

Summary of *Puccinia striiformis* f. sp. *tritici* (the Wheat Stripe Rust Pathogen) and *P. striiformis* f. sp. *hordei* (the Barley Stripe Rust Pathogen) races in the United States in 2015

1. **Samples.** A total of 370 stripe rust samples were collected from wheat (310), barley (26), triticale (1), and grasses (33) from 21 states of the US. From the samples, 310 *P. striiformis* f. sp. *tritici* (*Pst*) and 32 *P. striiformis* f. sp. *hordei* (*Psh*) isolates were obtained.
2. **Differential sets:** All of the *Pst* isolates were tested on 18 differential lines each with a single *Yr* gene and the barley isolates were tested on 12 barley lines.
3. **Number of *Pst* races:** From the 310 *Pst* isolates, 32 races were identified. The virulence spectra of the races ranged from 0 to 13 of the 18 *Yr* genes.
4. **The top five *Pst* races:**

PSTv-37 (Code: 171266) (virulent to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrTr1*, *YrExp2*, and avirulent to *Yr1*, *Yr5*, *Yr10*, *Yr15*, *Yr24*, *Yr32*, *YrSP*, *YrTye*) with 35.8% frequency (No. 1) in 2015, increased from 18.0% (No. 2) in 2014.

PSTv-52 (Code: 171262) (virulent to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrExp2*; and avirulent to *Yr1*, *Yr5*, *Yr10*, *Yr15*, *Yr24*, *Yr32*, *YrSP*, *YrTr1*, *YrTye*) with 32.6% frequency (No. 2) in 2015, increasing from 30.9% (No. 1) in 2014.

PSTv-18 (Code: 000000) (virulent to none of the 18 *Yr* genes and avirulent to all of the 18 *Yr* genes *Yr1*, *Yr5*, *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrSP*, *YrTr1*, *YrExp2*, *YrTye*) with 5.2% frequency (No. 3) in 2015, increased from 2.3% in 2014.

PSTv-53 (Code: 510011) (virulence to *Yr1*, *Yr6*, *Yr9*, *YrSP*, *YrTye*; and avirulent to *Yr5*, *Yr7*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrTr1*, *YrExp2*) with 4.2% frequency (No. 4) in 2015, increased from 3.5% in 2014.

PSTv-48 (Code: 510001) (virulence to *Yr1*, *Yr6*, *Yr9*, *YrTye*; and avirulent to *Yr5*, *Yr7*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrSP*, *YrTr1*, *YrExp2*) with 3.2% frequency (No. 5) in 2015, decreased from 6.3% (No. 5) in 2014.

The remaining 27 races were all below 3.0%.

The top two races (PSTv-52 and PSTv-37) were detected in both the western and eastern U.S., while the No. 3 – No. 5 (PSTv-18, PSTv-53, and PSTv-48, respectively) were detected again only in the western U.S.

5. **New races.** The following for new races, which were not detected from 2010 - 2014, were detected in 2015:

PSTv-140 (Code: 450021) (virulent to *Yr1*, *Yr7*, *Yr9*, *Yr44*, *YrTye*; and avirulent to *Yr5*, *Yr6*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *YrSP*, *YrTr1*, *YrExp2*), detected in Washington, is similar to a previously predominant race PSTv-79 (No. 4 in 2014), but with additional virulence to *YrTye*.

PSTv-141 (Code: 550221) (virulent to *Yr1*, *Yr6*, *Yr7*, *Yr9*, *Yr27*, *Yr44*, *YrTye*; and avirulent to *Yr5*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr32*, *Yr43*, *YrSP*, *YrTr1*, *YrExp2*), detected in Washington, is similar to race PSTv-140 (No. 4 in 2014), but with additional virulences to *Yr6* and *Yr27*.

PSTv-142 (Code: 150022) (virulent to *Yr6*, *Yr7*, *Yr9*, *Yr44*, *YrTye*; and avirulent to *Yr1*, *Yr5*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *YrSP*, *YrTr1*, *YrExp2*), detected in California, is similar to race PSTv-28, but without virulence to *Yr17*.

PSTv-143 (Code: 510015) (virulent to *Yr1*, *Yr6*, *Yr9*, *YrSP*, *YrTr1*, *YrTye*; and avirulent to *Yr5*, *Yr7*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrExp2*), detected in Washington, is similar to race PSTv-53, but with additional virulence to *YrTr1*.

6. **Resistance of *Yr5* and *Yr15*.** No races were found virulence to *Yr5* and *Yr15*, and therefore, these two genes are still effective against all races identified so far in the U.S.
7. **Races of the barley stripe rust pathogen.** Three races, PSH-33 (43.8%), PSH-48 (53.1%), and PSH-74 (3.1%), were identified in 2015, which were also the top two races in 2012. The predominant races PSH-48 (virulent only on ‘Topper’ among the 12 differentials) and PSH-33 (virulent on Topper and ‘Abed Binder 12’) were also the top two races in 2014 with 44.4% PSH-33 and 33.3% PSH-48. No new races of *P. striiformis* f. sp. *hordei* were detected in 2015.

Excel data and summary tables:

1. PSTsum15 including the following worksheets:
 1. Summary data of *Pst* isolates
 2. Summary data of *Pst* isolates by states
 3. Summary data of *Pst* isolates by epidemiological regions
 4. All PSTv races, frequencies, and distributions
 5. PSTv races and frequencies in various states
 6. PSTv races and frequencies in various epidemiological regions
 7. Frequencies of virulences to the 18 *Yr* genes used as differentials
 8. New PSTv races, codes, virulence formulae, type isolates, and detected states, regions and varieties.
2. PSHsum15 including the following worksheets:
 1. Summary data of *Psh* isolates
 2. Summary data sorted by races
 3. All PSH races, frequencies, and distributions