

Table 1. Number and frequency (%) of virulence phenotypes of *Puccinia triticina* in the United States in 2012 identified by virulence to 19^a lines of wheat with single genes for leaf rust resistance.

Phenotype	Virulences	Area 1 ^b		Area 2 ^c		Area 3 ^d		Area 4 ^e		Area 5 ^f		Area 6 ^g		Area 8 ^h		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
FCPSB	2c,3,26,3ka,17,30,B,10,14a	0	0	0	0	1	1.4	0	0	0	0	0	0	0	0	1	0.2
LCDNB	1,26,17,B,14a	0	0	2	12.5	0	0	0	0	0	0	0	0	0	0	2	0.4
MBBJG	1,3,10,14a,28	0	0	0	0	0	0	0	0	0	0	0	0	7	21.9	7	1.4
MBBSG	1,3,B,10,14a,28	0	0	0	0	0	0	0	0	0	0	0	0	1	3.1	1	0.2
MBDRG	1,3,17,B,10,18,28	0	0	0	0	0	0	0	0	0	0	0	0	1	3.1	1	0.2
MBDSB	1,3,17,B,10,14a	0	0	0	0	1	1.4	0	0	1	1.1	1	1.5	3	9.4	6	1.2
MBDSD	1,3,17,B,10,14a,41	0	0	0	0	1	1.4	7	6.2	10	10.5	6	8.8	0	0	24	4.8
MBGJG	1,3,11,10,14a,28	0	0	0	0	0	0	0	0	0	0	0	0	1	3.1	1	0.2
MBNSB	1,3,3ka,17,B,10,14a	0	0	0	0	0	0	0	0	0	0	0	0	1	3.1	1	0.2
MBPSB	1,3,3ka,17,30,B,10,14a	0	0	0	0	1	1.4	0	0	1	1.1	4	5.9	0	0	6	1.2
MBTNB	1,3,3ka,11,17,30,B,14a	19	18.4	1	6.3	25	33.8	1	0.9	3	3.2	0	0	0	0	49	9.8
MCBJG	1,3,26,10,14a,28	0	0	0	0	0	0	0	0	0	0	0	0	3	9.4	3	0.6
MCBSG	1,3,26,B,10,14a,28	0	0	0	0	0	0	0	0	0	0	0	0	1	3.1	1	0.2
MCDSB	1,3,26,17,B,10,14a	0	0	0	0	1	1.4	3	2.7	0	0	0	0	3	9.4	7	1.4
MCDSB	1,3,26,17,B,10,14a,41	0	0	0	0	0	0	2	1.8	0	0	0	0	0	0	2	0.4
MCGJG	1,3,26,11,10,14a,28	0	0	2	12.5	1	1.4	0	0	0	0	0	0	1	3.1	4	0.8
MCNSB	1,3,26,3ka,17,B,10,14a	0	0	0	0	0	0	1	0.9	0	0	0	0	1	3.1	2	0.4
MCQHG	1,3,26,3ka,11,10,18,28	0	0	1	6.3	0	0	0	0	0	0	0	0	0	0	1	0.2
MCRJG	1,3,26,3ka,11,30,10,14a,28	2	1.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.4
MCTNB	1,3,26,3ka,11,17,30,B,14a	14	13.6	2	12.5	4	5.4	0	0	3	3.2	1	1.5	0	0	24	4.8
MCTNG	1,3,26,3ka,11,17,30,B,14a,28	0	0	0	0	0	0	0	0	0	0	1	1.5	0	0	1	0.2
MCTQB	1,3,26,3ka,11,17,30,B,10	3	2.9	0	0	0	0	0	0	0	0	0	0	0	0	3	0.6
MCTSB	1,3,26,3ka,11,17,30,B,10,14a	2	1.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.4
MDDSB	1,3,24,17,B,10,14a	0	0	0	0	0	0	3	2.7	1	1.1	0	0	0	0	4	0.8
MDNSB	1,3,24,3ka,17,B,10,14a	0	0	0	0	0	0	2	1.8	0	0	0	0	0	0	2	0.4
MDPSB	1,3,24,3ka,17,30,B,10,14a	0	0	0	0	1	1.4	0	0	2	2.1	1	1.5	0	0	4	0.8
MFBSB	1,3,24,26,B,10,14a	0	0	0	0	1	1.4	1	0.9	0	0	0	0	0	0	2	0.4
MFDSB	1,3,24,26,17,B,10,14a	0	0	0	0	1	1.4	5	4.4	1	1.1	0	0	0	0	7	1.4
MFGJG	1,3,24,26,11,10,14a,28	3	2.9	0	0	0	0	0	0	0	0	0	0	0	0	3	0.6
MFNSB	1,3,24,26,3ka,17,B,10,14a	2	1.9	0	0	2	2.7	5	4.4	1	1.1	0	0	1	3.1	11	2.2
MFPSB	1,3,24,26,3ka,17,30,B,10,14a	2	1.9	0	0	2	2.7	3	2.7	6	6.3	3	4.4	0	0	16	3.2
MHTSB	1,3,16,26,3ka,11,17,30,B,10,14a	0	0	0	0	2	2.7	0	0	0	0	0	0	0	0	2	0.4
MKDSB	1,3,16,24,26,17,B,10,14a	0	0	0	0	0	0	2	1.8	0	0	0	0	0	0	2	0.4
MLDSD	1,3,9,17,B,10,14a,41	1	1	0	0	2	2.7	12	10.6	3	3.2	2	2.9	0	0	20	4
MLTSD	1,3,9,3ka,11,17,30,B,10,14a,41	0	0	0	0	0	0	1	0.9	0	0	0	0	0	0	1	0.2
MMNSD	1,3,9,26,3ka,17,B,10,14a,41	0	0	0	0	0	0	0	0	1	1.1	0	0	0	0	1	0.2
MMPSD	1,3,9,26,3ka,17,30,B,10,14a,41	0	0	0	0	0	0	2	1.8	3	3.2	1	1.5	0	0	6	1.2
MRTSD	1,3,9,16,26,3ka,11,17,30,B,10,14a,41	0	0	1	6.3	0	0	0	0	0	0	0	0	0	0	1	0.2
NBBRG	1,2c,B,10,18,28	0	0	2	12.5	0	0	0	0	0	0	0	0	7	21.9	9	1.8
PBDGG	1,2c,3,17,10,28	0	0	0	0	0	0	0	0	1	1.1	0	0	0	0	1	0.2
PBDQG	1,2c,3,17,B,10,28	0	0	0	0	0	0	1	0.9	1	1.1	0	0	0	0	2	0.4
PCLGG	1,2c,3,26,3ka,10,28	0	0	1	6.3	0	0	0	0	0	0	0	0	0	0	1	0.2
PCRKG	1,2c,3,26,3ka,11,30,10,14a,18,28	0	0	1	6.3	0	0	0	0	0	0	0	0	0	0	1	0.2
TBBDG	1,2a,2c,3,14a,28	0	0	0	0	0	0	0	0	1	1.1	0	0	0	0	1	0.2
TBBG	1,2a,2c,3,10,21,28,41,42	0	0	0	0	0	0	1	0.9	0	0	0	0	0	0	1	0.2
TBBGJ	1,2a,2c,3,10,28,41	0	0	1	6.3	0	0	18	15.9	15	15.8	8	11.8	0	0	42	8.4

TBBGS	1,2a,2c,3,10,21,28,41	0	0	0	0	0	0	0	0	0	0	3	4.4	0	0	3	0.6
TBBJG	1,2a,2c,3,10,14a,28	0	0	0	0	1	1.4	0	0	0	0	0	0	0	0	1	0.2
TBBJJ	1,2a,2c,3,10,14a,28,41	0	0	0	0	0	0	0	0	0	0	2	2.9	0	0	2	0.4
TBBQJ	1,2a,2c,3,B,10,28,41	0	0	0	0	0	0	1	0.9	1	1.1	0	0	0	0	2	0.4
TBJSB	1,2a,2c,3,11,17,B,10,14a	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
TBRFG	1,2a,2c,3,3ka,11,30,14a,18,28	1	1	0	0	1	1.4	0	0	0	0	0	0	0	0	2	0.4
TBRKG	1,2a,2c,3,3ka,11,30,10,14a,18,28	11	10.7	0	0	12	16.2	1	0.9	6	6.3	0	0	1	3.1	31	6.2
TCGJG	1,2a,2c,3,26,11,10,14a,28	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
TCRDG	1,2a,2c,3,26,3ka,11,30,14a,28	0	0	0	0	1	1.4	0	0	0	0	0	0	0	0	1	0.2
TCRFG	1,2a,2c,3,26,3ka,11,30,14a,18,28	2	1.9	0	0	2	2.7	0	0	1	1.1	0	0	0	0	5	1
TCRKG	1,2a,2c,3,26,3ka,11,30,10,14a,18,28	33	32	2	12.5	9	12.2	1	0.9	5	5.3	1	1.5	0	0	51	10.2
TCTDB	1,2a,2c,3,26,3ka,11,17,30,14a	2	1.9	0	0	0	0	0	0	0	0	0	0	0	0	2	0.4
TCTNG	1,2a,2c,3,26,3ka,11,17,30,B,14a,28	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
TDBGJ	1,2a,2c,3,24,10,28,41	0	0	0	0	0	0	1	0.9	0	0	0	0	0	0	1	0.2
TDBGQ	1,2a,2c,3,24,10,21,28	0	0	0	0	0	0	0	0	0	0	10	14.7	0	0	10	2
TDBJG	1,2a,2c,3,24,10,14a,28	0	0	0	0	0	0	0	0	3	3.2	5	7.4	0	0	8	1.6
TDBJQ	1,2a,2c,3,24,10,14a,21,28	0	0	0	0	0	0	0	0	0	0	1	1.5	0	0	1	0.2
TDGJG	1,2a,2c,3,24,11,10,14a,28	2	1.9	0	0	0	0	1	0.9	0	0	0	0	0	0	3	0.6
TDPSB	1,2a,2c,3,24,3ka,17,30,B,10,14a	0	0	0	0	0	0	0	0	1	1.1	0	0	0	0	1	0.2
TFGJG	1,2a,2c,3,24,26,11,10,14a,28	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2
TFGJQ	1,2a,2c,3,24,26,11,10,14a,21,28	0	0	0	0	0	0	0	0	0	0	1	1.5	0	0	1	0.2
TFPSB	1,2a,2c,3,24,26,3ka,17,30,B,10,14a	0	0	0	0	0	0	1	0.9	0	0	1	1.5	0	0	2	0.4
TGBGS	1,2a,2c,3,16,10,21,28,41	0	0	0	0	0	0	0	0	0	0	1	1.5	0	0	1	0.2
TNBJG	1,2a,2c,3,9,24,10,28,41	0	0	0	0	1	1.4	26	23	21	22.1	7	10.3	0	0	55	11
TNBJJ	1,2a,2c,3,9,24,10,14a,28,41	0	0	0	0	0	0	5	4.4	0	0	3	4.4	0	0	8	1.6
TNRJJ	1,2a,2c,3,9,24,3ka,11,30,10,14a,28,41	0	0	0	0	1	1.4	0	0	1	1.1	4	5.9	0	0	6	1.2
TPBGD	1,2a,2c,3,9,24,26,10,41	0	0	0	0	0	0	1	0.9	0	0	0	0	0	0	1	0.2
TPBGJ	1,2a,2c,3,9,24,26,10,28,41	0	0	0	0	0	0	0	4	3.5	2	2.1	1	1.5	0	7	1.4
TPBQJ	1,2a,2c,3,9,24,26,B,10,28,41	0	0	0	0	0	0	1	0.9	0	0	0	0	0	0	1	0.2
Total		103		16		74		113		95		68		32		501	

^a Lines tested were Thatcher lines with genes *Lr1*, *Lr2a*, *Lr2c*, *Lr3a*, *Lr9*, *Lr16*, *Lr24*, *Lr26*, *Lr3ka*, *Lr11*, *Lr17*, *Lr30*, *LrB*, *Lr10*, *Lr14a*, *Lr18*, *Lr21*, *Lr28*, and winter wheat lines with gene *Lr41*.

^b States of AL, AR, GA, LA, MS, NC, VA

^c State of NY

^d States of IL, IN, eastern MO, OH, WI

^e States of OK, TX

^f States of KS, western MO, NE

^g States of MN, ND, SD

^h States of MT, WA

Table 2. Number and frequency (%) of isolates of *Puccinia triticina* in the United States in 2012 virulent to 19 lines of wheat with single resistance genes for leaf rust resistance.

Resistance gene	Area 1 ^a		Area 2 ^b		Area 3 ^c		Area 4 ^d		Area 5 ^e		Area 6 ^f		Area 8 ^g		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Lr1	103	100	16	100	73	98.6	113	100	95	100	68	100	32	100	500	99.8
Lr2a	55	53.4	3	18.8	28	37.8	62	54.9	57	60	48	70.6	1	3.1	254	50.7
Lr2c	55	53.4	7	43.8	29	39.2	63	55.8	59	62.1	48	70.6	8	25	269	53.7
Lr3	103	100	12	75	74	100	113	100	95	100	68	100	25	78.1	490	97.8
Lr9	1	1	1	6.3	4	5.4	52	46	31	32.6	18	26.5	0	0	107	21.4
Lr16	0	0	1	6.3	2	2.7	2	1.8	0	0	1	1.5	0	0	6	1.2
Lr24	10	9.7	0	0	9	12.2	61	54	39	41.1	37	54.4	1	3.1	157	31.3
Lr26	68	66	12	75	27	36.5	32	28.3	23	24.2	10	14.7	10	31.3	182	36.3
Lr3ka	94	91.3	9	56.3	64	86.5	18	15.9	34	35.8	17	25	4	12.5	240	47.9
Lr11	98	95.1	10	62.5	58	78.4	5	4.4	19	20	8	11.8	3	9.4	201	40.1
Lr17	47	45.6	6	37.5	44	59.5	51	45.1	39	41.1	21	30.9	10	31.3	218	43.5
Lr30	92	89.3	7	43.8	62	83.8	10	8.8	32	33.7	17	25	1	3.1	221	44.1
LrB	45	43.7	8	50	45	60.8	54	47.8	39	41.1	21	30.9	19	59.4	231	46.1
Lr10	64	62.1	11	68.8	41	55.4	112	99.1	87	91.6	66	97.1	32	100	413	82.4
Lr14a	100	97.1	11	68.8	73	98.6	59	52.2	54	56.8	38	55.9	24	75	359	71.7
Lr18	47	45.6	6	37.5	24	32.4	2	1.8	12	12.6	1	1.5	9	28.1	101	20.2
Lr21	0	0	0	0	0	0	1	0.9	0	0	16	23.5	0	0	17	3.4
Lr28	57	55.3	10	62.5	29	39.2	61	54	58	61.1	48	70.6	23	71.9	286	57.1
Lr41	1	1	2	12.5	5	6.8	82	72.6	57	60	38	55.9	0	0	185	36.9
Lr42	0	0	0	0	0	0	1	0.9	0	0	0	0	0	0	1	0.2
Total	103		16		74		113		95		68		32		501	

^a States of AL, AR, GA, LA, MS, NC, VA

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