

**Washington Grain Commission  
Wheat and Barley Research Annual Progress Report**

**Project #:3144**

**Progress Report Year:**       2   of   3  

**Title:**                     ***Breeding Wheat Varieties With Efficient Control of ROS Production***

**Researcher:**             *Andrei Smertenko, Institute of Biological Chemistry, CAHNRS, WSU*

**Cooperators:**           *Dr. Michael Pumphrey, Department of Crop and Soil Sciences.*

**Executive summary:**     *This project aims to advance toolbox for breeding drought and heat tolerant wheat varieties. Our approach is based on the fact that harsh environmental conditions, including heat and drought, increase production of free radicals also known as Reactive Oxygen Species (ROS). ROS diminish the yield by damaging cells inside plant body. Plants alleviate the ROS damages using so-called "scavenging" mechanisms. Varieties with higher scavenging activity would yield better in hot and dry climates. We want to identify genetic markers with more efficient ROS scavenging and introduce these markers into breeding programs. Previously, our laboratory developed a technique for measuring ROS scavenging under the greenhouse condition. In Year 1 (growth season 2019) the suitability of our technique for analysis of material in the field was tested using 14 spring wheat varieties in Lind, Moses Lake, and Spillman farms. We found that our technique detected variability of the ROS scavenging in the field-grown material. One of the tested varieties, Kelse, was amongst varieties with more efficient ROS scavenging. In Year 2 we collaborated with Dr Pumphrey to phenotype ROS scavenging in 180 RILs of the biparental population Kelse x Scarlet in Lind. This RIL population has been genotyped. It means we can use this material to identify genetic markers of efficient ROS scavenging. The material was collected on May 29 when the maximum day temperature reached 88°F. Despite delays caused by COVID-19 pandemics, we completed the measurements. The results demonstrate significant variability of ROS scavenging activity in the population.*

**Impact:**                   *We produced phenotyping data on ROS scavenging in the Kelse x Scarlet population under heat and drought stress. This information will be used to identify genetic marker of efficient ROS scavenging. In the long-term this will contribute to breeding drought and heat-tolerant wheat varieties. The project provided training to undergraduate student Jessica Fisher, graduate student Kathleen Hickey, and post-doctoral scientist Taras Nazarov.*

