Supplemental Figure 1.

A

Primer set name	Sense primer	Antisense primer
RanGAP1_1	ATGYTNGTNGARMGNATG	SWDATNCCRTCRTTCAT
RanGAP1_2	ATHAARYTNTGGCCNCC	CCYTCRTCNCCNGTCAT
GeneRacer 5’	GeneRacer 5’ primer	GGTCTGCCAGCTACAAAGTCGGAAAT
GeneRacer 3’	GATGGTGATGGAAGCTCTGCTGTACAA	GeneRacer 3’ primer
GeneRacer 5’ nested	GeneRacer 5’ nested primer	CCTCTTCGGCTTCGATGAAGGATCTT
GeneRacer 3’ nested	GCTCTGCTGTACAACTATACGCCAAAGA	GeneRacer 3’ nested primer
ACRanGAP1_1	ACTGAAAGAGTAGAAATGGAGCACGAGG	GACTGCTAAAAACACACAAGTGCTCTTCAG
ACRanGAP1_2	CAGATTGTCATGGAGACTGCTCCAGC	GACTGCTAAAAACACACAAGTGCTCTTCAG
ACRanGAP1_3	ATTCAGGGTACCTGGAGACTGCTCCAGC	TCTCAGGATCCGGACCAAGCAAATCCTCC

B

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   1 TGGAGCACGAGGACACTGAC ATGGTCTGAAGGAGTAGAAA GACCGTAACTTTTCAACTAT TCTGTCAGTCATCCTCCCTG AAGCTTAGGGTTTCTAAAAA  100
 101 ATTCAGGTTTCATCTTCCTC CCTGAAGCTTAGGGTTTTTA AACAATTCAGATTGTCATGG AGACTGCTCCAGCTCAGAGT GATCAACCAAAATCCTTCTC  200
 201 AATCAAGCTCTGGCCACCAA GCGAAAAAACTCGACTGATG CTTGTAGAAGGGATGACCAA AAACCTCTCAACCGAGTCCA TTTTTTCTAGGAAGTATGGG  300
 301 CTTCTAACCGTAGAAGAAGC CACTGAACATGCAAAAAACA TTGAAGACACATGCTTTAAA TCTGCCTGTGAACACTTCGA TAGAGAGCCAGATGGTGATG  400
 401 GAAGCTCTGCTGTACAACTA TACGCCAAAGAAACGAGCAA GCTCATGCTTGAAGTTCTCA AAAAAGGCCCCAAATCCAAA GAGGAAAAAGATATAATCAT  500
 501 CGATTCTCCCAAGCAAAAGG TTTTTGACATATCTCAAGGA AAAAGATCCTTCATCGAAGC CGAAGAGGCCAAAGAGCTTC TTACCCCACTCACTGAAAAA  600
 601 GGAAACGGTTACAGTAAAAT CATATTCAGCAACAGAAGCT TTGGCATTGAAGCTGCTAAG CTAGCCGAGCCTATACTAGC ATCTCTAAAAGATCAACTCA  700
 701 AAGAGGTTGATATTTCCGAC TTTGTAGCTGGCAGACCTGA AGATGAAGCCTTGGAAGTTA TGAGAATATTCTCATCAGCA TTAGAAGGGTGCATTCTAAA  800
 801 CTATTTGAATCTATCCGATA ATGCTTTGGGCGAGAAAGGT GTAAGGGCATTTGGGTCATT GTTAAAATCTCAACATAACT TAGAGGAGCTTTATTTGATG  900
 901 AATGATGGCATATCAGAGGA AGTAGCTAAGGCTTTGACCG AGTTGATTCCATCAACTGAT AAAATTAAGGTTCTCCATTT TCATAACAATATGACGGGGG 1000
1001 ATGAAGGAGCTATTTCAATA GCTGAACTATTGAAATCATC GCCTTTACTAGAAAATTTCA GATGTTCGTCGACTAGAGTG GGATCAGAAGGAGGGATTGC 1100
1101 ACTTGTTGAAGCTTTGAAAG GTTGCGAGCATTTGAAGAAG CTGGATTTGAGGGATAATAT GTTTGGTGTGGAAGCTGGAT TAGCTCTTAGCAAAACCTTA 1200
1201 GAAAAGCTCAATGATATAAG CGAGTTGTATCTAAGCTATT TGAACTTAGAAGACAAAGGA GCGATTGCAGTGTTGGAAGC AATAGAGAAATATTTGCCTA 1300
1301 AAATTGAAGTTTTGGAAATG GCTGGAAATGACATAACAGT GAAAGCTTCAAAAGCCCTGG CTTCTTGCATTTCATCGAAG AAAATGTTGAAGAAGCTGGT 1400
1401 GTTGTCTGAGAATGAACTGA AAGATGAAGGGGCTGTTAGG ATAGCTACTGCTTTGGAAGA TGGCCATGTTGAGCTTAGAG AAGTGGATTTGAGTAGCAAT 1500
1501 ATGATTAGGAGAGTTGGTGC TAGAAGCTTAGCACGTGCAA TGGCTAAGGATAAACCAAAA TTAACGATGTTGAATATTAA TGGGAATTATATTTCGGATG 1600
1601 AAGGCATTGATGAGGTAAAG GAGATATTGAAGGAGGATTT GCTTGGTCCATTTGATGAGA ACGATGTTGATGGTGAAGAA GATGATGGTGATGAAGATGA 1700
1701 AGAAGCTGAAGAAGAAGAAG AAGAAGAAGAAGAAGAAGAA AAAGAAGACGTTGACGCTAA GCTTGAGAAACTTAAAGTTA ATGACGAGTAAGCAACTATA 1800
1801 TTTCTATAAAATTATAATGT TCCAGGGACTACTAATTTGA GGGTTTTCAATTTAGCCAGC TGCAAAATATTGGCTGGTAT GTACTATTGTTTTTAGACTG 1900
1901 AACTATGAGAGTCTGAACTG AAGAGCACTTGTGTGTTTTT AGCAGTC                                                        1947
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C

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Allium cepa                 METAPAQSDQPKSFSIKWWPSEKTRLMLVEGMTKNLSTESIFSRKYGLLTVEEATEHAKNIEDTCGKSACEHFDREPDGDGSSAVQLYAKEISKLMLEVLKKGEKSKEEKDIIIDS...  117
Arabidopsis thaliana 1      MDHS.AKTTQNRVLSIKWWPSKSTRLMLVERMTKNITTPSIFSRKYGLISVEEAEQDAKRIEDLAGATANKHFQNEPDGDGTSAVHVYAKESSKLMLDVLKRGE..QEESEVEVSKDG.  116
Arabidopsis thaliana 2      MADI.LDSRPH.AFSIKWWPSLPTRKALIERITNNFSSKIIFTEKYGSLTKDQATENAKRIEDIAESTANQQFEREPDGDGSAVQLYAKEQSKLILEVLKKGEVAKVAARELISEDSV  118
Medicago truncatula         MDST.VPSYCHRTLSIKWWPSQSTRSMLVGRMARNLTTPSIFSRKYGLINKYQAEKDAKEIEDAASVTATQHFEKEPDGDGSSAVQLYAKESSKLMLEVLKRGERGKEENGELISEKGD  119
Oryza sativa                MDST.KQDFQPRTFSIKWWPSESTRLMLVERMTKNLSTESIFSRKYGLLGKEEADHNAKRIEVCGASADEHFKEEPDGDGSSAVQLYAKEISKLMLEVLKRGERTTVEPEVPVADTPL  119
Zea mays                    MDS..AQDFQPRTFSIKWWPSESTRLMLVDRMTNNLSTESIFSRKYRLLGKQPAHENAKTIEELCGASADEHFREEPDGDGSSAVQLYAKEASKMMLEVLKKGERTTAELEAPVADTPL  118
Vitis vinifera              MDST.AQNFQHRKMSIKWWAPSQSTRLMLVERMTKNLTTPSILSRKYGLLMREEAEEYAKRIEDAAPATANQHYEKEPDGDGSSAVQLYAKESSKLMLEILKRGEKTKEDGEVMTAEQTT  119
Consensus                   m           s k w ps  tr l     n    i  ky  l   a  ak ie  f  a      epdgdg sav  yake sk  l   k gp

Allium cepa                 .PKQKVFDISQGKRSFIEAEAKELLTPLTEKGNGWSKIFSNRSFGIEAAKLAEEILASLKDQLKEVDISDEVAGREEDEALEVMRIFSSALEGCILNYLNLSLNALGEKGVRAEGSLL  236
Arabidopsis thaliana 1      ...DVFDISGGSRAFIEEEAERLLRPLADFRNSYTKITRFSNRSFGSEAAKFAASVLSSILKDQLTEVDISDEVAGREAEALEVMNWFSSALEGSKLRYLNLSLNALGEKGIRAEASLL  233
Arabidopsis thaliana 2      SPRETFFDISKGKRAFIEAEEAELLLRPLKEFGNAVTKITCFSNRSFGLGAARVAEFILASLKDQLKEVDLSDEVAGREELEALEVMNIFSDAIQGSILSSLNLSLNALGEKGVRAEGALL  238
Medicago truncatula         AAVETVFDISQGRRAFTDGEEASELLLRPLMGP.NSFTNICFSNRSFGLDAAHVVEFMLTSIKDQLKEVDLSDEIAGRPEAEALEVMNIFSSALEGAVLRHLNLSLNALGEKGVRARRALL  238
Oryza sativa                EPADSVEDISGGKRAFIEADEAKELLSPLIKPGNAVKRICFSNRSFGIGAANVAGPILESIKKQLTEVDISDEVAGRPEDEALDVMRIFSKALEGAVLRYLNISLNALGEKGVRAPEELL  239
Zea mays                    VSADTVLDISQGKRAFIEADEAKELLSPLTKPGNSVKRICFSNRSFGIGAANVAGPILESVKNQLTEVDISDEVAGRSEDEALDVMRIFSKALDGSVLRYLNLSLNALGEKGVRAPSELL  238
Vitis vinifera              SPLETVFDISQGKRAFIDAEEAELLKPLKEPGNSYNRICFSNRSFGIDAAYVTEFILSSLKDQLMEVDLSDEIAGREEAELDVMNIFSSALEGCVLKYLNLSLNALGEKGVRAEGALL  239
Consensus                           dis g r fi   ea  ll pl    n   i fsnrsfg  aa      l s k ql evd sdf agr e ea  vm  fs al g  l  ln s na gekg rae  l

Allium cepa                 HSQHNLEELYLMNDGISEEVAKALTELIPSTDKIKVLHFHNNMTGDEGAISIAELLKSSPLLENFRCSSTRVGSEGGLALVPALKGCEHLKKLDLRDNMFGVEACLALSKTLEKLNDISE  356
Arabidopsis thaliana 1      NSQHDLEELYLMNDGISEDAARAVRELIPSTDKIRVLQFHNNMTGDEGATAIAEIVREGFSLEDFRCSSTRIGSEGGVALAEALEHCSHLKKLDLRDNMFGVEGCQLIAKTLSVLTHLTE  353
Arabidopsis thaliana 2      HSLSSLEELYLMNDGISKEAAQAVSELIPSTENLRVLFFHNNMTGDEGALAIAEVVKRSPLLENFRCSSTRVGSKGGLALSEALEHCTHMEKLDLRDNMFGAEACVSLSKTLSSFKHMTE  358
Medicago truncatula         HSQNDLEELYLMNDGISEEAAKAVAELIPSTEKLKVLHFHNNMTGDEGAFAIADVMKRSPALEDFRCSSTRVGAEGGVALAEALGACTHLKKLDLRDNMFGVEACVALSKVLPVFADLTE  358
Oryza sativa                HSQDNLEELYVMNDGISEEAAQALSELIPSTEKLKILHFHNNMTGDEGAMFIAEMVKRSPNLESFRCSATRIGSDGGVALAEALGTCTRLKKLDLRDNLFGVEACGALISKTLSKLPDLVE  359
Zea mays                    HSQESLEELYVMNDGISEEAAKALSELIPATEKLKVLHFHNNMTGDEGAMYIAEMVKRSPNVESFRCSATRIGSDGGVALSPALGTCTRLKKLDLRDNMFGVDACGLALSETLPKLPDLVE  358
Vitis vinifera              HSQNNLEELYLMNDGISEEAARAVCELIPSTEKLRILQFHNNMTGDEGAIALSEMVKRSPALEDFRCSSTRVDSEGGVALAKALGTCTRLKKLDLRDNMFGVEACVALSKALSAFKDLTE  359
Consensus                    s  leely mndgis  a a  el p t    l fhnnmtgdega  i     p  e frcs tr   gg al  al  c   kldlrdn fg  g  l         e

Allium cepa                 LYLSYLNLEDKGAIAVLEAIEKYLPKIEVLDMAGNDITVKASKALASCISSKKMLKKLVLSENELKEGAVRHATALEDGHVELREVDLSSNMIRRVGARSLARAMAKDKPKLTMLNING  476
Arabidopsis thaliana 1      LYLSYLNLEDEGTEALSEALKSAPSIEVLELAGNDITVKSTGNLAACIASKQSLAKLNLSENELKEEGTILLAKAVEGLHDQLVEVDLSTNMIRRAGARALAAQTVVKLKNTFKLLNING  471
Arabidopsis thaliana 2      LYLSYLNLEDEGAIATVNALKESASPIEVLELAGNDITVEAASAIAACVAAKQDLNKLNLSENELKEEGCVQLANCIEEVNSKLQYLDMSTNYIRRAGARALAAHVVVKLKEAFKLLNIDG  477
Medicago truncatula         IYLSYLNLEDDGAIANALKESAPSIELIDVAGNDITAKTAVSVAACISSKGFLTKLNLSENELKEEGAGLISKALEGLGQLSEVDLSTNLITWSGAKLLAEAVVQLKEGKKLLNVNA  476
Oryza sativa                LYLSDLNLENKGTVAIINTLKQSAPQLEVLEMAGNEINAKASQALAACLTAMQSLKKLTLAENELKDGAVVLAKSLEDGHQDLKELDVSTNMLQFVGARCFAQAIANLKPGCVQLNING  478
Zea mays                    LYLSDLNLENKGTIAIAKALKQSALQLEVLELAGNEINAKAAPDLAECLAVMQSLKKLTLAENELKNGAVILAKSLEDGHSDLKELDVSTNMLQFVGARCFARAVANLKDCVQLNING  477
Vitis vinifera              VYLSYLNLEDEGAKAIANALKESTPSIEVLELAGNDITVEAASTLAACIAAKQCLAKLSLAENELKEEGAILLSKALEGHNQLTEVDLSTNMSIRRAGARFLAQTVASLKPGCFKLLNING  478
Consensus                    y s lnle  g  a            e l  agn i       a c     l kl l enelkd g   i    e    l  d  n   ga  a     k    ln

Allium cepa                 NYISDEGIDEVKELLK.....EDLLGFFDPNDVDGEEDDGDEDEEAEEEEEEEEEEKEDVDAKLEKLKVNDE..                                              544
Arabidopsis thaliana 1      NFISEEGIDEVNDMEK...DCLDKLVPLLDPNDPEGEDFE...DEDEEEEGEDG......NELESKLGSLKIKQGEE                                            535
Arabidopsis thaliana 2      NIISEEGIEELKEIEK...KSPELLGALDPNDPEGEDDL...DDEEDEEDEENEGNGNGELESKLKNLEVNQED.                                              545
Medicago truncatula         NFISDEGIDELKDIEK...NSPDILGPLDPNDPEGEDID...EEAEEN..SDN.....DELESKLKGLEI.....                                              533
Oryza sativa                NFISDEGIDEVKDILKSGENSVEVLGPLDPNDPEGEAEDDEEEEEEEEDDGE........LDSKLQSLKVEQDD.                                              544
Zea mays                    NFISDEGVDEVKEILKAGKKSLDVLGPLDPNEPDGEPDD....EDAEDDEDE........LDLNLQSVKVEQDED                                              540
Vitis vinifera              NFISDEGIDEVKDIEK...NCPDVLGPLDPNDPEGEDNL...GEDEEEGAADNE....DELESKLKKLDIKNE..                                              541
Consensus                   n is eg  e     k       l  d n   ge                                    l
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Supplemental Figure 1. List of PCR primers for cloning of the gene for an onion RanGAP homolog, the nucleotide sequence of its cDNA and deduced amino acid sequence comparison of plant RanGAP-like proteins. (A) List of PCR primer sets. (B) Nucleotide sequence of AcRanGAP including 3' noncoding regions and 5' noncoding regions determined in this study. A start codon (ATG) and a stop codon (TAA) in AcRanGAP gene are shown in red. (C) Alignment of deduced amino acid sequences of seven RanGAP-like proteins from six plant species. Sequences were aligned using DNAMAN (Lynnon Co.). Black, dark gray and light gray boxes indicate identical, six similar or four to five similar residues, respectively. The accession numbers for the sequence shown in (C) are as follows*; Allium cepa* (LC05995), *Arabidopsis thaliana* 1 (AF214559), *Arabidopsis thaliana* 2 (AF214560), *Medicago truncatula* (BT052909), *Oryza sativa* (AK242655), *Zea mays* (EU960259), and *Vitis vinifera* (A5AWW1).