG-10 predominated in Alabama, Georgia, Virginia, Louisiana, Arkansas, and Kansas. Race MBG-10 is virulent on cultivars with Lr1, 3, 10, and 11.

Wheat stripe rust - By mid-April, stripe rust was found in the Sacramento Valley of California and southeastern and northwestern Washington. By mid-June, stripe rust increased slowly and then the adult plant resistance was expressed when the temperature increased. Losses to stripe rust were light in the Pacific Northwest this year. The only other reports of stripe rust this year were in northeastern Colorado and southwestern Montana plots, where rust was light.

Oat stem rust - Overwintering sites of oat stem rust were found in southern Georgia and southern Louisiana nurseries. In early April, traces of oat stem rust were found in south Texas fields and on wild oats in the same area. By late April, oat stem rust was severe in southern Georgia and Louisiana and light in central Louisiana plots. By late May, the northern limits of oat stem rust were in southeastern Kansas plots. During the first week in June, traces of oat stem rust were found in west central Kansas, southeastern Nebraska and east central Wisconsin. During the second week in July, severe oat stem rust was found in a northeastern South Dakota field and traces were found in west central Minnesota and north central South Dakota plots. In late July, light (1-3%) severities were observed on oats in plots and fields in northeastern North Dakota and northwestern Minnesota. In wild oats (Avena fatua) in this area, the oat stem rust severities were less than normal. Losses to oat stem rust in 1991 in the northern oat-growing area were less than in the previous two years. Race NA-27, virulent on Pg-1,-2,-3,-4 and -8, remains the predominant race of the population.

Oat crown rust - Crown rust was widespread and increasing on susceptible cultivars throughout the southeastern U.S.A. from the Florida Panhandle to southern Louisiana during the first week in April. By the third week in April, in southern Texas oat fields, rust was light to moderate, while in central Texas much of the oat foliage and thereby the rust was destroyed by cold weather during the winter. In the southern areas of Louisiana, Mississippi and Georgia crown rust killed susceptible cultivars by early May. Crown rust was severe on plots of oats from northern Mississippi through northern Georgia during late May. Traces of crown rust were present in oat fields in southeastern Kansas and wild oats in southwestern Oklahoma in late May. In early June, traces of crown rust were found in central Pennsylvania fields.

During mid-May, heavy aecial development was observed on buckthorns (alternate host) growing in southern Wisconsin and southeastern Minnesota, an area from which oat crown rust spread in 1990. Buckthorns growing close to the oat fields can be an important source of inoculum for local epidemics. Crown rust was found in south central Wisconsin fields during mid-May which is two weeks earlier than normal. In southeastern Minnesota, crown rust severities up to 5% were observed in mid-May. Crown rust was severe in southern Wisconsin and southeastern Minnesota oat fields by the second week in June. The severe outbreak of oat crown rust in southern Wisconsin and southern Minnesota this year (20-30% losses) appeared to be related to the severe aecial infection observed earlier on buckthorn bushes. Oats in northeastern Iowa this year were severely rusted with inoculum that arrived from other areas, possibly southeastern Minnesota or southwestern Wisconsin. Severe crown rust occurred in northeastern South Dakota and southeastern North Dakota fields during early July. However, in central South Dakota, crown rust

severities were light. In areas where rust was severe on commercial oats, it was also severe on the wild species (Avena fatua). However, in North Dakota and northern Minnesota, crown rust prevalences and severities were much higher on wild oats than commercial oats. Severe crown rust that developed in southern Wisconsin spread into northern Wisconsin in only light amounts.

Barley stem rust -The first report of barley stem rust this year was in southern Texas plots at Uvalde during the third week in April. The wheat stem rust race Pgt-QCC was identified from southern Texas collections. Pgt-QCC was the race that caused losses in the spring-sown barleys in the northern Great Plains in 1990. During early May, barley stem rust was common in an eastern Virginia nursery and at maturity the susceptible cultivars in this nursery were severely rusted. By late May, traces of barley stem rust were found in fields in central Kansas. Traces of stem rust were reported in spring barley plots in southern Minnesota and southeastern North Dakota during the second week in June. These plots were just starting to head, and Robust (possesses the T-gene) and Hypana (lacks the T-gene) had equal amounts of rust. More rust was present on Baart, a wheat that is susceptible to Pgt-QCC and lacks the pre-heading resistance of barley. Prolific rye was rust-free, indicating the absence of rye stem rust, which is virulent on most barleys. Thus, the rust on barley was likely race Pgt-QCC which was later positively identified.

During the last week in June, traces of barley stem rust were found in each field surveyed in the Red River Valley. By the second week in July, barley stem rust severities ranged from 0.1 to 20% in fields and nurseries surveyed from western Minnesota to northeastern Montana. The most severe rust and the only area where significant damage occurred was in east central North Dakota and adjacent Minnesota. Overall losses were light, but a few growers had a 10% loss in yield. Reduction in grain plumpness, the important measure for malting quality (and thus price), occurs at much lower rust severities than those that significantly affect yields.

Traces of stem rust were found on Hordeum jubatum (wild barley) plants growing along the roadside from northwestern Iowa to east central Nebraska in early June. Pustules were found on H. pusillum plants growing along fields in southeastern Nebraska and northeastern Kansas. Both of these species are susceptible to Pgt-QCC. By late July, severities ranged from 0.1 to 40% on wild barley growing along roadsides from west central Minnesota to north central North Dakota.

Race Pgt-QCC comprised 91% of the isolates identified so far from barley from Texas, Kansas, Minnesota, South Dakota, and North Dakota.

Barley leaf rust - In 1991, barley leaf rust overwintered in central North Carolina, southwestern Virginia and central California nurseries. In North Carolina and Virginia, 100% barley leaf rust severities were observed by early June, and losses in susceptible cultivars were significant. The first barley leaf rust reports in the Great Plains were in early June in plots in central Kansas and southern Minnesota and in a field in southeast North Dakota. During the last week in June, light infections of barley leaf rust were found in plots from east central South Dakota to northwestern Minnesota. Although leaf rust started very early, disease development was slow, probably for a number of reasons. Heavy infections of Helminthosporium and powdery mildew that destroyed the leaves before leaf rust became severe.

Barley stripe rust - Stripe rust was reported in the U.S.A. for the first time during the third week in April in barley plots in southern Texas at Uvalde. This was the only report of stripe rust on barley in the U.S.A in 1991. Collections from Uvalde were virulent on Morex barley, but not on Lemhi or Morocco wheat. This is evidence that the stripe rust is not wheat stripe rust, but is a specialized form of barley stripe rust, which previously had never been reported in the United States.

Rye stem rust - The first report of rye stem rust in 1991 was in fields in south central Wisconsin in early June. By late July, rye stem rust severities ranged from traces to 20% on spring rye in plots in northern North Dakota. The stem rust on rye almost certainly was rye stem rust (Puccinia graminis f. sp. secalis) because all known commercial cultivars of rye are resistant to wheat stem rust (P. graminis f. sp. tritici).

Rye leaf rust - The first report of rye leaf rust in 1991 was in a field and nursery in southern Texas in early April. Light amounts of rye leaf rust were found in southern Georgia plots during late April. By mid-May, leaf rust was severe in west central Oklahoma and light in southeastern Minnesota and south central Wisconsin fields. Leaf rust in the northern areas were three weeks earlier than normal, which may indicate that the rust overwintered in this area. By mid-June, rye leaf rust was just starting to appear on spring ryes. During the second week in July, leaf rust severities ranged from 5 to 40% west central Minnesota to northeastern North Dakota. Rye leaf rust was widely distributed this year throughout the U.S.A. and some losses occurred in fields where it overwintered.

Barberry rust - In 1991, aecial collections were made from barberry in southeastern Minnesota and south central Wisconsin. Rye stem rust (P. graminis f. sp. secalis) was identified from aecial collections made in these two states.

Other rust hosts - Leaf rust (P. recondita) severities on goatgrass (Aegilops cylindrica) growing alongside wheat fields and in roadside ditches throughout southern and central Oklahoma ranged from traces to 100% on flag leaves in mid-May. Overall, severities were somewhat less than in recent years. Stem rust collections were made from Agropyron repens growing near barberry bushes in southeastern Minnesota in mid-June. Traces of stem rust identified as Pgt-QCC were found on A. cylindrica in central Kansas in early June. Uromyces hordeinus was common in Kansas on Hordeum pusillum. This rust does not attack cultivated barley and has Nothoscordum bivale (yellow false garlic) as its alternate host.

Special Notice: We would like to thank everyone for mailing rust collections to us this year. We can no longer provide postage-paid envelopes and we do appreciate cooperators using the necessary postage. If you no longer wish to receive the Cereal Rust Bulletin or have an address change, please call or write us.

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Table 1: Wheat stem rust races identified through August 6, 1991.

State	Number of collections	Number of isolates	Pgt- race HFL	Pgt- race TPM	Pgt- race QCC	Pgt- race QFC
AR	1	3		3		
CO	3	9		4	4	1
GA	15	45		45		
IA	1	1			1	
IL	4	11		8		3
IN	2	6		6		
KS	65	171		34	94	43
LA	6	18		15	3	
MN	23	59		5	46	8
ND	13	37		3	30	4
NE	15	45		15	25	5
OK	23	69			53	16
SD	9	26		5	15	6
TX	16	48	6		35	7
Total	196	548	6	143	306	93

Table 2. Wheat leaf rust races identified through August 6, 1991.

Virulence Prt code[1]	formula[2]	Number of isolates per state									
		AL	AR	FL	GA	IN	KS	LA	OK	TX	VA
CBD	3,17								1		
CBG	3,11	4									
FBC	2c,3,30								1		
FBR-10,18	2c,3,3ka,10,11,18,30							1			
KBG-10	2a,2c,3,10,11		1							8	
MBB	1,3	2									
MBB-10	1,3,10	2									
MBG	1,3,11	20				1		2			
MBG-10	1,3,10,11	37	7	2	4		5	7	1	1	3
MDB-10	1,3,10,24	1	2				1		1	23	
MFB-10	1,3,10,24,26		3				1	2	2	23	
MFG-10	1,3,10,11,24,26									1	
PBG-10	1,2c,3,10,11										
PLM-10,18	1,2c,3,3ka,9,10,18,30		3								
PLR-10,18	1,2c,3,3ka,9,10,11,18,30	1			2						
TBB-10	1,2a,2c,3,10						1			5	
TBG-10	1,2a,2c,3,10,11	5	4	1	1		3	1	2	11	
TBJ-10,18	1,2a,2c,3,10,11,17,18	1						1			
TCB	1,2a,2c,3,26									1	
TCG-10	1,2a,2c,3,10,11,26									2	
TDB-10	1,2a,2c,3,10,24						2			2	
TDD-10	1,2a,2c,3,10,17,24									1	
TFB-10	1,2a,2c,3,10,24,26		2							1	
TFG-10	1,2a,2c,3,10,11,24,26	1									
TLG-18	1,2a,2c,3,9,11,18				1						1
Number of isolates		74	22	3	8	1	13	14	8	79	4
Number of collections		48	16	2	5	1	8	11	6	50	4

[1] Prt code: See Phytopathology 79:525-529.

[2] Differentially resistant single-gene lines tested:
Lr1,2a,2c,3,3ka,9,10,11,16,17,18,24,26,30.