Summary of *Puccinia striiformis* f. sp. *tritici* (*Pst*, the Wheat Stripe Rust Pathogen) and *P. striiformis* f. sp. *hordei* (*Psh*, the Barley Stripe Rust Pathogen) Races in the United States in 2018

1. **Samples.** A total of 304 stripe rust samples were collected and received from wheat (254), barley (38), and grasses (12) from 14 states. From the samples, 227 *P. striiformis* f. sp. *tritici* (*Pst*) and 36 *P. striiformis* f. sp. *hordei* (*Psh*) isolates were obtained.

2. **Differential sets:** All of the *Pst* isolates were tested on 18 wheat differential lines each with a single *Yr* gene, and the *Psh* isolates were tested on 12 barley lines.

3. **Number of *Pst* races:** From the 227 *Pst* isolates, 23 races were identified. The virulence spectra of the races ranged from 0 to 15 with a mean of 8.3 on the 18 *Yr* genes.

4. **The top five *Pst* races:**

   1) PSTv-37 (Octal code: 171266) (virulent to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrTr1*, *YrExp2*; and avirulent to *Yr1*, *Yr5*, *Yr10*, *Yr15*, *Yr24*, *Yr32*, *YrSP*, *Yr76*) with 44.7% frequency (No. 1), similar to 2017 (45.0). This race was detected in 13 states (CA, GA, ID, KS, LA, MI, MT, NC, NY, TN, TX, VA, and WA).

   2) PSTv-52 (Octal code: 171262) (virulent to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrExp2*; and avirulent to *Yr1*, *Yr5*, *Yr10*, *Yr15*, *Yr24*, *Yr32*, *YrSP*, *YrTr1*, *Yr76*) with 10.2% frequency (No. 2), increased from 4.6% (No. 3) in 2017. This race was detected in four states (ID, KS, NY, and WA)

   3) PSTv-322 (Octal code: 420000) (virulence to *Yr1*, *Yr8*; and avirulent to *Yr5*, *Yr6*, *Yr7*, *Yr9*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrSP*, *YrTr1*, *YrExp2*, *Yr76*) with 6.6% frequency (No. 3), increased from 2.3% in 2017. This race was detected in Montana and Washington.

   4) PSTv-39 (Octal code: 175266) (virulent to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr10*, *Yr17*, *Yr27*, *Yr43*, *Yr44*, *YrTr1*, *YrExp2*; and avirulent to *Yr1*, *Yr5*, *Yr15*, *Yr24*, *Yr32*, *YrSP*, *Yr76*) with 5.8% frequency (No. 4), increased from 2.3% in 2017. This race was detected only in Washington.

   5) PSTv-201 (Octal code: 020000) (virulent on *Yr8*; and avirulent on *Yr1*, *Yr5*, *Yr6*, *Yr7*, *Yr9*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrSP*, *YrTr1*, *YrExp2*, *Yr76*) with 4.0% frequency (No. 5). This race was first detected from samples in 2002 and was detected in Idaho and Washington in 2018.

   6) PSTv-378 (Octal code: 520000) (virulent on *Yr1*, *Yr6*, *Yr8*; and avirulent on *Yr5*, *Yr7*, *Yr9*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrSP*, *YrTr1*, *YrExp2*, *Yr76*) with 4.0% frequency (No. 5). This race was first detected in 2018 from Colorado and Washington.

The remaining 17 races were all below 3.2% and 8 of them were detected only from one or two samples.

5. **New race.** In 2018, one new race (PSTv-378) was identified. The information of its virulence/avirulence and distribution is mentioned above. This race was likely evolved from race PSTv-322 by mutation of the avirulence to *Yr6*.

6. **Virulence frequencies.** High frequencies were found for virulence to *Yr8* (88.9%), *Yr6* (86.3%), *Yr9* (80.5%), *Yr27* (79.2%), *Yr17* (77.0%), *Yr7* (75.7%), *Yr44* (74.3%), *YrExp2* (73.9%), *Yr43* (73.0%), and *YrTr1* (62.4%); and low frequencies for virulence to *Yr1* (28.3%), *Yr76* (10.2%), *YrSP* (10.6%), *Yr10* (11.1%), *Yr32* (2.7%), and *Yr24* (2.7%). No virulence was found to either *Yr5* or *Yr15*, and therefore, these two resistance genes are still effective against all races identified so far in the U.S.

7. **Races of the barley stripe rust pathogen.** Barley stripe rust isolates were obtained from samples of California, Oregon, Montana, and Washington. A total of 12 races of *P. striiformis* f. sp. *hordei* were identified in 2018, similar to 2017 (14 races). The first predominant race (23.8%) was PSH-33 (virulent on Topper and Abed Binder 12) with 17.1% frequency, slightly increased from 14.3% in 2017. The second predominant race was PSH-97 (virulent on Topper, Abed Binder 12, and Bancroft) with 14.3% frequency, increased from 2.4% in 2017. Both races PSH-54 (virulent on Topper, Abed Binder 12, Trumpf, and Bancroft) and PSH-101 (virulent on Topper, Heils Franken, Emir, Astrix, Hiproly, Varunda, Abed Binder 12, Trumpf, and Bancroft) were ranked No. 3 with 11.4% frequency. One new race (PSH-115) was detected from Washington. This race is virulent to Topper, Heils Franken, and Abed Binder 12 with a relatively narrow virulence spectrum.

Excel data and summary tables:

1. PSTsum17 including the following worksheets:
    1. Summary data of *Pst* isolates
    2. Summary data of *Pst* isolates sorted by epidemiological regions
    3. All *Pst* races, code, virulence formulae, frequencies, and distributions
    4. *Pst* races and frequencies in different states
    5. *Pst* races and frequencies in different epidemiological regions
    6. Frequencies of virulence factors to the 18 *Yr* gene lines used as differentials
    7. New *Pst* race, code, virulence formula, type isolate, and detected states, regions and variety.

2. PSHsum17 including the following worksheets:
    1. Summary data of *Psh* isolates
    2. Summary data sorted by races
    3. All *Psh* races, frequencies, and distributions
    4. New *Psh* race, code, virulence formula, type isolate, and detected states, regions and variety.