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Pleiotropic QTLs affecting heading date/flowering time and quality traits in durum wheat

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QTL analysis is a powerful tool to dissect complex phenotypic traits. A study was conducted to map QTLs associated with heading date and flowering time by using a durum wheat RIL population obtained from the cross between the line UC1113 and the variety Kofa. This population was previously used for our group to report QTLs for quality traits (grain color, carotenoid content, protein content and gluten strength). New analyses were performed in order to map regions associated with heading date and flowering time. Using these datasets pleiotropic QTLs affecting heading date/flowering time and quality traits were located in three genomic regions. In particular 1) on chromosome arm 2BS (*Xwmc154* -*Xcn1158*) associated to brightness (L^* value) and protein content, 2) on 3BS (*Xcfd79* -*Xksm45*) affecting flour redness (a^* value), gluten strength and 3) on 7BL (*Xcfa 2040* -*Xbarc1073*) with effect on flour yellow color (b^* value), carotenoid pigment content and protein content. An additional region affecting heading date, flour redness (a^* value) and gluten strength was mapped on 6AL (*Xbarc113* -*Xwmc553*) also affecting carotenoid pigment content and flour yellow color (b^* value) with a very strong effect. The 6AL QTL was one out of the two mapped using the mean values of heading date -measured in five environments- and explained 20.8% of the variation, just behind the main QTL for this trait mapped on 2BS (putative position of *Ppd-B1*). The QTL on 7BL mapped by using mean values of flowering time -measured in five environments- was the second most important QTL affecting both protein content, carotenoid pigments and flour yellow color in this population. This region explained from 11 up to 23% of the variation in flowering time and 18.2% in heading date in one environment. For both QTLs - 6AL and 7BL - the allele from Kofa increased the days from sowing to heading/flowering and improve the five quality parameters involved. This indicates that these regions caused a delay in heading/flowering date associated with increases in protein and carotenoid content, better gluten strength and flour color. On the other hand, for the 2BS and 3BS QTLs, an increase in heading/flowering date was detrimental for brightness, protein content, redness and gluten strength. These effects should be considered in breeding programs for quality traits.

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