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蔬菜

洋葱花发育B类MADS-box基因*AcDEF*的克隆与表达分析

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Cloning and Expression Analysis of B Class MADS-box Gene AcDEF Associated with Floral Development in Onion

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摘要 以紫皮洋葱常规品种‘RUPI’为试材，通过RACE方法克隆了*AP3/DEF*同源基因*AcDEF*，并用半定量RT-PCR和实时荧光定量PCR研究*AcDEF*在洋葱各类器官中的表达模式。GenBank登录号为JX661502的*AcDEF*基因长1 014 bp，开放阅读框长度为675 bp，编码224个氨基酸。系统发育分析表明，*AcDEF*基因属于单子叶B功能基因家族的*AP3/DEF*亚家族。表达模式分析显示，*AcDEF*在花器官中特异表达，其中在花瓣、雄蕊内高丰度表达，在花葶和膜状总苞中微量表达，在心皮中表达水平极低，在无性营养器官如根、假茎、叶片和鳞茎中无表达。在开花过程中，各花器官中*AcDEF*转录物的积累呈动态变化；在花瓣和雄蕊发育过程中*AcDEF*均高丰度表达，但在完全开放花的花瓣和雄蕊中表达量略有降低；在花葶、膜状总苞和心皮中表达量递减，在完全开放花的膜状总苞和心皮中*AcDEFAcDEF基因的序列结构和表达模式具有单子叶物种AP3/DEF基因的特征，属于paleoAP3进化系*。的表达量很低。

关键词： 洋葱 花发育 B－功能MADS-box基因 AcDEF基因

Abstract： We isolated the AP3/DEF-homologue from the onion variety ‘RUPI’ using RACE（rapid amplification of cDNA ends），and characterized its expression patterns in vegetative and floral organs using semi-quantitative RT-PCR and quantitative real-time PCR. Phylogenetic analysis indicates that our onion gene，denoted AcDEF，belongs to the AP3/ DEF subfamily of the B-function gene family and has sequence characteristics similar to other monocot paleoAP3 genes. The cDNA sequence is 1 014 bp long，includes both 5′ and 3′ untranslated regions，a poly（A）tail，and an open reading frame encoding a protein with a predicted length of 224 amino acids. Expression analyses indicate that AcDEF is specifically expressed in flower with no detectable signal in vegetative organs，such as roots，cauloids，leaves and bulbs. In addition，expression is tissue-specific in floral organs，with the highest level in the petals and stamens，moderate level in scapes and membranous sheath. AcDEF is expressed at very low levels in the carpels. Accumulation of AcDEF transcripts is dynamically changed and associated with the flower-bud formation and development. Expression of AcDEF is strongly detected during the initiation and early development of petals and stamens，but expression levels in these organs are somewhat reduced at later developmental stages. There also appears to be a gradual and obvious decrease in AcDEF expression during the different developmental stages of scapes，membranous sheath and carpels，such that it is almost absent from the membranous sheath and carpels in full-opening flowers.

Keywords： onion， Allium cepa L.， flower development， B-function MADS-box genes， AcDEF gene

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