

## Study on Stay-Green Properties of Ancient Wheat Species and Modern Bread Wheat

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### Abstract

*Triticum aestivum* (modern bread wheat/MBW) is a result of a number of random hybridisation events between progenitors of different ploidy levels. Genetic diversity has had an enormous impact on wheat breeding since Green Revolution in the 1960s. However, at present, the genetic diversity of MBW is narrowed due to selective breeding. One source of increased genetic diversity could be the ancient wheat species, which provide novel resources of genes to improve properties of MBW. A genotype with the ability to retain green leaf area for longer than an ordinary genotype is called a “stay-green” phenotype. They are a potential source of assimilating more carbon during the post-anthesis grain filling period hence increased grain yield. A field experiment was conducted to study stay-green properties of ten genotypes of three hulled wheat species (einkorn, emmer and spelt) and MBW in 2011-2012 at Sutton Bonnington Campus, University of Nottingham, UK. A randomised complete block design was used in the experiment with four replicates. Flag leaf greenness was measured as visual greenness score, green area duration (GAD) and chlorophyll content (SPAD value). Visual greenness score was plotted against thermal time (base temperature at anthesis 0 °C) using a four parameter logistic model. Above ground biomass (AGB) and grain yield were recorded at harvest. Delayed onset of flag leaf senescence, slow senescence rate and prolonged leaf greenness were observed in spelt genotype and were positively associated with AGB production. AGB was highest in spelt followed by emmer, bread wheat and einkorn at maturity ( $P < 0.001$ ). However, bread wheat produced the greatest grain yield due to its superior harvest index. Bread wheat recorded the highest SPAD value pre-anthesis followed by spelt, emmer and einkorn ( $P < 0.001$ ) while SPAD values of spelt genotypes during the post-anthesis period was higher than all other genotypes. GAD was significantly different between genotypes ( $P < 0.001$ ) where spelt cv. Oberkulmer had the highest GAD followed by spelt cv. Tauro. Hence, it can be concluded that spelt, an ancient wheat species, could be used as a source to obtain genetic materials to increase stay-green traits of MBW.

**Keywords:** Ancient wheat, Anthesis, Flag leaf greenness, Stay-green

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