HAPLOTYPE DIVERSITY IN THE MADS BOX GENE BM5, A CANDIDATE GENE CONTROLLING VERNALIZATION-INDUCED FLOWERING IN BARLEY

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Many plants from temperate regions are induced to flower only after extended exposure to low temperature. This process, vernalization, prevents the damage of the cold-sensitive flowering meristem during winter. Plant breeders have selected for variation in vernalization responsiveness to produce cultivars suited to planting in different climatic zones and agricultural practices. In cultivated barley and wheat, winter cultivars are sown in autumn, vernalized by the low temperature of winter, and develop grain in spring, while spring cultivars do not required vernalization and usually are planted in the late winter.

In hexaploid bread wheat, the Vrn-A1 gene, located on the long arm of chromosome 5A has been found to be a major determinant of vernalization responsiveness. Orthologous genes have been identified in Triticum monococcum (Vrn-A"m") and in barley (Vrn-H1, originally Sgh2). Recently the Vrn-A"m" locus of T. monococcum was mapped to a small region of chromosome 5 that includes two MADS box genes (Yan et al. 2003). One of these MADS box genes TmAP1 has an expression pattern consistent with a role in determining the vernalization response and therefore is a strong candidate gene for VRN1. The barley orthologue of the TmAP1 MADS box gene is BM5 and it shows a similar expression pattern to TmAP1 (Trevaskis et al. 2003).

As part of a search for molecular markers diagnostic for seasonal growth habit phenotype, we have surveyed haplotype diversity in a 1.3 kb region of 3' end of the BM5 gene across a panel of European barleys. The polymorphisms found were mainly confined to intronic sequence and define four haplotypes. One of these haplotypes appears so far to be specific to the winter gene pool. The distribution of BM5 haplotypes in European cultivated barley will be discussed.