

Table S1. Leaf rust severity in the field on differential lines in the North-Western Region of Russia in 1998–2013

| Line (cultivar) with <i>Lr</i> gene | 1998 | 2004 | 2005 | 2006 | 2007 | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------------------------------------------------------------------|--------|------|---------|------|------|---------|------|-------|------|-------|
| Resistant group (variation of disease severity from 0 to 10%) | | | | | | | | | | |
| Tc:Lr9, Lr19, Lr24, Lr25, Lr29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TcLr45, Lr41, Lr42, Lr43+24, Lr47 | - | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 |
| Lr28 | 0 | 10MR | 3MR | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TcLr23 | 10MR | 1MR | 1-3MR | 0 | 10MR | 0 | 0 | 1-5MR | 1MR | 0 |
| TcLr35 | 1MR | - | - | - | - | 1-3S | 0 | 1S | 1S | 0 |
| Lr39 | | - | - | - | 5S | 0 | 0 | 1-5S | 1-5S | 5S |
| Lr40 | - | - | - | - | 5S | 0 | 0 | 1-5S | 0 | 1-5S |
| Lr48 | - | - | - | - | 1-3S | 0 | 0 | 1-5S | 1-5S | 5-10S |
| Lr49 | | - | - | - | 0 | 0 | 0 | 1-5S | 0 | 0 |
| Lr50 | - | - | - | - | 1MR | 0 | 0 | 0 | 0 | 0 |
| Moderately susceptible group (variation of disease severity from 1 to 30%) | | | | | | | | | | |
| TcLr12 | 30MS | 30S | 20MS | 10S | 30S | 30S | 20S | 20R | 20S | 10S |
| TcLr13 | 50S | 50S | 15MS | 5S | 30S | 30S | 30S | 10S | 10S | 10S |
| TcLr21 | 5MS | 5MS | 15MS | 5S | 20S | - | 5S | 5S | 5S | 20S |
| TcLr22a | 5MS | 10MS | 5MS | 20S | 30S | 10S | 5S | 1S | 5S | 15S |
| Lr27+31 | 1MR | 20MS | 30MS | 0 | 5S | 0 | 10S | 0 | 30S | 30S |
| TcLr44 | 20MS | 20MS | 5MS | 5S | 30S | 30S | 15S | 10S | 10S | 30S |
| Lr46 | - | - | - | - | 30S | 30S | 20S | 5S | 5S | 10S |
| Highly variable resistance group (variation of disease severity from 5 to 80%) | | | | | | | | | | |
| TcLr11 | 100S | 80S | 80S | 10S | 70S | 100S | 50S | 30S | 70S | 100S |
| TcLr14b | 100S | 60S | 80S | 30S | 50S | 80-100S | 70S | 20S | 15S | 70S |
| TcLr16 | 100S | 70S | 80-100S | 50S | 80S | 80-100S | 30S | 50S | - | 100S |
| TcLr17 | 5-10MR | 70S | 80-100S | 50S | 20MS | 100S | 50S | 50S | 70S | 100S |
| TcLr18 | 5MR | 30S | 30MS | 50S | 70S | 80S | 50S | 30S | 15S | 5S |
| TcLr32 | 30MS | 30MS | 10MS | 20S | 50S | 50S | 50S | 50S | 10S | 10S |

| | | | | | | | | | | |
|--------------------------------|------|------|---------|------|-----|---------|--------|--------|--------|------|
| TcLr34 | 5MS | 20S | 50S | 20S | 50S | 80S | 50S | 5S | 5S | 100S |
| Susceptible group | | | | | | | | | | |
| TcLr1 | 80S | 70S | 80-100S | 40S | 80S | 70-80S | 50S | 80S | 80S | 100S |
| TcLr2a | 80S | 70S | 80-100S | 40S | 80S | 100S | 50-70S | 70 | 70S | 100S |
| TcLr2b | 60S | 70S | 80-100S | 30S | 80S | 80S | 50-70S | 70S | 70S | 100S |
| TcLr2c | 100S | 70S | 80-100S | 20S | 70S | 100S | 50-70S | 70S | 90S | 100S |
| TcLr3a | 100S | 90S | 80-100S | 40S | 70S | 70-100S | 50S | 70S | 70S | 100S |
| TcLr3bg | 100S | 90S | 80-100S | 30S | 80S | 50S | 50-70S | 70S | 70S | 100S |
| TcLr3ka | 100S | 70S | 80-100S | 30S | 80S | 50S | 50S | 70S | 50S | 100S |
| TcLr10 | 100S | 90S | 80-100S | 50S | 80S | 100S | 70S | 90S | 80S | 100S |
| TcLr14a | 100S | 100S | 80-100S | 50S | 70S | 100S | 70S | 70S | 90S | 100S |
| TcLr15 | 100S | 80S | 80-100S | 40S | 70S | 80-100S | 50S | 50S | 50S | 100S |
| TcLr20 | 100S | 50MS | 80-100S | 50-S | 60S | 100S | 70S | 10S | 50S | 100S |
| TcLr26 | 50MS | 15MS | 50-80S | 50S | 70S | 80-100S | 50S | 50S | 50S | 100S |
| TcLr30 | 100S | 100S | 80-100S | 30S | 80S | 100S | 50S | 50S | 50S | 100S |
| TcLr33 | 100S | 70S | 70-80S | 30S | 70S | 80-100S | 50S | 50S | 50S | 100S |
| Thatcher (susceptible control) | 100S | 100S | 100S | 50S | 80S | 100S | 50-70S | 70-90S | 60-90S | 100S |

Tc – isogenic Thatcher line with *Lr* gene, *Lr41* – KS90WGRC10, *Lr42* – KS91WGRC11, *Lr43+24* KS91WGRC16, *Lr47* – Pavon 76, *Lr28* – CS 2A12M, *Lr39* – KS86WGRC02, *Lr40* – KS89WGRC07, *Lr50* – KS96WGRC36, *Lr48* – CSP44, *Lr49* – VL404№8677, *Lr27+31* – Gatcher, *Lr46* – Pavon.

- Not evaluated

Table S2. Leaf rust severity in the field on differential lines in the North-West of Russia in 2014–2022

| Line (cultivar) with <i>Lr</i> gene | 2014 | 2015 | 2016 | 2017 | 2019 | 2020 | 2022 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------|------|------|--------|------|------|
| Resistant group (variation of disease severity from 0 to 10%) | | | | | | | |
| Tc: <i>Lr</i> 9, <i>Lr</i> 19, <i>Lr</i> 24, <i>Lr</i> 28, <i>Lr</i> 29, <i>Lr</i> 41, <i>Lr</i> 42, <i>Lr</i> 43+24, <i>Lr</i> 45, <i>Lr</i> 47, <i>Lr</i> 51, <i>Lr</i> 53, <i>Lr</i> 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tc <i>Lr</i> 21 | 5S | 5S | 5S | 5S | 1S | 0 | 0 |
| Tc <i>Lr</i> 22a | 5S | 0R | 1S | 1MR | 0 | 1S | 0 |
| Tc <i>Lr</i> 23 | 1MR | 0 | 0 | 0 | 0 | 0 | 0 |
| Tc <i>Lr</i> 25 | 0 | - | - | - | 1S | 0 | 0 |
| Tc <i>Lr</i> 35 | 1S | 0 | 0 | 1S | 1S | 1S | 0 |
| Tc <i>Lr</i> 37 | 5S | 0 | 0 | 0 | 0 | 1S | 0 |
| <i>Lr</i> 39 | 5S | 0 | 5S | 5S | 0 | 0 | 0 |
| <i>Lr</i> 40 | 5S | 0 | 5S | 5S | 0 | 0 | 0 |
| <i>Lr</i> 48 | 5S | 5S | 5S | 0 | 0 | 1MR | 1MR |
| <i>Lr</i> 49 | 1S | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Lr</i> 50 | 0 | 0 | 1MR | 0 | 0 | 0 | 0 |
| Tc <i>Lr</i> 64 | 10S | 5S | 1S | 0 | 0 | 1S | 1S |
| Tc <i>Lr</i> 11 | 1S | 10S | 10S | 10S | 10S | 5S | 10S |
| <i>Lr</i> 27+31 | - | - | 10S | 5S | 10S | 10S | 10S |
| Tc <i>Lr</i> 32 | 10S | 0 | 10S | 10MS | 0 | 10MS | 0 |
| Tc <i>Lr</i> 44 | 5MR | - | 1S | 0R | 10S | 10S | 0 |
| Moderately resistant group (variation of disease severity from 1 to 30%) | | | | | | | |
| Tc <i>Lr</i> 12 | 5MR | 30S | 30S | 30S | 5S | 1S | 5S |
| Tc <i>Lr</i> 13 | 10S | 30S | 30S | 30S | 5S | 5S | 5S |
| Highly variable resistance group (variation of disease severity from 5 to 80%) | | | | | | | |
| Tc <i>Lr</i> 14b | 80S | 5–10S | 15S | 50S | 20S | 30S | 70S |
| Tc <i>Lr</i> 16 | 70–80S | 100S | 100S | 100S | 50S | 30S | 60S |
| Tc <i>Lr</i> 17 | 50S | 50S | 100S | 100S | 30S | 15S | 60S |
| Tc <i>Lr</i> 18 | 20S | 50S | 40S | 1S | 0 | 0 | 0 |
| Tc <i>Lr</i> 30 | 80–100S | 100S | 100S | 15S | 60S | 50S | 60S |
| Tc <i>Lr</i> 34 | 30S | 50S | 20S | 80S | 30–50S | 10S | 60S |
| Tc <i>Lr</i> 33 | 80S | 70S | 30S | 80S | 10S | 10S | 60S |

| | | | | | | | |
|--------------------------------|---------|--------|------|------|------|-----|---------|
| <i>Lr46</i> | 70S | 5S | 50S | 50S | 15S | 20S | 20S |
| <i>TcLr67</i> | 100S | 80S | 100S | 100S | 30S | 10S | 70S |
| Susceptible group | | | | | | | |
| <i>TcLr1</i> | 80-100S | 100S | 100S | 100S | 100S | 70S | 90S |
| <i>TcLr2a</i> | 80-100S | 100S | 100S | 100S | 100S | 70S | 90S |
| <i>TcLr2b</i> | 80-100S | 100S | 100S | 100S | 100S | 70S | 90S |
| <i>TcLr2c</i> | 80-100S | 70-80S | 100S | 100S | 100S | 80S | 100S |
| <i>TcLr3a</i> | 80-100S | 100S | 100S | 100S | 100S | 60S | 100S |
| <i>TcLr3bg</i> | 80-100S | 100S | 100S | 100S | 100S | 60S | 80S |
| <i>TcLr3ka</i> | 80-100S | 100S | 100S | 100S | 100S | 60S | 70S |
| <i>TcLr10</i> | 100S | 100S | 100S | 100S | 100S | 80S | 100S |
| <i>TcLr14a</i> | 100S | 100S | 70S | 60S | 70S | 60S | 70S |
| <i>TcLr15</i> | 100S | 100S | 100 | 100S | 50S | 60S | 90S |
| <i>TcLr20</i> | 80-100S | 100S | 100S | 100R | 70S | 50S | 80S |
| <i>TcLr26</i> | 80S | 100S | 100S | 100S | 100 | 80S | 90S |
| Thatcher (susceptible control) | 80-100S | 100S | 100S | 100S | 100S | 80S | 90-100S |