

Table 1: Number and frequency (%) of 2019 *Puccinia triticina* virulence phenotypes in USA

Race	Virulence combination (ineffective Lr genes)	Southeast		Ohio Valley		Texas-Oklahoma		Kansas-Nebraska		Minnesota - SD, ND		Washington		Total	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
LBDSG	1,17,B,10,14a,28	0	0	0	0	0	0	0	0	0	0	2	22.2	2	0.8
LCDSG	1,26,17,B,10,14a,28	0	0	0	0	0	0	0	0	0	0	3	33.3	3	1.2
MBDSB	1,3,17,B,10,14a	0	0	0	0	0	0	0	0	0	0	2	22.2	2	0.8
MBDSD	1,3,17,B,10,14a,39	1	4.3	0	0	3	3.7	1	1.9	4	6.5	0	0	9	3.6
MBTNB	1,3,3ka,11,17,30,B,14a	8	34.8	10	40	3	3.7	0	0	1	1.6	0	0	22	8.7
MBTSB	1,3,3ka,11,17,30,B,10,14a	0	0	1	4	0	0	0	0	0	0	0	0	1	0.4
MCDSB	1,3,26,17,B,10,14a	0	0	0	0	0	0	0	0	0	0	2	22.2	2	0.8
MCSD	1,3,26,17,B,10,14a,39	0	0	0	0	1	1.2	0	0	1	1.6	0	0	2	0.8
MCTNB	1,3,26,3ka,11,17,30,B,14a	4	17.4	4	16	0	0	0	0	1	1.6	0	0	9	3.6
MDPSD	1,3,24,3ka,17,30,B,10,14a,39	1	4.3	0	0	0	0	0	0	0	0	0	0	1	0.4
MFJSB	1,3,24,26,11,17,B,10,14a	0	0	0	0	0	0	0	0	1	1.6	0	0	1	0.4
MJBGJ	1,3,16,24,10,28,39	0	0	0	0	1	1.2	0	0	0	0	0	0	1	0.4
MJBJG	1,3,16,24,10,14a,28	0	0	0	0	0	0	1	1.9	0	0	0	0	1	0.4
MLPSD	1,3,9,3ka,17,30,B,10,14a,39	0	0	0	0	0	0	0	0	1	1.6	0	0	1	0.4
MNDSD	1,3,9,24,17,B,10,14a,39	0	0	0	0	0	0	1	1.9	0	0	0	0	1	0.4
MNPSD	1,3,9,24,3ka,17,30,B,10,14a,39	4	17.4	3	12	48	59.3	36	69.2	23	37.1	0	0	114	45.2
MNPTS	1,3,9,24,3ka,17,30,B,10,14a,18,21,28,39	0	0	0	0	0	0	0	0	1	1.6	0	0	1	0.4
MPDSD	1,3,9,24,26,17,B,10,14a,39	0	0	0	0	0	0	2	3.8	0	0	0	0	2	0.8
MPPSD	1,3,9,24,26,3ka,17,30,B,10,14a,39	0	0	1	4	11	13.6	8	15.4	10	16.1	0	0	30	11.9
MPTSD	1,3,9,24,26,3ka,11,17,30,B,10,14a,39	0	0	0	0	1	1.2	0	0	0	0	0	0	1	0.4
PCDGJ	1,2c,3,26,17,10,28,39	0	0	0	0	1	1.2	0	0	1	1.6	0	0	2	0.8
TBBGQ	1,2a,2c,3,10,21,28	0	0	0	0	0	0	0	0	1	1.6	0	0	1	0.4
TBBGS	1,2a,2c,3,10,21,28,39	0	0	0	0	5	6.2	0	0	14	22.6	0	0	19	7.5
TBRKG	1,2a,2c,3,3ka,11,30,10,14a,18,28	1	4.3	1	4	1	1.2	0	0	0	0	0	0	3	1.2
TBTNB	1,2a,2c,3,3ka,11,17,30,B,14a	2	8.7	3	12	0	0	0	0	0	0	0	0	5	2
TCTNB	1,2a,2c,3,26,3ka,11,17,30,B,14a	2	8.7	0	0	0	0	0	0	0	0	0	0	2	0.8
TFKGB	1,2a,2c,3,24,26,11,17,30,10	0	0	1	4	0	0	0	0	0	0	0	0	1	0.4
TFPSB	1,2a,2c,3,24,26,3ka,17,30,B,10,14a	0	0	1	4	0	0	0	0	0	0	0	0	1	0.4
TNBGJ	1,2a,2c,3,9,24,10,28,39	0	0	0	0	0	0	3	5.8	2	3.2	0	0	5	2
TNBGS	1,2a,2c,3,9,24,10,21,28,39	0	0	0	0	1	1.2	0	0	0	0	0	0	1	0.4
TNBJJ	1,2a,2c,3,9,24,10,14a,28,39	0	0	0	0	4	4.9	0	0	0	0	0	0	4	1.6
TPBGJ	1,2a,2c,3,9,24,26,10,28,39	0	0	0	0	1	1.2	0	0	1	1.6	0	0	2	0.8
<b>Total</b>		<b>23</b>		<b>25</b>		<b>81</b>		<b>52</b>		<b>62</b>		<b>9</b>		<b>252</b>	

Frequency (%) of isolates of *Puccinia triticina* collected in 2019 in the USA with virulence to Thatcher lines of wheat with single genes for leaf rust resistance

Resistance gene	Southeast		Ohio Valley		Texas - Oklahoma		Kansas - Nebraska		Minnesota - SD, ND		Washington		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Lr1	23	100	25	100	81	100	52	100	62	100	9	100	252	100
Lr2a	5	21.7	6	24	12	14.8	3	5.8	18	29	0	0	44	17.5
Lr2c	5	21.7	6	24	13	16	3	5.8	19	30.6	0	0	46	18.3
Lr3	23	100	25	100	81	100	52	100	62	100	4	44.4	247	98
Lr9	4	17.4	4	16	66	81.5	50	96.2	38	61.3	0	0	162	64.3
Lr16	0	0	0	0	1	1.2	1	1.9	0	0	0	0	2	0.8
Lr24	5	21.7	6	24	67	82.7	51	98.1	38	61.3	0	0	167	66.3
Lr26	6	26.1	7	28	15	18.5	10	19.2	15	24.2	5	55.6	58	23
Lr3ka	22	95.7	24	96	64	79	44	84.6	37	59.7	0	0	191	75.8
Lr11	17	73.9	20	80	5	6.2	0	0	3	4.8	0	0	45	17.9
Lr17	22	95.7	24	96	68	84	48	92.3	44	71	9	100	215	85.3
Lr30	22	95.7	25	100	64	79	44	84.6	37	59.7	0	0	192	76.2
LrB	22	95.7	23	92	67	82.7	48	92.3	43	69.4	9	100	212	84.1
Lr10	7	30.4	8	32	78	96.3	52	100	60	96.8	9	100	214	84.9
Lr14a	23	100	24	96	72	88.9	49	94.2	43	69.4	9	100	220	87.3
Lr18	1	4.3	1	4	1	1.2	0	0	1	1.6	0	0	4	1.6
Lr21	0	0	0	0	6	7.4	0	0	16	25.8	0	0	22	8.7
Lr28	1	4.3	1	4	14	17.3	4	7.7	20	32.3	5	55.6	45	17.9
Lr39	6	26.1	4	16	77	95.1	51	98.1	58	93.5	0	0	196	77.8
Lr42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>23</b>		<b>25</b>		<b>81</b>		<b>52</b>		<b>62</b>		<b>9</b>		<b>252</b>	