

SUPPLEMENTARY DATA

TABLE S1. Primers used for gene cloning in this study

Gene classification	Primer name	Sequences	Gene name (sequenced clone no.)
B-class MADS-box genes	B1	5'- AACAGGCAGGTSACCTAYTC - 3'	<i>SIchAP3-1</i> (14), <i>SIchAP3-2</i> (5), <i>SIchAP3-3</i> (15), <i>SIchPI</i> (28)
	B2	5'- TYACTGTTCTMTGTGATGCT - 3'	<i>DEinAP3-1</i> (18), <i>DEinAP3-2</i> (6), <i>DEinPI</i> (38)
			<i>HOgrAP3</i> (44), <i>HOgrPI</i> (25)
C-class MADS-box genes	L2	5'- CARGTSACCTTYTGCAARCG - 3'	<i>SIchAG</i> (2)
	L5	5'- TCYGTKCTYTGTGATGCWG - 3'	<i>DEinAG</i> (2)
			<i>HOgrAG1</i> (3), <i>HOgrAG2</i> (3)
E-class MADS-box genes	SEP1	5' - GAGAACAARATHAACAGGCARG - 3'	
	SEP2	5' - AGGTTGCTCTMATMATYTTC - 3'	<i>SIchSEP3</i> (22)

TABLE S2. Primers used for *in situ* hybridization and RT-PCR in this study

	Gene	Forward primer (5'-3')	Reverse primer (5'-3')
<i>In situ</i> hybridization	<i>SIchFL1</i>	TCTGATCTCCAAAGAAAGG	GACATGGTAGAAGAGTCTCC
	<i>SIchFL2</i>	GAGCAGAATAACCAGCTAGG	CCTTCCCATGTCTATTACGC
	<i>SIchAP3-1</i>	TGCGTGGTCTTGAGCAAGAA	CGATGATGGAATGTTAGAGGG
	<i>SIchAP3-2</i>	GGATGAGCCTCAATTCGCAC	CTACTGACCAGGGAAAGTCTG
	<i>SIchAP3-3</i>	TGAGCAAGAAATGGAGAGT	TGAAGATTGGGTTGAGC
	<i>SIchPI</i>	GAAATGGATGGGAATGTGCGA	TATGGCAACCTACGTACAAGC
	<i>SIchAG</i>	ACTCAAACAGGCACTTCA	ACATCGTATTCATTTCCCG
	<i>SIchSEP3</i>	GTGAACTATGGTCGACAGCA	CTCGCACACAAACAAGGATCG
RT-PCR	<i>SIchAP3-1</i>	CGGTATCAGCAAACCTCTAGG	TTCTTCCTTCCTGAACCAG
	<i>SIchAP3-2</i>	GGCAGAGGATTGGTGGAGATG	GTGCCAAATCCACTTCCATTC
	<i>SIchAP3-3</i>	TCAACAACAACGAAGAGGT	TAGTACCTTCCGTTATCTGC
	<i>SIchPI</i>	AGAGGTTGTGGGATGCTAAGC	GGTAAACGGCATCTGATGAG
	<i>SIchAG</i>	CTCGAAATTGCGCCAACCTG	GTTCCGAGAGTCAAATGGTGC

TABLE S3. Representative floral MADS-box genes used in the phylogenetic analysis

Gene classification	Order	Family	Species	Gene name	Accession No.			
A-class MADS-box genes	Poales	Poaceae	<i>Oryza sativa</i>	<i>OsMADS14</i>	AF058697			
				<i>OsMADS15</i>	AF058698			
	Ranunculales	Eupteleaceae	<i>Euptelea pleiospermum</i>	<i>EUplFL1</i>	DQ656558			
				<i>EUplFL2</i>	DQ656559			
				Lardizabalaceae	<i>Akebia trifoliata</i>	<i>AktFL1</i>	AY627632	
						<i>AktFL2</i>	GU357459	
				<i>Decaisnea insignis</i>	<i>DEinFL1</i>	DQ656556		
					<i>DEinFL2</i>	DQ656557		
					<i>Sinofranchetia chinensis</i>	<i>SIchFL1</i>	DQ656565	
						<i>SIchFL2</i>	DQ656566	
				Buxales	Buxaceae	<i>Pachysandra terminalis</i>	<i>PAteFL1</i>	DQ656553
							<i>PatFL2</i>	AY306165
	<i>PAteFL3</i>	DQ656562						
	Brassicales	Brassicaceae	<i>Arabidopsis thaliana</i>	<i>AP1</i>	NM-105581			
				<i>CAL</i>	NM-102395			
				<i>FUL</i>	NM-125484			
				<i>AGL79</i>	NM-113925			
	Lamiales	Plantaginaceae	<i>Antirrhinum majus</i>	<i>SQUA</i>	X63701			
	Solanales	Solanaceae	<i>Petunia x hybrida</i>	<i>FBP29</i>	AF335245			
				<i>PFG</i>	AF176782			
				<i>FBP26</i>	AF176783			
	Asterales	Asteraceae	<i>Chrysanthemum x morifolium</i>	<i>CDM111</i>	AY173054			
				<i>CDM41</i>	AY173055			
<i>CDM8</i>				AY173056				
B-class MADS-box genes	Poales	Poaceae	<i>Oryza sativa</i>	<i>SPW1</i>	AF424549			
				<i>OsMADS4</i>	L37527			
	Ranunculales	Eupteleaceae	<i>Euptelea pleiospermum</i>	<i>EUplAP3-1</i>	GU357449			
				<i>EUplAP3-2</i>	GU357450			
				<i>EUplPI</i>	GU357451			
				Lardizabalaceae	<i>Akebia trifoliata</i>	<i>AktAP3-1</i>	AY627630	
						<i>AktAP3-2</i>	AY627631	
						<i>AktAP3-3</i>	DQ303124	
				<i>Decaisnea insignis</i>	<i>AktPI</i>	AY627634		
					<i>DEinAP3-1</i>	JQ806400		
					<i>DEinAP3-2</i>	JQ806401		
					<i>DEinPI</i>	JQ806402		
	<i>Holboellia grandiflora</i>	<i>HOgrAP3</i>	JQ806404					
		<i>HOgrPI</i>	JQ806405					
	<i>Sinofranchetia chinensis</i>	<i>SIchAP3-1</i>	JQ806394					
		<i>SIchAP3-2</i>	JQ806395					
		<i>SIchAP3-3</i>	JQ806396					
		<i>SIchPI</i>	JQ806397					
	Buxales	Buxaceae	<i>Pachysandra terminalis</i>	<i>PAteAP3-1</i>	GU357454			

				<i>PAteAP3-2</i>	GU357462
				<i>PAtePI</i>	GU357455
	Brassicales	Brassicaceae	<i>Arabidopsis thaliana</i>	<i>AP3</i>	M86357
				<i>PI</i>	D30807
	Lamiales	Plantaginaceae	<i>Antirrhinum majus</i>	<i>DEF</i>	X62810
	Solanales	Solanaceae	<i>Petunia x hybrida</i>	<i>phDEF</i>	X69946
				<i>phTM6</i>	AF230704
				<i>FBP1</i>	AY532265
				<i>pMADS2</i>	X69947
	Asterales	Asteraceae	<i>Chrysanthemum x morifolium</i>	<i>CDM115</i>	AY173060
				<i>CDM19</i>	AY173064
				<i>CDM86</i>	AY173061
C-class MADS-box genes	Asparagales	Agapanthaceae	<i>Agapanthus praecox</i>	<i>ApMADS2</i>	AB079260
	Poales	Poaceae	<i>Oryza sativa</i>	<i>OsMADS3</i>	L37528
				<i>OsMADS13</i>	AF151693
	Ranunculales	Eupteleaceae	<i>Euptelea pleiospermum</i>	<i>EUplAG1</i>	GU357452
				<i>EUplAG2</i>	GU357453
		Lardizabalaceae	<i>Akebia trifoliata</i>	<i>AktAG1</i>	AY627635
				<i>AktAG2</i>	AY627629
			<i>Decaisnea insignis</i>	<i>DEinAG</i>	JQ806403
			<i>Holboellia grandiflora</i>	<i>HOgrAG1</i>	JQ806406
				<i>HOgrAG2</i>	JQ806407
			<i>Sinofranchetia chinensis</i>	<i>SIchAG</i>	JQ806398
Buxales	Buxaceae	<i>Pachysandra terminalis</i>	<i>PAteAG</i>	GU357456	
Brassicales	Brassicaceae	<i>Arabidopsis thaliana</i>	<i>AG</i>	NM-118013	
			<i>SHP1</i>	NM-115740	
			<i>SHP2</i>	NM-129844	
			<i>STK</i>	NM-117064	
	Lamiales	Plantaginaceae	<i>Antirrhinum majus</i>	<i>FAR</i>	AJ239057
				<i>PLE</i>	S53900
	Solanales	Solanaceae	<i>Petunia x hybrida</i>	<i>pMADS3</i>	X72912
				<i>FBP6</i>	X68675
				<i>FBP11</i>	X81852
				<i>FBP7</i>	X81651
E-class MADS-box genes	Asterales	Asteraceae	<i>Chrysanthemum x morifolium</i>	<i>CDM37</i>	AY173059
	Asparagales	Asparagaceae	<i>Asparagus officinalis</i>	<i>AOM1</i>	AY382400
				<i>AOMADS2</i>	DQ344503
				<i>AOMADS3</i>	DQ344504
	Poales	Poaceae	<i>Oryza sativa</i>	<i>OsMADS7</i>	U78891
				<i>OsMADS8</i>	U78892
				<i>OsMADS1</i>	L34271
				<i>OsMADS5</i>	U78890
	Ranunculales	Eupteleaceae	<i>Euptelea pleiospermum</i>	<i>EUplSEP3</i>	GU357460
				<i>EUplSEP1</i>	GU357461
	Lardizabalaceae	<i>Akebia trifoliata</i>	<i>AktSEP3</i>	AY627628	
			<i>AktSEP1-1</i>	GU357447	
			<i>AktSEP1-2</i>	GU357448	

			<i>Sinofranchetia chinensis</i>	<i>SIchSEP3</i>	JQ806399
Buxales	Buxaceae		<i>Pachysandra terminalis</i>	<i>PAteSEP3-1</i>	GU357457
				<i>PAteSEP3-2</i>	GU357458
Brassicales	Brassicaceae		<i>Arabidopsis thaliana</i>	<i>SEP3</i>	NM-102272
				<i>SEP1</i>	NM-121585
				<i>SEP2</i>	NM-111098
				<i>SEP4</i>	NM-126418
Lamiales	Plantaginaceae		<i>Antirrhinum majus</i>	<i>DEFH200</i>	X95469
				<i>DEFH72</i>	X95468
				<i>DEFH49</i>	X95467
Solanales	Solanaceae		<i>Petunia x hybrida</i>	<i>FBP2</i>	M91666
				<i>pMADS12</i>	AY370527
				<i>FBP9</i>	AF335236
				<i>FBP5</i>	AF335235
				<i>FBP4</i>	AF335234
				<i>FBP23</i>	AF335241
Asterales	Asteraceae		<i>Chrysanthemum x morifolium</i>	<i>CDM44</i>	AY173057
Outgroup	Brassicales	Brassicaceae	<i>Arabidopsis thaliana</i>	<i>SVP</i>	NM-127820

TABLE S4. Genes used in the phylogenetic analysis of AP3-like genes in Ranunculales

Order	Family	Species	Gene name	Accession No.
Ranunculales	Ranunculaceae	<i>Aconitum sinomontanum</i>	<i>AcsAP3-1</i>	EU481818
			<i>AcsAP3-2</i>	EU481817
			<i>AcsAP3-3</i>	EU481816
		<i>Actaea asiatica</i>	<i>AcaAP3-1</i>	HQ647375
			<i>AcaAP3-2</i>	HQ647376
		<i>Adonis vernalis</i>	<i>AdvAP3-2</i>	HQ694800
			<i>AdvAP3-3</i>	HQ694799
		<i>Anemone nemorosa</i>	<i>AnnAP3-1</i>	AY162841
			<i>AnnAP3-2</i>	AY162842
			<i>AnnAP3-3</i>	AY162843
		<i>Aquilegia alpina</i>	<i>AqaAP3-1</i>	AY162849
			<i>AqaAP3-2</i>	AY162850
			<i>AqaAP3-3</i>	AY162851
		<i>Caltha palustris</i>	<i>CapAP3-1</i>	EU481813
			<i>CapAP3-2</i>	EU481812
		<i>Cimicifuga racemosa</i>	<i>CirAP3-1</i>	AY162862
			<i>CirAP3-2</i>	AY162863
			<i>CirAP3-3</i>	AY162864
		<i>Clematis alpina</i>	<i>ClaAP3-1</i>	EU481808
			<i>ClaAP3-2</i>	EU481807
			<i>ClaAP3-3</i>	EU481806
		<i>Clematis integrifolia</i>	<i>CliAP3-1</i>	AY162870
			<i>CliAP3-2</i>	AY162871
		<i>Delphinium exaltatum</i>	<i>DleAP3-1</i>	EU481804
			<i>DleAP3-2</i>	EU481803
			<i>DleAP3-3</i>	EU481802
		<i>Helleborus hydrida</i>	<i>HhAP3-1</i>	Sharma <i>et al.</i> , 2011
			<i>HhAP3-2</i>	Sharma <i>et al.</i> , 2011
			<i>HhAP3-3a</i>	Sharma <i>et al.</i> , 2011
			<i>HhAP3-3b</i>	Sharma <i>et al.</i> , 2011
		<i>Hepatica henryi</i>	<i>HeheAP3-1</i>	HQ647378
			<i>HeheAP3-2</i>	HQ647379
		<i>Hydrastis canadensis</i>	<i>HycAP3-1</i>	EU481800
		<i>Nigella sativa</i>	<i>NgsAP3-2</i>	HQ694795
			<i>NgsAP3-3</i>	HQ694794
		<i>Ranunculus bulbosus</i>	<i>RbAP3-1</i>	AF052876
			<i>RbAP3-2</i>	AF130869
		<i>Ranunculus ficaria</i>	<i>RfAP3-1</i>	AF052854
			<i>RfAP3-2</i>	AF130870
			<i>RfAP3-3</i>	AY162883
		<i>Thalictrum dioicum</i>	<i>ThdAP3-1</i>	AY867875
			<i>ThdAP3-2a</i>	AY867876
			<i>ThdAP3-2b</i>	AY867877
		<i>Thalictrum thalictroides</i>	<i>ThtAP3-1</i>	AY162886

			<i>ThtAP3-2a</i>	AY162887
			<i>ThtAP3-2b</i>	AY162888
		<i>Trautvetteria caroliniensis</i>	<i>TrcAP3</i>	AY162904
		<i>Trollius laxus</i>	<i>TllAP3-1</i>	AY162890
			<i>TllAP3-2</i>	AY162892
			<i>TllAP3-3</i>	AY162894
		<i>Xanthorhiza simplicissima</i>	<i>XsAP3-2</i>	EU481797
			<i>XsAP3-3</i>	EU481796
Berberidaceae		<i>Berberis gilgiana</i>	<i>BgAP3-1</i>	AY162857
			<i>BgAP3-2</i>	AY162858
		<i>Epimedium grandiflorum</i>	<i>EpgAP3-1</i>	EU481793
			<i>EpgAP3-3</i>	EU481794
		<i>Jeffersonia diphylla</i>	<i>JdAP3-1</i>	EU481791
Circaeasteraceae		<i>Kingdonia uniflora</i>	<i>KiuAP3a</i>	HQ647371
			<i>KiuAP3b</i>	HQ647372
Menispermaceae		<i>Cocculus trilobus</i>	<i>CctAP3-1</i>	HQ694788
			<i>CctAP3-2</i>	HQ694789
			<i>CctAP3-3</i>	HQ694790
		<i>Menispermum dauricum</i>	<i>MndAP3-1</i>	EU481786
			<i>MndAP3-2</i>	EU481784
			<i>MndAP3-3</i>	EU481783
Lardizabalaceae		<i>Akebia quinata</i>	<i>AkqAP3-1</i>	AY162835
			<i>AkqAP3-2</i>	AY162839
		<i>Decaisnea insignis</i>	<i>DEinAP3-1</i>	JQ806400
			<i>DEinAP3-2</i>	JQ806401
		<i>Holboellia coriacea</i>	<i>HbcAP3-1</i>	EU481789
			<i>HbcAP3-2</i>	EU481788
		<i>Holboellia grandiflora</i>	<i>HOgrAP3</i>	JQ806404
		<i>Sinofranchetia chinensis</i>	<i>SIchAP3-1</i>	JQ806394
			<i>SIchAP3-2</i>	JQ806395
			<i>SIchAP3-3</i>	JQ806396
Papaveraceae		<i>Eschscholzia californica</i>	<i>EcDEF1</i>	EF378697
			<i>EcDEF2</i>	EF378698
		<i>Papaver nudicaule</i>	<i>PnAP3-1</i>	AF052873
			<i>PnAP3-2</i>	AF052874
		<i>Sanguinaria canadensis</i>	<i>ScAP3</i>	AF130868
Fumariaceae		<i>Dicentra eximia</i>	<i>DeAP3</i>	AF052875
Eupteleaceae		<i>Euptelea pleiosperma</i>	<i>EupAP3-1</i>	GU357449
Buxales	Buxaceae	<i>Pachysandra procumbens</i>	<i>PpAP3-1</i>	DQ479360
			<i>PpAP3-2</i>	DQ479361
			<i>PpAP3-3</i>	DQ479362
Proteales	Nelumbonaceae	<i>Nelumbo nucifera</i>	<i>NnAP3</i>	DQ453775
Sabiaceae	Sabiaceae	<i>Meliosma dilleniifolia</i>	<i>MdAP3-1</i>	AY436709
			<i>MdAP3-2</i>	AY436710
			<i>MdAP3-3</i>	AY436711
	Platanaceae	<i>Platanus occidentalis</i>	<i>PloAP3-1</i>	AAO26529
Trochodendrales	Trochodendraceae	<i>Trochodendron aralioides</i>	<i>TraAP3</i>	DQ453774

TABLE S5. Genes used in the phylogenetic analysis of *PI*-like genes in Ranunculales

Order	Family	Species	Gene name	Accession No.	
Ranunculales	Ranunculaceae	<i>Aconitum sinomontanum</i>	<i>AcsPI</i>	EU481819	
		<i>Actaea asiatica</i>	<i>AcaPI</i>	HQ647377	
		<i>Adonis vernalis</i>	<i>AdvPI-1</i>	HQ694801	
			<i>AdvPI-2</i>	HQ694802	
		<i>Anemone nemorosa</i>	<i>AnnPI-1</i>	AY162845	
			<i>AnnPI-2</i>	AY162847	
		<i>Aquilegia alpina</i>	<i>AqaPI</i>	AY162852	
		<i>Cimicifuga racemosa</i>	<i>CirPI-1</i>	AY162865	
			<i>CirPI-2</i>	AY162867	
		<i>Clematis integrifolia</i>	<i>CliPI-1</i>	AY162872	
			<i>CliPI-2</i>	AY162873	
		<i>Caltha palustris</i>	<i>CapPI</i>	EU481814	
		<i>Clematis alpina</i>	<i>ClaPI-1</i>	EU481811	
			<i>ClaPI-2</i>	EU481810	
		<i>Delphinium exaltatum</i>	<i>DlePI</i>	EU481805	
		<i>Helleborus hydrida</i>	<i>HhPI1</i>	Sharma <i>et al.</i> , 2011	
			<i>HhPI2</i>	Sharma <i>et al.</i> , 2011	
			<i>HhPI3</i>	Sharma <i>et al.</i> , 2011	
		<i>Hepatica henryi</i>	<i>HehePI</i>	HQ647380	
		<i>Hydrastis canadensis</i>	<i>HycPI</i>	EU481801	
		<i>Nigella sativa</i>	<i>NgsPI-1</i>	HQ694797	
			<i>NgsPI-2</i>	HQ694796	
		<i>Ranunculus bulbosus</i>	<i>RbPI-1</i>	AF052859	
			<i>RbPI-2</i>	AF052860	
		<i>Ranunculus ficaria</i>	<i>RfPI-1</i>	AF052858	
			<i>RfPI-1b</i>	AY162884	
			<i>RfPI-2</i>	AF130872	
			<i>RfPI-3</i>	AY162885	
		<i>Thalictrum thalictroides</i>	<i>ThtPI-1</i>	AY162889	
		<i>Trautvetteria caroliniensis</i>	<i>TrcPI-1</i>	AY162905	
			<i>TrcPI-2</i>	AY162906	
		<i>Trollius laxus</i>	<i>TllPI-1</i>	AY162896	
			<i>TllPI-2</i>	AY162898	
			<i>TllPI-3</i>	AY162900	
			<i>TllPI-4</i>	AY162902	
		<i>Xanthorhiza simplicissima</i>	<i>XsPI-1</i>	EU481799	
			<i>XsPI-2</i>	EU481798	
		Berberidaceae	<i>Berberis gilgiana</i>	<i>BgPI-1</i>	AY162860
				<i>BgPI-2</i>	AY162861
			<i>Epimedium grandiflorum</i>	<i>EpgPI</i>	EU481795
			<i>Jeffersonia diphylla</i>	<i>JdPI</i>	EU481792
			<i>Nandina domestica</i>	<i>NndPI</i>	HQ694793
Podophyllaceae	<i>Podophyllum peltatum</i>	<i>PdcPI</i>	HQ694792		
	Circaeasteraceae	<i>Circaeaster agrestis</i>	<i>CiaPI</i>	HQ647374	

	<i>Kingdonia uniflora</i>	<i>KiuPI</i>	HQ647373
Menispermaceae	<i>Menispermum dauricum</i>	<i>MndPI</i>	EU481787
	<i>Cocculus trilobus</i>	<i>CctPI</i>	HQ694791
Lardizabalaceae	<i>Akebia trifoliata</i>	<i>AktPI</i>	AY627634
	<i>Akebia quinata</i>	<i>AkqPI</i>	AY162837
	<i>Decaisnea insignis</i>	<i>DEinPI</i>	JQ806402
	<i>Holboellia coriacea</i>	<i>HbcPI</i>	EU481790
	<i>Holboellia grandiflora</i>	<i>HOgrPI</i>	JQ806405
	<i>Sinofranchetia chinensis</i>	<i>SIchPI</i>	JQ806397
Papaveraceae	<i>Eschscholzia californica</i>	<i>EcGLO</i>	EF378699
	<i>Papaver nudicaule</i>	<i>PnPI-1</i>	AF052855
		<i>PnPI-1</i>	AF052856
	<i>Sanguinaria canadensis</i>	<i>ScPI</i>	AF130871
Fumariaceae	<i>Dicentra eximia</i>	<i>DePI</i>	AF052857
Eupteleaceae	<i>Euptelea pleiosperma</i>	<i>EupPI</i>	GU357451

FIG. S1. Multiple sequence alignment for AP3-like proteins of representative species from Ranunculales. The conserved MADS domain and K domain are highlighted by a solid line and a dashed line, respectively. The PI-motif-derived and paleoAP3 motifs are indicated with boxes.

```

RfAP3-1 -----NRQVTYSKRRAGIMKKAKELTVLCDAKVS LIMFSSTGKCVDFISPSIS--PKAFYDKYRDVTGDDLWKSQY
CirAP3-1 -----GGIMKKAKELHVLCDAEVSLIMFSNTGKMTDFISPNIT--MKMYDKYQQASGLNLWQSQY
EpgAP3-3 -----TGIVKKARELTVLCDAEVSLIMFSSTGKLSEYISPSIT--TKKLFQYQQMTAINLWNSHY
MndAP3-1 -----SGIMKKARELTVLCDAEVSLIMFSSTGKFSEYVGPVSVT--TKKMFQYQQVTGINLWNSHY
SIchAP3-1 -----NRQVTYSKRRAGITKKARELSVLCDAEVSLIMFSNTGKLSEYITPSVT--PKKVFDRYQQTLGINLWNSHY
PnAP3-2 MGRGKIEIKRIENATNRQVTYSKRRSGILKKAKELTVLCDAEVSLIMFSSTGKMTSEYLSPSLNGNTKRVDYKQQLSGISLWNSHY
RfAP3-2 -----AGIMKKAQELTVLCDAKVALIMFSSTGKVSSEYVSPGTS--FKSYVDYQQAINKMSLWDSHY
CirAP3-2 -----AGITKKAQELTVLCDAQVSLIMISSTGKLFSEYTSSTT--TKSIYDRYQQTTGLNLWQSHY
BgAP3-2 -----TGIMKKAKELTVLCDAEVSLIMFSSTRKLFSEFISPSST--VKKIFDRYQQVTGKQLWQHSHY
MndAP3-2 -----AGIMKKARELTVLCDAEVSLIMFSSTGKVFSEYISPSST--TKKIFDRYQQVSGISLWQSHY
SIchAP3-2 -----NRQVTYSKRRAGIVKKAQELTVLCDAEVSLIMFSSTGKVFSEYISPSVT--TKKVFDRYQHVSGINIWHSY
RfAP3-3 -----TGIVKKARELTVLCDAQVSLIMFSSTGKLSEYISPSIT--RKKVYDMYQKVAEVDLWNSHY
CirAP3-3 -----TGIVKKARELTVLCDAEVSLIMFSSTGKLSEYISPSIT--TKKIYDQYQQVTGVDLWNSHY
BgAP3-1 -----TGIVKKARELTVLCDAEVSLIMFSSTGKLSEYISPSIT--TKRFLDQYQQMTGINLWTHSHY
EpgAP3-1 -----AGIFKKAKELAVLCDAEVSLMFSNTGKLSEFKSPSLT--LKNVYDRYQQNTGIDLWQSHY
MndAP3-3 -----TGIVKKARELTVLCDAEVSLIMFSSTGKLSEFISPSIT--MKKLFQYQQVSGIDLWNSHY
SIchAP3-3 -----NRQVTYSKRRAGIVKKAQELTVLCDAEVSLIMFSSTGKVFSEYISPSIT--TKRFLDQYQQVSGIDLWNSHY
PnAP3-1 -----SGIFKKAKELTILCDAQVCLIMFSNTGKVFSEYVSPSTT--MKEFFDRFRRTINIDLWASQY

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MADS domain

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RfAP3-1 DKMQQELKTLVETNRKLREIGQVRG-EDLSNLSIKELRGLEQLDRDTEKVVQRKFGLLSSQGETQRKKIRNLAEINGNLWQY-
CirAP3-1 EKMQDNLNKLMEINRKLREIGKRLG-EDLNDLSFAELRGLEQLHLESSCKTVRDRKFGLLGTQTETCRKKIKNLEEVHNNLLHEY-
EpgAP3-3 ERMQESLRKQNETNMKLREIGQRKG-EGLDLDFDDLGNLEQLNSSLKTVRDRKYHMIATQTETYRKKLRNLQETHSLIREF-
MndAP3-1 ERMQDHLNKLEIINRKLREIRHRIG-EDSNLDSIEELRGLEQLNSSLKIVRERKYHLISSKTKLENVEETYNNLMQEL-
SIchAP3-1 ERMQENLNKQKEINRRLREIRQRMG-EDLNELSDVLRGLEQLNSSLKIVRERKYHLITTTQTDYRKKLRNLLEETHNNLIREL-
PnAP3-2 ESLQNALNKQKEINRRLREIRQRMG-EDLDELTEELRSLEQLNEASVKVVRDRKYHVIITQTETTRKKLRNHTEQNHGLLREF-
RfAP3-2 EKMQGTLLKVKETNNNLRREIRQRQG-DDLDGLSFMELRGLEQLNSSLVDRVRHRKKNHVIRTQDNTNKKIKSHEETNRNFMASL-
EKMQENLNKLKETNSKLREIRQRNG-EDIDDLTFQQLRGLEQLNSSLKIVRERKYHVIITQTDYRKKLRNLLEETHNNLRAF-
BgAP3-2 EKMQETLNKLDVNNNLRREIRQRKGDDDLDDLNIEQLRDLEQNMEKSVKAVRDRKHFVIGTQNTSKKKIKNLQETHKFLCEL-
MndAP3-2 ERMQDNLNKLKEINNLRREIRHRIG-EDLNDLSIEELRSLEQLNSSLKSVRERKYHVIHNTQETCKKKLRNLEERHNDLLEL-
SIchAP3-2 ERMQDHLKQKEINNLRREIRQRIGGDDLNGLSIQELRGLEQLNSSLKTVRERK-----
RfAP3-3 ERMQKELKLLKETNMELRKEIRQRVG-EEIDLSIQQLRGLEQLDDESVKAVRDRKYHTIATQTETYRKKLRNLHETHHLVREI-
CirAP3-3 EKMQETLKKQKESNMKLREIRQRNG-EGLDLDFDELRGLEQLNSSLKIVRERKYHVIITQTDYRKKLRNLQETHHLVREF-
BgAP3-1 ERMQESLKKQNDTNMRLREISQRMG-ECLDELNFDLHSLQDLGSLKVVDRDRKYHMIATQTETYRKKLRNLLEETHKNLVREF-
EpgAP3-1 ERMQENLNKQKELNNKLREIGQRTG-EDISGLTLADLRGLEQLDLSLRTVDRERKYHVIITQTDYRKKLRNVVETHNNLNLQ-
MndAP3-3 ERMQENLNSLKEINLKLREISQRMG-QYMDLDSIEELRRLHEDLESSLKTVRDRKYHTIATQTETYRKKLRNLQETHSLLEF-
SIchAP3-3 ERMQELNKQLEINMRLREIKRIG-EGLNDLSFEELRGLEQLNSSLKIVRERKYHMIITQTDYRKKLRNLQETHNNLHFEF-
PnAP3-1 ETLQEEELKQKEINNKLKKEIRQRTGQDDLSELSLDEMIRILEKNLIDSADIVRNRKNHVLNSHTETSKKRKAQEETYNLVRALH

```

K domain

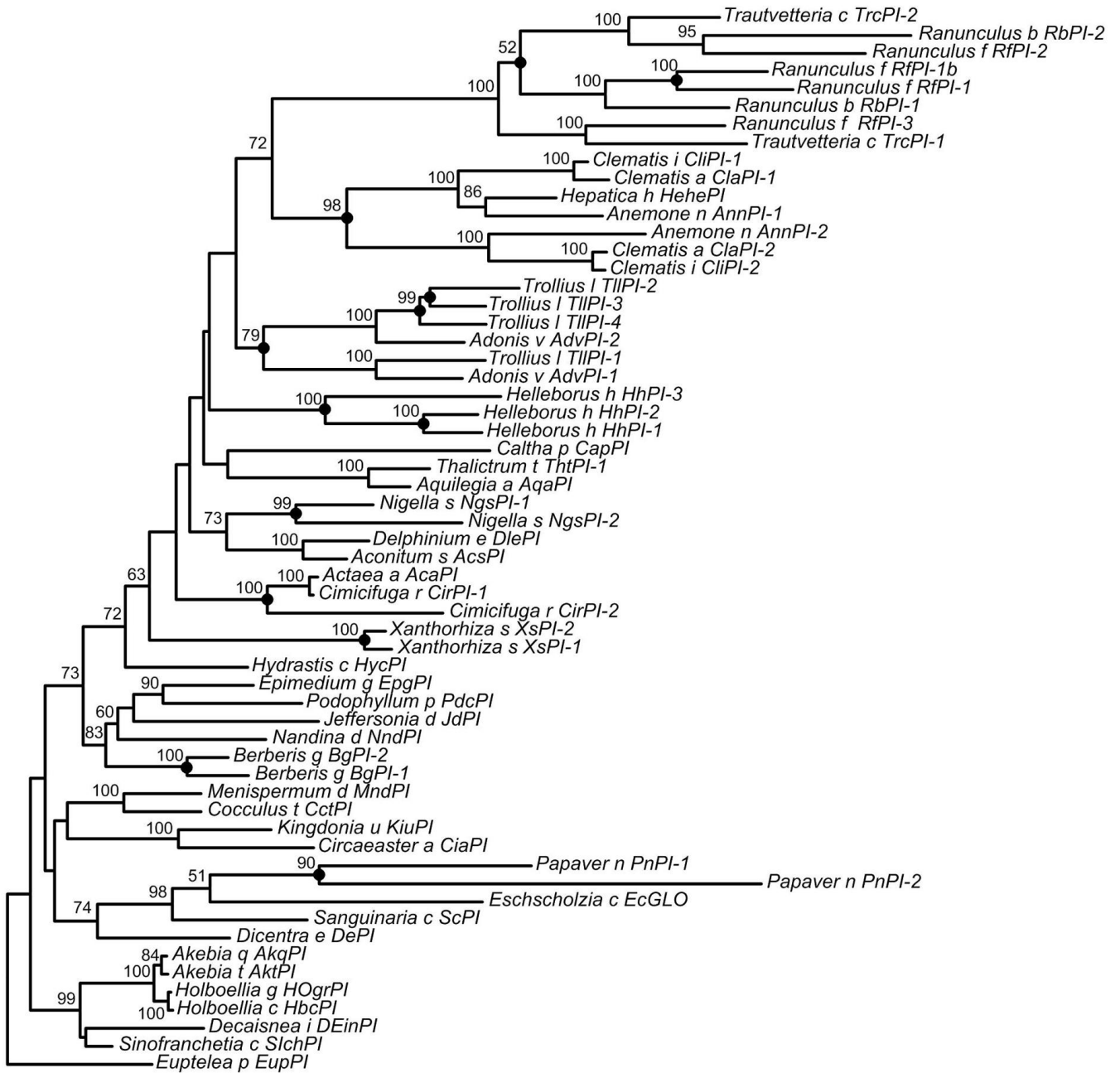
```

RfAP3-1 ---QERMED---EYAL-AN--G-----M-S-----TLELNG-----VFSFRLRPS-QTNLHN--DEEYETHDLRLA-
CirAP3-1 ---EERLEE---AYAL-ANHEG-----M-S-----TNELANDG---SHVFMFRLQPS-QPNLRD--DGGYGIHDLRLG-
EpgAP3-3 ---EARGED-PYY-----DGE---LET-----IMGMVSG-----LYSFHLYPS-QPNLQD--GGEYES--FNL-
MndAP3-1 ---EGRIGS---QFSM-TNAEED---YHS-----AVHQVNGG---SQI---FRLQPS-QPNLQD--GGYGSYGLRLM-
SIchAP3-1 -VQEGRNED-LHYAFGNNHEGD---YQS-----ALELANGG---SHIFALRLQPS-QPNLRD--GGYGSYGLRLA-
PnAP3-2 ---EPILDEDPHYVI-AHQEED---YES-----AIELAHGG---PNIFAFRLQPS-QPNLHN--GGGYNCHDLRLA-
RfAP3-2 ---EQMGKVEPQYAY-VPQDED-----YDANNMG---SRIYAIHQTH-Q-N---GEDYGSYGLSLA-
CirAP3-2 ---EERIEEDCHYAL-VDQEGD---YQS-----AIGLANGG---PHIFSIQLQPS-QPNLRD--DEGYASYGLRLA-
BgAP3-2 ---DQ-----IEL-ASH-----FES-----SSFGLANRS---SHEFAFRLQPS-TPNLQD--GRGYGSYDFHLA-
MndAP3-2 ---EGRDAD-SHYSL-A-----ES-----SLGLANGN---SHVFAFRLHPF-HPNL-----GGYGSYDFHLA-
SIchAP3-2 ---EGREDE-PQFAL-ADHEGE---YES-----ALGSTNGG---SHMFAFRLQPS-QPNLQD--GSGFGTYDLRLA-
RfAP3-3 ---EARGED-AYY-----DGD---YEA-----IMALTNAG---AHFLPYGLHPG-QPDHHD--GDGYALHNLRLA-
CirAP3-3 ---EARGED-PYY-----EGG---YES-----LLGMSNGA---AHLPLPYRLQPS-QPNLQD--GENYGSYNLRLG-
BgAP3-1 ---EIRGED-PYY-----EAD---MET-----SMDVVNG-----LYDYRLQLN-QPNL-R--GEGFQY-FGVMH-
EpgAP3-1 ---EVNQMA-----KESD---YHL-----AIELANAG---SPVVAFRLQPN-QPNLHD--EGYGLRDLRLS-
MndAP3-3 ---EARGED-PYYN-----EGE---YET-----LVGLNGS---ADIVSFHFQPN-LPS---GGGFGPYNLRLA-
SIchAP3-3 ---EDKDED-PYYGL-AD-NGR---YYES-----SLGLVNEP---PQIFSFHLQQAQPNLQD--GGYGFGLTHLS-
PnAP3-1 SQADREEQEFHFYAI PADTEGDHHRDYLSSSSSMRRLSISGGGCENSQITFQLQPS-QPNLHHAAGGY-FYSQHYA-

```

PI Motif-Derived PaleoAP3 Motif

FIG. S2. Maximum-likelihood tree of *PI*-like genes in Ranunculales. Bootstrap values (>50%) are shown above the branches. The inferred small-scale gene duplication events are indicated with dots.



0.05