

植物遗传学

# 小麦高分子量谷蛋白亚基Glu-B1位点沉默基因的克隆与序列分析

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收稿日期 2006-6-29 修回日期 2006-9-2 网络版发布日期 2006-10-17 接受日期

## 摘要

二粒小麦(*Triticum turgidum* L. var. *dicoccoides*)具有极其丰富的遗传多样性, 是栽培小麦品种改良的巨大基因库。在高分子量谷蛋白基因的组成上, 它具有许多栽培小麦不存在的变异类型, 在Glu-B1位点上的变异更大。我们利用种子贮藏蛋白的SDS-PAGE方法从原产于伊朗的二粒小麦材料PI94640中观察到缺失Glu-B1区的高分子量谷蛋白亚基。利用Glu-1Bx基因保守序列设计PCR引物, 对该材料的总DNA扩增, 获得了x型亚基编码基因(Glu-1Bxm)的全序列, 其全长为3 442 bp含1 070 bp的启动子区。序列比较发现, Glu-1Bxm在启动子区序列与Glu-1Bx7的最为相似。而在基因编码区, 我们发现Glu-1Bxm仅编码212个氨基酸, 由于开放阅读框中起始密码子后第637位核苷酸发生了点突变, 即编码谷酰胺的CAA突变为终止密码TAA, 可能直接导致了该高分子量谷蛋白亚基的失活, 这是我们在小麦Glu-B1位点基因沉默分子证据的首次报道。将Glu-1Bxm全序列与Glu-B1位点其他等位基因进行了系统树分析, 发现Glu-1Bxm是较为古老的类型。本文还对该特异高分子量谷蛋白亚基变异类型对品质遗传改良研究的意义进行了讨论。

关键词 [Glu-1Bx; 高分子量谷蛋白基因; 基因沉默; 小麦](#)

分类号

## Molecular Characterization of a HMW Glutenin Subunit Allele Providing Evidence for Silencing of x-type Gene on Glu-B1

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### Abstract

<P>Understanding the molecular structure of high-molecular-weight glutenin subunit (HMW-GS) may provide useful evidence for the study on the improvement of quality of cultivated wheat and the evolution of Glu-1 alleles. Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) shows that the subunits encoded by Glu-B1 were null, named 1Bxm, in a *Triticum turgidum* var. *dicoccoides* line PI94640. Primers based on the conserved regions in wheat HMW-GS gene promoter and coding sequences were used to amplify the genomic DNA of line PI94640. The PCR products were sequenced, and the total nucleotide sequence of 3 442 bp including upstream sequence of 1 070 bp was obtained. Compared with the reported gene sequences of Glu-1Bx alleles, the promoter region of the Glu-1Bxm showed close resemblance to 1Bx7. The Glu-1Bxm coding region differs from the other Glu-1Bx alleles for a deduced mature protein with only 212 residues, and a stop codon (TAA) at 637 bp downstream from the start codon was present, which was probably responsible for the silencing of x-type subunit genes at the Glu-B1 locus. Phylogenetic tree based on the nucleotide sequence alignment of HMW glutenin subunit genes showed that 1Bxm was the most ancient type of Glu-B1 alleles, suggesting that the evolution rates are different among Glu-1Bx genes. Further study on the

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contribution of the unique silenced Glu-B1 alleles to quality improvement was also discussed. </P>

**Key words** [gene silence](#); [Glu-1Bx](#); [high molecular weight glutenin subunit](#); [Triticum turgidum](#)

DOI:

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