

牡丹 *PIN-Like* (*PILS*) 基因家族鉴定及在种子发育中的功能

孙音¹ 高凌云² 张谦¹ 姚俊修¹ 张广意¹ 姜楠南^{1*}

(1. 山东省林业科学研究院乡土珍贵树种育种国家林业和草原局重点实验室, 济南 250014; 2. 荣成市国土生态修复中心, 威海 264300)

Identification of the *PIN-Like* (*PILS*) Gene Family in Tree Peony and Its Function in Seed Development

SUN Yin¹ GAO Ling-yun² ZHANG Qian¹ YAO Jun-xiu¹ ZHANG Guang-yi¹ JIANG Nan-nan^{1*}

(1. Shandong Academy of Forestry, Key Laboratory of National Forestry and Grassland Administration on Native Precious Tree Species Breeding, Jinan 250014; 2. Rongcheng Territorial Ecological Restoration Center, Weihai 264300)

DOI: 10.13560/j.cnki.biotech.bull.1985.2026-0431

附表 1 引物及反义探针序列

STable 1 Primers and antisense strand probe sequence

基因名称 Gene Name	碱基序列 Base sequence (5'-3')	用途 Usage
<i>beta-actin</i> -F	GTTCCAGCCATCACTAATCGG	
<i>beta-actin</i> -R	GAATAGACCCTCCAATCCAGACAC	
<i>PoPILS1a</i> -F	GCTATCCCAACCGTCACCCCT	
<i>PoPILS1a</i> -R	TAACAACAAGAATGCCCGACAG	
<i>PoPILS1b</i> -F	TGTTTAATCCATCACTTGTTGGGTAG	
<i>PoPILS1b</i> -R	CCAAGTGCTGAGCCAATAATAAAC	
<i>PoPILS5a</i> -F	TCGCCAGACCCATTATACCA	
<i>PoPILS5a</i> -R	AGGACAGGATCCACATGTAGACC	实时荧光定量
<i>PoPILS5b</i> -F	CATCTGATACGAAATTCGGCTG	
<i>PoPILS5b</i> -R	GAGTTGAGTTTCCTGGTTAGCATC	
<i>PoPILS6</i> -F	ACCACTCGTCCTGATTGCG	
<i>PoPILS6</i> -R	TTGTTCAAGGTGTGTTATCCGTTG	
<i>PoPILS2a</i> -F	GGGGATGATTTGCGAAGTG	
<i>PoPILS2a</i> -R	CAGAGGAGGAAATCTTGAGAGTAA	
<i>PoPILS2b</i> -F	TATTTTATCCATCTGGGTGAGTCC	
<i>PoPILS2b</i> -R	GGAGGTGGGCGACATAAAATC	
<i>PoPILS1a</i> -F	CACGGGGGACGAGCTCGGTACCATGGAGGGAAGAGCTACAC	
<i>PoPILS1a</i> -R	TGCTCACCATGTCGACTCTAGAAGCTATTAGCCACATGAAGA	亚细胞定位
<i>PoPILS5a</i> -F	CACGGGGGACGAGCTCGGTACCATGGTTTTATCTACGACTG	
<i>PoPILS5a</i> -R	TGCTCACCATGTCGACTCTAGAGGACAGGATCCACATGTAGA	
<i>PoPILS1a</i> -F	GAGCTCGGTACCCGGGATCCATGGAGGGAAGAGCTACA	超量表达转化
<i>PoPILS1a</i> -R	AAGCAAAGCTCTGCAGGTCGACTCAAGCTATTAGCCACAT	

基因名称 Gene Name	碱基序列 Base sequence (5'-3')	用途 Usage
<i>PoPILS1a</i>	TGACCAAAGCGTTAGGGCAACCGATGCCAAAGCATACGTCCACAGCATA	原位杂交探针
	ATAACAGAGCAITTCCTCTCTCCAGCTCCGAACAATTGGGTAATCGTGCC	
	TATGTTCAATTGCCGGTGGAAAGTGCATACTGTAGTAGAAGAACAAACTGAT	
	ACAAATGGATCTGACTGCACCAGCCCCATGTGAATAGC	
	ATATTCATGGCAGGTGGCAAGGTAAACTGAACCATTAGCACATAGTGGTA	
<i>PoPILS5a</i>	TAATGGGTCTGGCGAGAGGAAGCCAAGATTGGCCGCTGCTTTCACGACC	
	CCCAATGCCAATCACCGAAAGAAATAAGTATCTAACGCAAAGGATCCCA	
	ATAATGACCAAAAATTTAATCTCGATGCCCGTAAGCC	

附表 2 牡丹 *PILS* 基因家族蛋白理化性质

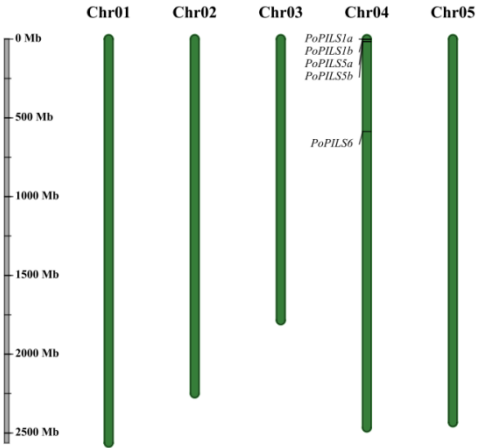
STable 2 Physicochemical properties of *PoPILS* gene family

基 因 名 称	基因 ID	染色体位置	外显子 Exon	氨基酸数量	相 对 分 子 质 量	等电点 pI
Gene name	Gene ID	Location		Amino acid	Mw (Da)	
<i>PoPILS1a</i>	Pos.gene81279	Chr04	8	311	33 284.45	9.19
<i>PoPILS1b</i>	Pos.gene81280	Chr04	6	219	24 094.39	8.30
<i>PoPILS5a</i>	Pos.gene3062	Chr04	6	191	20 896.00	9.18
<i>PoPILS5b</i>	Pos.gene75828	Chr04	7	261	28 972.81	5.37
<i>PoPILS6</i>	Pos.gene49961	Chr04	12	409	44 366.06	8.76
<i>PoPILS2a</i>	Pos.gene54238	unchr_scaff 1		441	48 390.86	5.26
<i>PoPILS2b</i>	Pos.gene13258	unchr_scaff 3		494	54 827.91	7.63

附表 3 PoPILS 蛋白的磷酸化位点预测

STable 3 The predicted phosphorylation sites of PoPILS proteins

基因	丝氨酸	苏氨酸	酪氨酸	阈值
Gene	Serine	Threonine	Tyrosine	Threshold
<i>PoPILS1a</i>	20	8	2	30
<i>PoPILS1b</i>	8	2	2	12
<i>PoPILS2a</i>	26	14	3	43
<i>PoPILS2b</i>	26	13	5	44
<i>PoPILS5a</i>	10	9	0	19
<i>PoPILS5b</i>	7	3	1	11
<i>PoPILS6</i>	16	11	2	29



左边的比例尺显示牡丹染色体的长度

The scale bar of the left displays the length of tree peony chromosomes

附图 1 *PoPILS* 在染色体上的分布

SFig. 1 The distribution of *PoPILS* on chromosomes

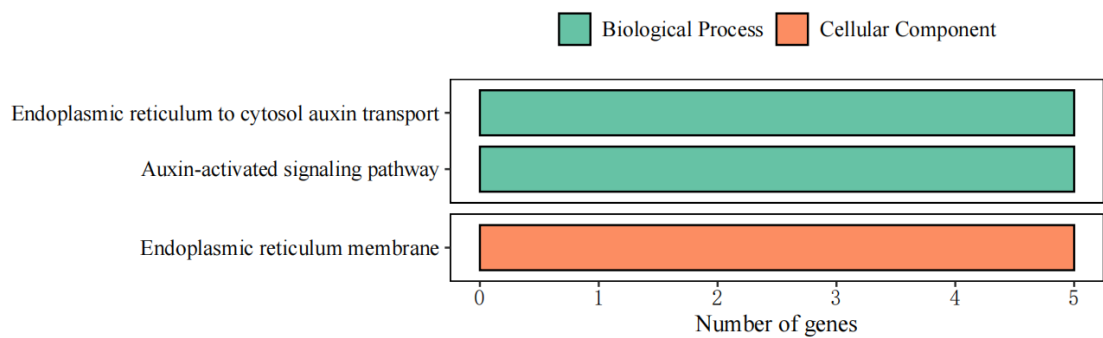


位于 N-和 C-末端两个高度转化的疏水结构域内的跨膜螺旋的预测通过具有不同颜色的矩形填充来显示

The transmembrane and modular loop structure of *PoPILS* Prediction of trans-membrane helices within two highly converted hydrophobic domains located at N-and C-termini were shown by the rectangle filling with distinct colors

附图 2 *PoPILS* 的跨膜和模块化环结构

SFig. 2 The transmembrane and modular ring structures of *PoPILS*



注：GO 注释 3 类目录在右侧分别用绿色以及红色方框标记。

Note:The three categories of GO are symbolized by green and red respectively on the right.

附图 3 *PoPILS* GO 注释

SFig.3 *PoPILS* GO ontology