Background

• Genomics and Phenomics have potential to revolutionize the field of plant breeding
• Genomic selection (GS) is a technique to predict quantitative traits in crop plants
• Spectral reflectance indices (SRI) tells about different physiological processes in plants
• Combining GS and high throughput phenotyping (HTP) have tremendous potential for predictions of traits in wheat

Objectives

• Compare performances of GS only, HTP only, and GS+HTP models for prediction in wheat
• Select best stages for collecting HTP data for grain yield and grain protein content (GPC)
• Identify best SRI for predicting grain yield and GPC in spring wheat breeding program

Materials and Methods

• 650 wheat lines were used for this study
• Lines were grown in Pullman, WA during the 2014-2016 growing season
• SRI were collected at heading and grain filling stages for measuring different physiological parameters (Figure 1)
• Genomic selection (GS) was performed using rrBLUP model
• SRI were incorporated as covariate in the GS model for combining HTP and GS

Results

• Predictions for grain yield and GPC increases by combining GS and HTP (Table 1)
• GPC and grain yield accurately predicted at heading and grain filling stages, respectively
• GNDVI performed better for GPC (Figure 2)
• NWI performed best for grain yield (Figure 3)

Discussion and Implications

• Increased prediction accuracies ultimately helps in increasing genetic gain in breeding
• Selected stages will be used for subsequent collection of HTP data in wheat breeding
• Only selected SRI will be used for future predictions of the traits

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