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Marín S., Pistón F., Barro F.

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Expression of two D-hordeins from *Hordeum chilense* in bread and durum wheat

S. Marín, F. Pistón and F. Barro
Instituto de Agricultura Sostenible, CSIC, Alameda del Obispo s/n, 14080, Córdoba, Spain

**SUMMARY** – Two D-hordeins genes from *H. chilense* were introduced into bread and pasta wheat by particle bombardment. The D-hordeins showed levels of expression similar to that of the homeologous high molecular weight glutenin subunits (HMW-GS) of wheat. These transgenic lines increase the genetic variability for storage protein and can expand the end-use of wheat.

**Introduction**

The HMW-GS of wheat are responsible for the breadmaking quality (Shewry *et al*., 1992). These HMW-GS are coded by single genes located on chromosomes 1A, 1B and 1D of wheat. In barley, the homeologous to the HMW-GS are the D-hordeins. *Hordeum chilense* is a wild barley which has been successfully used in the synthesis of amphiploids by crossing with *Triticum* spp. (Martín and Chapman, 1977; Martín and Sanchez-Monge, 1982). In these amphiploids, called tritordeum, the D-hordeins play an important role in breadmaking quality (Alvarez *et al*., 1999). The aim of this work is to investigate the effect of two D-hordeins in the breadmaking and pasta quality of wheat.

**Material and methods**

Two D-hordein genes from lines H1 and H7 of *Hordeum chilense* were isolated by “genome walking” and the complete gene, including promoter, amplified by PCR and cloned into a transformation vector. These sequences were introduced in bread and durum wheat by particle bombardment. The HMW-GS composition were analysed in SDS-PAGE gels in a discontinuous Tris-HCl-SDS buffer system (pH: 6.8/8.8) at a 10% polyacrylamide concentration (w/v, C= 1.28%).

**Results and discussion**

The nucleotide and amino acid sequences showed that both D-hordeins were different in length, due to differences in the repetitive regions. The Blast comparison showed that both D-hordeins are similar to the HMW-GS 1Dx5 and 1Dy10 of bread wheat. Immature embryos of bread wheat 'Perico' and 'Bobwhite', and durum wheat 'Don Pedro' were transformed with the D-hordein genes from *H. chilense*. SDS-PAGE analysis showed similar levels of expression of both D-hordeins in comparison to the endogenous HMW-GS (Figure 1). Both D-hordeins were also transferred to the bread line 'Anza' by crossing with transgenic lines. Transformation with D-hordeins will be useful to expand the genetic variability for storage proteins and to investigate the effect of D-hordeins in the breadmaking and pasta quality of wheat.
Fig. 1. Expression of D-hordeins in different backgrounds of wheat. A. Transgenic lines (L1, L2, L3) of bread wheat 'Perico' expressing the D-hordeins from H1 and H7. B. Transgenic lines (L4, L5) of bread wheat 'Bobwhite' (BW208) expressing the D-hordeins from H1 and H7. C. Transgenic line (L6) of durum wheat 'Don Pedro' expressing the D-hordein from H7. D. Expression of the D-hordein from H7 in bread wheat 'Anza'. This D-hordein was transferred by crossing 'Anza' with line L2 (panel A). Arrows indicate the transgenic subunits and numbers indicate the corresponding HMW-GS.

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References


