A QTL for grain yield on 7AL of wheat is activated by ABA and low nutrient treatments during flag leaf ontogeny

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Studies with wheat doubled haploids from the cross Chinese Spring (CS)×SQ1 trialled over 24 year×treatment×locations identified a frequent yield QTL on 7AL associated with a locus for SSR psp3094, expressed mainly under stressed conditions.

SQ1 alleles increased yield as well as biomass and flag leaf (FL) width. Near-isogenic lines (NILs) for the 7AL yield QTL were made with CS or SQ1 alleles in an SQ1 background, selecting with psp3094. In a preliminary field trial, the SQ1 allele was associated with 21% higher yield/ear, significantly higher FL chlorophyll content and wider FLs due to more cell files across the leaf. In a controlled environment experiment, eight CS-allele and eight SQ1-allele NILs, with two replicate plants/NIL grown in high nutrient compost, were given either no treatment, lowlight, low-nutrient or abscisic acid (ABA) spray treatments for 2 weeks during flag leaf emergence on the main stem, tillers 1 and 2. No significant differences between CS-NILs and SQ1-NILs in FL width were found in any treatment on shoots with FL cell division already complete. However, for FLs still undergoing cell division, final leaf width significantly differed between CS-NILs and SQ1-NILs, but only in ABA- and low-nutrient treatments (by 11.0% and 13.9%, respectively). Therefore, the 7AL yield QTL probably results from allele differences in a nutrient-regulated gene which determines termination of FL lamina lateral meristematic activity during leaf ontogeny, perhaps via an ABA-signalling pathway. A rice AINTEGUMENTA candidate gene homologue has an ABRE −607 bp upstream.