

# The genetics of drought and heat tolerance in bread wheat

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Drought can have numerous effects on a wheat plant including reduced photosynthesis, reduced kernel sink potential and/or increased pollen sterility, amongst others. However, traits such as higher stem carbohydrate accumulation and remobilization, carbon isotope discrimination, osmotic adjustment and leaf glaucousness may assist crop production under drought stress. Progress within traditional breeding programs for tolerance to abiotic stress such as drought and heat are slow, due to its complex genetic basis and the large influence of environmental variation. To date, relatively few studies have been conducted in wheat to genetically dissect tolerance to drought or heat. We crossed Kukri, a locally developed bread wheat cultivar intolerant of drought and heat, with RAC875, a locally adapted breeding line, tolerant of the two stresses. A doubled haploid population was subsequently produced, with 368 lines. In 2007, the population was grown at 5 sites in southern Australia and this poster outlines data sets collected for key morpho-physiological traits. Some results will be presented here, as well as key QTL identified for yield components, harvest index and flag leaf dimensions. Kukri and RAC875 will initially be studied for heat tolerance to identify any morpho-physiological differences such as spike fertility or grain size. Future work aims to investigate heat tolerance within the population. To this end, a growth room heat assay is being developed aiming to replicate higher temperature stress conditions in a reproducible test that produces maximum variation between adult lines and minimizes experimental error. A subset of the population has also been grown under irrigated, high temperature conditions at CIMMYT, Mexico and some preliminary results from data collected are presented.