

2017 Report to KSGGA
Understanding the Genetic Basis of Wheat Development
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Objective: The objective of this project is to increase our understanding of the genes that affect the vernalization and photoperiod response in wheat. We hope to reduce growers' risk of freeze damage and yield losses by fine tuning our planting date recommendations based on the photoperiod and vernalization genes a variety has.

The development of the wheat plant through harvest maturity is controlled by genes with both large and small effects. The large effect genes are those that control response to vernalization – the cold period required for winter wheat to flower - and photoperiod or daylength. This is important because late spring freezes are common in KY. Varieties like Truman will not flower until daylength is long enough for them to shift into reproductive growth. Truman's photoperiod sensitivity is associated with a maturity date that is too late for KY growers. We want to combine this sensitivity with earlier maturity. In 2017 we grew a set of *near isogenic lines* – that is, lines that are genetically identical except for different combinations of vernalization and photoperiod genes. Wheat has 3 copies of each gene. The lines in this study are either **sensitive** or **insensitive** for all 3 photoperiod genes and either **short** or **long** for the vernalization genes.

The sets of 26 lines were planted in a replicated experiment at two locations: Princeton and Lexington on early (mid October) and late planting dates (early November). We measured early spring growth, date of breaking dormancy; heading date; flowering date; date of physiological maturity; yield; test weight; and thousand kernel weight.

Based on the 2017 data, the long vernalizing genes were better (higher yields) in our environment, but this varied some with the photoperiod genes that were present in a line. In a line like Truman, for example, which is photoperiod sensitive (i.e., requires a long day in order to flower), the short vernalizing genes did not lower yield. This tells us that photoperiod sensitivity is more important than vernalization sensitivity in our environment, though this is not necessarily true in southern states like GA.

We did not seek funding for 2017-18 but we plan to plant the study in order to gather another year's data. The picture is a complex one and we hope that a second year of data will provide the information we need to provide growers with planting date recommendations that are based on the photoperiod and vernalization profiles of different wheat varieties.