

**Project #: 126593**

**Progress Report Year:** 2 of 3 years (maximum of 3 year funding cycle)

**Title: Intelligent Prediction and Association Tool to Facilitate Wheat Breeding**

**PI:** Dr. Zhiwu Zhang

**Cooperators:** Dr. Michael Pumphrey, Dr. Arron H. Carter, and Dr. Kimberly Campbell

**Executive summary:** *We updated one software package, released a new software packages, and published one article partially under support of this project in this fiscal year. The GAPIT software package updated for new functions for both GWAS (Genome Wide Association Study) and GS (Genomic Selection) (<http://zzlab.net/GAPIT>). GAPIT is R Package for users with programming skills in R language. Analyses can be programmed to process large amount of analyses with same settings. The new software package is GbyE (<http://zzlab.net/GbyE>). Both of these packages implemented a new method we published by Huang and et al. (*Giga Science*, 2019). We also publish an article on Wheat Life in October of 2019 entitled “ [Party game ignites satellite, drone research effort](#)”. A podcast was also published by [Wheat Science](#) about the stories behind the research project.*

**Impact:** *Our collaborative research positions WSU/USDA-ARS research team as one of the the world’s leading institutions to conduct fundamental and applied research, publish academic articles, and update and release software packages. Our project’s success not only benefit Washington, but will also benefit the entire world through the dissemination of knowledge. In short term, breeders can conduct most of data analyses without frustration on data formatting and selecting different analytical functions. They have more oppertunities to find the casative genes controlling traits of interest. They have more confidence to eliminate lines with low genetic potentials to reduce the cost of field trials. In long term, breeders have more chances to retain the genetic lines with desirable genes, and recombine them to create superior varieties.*

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Project PI(s): *Zhiwu Zhang, Michael Pumphrey, Arron H. Carter, and Kimberly Campbell*

Project initiation date: 1-Jul-18

Project year: 2 of 3

<b>Objective</b>	<b>Deliverable</b>	<b>Progress</b>	<b>Timeline</b>	<b>Communication</b>
2) Develop methods for examining GxE for large datasets, facilitating the selection of varieties with broader adaptability and optimum performance.	A standing alone software package was released ( <a href="http://zzlab.net/GbyE">http://zzlab.net/GbyE</a> ) to model G by E	We have developed BLINK method with previous WGC support. BLINK is about hundred time faster than existing methods and had higher statistical power for detecting additive genetic effect. The BLINK was used as the foundation to model G by E.	December 31, 2019: We developed source code to model G by E; June 30, 2020: Complete system testing on real data from all the Co-Pis	1) One article for Wheat Life; 2) One presentation at WGC annual meeting; 3) One presentation at national/international conference; and 4) one paper on academic journal