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 2016

1. **Samples.** A total of 465 stripe rust samples were collected from wheat (415), barley (20), triticale (4), and grasses (26) from 26 states of the US, plus Ontario, Canada. From the samples, 386 *P. striiformis* f. sp. *tritici* (*Pst*) and 30 *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 386 *Pst* isolates, 69 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-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 22.6% frequency (No.1) decreased from 32.6% frequency (No. 2) in 2015.

   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 22.1% frequency (No.2), decreased from 35.8% frequency (No. 1) in 2015.

   PSTv-198 (Octal code: 170262) (virulent to *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr27*, *Yr43*, *Yr44*, *YrExp2*, and avirulent to *Yr1*, *Yr5*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr32*, *YrSP*, *YrTr1*, *Yr76*) with 12.9 frequency (No.3). This race, different from PSTv-52 only by the avirulence to *Yr17*, was first detected in 2002, but not detected in the last seven years.

   PSTv-53 (Code: 510011) (virulence to *Yr1*, *Yr6*, *Yr9*, *YrSP*, *Yr76*; and avirulent to *Yr5*, *Yr7*, *Yr8*, *Yr10*, *Yr15*, *Yr17*, *Yr24*, *Yr27*, *Yr32*, *Yr43*, *Yr44*, *YrTr1*, *YrExp2*) with 5.7% frequency (No. 4), increased from 4.2% frequency (No. 4) in 2015.

   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*, *Yr76*) with 3.8% frequency (No. 5), increased from 5.2% frequency (No. 3) in 2015.

The remaining 64 races were all below 3.5% and 46 of them were detected only from one sample.

The top three races (PSTv-52, PSTv-37, PSTv-198) were detected throughout the country, and the top 4 (PSTv-53) and 5 (PSTv-18) were detected mostly in the western U.S.

5. **New races.** In 2016, 32 new races were identified, the highest number in a single year. These races and their virulence formulae and collection information is given in TABLE 16PST8 (the last worksheet) of file PSTsum16.xlsx. These new races were mostly detected from one sample and only five of them were detected from 2 to 6 samples. Based on the virulence patterns, these races most likely evolved from the previously identified races through changing one or two avirulence or virulence genes.

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.** Nine races of *P. striiformis* f. sp. *hordei* were identified in 2016, the highest number in the recent years. The top most predominant races were PSH-33 (virulent on Topper and 'Abed Binder 12') (50% frequency) and PSH-48 (virulent only on 'Topper' among the 12 differentials) (26.7% frequency). These races were also predominant in 2015, but just switched No.1 and No. 2 positions. One new race, PSH-90 (virulent on 'Topper', 'Abed Binder 12', 'I 5', and "Bancroft') was detected from Montana.

Excel data and summary tables:

1. PSTsum16 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 virulence factors to the 18 *Yr* genes used as differentials
    8. New PSTv races, codes, virulence formulae, type isolates, and detected states, regions and varieties.

2. PSHsum16 including the following worksheets:
    1. Summary data of *Psh* isolates
    2. Summary data sorted by races
    3. All PSH races, frequencies, and distributions