月季 *RhMYB22* 基因的克隆及其调控花青素生物合成的功能分析

陈美林[1] 马乐涵[1] 林子英[1] 杨恬[1] 孙佳慧[1] 李泽卿[2*] 邢文[1*]

（1. 中南林业科技大学园林与建筑学院，长沙 410004；2. 湖北科技学院核技术与化学生物学院 国家林业草原桂花工程技术研究中心，咸宁 437000）

Cloning and Functional Analysis of *RhMYB22* in Regulating Anthocyanin Biosynthesis in Rose

CHEN Mei-lin[1] MA Le-han[1] LIN Zi-yin[1] YANG Tian[1] SUN Jia-hui[1] LI Ze-qing[2*] XING Wen[1*]

(1. *College of Landscape Architecture*, *Central South University of Forestry and Technology*, *Changsha* 410004; 2. *College of Nuclear Technology and Chemical Biology*, *National Forestry and Grassland Administration Engineering Research Center for Osmanthus fragrans*, *Hubei University of Science and Technology*, *Xianning* 437000)

DOI: 10.13560/j.cnki.biotech.bull.1985.2026-0249

附表 1 载体构建、实时荧光定量 PCR 及测序引物

Supplementary Table1 Primers designed for vector construction, qRT-PCR and sequencing

基因 Gene name	引物序列 Primer sequence (5′–3′)	用途 Purpose
RhANS	F:GGAACTTGCCCTCGGCGTGG R:ATCACGATGGAGTTGGGCACGC	
RhANR	F:AACCACAAGACCACCAAGAACTG R:ACTCGGTCAACGGGTCATCC	
RhCHS	F:CTACTTTCGTATCACCAACAGCG R:TTCAGTCAAATACATATAACGCTTC	
RhCHSa	F:CGAGATATCACAATGGTGACCGT R:GGTGCAATTGCTGATCCACG	
RhCHSc	F:CCCAATATCGAAATGGTGACTGTCG R:TGGAATTTCTTCTTGAGCTCAACCT	
RhC4H	F:ATGTTCGACAGGAGATTTGAAAGCG R:ATTATACTCGAAGCTCTGCGCCAAC	
RhDFR	F:CACCGTGCGAGACCCTGCTAA R:TCAAAATCCATAGGAGTGGCGACA	荧光定量 PCR（月季）
RhF3'H	F:GCCCTTCTCGTCCTCCCAA R:GCACCACCCACGGCTGATTG	
RhLAR	F:AAGGTGAGGCGTGCGATTGAGAA R: CGGAACAACCTCTGAAGGATGCT	qRT-PCR (*R.hybrida*)
Rh3GT5	F: GAAGTAGGGAAGGTGATGAGAAGC R: TCAAATTGGCGCAGCTAGATC	
RhPAL	F:AAGATTTTGCGAGAAGGATTTGC R:GCATTCTTCTCATTCTCACCATTTGT	
RhUFGT	F:GAGCCACAAAGTTGCTAGTTCTAG R: CTTTTTGCCGGAACTCGAGAAG	
RhF3H	F:AGGTTGTCCATAGCCACATTCCA R: AGGTCCTTGCTCATCTTCTTCTTGT	
RhCHI	F:ATGCCATCTCTCCAAGAATCAAAT R:AGAACACATCAAAAAGTGCCGAA	

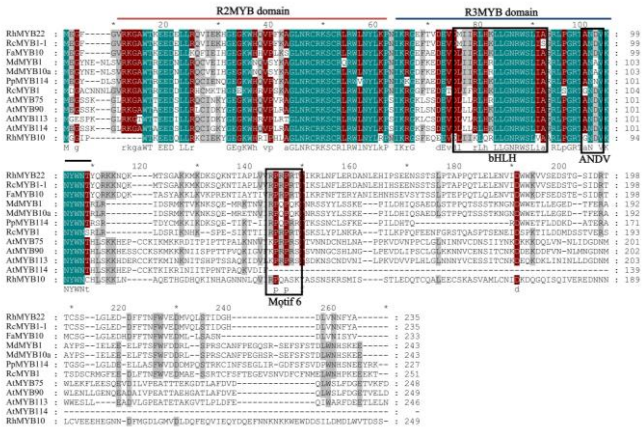
RhGT1	F: AATCCCCAACATCCTCCAAGTCCT	R:TTAGTAGAGCGGTCAAACAACAGC	
RhFLS	F: TGGAGGGATACGGAACATTTTTA	R: CACCACCTTGTGTAGATTCTTTGC	
RhMYB22	F:TTATGTGGTATTTAGGGTTTAGGAT R:TCTCTGGTTCTAAGGTCAAACTATT		
RcGAPDH	F:TGAAGGGTGGTGCCAAGAA	R:AAGGGGAGCAAGACAGTTGG	
NtC4H	F:CCAGCGTAATTTAGTTGTTGTG	R:CCATATCTTGACCTTTTCCAGT	
NtEF-1α	F:TGGTTGTGACTTTTGGTCCCA	R:ACAAACCCACGCTTGAGATCC	
Nt4CL	F:TCATTGACGAGGATGACGAG	R:TGGGATGGTTGAGAAGAAGG	
NtCHS	F:AAGCAAGAGAAACTAAAGGCTACAAG	R:AAATCCAAAAAGCACACCCCAT	
NtCHI	F:CGGGTGCCTCCATTCTTTTTATC R:CCTGACACTCTTTCGGCGATACTAC		
NtF3H	F:CCAGACAAACCAGATGGATGGATAG	R:CAAGGGTAAGGTCGGGCTGTG	荧光定量 PCR（烟草） qRT-PCR (*N.tabacum* 'NC89') 基因克隆 Gene cloning 亚细胞定位载体构建 Construction of subcellular localization vector
NtF3'H	F:TGGCTATTTCATTCCAAAAGGCTCA R:CTTCAAAGTCATTTCCTCGCACATC		
NtFLS	F:CTTGAAGGGAAAAGGGGTTGG	R:CGCAACTTCTCGCAGCCTCT	
NtDFR	F:GCAGTTGCTTCCCTTTTCTACC	R:TTCCCCATTGGTTGACTTTCC	
NtLAR	F:TCAATGGTGCGAAAGGACTC	R:TGCTGCAGAGAATATCAACC	
NtANR	F:CATTTGACTTTCCCAAACGC	R:ATTGGGCTTTTGAGTTGTGC	
NtANS	F:GTGCCTGGGTTACAACTTTTCTATG R:CATTGCTTAGGATTTCAAGGGTGTC		
NtUFGT	F:ATGTTGAAGGGCTAAAAGAAAGAGC R:CAAGTCCCAGCTGATACATATTCCC		
pMD18-RhMYB22	F:TTCATTTGGAGAGAACACGGGGGAC	R:GAAGAAGTCGTCCTCTAAAC	
pBWA(V)HS-RhMYB22-GLosgfp	F:AACACGGGGGACTTTGCAACATGGAGGGTTTCGGCGTGAGAAAAG R:CCTGAAGCGGCCGCTGTACATGCGTAGAAGTTGTTGACTAGATCATGGC		

S1：未开花蕾期、S2：C 初开花蕾期、S3：全开花朵期

S1: Unopened bud stage. S2: Initial flowering stage. S3: Fully-opened bud stage

附图 1 月季'金丝雀'和'浪漫宝贝'花朵表型

Supplementary Fig. 1. Phenotypes of flowers of *R. hybrida* 'Canary' and *R. hybrida* 'Baby Romantica'



红色线条和蓝色线条所指区域表示 R2 和 R3 结构域，黑色方框分别表示与 bHLH 互作的基序、ANDV 基序和 motif 6

The red and blue lines indicate the R2 and R3 domains, the black box indicate the motifs that interact with bHLH, the ANDV motifs and motif 6

附图 2 RhMYB22 与其他植物参与花青素苷合成 MYB 转录因子序列比对

Supplementary Fig. 2 Sequence alignment of RhMYB22 with known R2R3MYBs involved in anthocyanin biosynthesis