

1 **Fig1S. Amino acid sequence alignment between the primase domains of T7**
2 **primase-helicase and AtTwinkle.** The six conserved motifs of prokaryotic primases
3 are indicated by roman numbers. The identity of the catalytic conserved amino acids
4 in the RNAP domain and the conserved cysteines that coordinate a zinc atom in the
5 zinc finger of T7 primase are indicated by a red asterisk.

6

7 **Fig 2S. Amino acid alignment of selected plant primase-helicases.** Amino acid
8 alignment between selected plant Twinkles. The conserved cysteines and the
9 catalytic amino acids in the RNAP domain are colored in black.

10

11 **Fig. 3S AtTwinkle oligoribonucleotide synthesis using an array of 64**
12 **trinucleotides sequences labeled with [α -³²P]-ATP.** The reaction contained
13 individual oligonucleotides with the 5'-TTTTTTTXXXTTTTTT--3' sequence. The
14 identity of each deoxynucleotide is denoted by a color code. The identity of the 3'
15 deoxynucleotide varies in each panel. Panel A contains an adenine, panel B contains
16 a cytosine, panel C contains a guanosine and panel D contains a thymidine. Within
17 each panel reactions 1 to 4 contained an adenine, 5 to 8 a cytosine, 9 to 12 a guanine
18 and 13 to 16 a thymidine. Finally, each of the four groups contained an adenine,
19 cytidine, guanine and thymidine in the first, second, third and four positions
20 respectively). Primase reactions were carried out using 5 μ M of the synthetic
21 template and 0.5 μ M of each recombinant AtPrimase-helicase.

22

23 **Fig. 4S AtTwinkle oligoribonucleotide synthesis using an array of 64**
24 **trinucleotides sequences labeled with [α -³²P]-CTP.** The experimental setup is
25 equal to one described for Fig. 3S.

26

27 **Fig. 5S AtTwinkle oligoribonucleotide synthesis using an array of 64**
28 **trinucleotides sequences labeled with [α -³²P]-GTP.** The experimental setup is
29 equal to one described for Fig. 3S.

30

31 **Fig. 6S AtTwinkle oligoribonucleotide synthesis using an array of 64**
32 **trinucleotides sequences labeled with [α - 32 P]-UTP.** The experimental setup is
33 equal to one described for Fig. 3S.

34

35 **Fig. 7S Quantification of oligoribonucleotide synthesis by AtTwinkle in**
36 **trinucleotides templates.** Graphical representation of the total amount of
37 synthetized oligoribonucleotides in a GGA template as 100%. The percentage of
38 each RNA product (2-mer to 8-mer) from the GGA template is indicated. The relative
39 abundance of total RNA synthesis and its breakdown from 2-mer to 8-mers, in
40 comparison to the synthesis in the GGA template, is indicated for the rest of the
41 templates.

42

Fig. 1S

Motif I: Zn Finger

AtTwinkle [92]	TPVDTEVEADKRVVLSRLVTLRRKLAEQGVDAENCPPGQHSGLICPTCEGGNSGEKSLS
T7 gp4 [1]	-----MDNSHDSDSV-----FLYHIPCDNC--GSSD--GNS

AtTwinkle [151] LEIAPDGSSATWNCFRGKCGLKGGVRADGLASADPIEKVERKITVEGIELEPLCDEIQD
T7 gp4 [28] LE---SDG---HTFCYV---CEKWKERAS--KRKPS-GGKP--GTYNWWNFGESNG---RYS

Motif II Motif III RNAP basic

AtTwinkle [211]	YFAARAI SRKTLERN RVMQKRIGDEIVIAFTYWQ-RGELV SCKYRS LT KMEF QE-RKTRR
T7 gp4 [80]	ALTARGISKE TCQKAGYWI AKVDGV MYQVAD YRDQ NGNIV SOKVR DKDKN EKT TGSH KSD

Motif IV

AtTwinkle [269]	ILYGLDDIEKTSEVIIVEGEIDKLAMEEA-G-FLNCVSVPDGAPAKVSSK EIPSEDKDTK
T7 gp4 [140]	ALFGKHLWNGGKKIVVTEGEIDMLTV MELQDC KYPVVSLGHGASA AK-----

Motif V Motif VI

AtTwinkle [327]	YKFLWCNDYLKKASRIVIATDGDGP GQAMAEEIARRLGKERCWRVKWP KKSEDEHF KDA
T7 gp4 [187]	-KTCAANYEYFDQFEQIIILMFDMDEAGRKA VEAAQVL PAGKVR VAVLP-----CKDA

AtTwinkle [387] NEVLM SKGP HLLKEA ILDAE PY PILGLFS FKDF FDEIDAYYDRTHGHEYGVSTGWKNLDN
T7 gp4 [239] NECHLN GHDR EIMEQ-----

Beta_vulgaris -----RLFICCCDWKS-----GMNDLLFLGRGRLLPLPLRDCPAPTCFTFR-----RQFFNTS-----RLPFVNTY9-KPTSVQPK-----SL-TNAGYSY-AAHPLSLS-----VSLEG 99
 Camelina_sativa -----MRFLLRLPQOAH-----INKLCSMSV-----LMGSKQFLFCLLPSFAVSSSSSSSPSPYSPG-----RQLSSV-----RRPRVFLAS-RPVHSNSPF-----HQ-RTNGLSSY-TSI SRVP-----TP-----WD-P-EEDAD 106
 Salicornia_bipersicum -----MLLPPYDRIVVN-----NSNN-----F-----IMGSKYFLHKGPCITLPL-----YKSI-----PVLKQT-----RLLPFSFAG-----FNRCTSSFSYRDRGP-----PPVWSGUM-L-EDPK 90
 Vitis_vinifera -----MFPSPLFLKLVRUDPMMLL-QQQRV1VISSRTI-----IMASKKHLLKPTTSTLPLK-----YKSI-----PVLSSFC-----RLLPFSFAG-----FNRCTSSFSYRDRGP-----PPVWSGUM-L-EDPK 90
 Tarenaya_hassleriana -----MLRVRSHHTL-----L-----L-----IMASKQFLFELPSVPSVFCPTSTSPSSSR-----RQFFTAS-----RLYLPFVAS-AMRSONSP-----RE-STNGFSS-PCLSRVP-----YP-----AH-P-EEDAD 102
 Lupinus_angustifolius -----MPLFLRPPONNL-----KLKLCMPL-----IMASKQFLFELPSVPSVFCPTSTSPSSSR-----RQFFTAS-----RLYLPFVAS-AMRSONSP-----RE-STNGFSS-PCLSRVP-----YP-----AH-P-EEDAD 102
 Nelumbo_nucifera -----MLRVRSHHTL-----L-----L-----IMASKQFLFELPSVPSVFCPTSTSPSSSR-----RQFFTAS-----RLYLPFVAS-AMRSONSP-----RE-STNGFSS-PCLSRVP-----YP-----AH-P-EEDAD 102
 Noccea_caeulescens -----MKRSKH1QRAVGAINAFLRPEPDRLRPLSPGDLKFVSWPNPKLVENDQVQSRASSQMLVHPRFLHPL-----LSSN-----IMASKKNLLSARPTFIPFSR-----LHHHFHTY-----RLLFTSTS-FP-KPISIFHHL-----IV-KKSGFCY-MYARVP-----RP-----VH-M-DYPER 146
 Juglans_regia -----MPLIQCLYRPLQYTPLLSSSSSSFSSTTSPPRLGRAMSRLSYATTLSSFFKVKPFPGLQ-----KGGHYTKSQGW-----VMDSKNLFKFTSFIPS-----PSSH-----GRLFHIR-----RLHFSVHS-KPFSNIOP-----PL-NTNGFSS-ICHANIP-----PP-----VY-M-ESP2 144
 Eucalyptus_grandis -----MPLLPPRSLRAHVAASL-----SSDAAAAAAA-----MGGSKYFLPFRGAYGLFSCAR-----RAGSMOP5-----CL-KANGVPH-RPHSSIP-----RP-----VQ-L-EGCPVG 115
 Musa_acuminata -----MSEJPCGAI-----OSL-----L-----MGGSKYFLPFRGAYGLFSCAR-----RAGSMOP5-----CL-KANGVPH-RPHSSIP-----RP-----VQ-L-EGCPVG 115
 Nicotiana_tomentosif -----MILLPYRVLVN-----NSNNFA-----MGGSKYFLHKGPCITLPL-----IIPVLSK-----RLFQFQ-----RLFSTFTAS-KPISIFHHL-----IIPVLSK-----RGTNSL9-YRPQRIP-----PP-VSGVV-L-EDPV 92
 Ficus_x_bretschneide -----MRLLLHRPFRLK-----SFLSSSTSGL-----IMASKQLLNSAFFFNPFLT-----PSAH-----RHPFHSR-----SILVSPPISS-KPVLKIRPL-----CL-RTNGYSLSPAHVAEPGKFRRKFLVLSKEVE-----V-EAPKE 107
 Brassica_rapa -----MRFLLRLPOTH-----RKLSSCPS-----IMASKQFLFELPSVPSVFCPTSTSPSSSR-----RQFLSSV-----RPRVFLAS-RPVHSNSPF-----HQ-RTNGVSPY-TSI SRVP-----SP-----VWDP 98
 Raphanus_sativus -----MRFLLRLPOTH-----RKLSSCPS-----IMASKQFLFELPSVPSVFCPTSTSPSSSR-----RQFLSSV-----RPRVFLAS-RPVHSNSPF-----HQ-RTNGVSPY-TVSRSVP-----TP-----VWDP 101
 Arabidopsis_thaliana -----MRFLLRLPOTH-----RKLSSCPS-----IMASKQFLFELPSVPSVFCPTSTSPSSSR-----RQFLSSV-----RPRVFLAS-RPVHSNSPF-----HQ-RTNGVSPY-TSI SRVP-----TP-----VWDP 101
 Theobroma_cacao -----MLRFDPH1RNPNRFLRHLK-----SFLCSN-SAA-----IMASKTFFSLLNPLPT-----SP-----KRLSTPC-----KRLVPLHKS-LPDPSKNSHL-----SL-RTNGFSS-IPSANSV-----AP-----VY-S-KELED 99
 Phoenix_dactylifera -----MQLPFLRCFLDNL-----LHSSS-----L-----MGGSKHLLLRLRPLPPS-----VSPYR-----LHLLHTR-----GLLFQ5-----SL-KSARF5-----VCPVTQS-----KA-----VH-L-PELD 92
 Gossypium_arboresum -----MLRPSHNRFLHLLRN-----SSFAK9-TTI-----FMASKHFLPSPLLQTLTS-----PKHFTSTS-----KRLPLSLLS-KP1FSKHN-----SL-RTNGFCSLPSVSP-----SP-----AY-S-QDLED 99
 Ricinus_commune -----MFRAYSPQIHL-----YKLS-----MGGSKYFLHKGPCITLPL-----IIPVLSK-----RLQYHTC-----RLFQFQ-----RLFSTFTAS-KPISIFHHL-----IIPVLSK-----RGTNSL9-YRPQRIP-----PP-VSGVV-L-EDPV 92
 Malus_domestica -----MRLLLHRPFRLK-----SFLSSSTSGL-----IMASKQLLNSAFFFNPFLT-----PSAH-----RHPFHSR-----SILVSPPISS-KPVLKIRPL-----CL-RTNGYSLSPAHVAEPGKFRRKFLVLSKEVE-----V-EAPKE 107
 Manihot_esculenta -----MLRLAHYNRSTHL-----HKLVTFSSSN-----GLHMSMSKFLRPLPATPPPF-----PSFR-----RHPFHSR-----SILVSPPISS-KPVLKIRPL-----CL-RTNGYSLSPAHVAEPGKFRRKFLVLSKEVE-----V-EAPKE 107
 Cucumis_melo -----MRLFHNNHCLYTFPSKL-----SSFSFPC-----IMGSFPLCKLCSKTS1FLVFLSHLSSSSSSSYSQ-----YFLYRSI-----SILHGSFPV-RPLSLVKP-----AM-KPNGFSS-TSHANVP-----RP-----PA-FSENPR 110
 Gossypium_hirsutum -----MRLFHSHNQRFHLLRN-----SSFAK9-TTI-----FMTSKHFLPSPLLQTLTS-----PKHFTSTS-----KRLVPLHKS-LPDPSKNSHL-----SL-RTNGFSS-IPSANSV-----AP-----VY-S-KELED 99
 Prunus_mume -----MRLLHRPLRKL-----SFLTS-AGL-----IMGTQVLFKSTTCPNPFLT-----PSQ-----RILFHSH-----RLVSPPLS-KPMSKTRPL-----CL-RTNGYSLVSHANGAAP-----AE-L-ENAE 93
 Marchantia_polymorphica -----MLVLAGHVRRAAGG-----RIQVTSVWSASTGLAR1HMLVPLSLCCK-----PQLQ-----RILFHSH-----RTVPRFCV-EPI1SLTRG-----RKSFGNCFRTSLS1-----IHR SMGAA-----MARER 96
 Capsicum_annuum -----MLVLYPRVIRVN-----NSNN-----MGGSKYFLHKGPCITFATT-----RKT1-----PVLFCQ-----RLFSTFTVS-KP1F-----RGTNSL9-YRPQRIP-----LP-----VSGVMLEDPA 85
 Nicotiana_tabacum -----MLVLYPRVIRVN-----NSNN-----MGGSKYFLHKGPCITFATT-----RKT1-----PVLFCQ-----RLFSTFTVS-KP1F-----RGTNSL9-YRPQRIP-----LP-----VSGVMLEDPA 85
 Arachis_ipaensis -----MLRYPHTL-----ATM-----SMTWHPFIRPTGTHPPFS-----LHHHFNPC-----RQFLVLCRPLSRLPSLPL-----TSNGYSR-SSSHVP-----RP-----VH-L-ENPD 86
 Daucus_carota -----MLRYPHTL-----ATM-----SMTWHPFIRPTGTHPPFS-----LHS-----SRTYS-----RILHHSFAS-TPLSNSP-----L1-RSGC99-Y-TPHAR-----RP-----VH-L-ENPD 86
 Arachis_dichotomae -----MLRYPHTL-----ATM-----SMTWHPFIRPTGTHPPFS-----LHS-----SRTYS-----RILHHSFAS-TPLSNSP-----L1-RSGC99-Y-TPHAR-----RP-----VH-L-ENPD 86
 Oryza_sativa -----MPPRPSLQSLLIMAASSS-----AAAAGDSL-----LAAAARRRLPAAAALAC-----GHL-----RILHHSFAS-SGRRCHEVAC-CV-RTBPAKRASFANVS-----RS-----VH-STENY 1
 Solanum_bicolor -----MPPRPSLHSLLIMAASSS-----AAAAGDSL-----LAAAARRRLPAAAAGHHR-----GHL-----RILHHSFAS-SGRRCHEVAC-CV-RTBPAKRASFANVS-----RS-----VH-STENY 1
 Citrus_sinensis -----MRFL-----LQHNPFIAGGSFSHSLRHLKLEY-----LFWDSDSTLN-----AAASTRLFTINGSPCFSS-----SPRRLITTSIAFKRINNNNNYK-----NDD-DNNNNHHHPT-----T1-RTKDLSS-VSYRNHNP-----TP-----SETBE 109
 Cynara_cardunculus -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Solanum_tuberosum -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Solarium_pennellii -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Brachypodium_distachys -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Setaria_italica -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Vigna_radiata -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Brassica_oleracea -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Medicago_truncatula -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Zosteria_marina -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Erythranthe_guttata -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Coccomyxa_subellipso -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Cicer_arietinum -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Gossypium_raimondii -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Cucumis_sativus -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Aegilops_taushensis -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Amborella_trichopoda -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Fragaria_vega -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Sesamum_indicum -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Populus_euphratica -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Morus_notabilis -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Nicotiana_sylvesteris -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Capsella_rubella -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Arabis_alpina -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Zea_mays -----MNRTLNPSPSYIYLPPRPLSLSLSPSPHPNPPSSPALPAPCFRAS-----DQPGCRNPTRCPVMPPRPLSLHSLIMMAAASSGDSLPLAAR-----RRLAATAAAGGHRIRLHSFGRPRPARPEVVCV-RSAPDSRRSAAPAPCS-----RN-----VLSAKNY 149
 Jatropha_curcas -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Eutrema_salsugineum -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Prunus_perseae -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Phaseolus vulgaris -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Populus_trichocarpa -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Citrus_clementina -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Genista_aurea -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Ostreococcus_tauri -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Micromonas_posillae -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Selaginella_moellendorffii -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Ostreococcus_lucimarinus -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Micromonas_commoda -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91
 Physcomitrella_patens -----MLLHRSSRLSLH-----CLFFNSAVACP-----IMGSYFLHKGKTPTRSSL-----NKNKSNH-----KFISSFLPS-NPSVPLVSL-----SL-KPDSLST-----CSHASIS-----TP-----VSKVICLEXP 91

Beta_vulgaris	STHHSARSLVMLMKKLELGIIEGHQHSI-PG-QYSHLL	-----P-GCBEHSLSLMPSD-----	GNSAVI-----E-----GWQG-----NTR-----AKA-----DVRLSH-----KGKRT-----GLTF-----KDLG-----LEPLCDE-----LLAYFAER-----IAETLRLRNVMQR-----233
Camelina_sativa	KRCGVSKSLVLTURRKLAEGQICIDAQNCP-PG-QYSGLL	-----P-SLKEGLSLPSD-----	GSDNT-----E-----GLKG-----GVK-----AE-----DGRLPF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----235
Solanum_tuberosum	DITESDHEKALKQLKLQGKQDIDGSCG-PG-QYNGLL	-----P-GSNEKGLSLPFD-----	GXANR-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----LLAYFAER-----ISGKTLERLNVMQR-----236
Vitis_vinifera	TGNSSARSLVNLKQKLUKEIGFDTQMLK-PG-QYNGLL	-----P-GSMEKGLSLPFD-----	GUDH-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----235
Tarenaya_hassleriana	KKIVLSRULVILURRKLAEGQICIDAQNCP-PG-QYNGLL	-----P-GSNEKGLSLPFD-----	GSAV-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----LLAYFAER-----ISGKTLERLNVMQR-----231
Lupinus_angustifolius	EDDSIRNLALKRLAEKGIDTCSR-PG-QYNGLL	-----P-GDSIEKSLSLPFD-----	GGSAM-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----225
Nelumbo_nucifera	EDDSIRNLALKRLAEKGIDTCSR-PG-QYNGLL	-----P-GDSMERSLSLPFD-----	GGSAM-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----281
Noocsea_caeruleascens	KSDV1SKLNLRLKLAEGKIDACNP-PG-QYCGLL	-----P-GGSEERSLSLPFD-----	GGSAM-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----285
Juglans_regia	NGLDSAQILILQKQLEELGMDSEICV-PG-QYNGHL	-----P-GGSEERSLSLPFD-----	GGAAL-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----279
Eucalyptus_grandis	RGIETPLVLMKRLKEEVGIEYIAACI-PG-ICSPAILP	-----P-GSRSSTVKSLVLFVHEED-----	GGSAM-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGKTLERLNVMQR-----249
Musa_acuminata	ETIIFAERIAHTKRMKEVIEYIAACI-PG-ICSPAILP	-----P-GSRSSTVKSLVLFVHEED-----	GGSAM-----E-----GLKG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUNKKYRQJTE-----ESLG-----LEPLCD-----VIAFYFAER-----ISGKTLERLNVMQR-----224
Nicotiana_tomentosoides	GIAESEHVKALKELQKSLQGIDIGSCG-PG-QYSGLL	-----P-GQSGERSLSLPFD-----	GHAAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----LLSYFSEB-----ISGSETLRLRNVMQR-----228
Ficus_bretschneideri	NGMSMMQMRILKEKLENLGLIDGETITSVPG-PG-QYNGHL	-----P-GDSEKSLSLMPSD-----	WDRAIT-----E-----GLKG-----GWWTG-----STR-----AF-----GNRLPP-----ET-----KLIK-----REITE-----ESLG-----LEPLCEE-----IVDYFSEB-----ISGRTIMLRNVMQR-----239
Brassica_rapa	GAQVS---RLANLRLKLAEGQICIDAQNCP-SG-QYSGLL	-----P-GDGGESKGLSLPFD-----	CSAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAAR-----ISGAEATLKRNVMQR-----227
Raphanus_sativus	DAVQSRSLRNLRLKLAEGQICIDAQNCP-SG-QYSGLL	-----P-GDGGESKGLSLPFD-----	CSAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAAR-----ISGAEATLKRNVMQR-----231
Arabidopsis_thaliana	KRVLVSLRVLVILURRKLAEGQICIDAQNCP-PG-QYNGLL	-----P-GDGGESKGLSLPFD-----	CSAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAAR-----ISGAEATLKRNVMQR-----230
Theobroma_cacao	WPLNMRSLLEILHKKLQKLGIDISACV-PG-RENRLRIL	-----P-GDSEKSLSLPFD-----	GGSAM-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----234
Phoenix_dactylifera	KRDFOTERLARLRLKLAEGQICGSCQ-PG-QYTHMT	-----P-GPSEOKSFLSLPFD-----	LEAL-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----227
Gossypium_arboresum	QFSOTRSQIJIANHKLQKLGIDITECV-AG-RENRLRIL	-----P-GGSEGESLSLPFD-----	GGSAM-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----234
Ricinus_commune	EDSEKPHLELKRGKLEVLQGMENLV-PG-QYSSLL	-----P-GQSGERSLSLPFD-----	GSPAN-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----232
Malus_domestica	NGMSMMQMRILKEKLENLGLIDGETITSVPG-PG-QYNGHL	-----P-GDSEKSLSLMPSD-----	WDRAIT-----E-----GLKG-----GWWTG-----STR-----AF-----GNRLPP-----ET-----KLIK-----REITE-----ESLG-----LEPLCEE-----IOPYFAER-----ISGRTIMLRNVMQR-----239
Manihot_esculenta	EVKSLRQLDILURRKLAEGQICIDAQNCP-PG-QYNGHL	-----P-GDLEKDFSLSLPFD-----	GSAS-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----229
Cucumis_melo	KALSTSLINLILURRKLAEGQICIDAQNCP-SG-QYSGLL	-----P-GDSEKSLSLPFD-----	GGAAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----254
Gossypium_hirsutum	QPSDTRSQIJIANHKLQKLGIDITVPG-AG-RENRLRIL	-----P-GDGGESKGLSLPFD-----	GGSAM-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----234
Prunus_mume	KRDFONQSLRNLRLKLAEGQICGSCQ-PG-QYTHMT	-----P-GDGGESKGLSLPFD-----	DNKL-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEATLKRNVMQR-----228
Marchantia polymorpha	EFVPFRNNEKTTREQLAVKVNIIQPSYA-PG-QY-RIV	-----P-GTKEKSLAVG-----D-----TGLA-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LQPPIE-----VVENFHE-----ISGANTILERVRVC1-----239	
Capsicum_annuum	GTAEHEHMMALQKSLQGIDIGSCG-PG-QYSGLL	-----P-GDNEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----221
Nicotiana_tabacum	GTAESEHVKALKELQKSLQGIDIGSCG-PG-QYSGLL	-----P-GQSGERSLSLPFD-----	GHAAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----228
Arachis_ipaensis	DKRDFONQSLRNLRLKLAEGQICGSCQ-PG-QYSGLL	-----P-GQSGERSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----220
Daucus_carota	DAEINSRSLRNLRLKLAEGQICGSCQ-PG-QYSGLL	-----P-GQSGERSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----218
Arachis_dichotomae	DKRDFONQSLRNLRLKLAEGQICGSCQ-PG-QYSGLL	-----P-GQSGERSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----220
Oryza_sativa	KKGECEORLQLIURRKLAEGQICGSCQ-PG-QYSGLL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----254
Soybean_bicolor	AAAEERLQLIURRKLAEGQICGSCQ-PG-QYSGLL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----234
Citrus_sinensis	KMLDSRSLWILLIKKLQKLGIDIGCRCA-PG-VERNRL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----228
Cynara_cardunculus	EIVDSQQLLRLKLAEGQICGSCCT-PG-QTYGLL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----222
Solanum_tuberosum	EIAESDEKHALQKSLQGIDIGSCG-PG-QYNGLL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----224
Solanum_pennellii	DKRDFONQSLRNLRLKLAEGQICGSCQ-PG-QYNGLL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----226
Brachypodium_distachys	KKACEERGILVKMKKEGINSERWR-LD-IYKLLK	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----218
Setaria_italica	KAASEERGLQKSLQGIDIGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----220
Vigna_radiata	KSVL-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----244		
Brassica_oleracea	GAVOS---RLANLRLKLAEGQICGSCQ-SG-QYSGLL	-----P-GDGGESKGLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAAR-----ISGAEATLKRNVMQR-----227
Medicago_truncatula	NMES---OFLILKKLRLKLAEGQICGSCQ-PG-QYNGHL	-----P-GDGGESKGLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAAR-----ISGAEATLKRNVMQR-----219
Zosteria_marina	ODVVKLVERILNLKENNGIH-NWT-PGEQYSNLI	-----P-GDGDORSFLSLRHNK-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----219
Erythrangium_guttatum	GTAVKSLRQLLRLKLAEGQICGSCQ-PG-QYNGL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----245
Coccomyxa_subellipsoidea	-----TIRDNUSSAGIILQKQLEIGIDGDC1-----	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----118
Cicer_arietinum	ENKLEMQFGVLLKKLQKSLQGIDIGSCG-PG-QYNGHL	-----P-GDAGEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----226
Gossypium_raimondii	Gossypium_raimondii	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----240
Cucumis_sativus	KASSSTRSLNLLURRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----244
Aegilops_tauschii	RRACEERLQLVQGEVGMETGICV-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----224
Ambroria_trichopoda	DNVVPERLSLRELLRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----220
Fragaria Vesca	EITDEOCESELRLRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----226
Sesamum_indicum	QIVDEKLMLMRLKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----153
Populus_euphratica	PEVKKGKSLLEILURRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----233
Morus_notabilis	KNAS-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----206		
Nicotiana_sylvestris	ENKLEMQFGVLLKKLQKSLQGIDIGSCG-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----228
Capsella_burcea	KRAVSKVSLVLTURRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----228
Arabis_alpina	KRIVTVSLNLLURRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----236
Zea_mays	SVTQVSLNLLURRKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----219
Jatropha_curcas	EDLOTTMLMRLKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----295
Eutrema_salsuginineum	RAVQFQLRNLRLKLAEGQICGSCQ-PG-QYNGHL	-----P-GDSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----205
Prunus_perseica	-----MDDWT-LG-KERHLI-----P-----GTTYPEPSLRLBED-----	-----P-GSSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----229
Phaseolus vulgaris	KSVL-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----142		
Polygonum_trichocarpa	-----MDDWT-LG-KERHLI-----P-----GTTYPEPSLRLBED-----	-----P-GSSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----224
Citrus_clementina	-----MDDWT-LG-KERHLI-----P-----GTTYPEPSLRLBED-----	-----P-GSSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----134
Genista_aurea	SGVGYNSPEILURRKLAEGQICGSCQ-PG-QYNGHL	-----P-GSSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----180
Ostreococcus_tauri	AAQESTGFGPLRLDALMDQGIVLQSYT-PG-QH-RIV	-----P-GTGERSLAVH-----	GKAQ-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----233
Micromonas_pusilla	-----MDDWT-LG-KERHLI-----P-----GTTYPEPSLRLBED-----	-----P-GSSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----126
Selaginella_moellendorffii	-----MDDWT-LG-KERHLI-----P-----GTTYPEPSLRLBED-----	-----P-GSSEKSLSLPFD-----	GTAHAT-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----117
Ostreococcus_lucimarinus	MDHJIVQSYT-PG-QH-RIV	-----P-GTGERSLAVH-----	GKAQ-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----127
Micromonas_commoda	SPI-----ALRVLVLEKGIVLTSYT-PG-QH-RIV	-----P-GTGERSLAVH-----	GKAQ-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----155
Physcomitrella_paten	-----ALTKTVKEQLISKLGKILKSYG-PG-TVRG-I	-----P-GSSEKSLSLPFD-----	GKAQ-----E-----GLKG-----GWRG-----GTR-----AF-----DVTCAF-----ADMKRIG-----KUTKYYRQJTE-----ESLG-----LEPLCD-----IOPYFAER-----ISGAEETLQRNVMQR-----163

Beta_vulgaris	-KJNDT-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRLVLDDEL	-WCRCLEN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSFGCNW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-ASLERMTKBLEEGE	-KQH	538	
Camelina_sativa	-KJNED-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GRAVORMNVEELER	-KQH	539	
Solana_tuberosum	-KKGDI-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESIERMVSAQEEF	-KQH	531	
Vitis_vinifera	-KJNED-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-KA-N-	-GESIERMVSAQEEF	-KQH	540	
Tarenaya_hassleriana	-KKGDI-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GGPARMSVW	-KQH	545	
Lupinus_angustifolius	-KKGDG-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GENVERMSVVEF	-KQH	530	
Nelumbo_nucifera	-KKDGG-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEGHJKI	-FFF-SA-N-	-GESERMRSVVEELER	-KQH	603	
Noocaea_caeruleascens	-EKGEM-AHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEGHJKI	-FFF-SA-N-	-GKTVTMRNSIEELNE	-KQH	591	
Juglans_regia	-KJNEV-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-NA-N-	-GGSVRMVTELEEF	-KQH	584	
Eucalyptus_grandis	-KJNED-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-NA-N-	-GEPARMSVDEEF	-KQH	554	
Musa_acuminata	-EKSAN-EVCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-GGSTERMTVQELEEF	-KQH	529	
Nicotiana_tomentosif	-KJNTD-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-GESVORMSAQEEF	-KQH	533	
Ficus_bretschneidei	-KJNDK-ENFKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DK-N-	-GGSAERMSVVEEEF	-KQH	544	
Brassica_rapa	-KSKSD-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-Y-	-GRSVERMSVVEELER	-KQH	532	
Raphanus_sativus	-KSKDD-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHJKI	-FFF-DA-Y-	-GRSVERMSVVEELER	-KQH	536	
Arabidopsis_thaliana	-KSKSD-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHJKI	-FFF-DA-Y-	-GRSVERMSVVEELER	-KQH	535	
Theobroma_cacao	-KJNEV-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DS-N-	-GGSVRMVTELEEF	-KQH	539	
Phoenix_dactylifera	-KJNST-DFVCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-NA-N-	-GGSVRMVTELEEF	-KQH	531	
Gossypium_arboresum	-KKNDV-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGVEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSVGW	-RALSLENK	-VREHARKLLEKS1K	-FFF-GV-Y-	-GSVERMSVVEELER	-KQH	539	
Ricinus_communs	-KKSKD-TFHQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-RASTDIDGQFVKRNVEEEF	-KQH	542	
Malus_domestica	-KJNDK-ENFKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-GGSAERMSVVEEEF	-KQH	544	
Manihot_esculenta	-KKNEK-EYKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-Y-	-GRSVERMSVVEELER	-KQH	534	
Cucumis_melo	-KJNEV-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHJKI	-FFF-VG-	-GGSVRMVTELEEF	-KQH	559	
Gossypium_hirsutum	-KKNDL-DFHQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKS1K	-FFF-GV-Y-	-GSVERMSVVEELER	-KQH	539	
Prunus_mume	-MKNDN-DFHQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DK-N-	-GGSAERMSAEEF	-KQH	533	
Marchantia polymorpha	-KREGAAAVQKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-ANSIRMDGAFEE	-KQH	577	
Capsicum_annonum	-NKTSI-DRQCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESVERMTVQEEEF	-KQH	526	
Nicotiana_tabacum	-RKSTI-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNRSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESVORMSAQEEF	-KQH	533	
Arachis_ipaensis	-KJNGK-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-Y-	-GEHTERMTLEEYEEF	-KQH	526	
Daucus_carota	-KJNGK-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-Y-	-GEHTERMTLEEYEEF	-KQH	521	
Arachis_dichotomae	-KJNGK-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-Y-	-GEHTERMTLEEYEEF	-KQH	524	
Oryza_sativa	-KJNGK-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-Y-	-GEHTERMTLEEYEEF	-KQH	541	
Solanum_bicolor	-KKNDT-DFCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNVSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-QA-Y-	-GGDAQRNTDFFEEF	-KQH	447	
Citrus_sinensis	-KKNDV-DFHQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTHGLEY-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-GGSVRMVTELEEF	-KQH	549	
Cynara_cardunculus	-SKNET-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGDEL-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DA-N-	-GKSVRMSEEDEEF	-KQH	500	
Solanum_tuberosum	-KKSTI-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGDEL-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESVERMSAQEEF	-KQH	529	
Solanum_pennellii	-KKSTI-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGDEL-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESVERMSAQEEF	-KQH	531	
Brachypodium_distachys	-KKNET-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGDEL-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GGSVRMSPDEEEF	-KQH	544	
Setaria_italica	-KKNET-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGDEL-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-GA-N-	-GGSVRMSPDEEEF	-KQH	548	
Vigna_radiata	-KKGRL-DFQCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-GA-N-	-GGSVRMSPDEEEF	-KQH	547	
Brassica_clearens	-KSKSD-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-NL-N-	-GEXXXXVXEEEF	-KQH	529	
Medicago_truncatula	-KKGKS-DFCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-NL-N-	-GRSVERMSVVEELER	-KQH	535	
Zosterella_marina	-QFNEE-KICKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-NL-N-	-AEDAERMSLSEEYEEF	-KQH	524	
Erythranthe_guttata	-KJNDT-ESFKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GASVERMSISEEEF	-KQH	523	
Coccomyxa_subellipso	-EPSTTPDADGDQGAQKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESVERMSTKFEER	-KQH	550	
Cicer_arietinum	-KGKGL-DDCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-VQKARHLLKEYIGFL	-DA-K-	AGKAARMEAQDVEEFLQDQE	439
Gossypium_raimondii	-KJNDV-DFHQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-AEQVERMSVVEEEF	-KQH	534	
Cucumis_sativus	-KJNEV-EHFQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-AEQVERMSVVEEEF	-KQH	539	
Aegilops_tauschii	-KKNET-EFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-GV-G-	-GGSVRMSPDEEEF	-KQH	443	
Amborella_trichopoda	-KKNEL-EVCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-SWF5FC-PGFYF	-KQH	547	
Fragaria Vesca	-KKNNE-HFVKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GGSVRMSPDEEEF	-KQH	536	
Sesamum_indicum	-KKNDN-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GDSIPRMSDELRF	-KQH	526	
Populus_euphratica	-KJNDT-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GGPAERMSVVEEEF	-KQH	536	
Morus_nobilis	-KJNEV-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-DV-N-	-GESAERMSAEEF	-KQH	540	
Nicotiana_sylvestris	-KKNDL-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GESAERMSAEEF	-KQH	540	
Capsella_burcea	-KKSED-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GESAERMSAEEF	-KQH	533	
Arabis_alpina	-KKSED-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GESAERMSAEEF	-KQH	541	
Zea_mays	-KKNDT-DFCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GRTPF1PSVVEELER	-KQH	524	
Jatropha_curcas	-KKNET-DFCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GRTPF1PSVVEELER	-KQH	599	
Eutrema_salsuginineum	-KKSDH-DFQCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GCTAERMSVDEEEF	-KQH	510	
Phrusa_perica	-KKNDT-DFKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GGSVRMSPDEEEF	-KQH	534	
Phaseolus vulgaris	-KKGRS-DFCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GGSVRMSPDEEEF	-KQH	447	
Polygonum_trichocarpum	-KKNDT-DFHCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GGENOMSAQEEF	-KQH	549	
Citrus_clementina	-KKNDT-DFHCKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GGENOMSAQEEF	-KQH	533	
Genista_aurea	-KKDNF-SSYKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GGSAERMSVDEEEF	-KQH	439	
Ostreococcus_tauri	-KKDNF-SSYKANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-GESIVRMSEEEF	-KQH	486	
Micromonas_pusilla	-EGCKQANE	-VWYIPEKKEKDTDNALI	-PFGCFAM	-DFTEDAYHRTLGVD-	-WCKTIN	-VVPGEILIVVCPNSGKS	-WIDALLCNLNHSVGW	-RALSLENK	-VREHARKLLEKHVKI	-FFF-FD-N-	-SKARMNFDSMRDEEEF	-KQH	539	

Beta_vulgaris	N ⁺	HLMCENDSLPNIKWVLDAKAVRLRHGVRGVVIDPYNELDHQRGSS	--MTETEYVSQVLTMVKRFAQHHQSCHVFWAHPRQ--	--MHNWAGEAQNLYDISGSAHFINKCDNGIVIHRNRDPEAGPIDRVOICVRVNRKVAGTIGDAFLSYN--	688
Camelina_sativa	D ⁺	FLECEMDSPNIVWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWQDCSAQNLYDISGSAHFINKCDNGIVIHRNRDPEAGPLDLVQICVRVNRKVAGQIGDAYLCYD--	689
Solana_tuberosum	D ⁺	FLECEMDCLNINIWLLAKANBLBHGNCI	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHWNGCPNPPLYDISGSAHFINKCDNGIVIHRNRDPEASGPUDVQICVRVNRKVAGTIGDAFLSYN--	691
Vitis_vinifera	F ⁺	YLCEKOSLPNWKWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHWNGCPNPPLYDISGSAHFINKCDNGIVIHRNRDPEAGPLVQICVRVNRKVAGTIGDAFLSYN--	690
Tarenaya_hassleriana	D ⁺	HLMCDDDSLPNWKWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNGCPNPPLYDISGSAHFINKCDNGIVIHRNRDPEADGPLDVLQICVRVNRKVAGQIGDAYLCYD--	695
Lupinus_angustifolius	D ⁺	HLMCDDDSLPNWKWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNGCPNPPLYDISGSAHFINKCDNGIVIHRNRDPEADGPLDVLQICVRVNRKVAGTIGDAFLSYN--	680
Nelumbo_nucifera	D ⁺	HLMCDDCLPSVWKWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHWNGCPNPPLYDISGSAHFINKCDNGIVIHRNRDPEADGPLDVLQICVRVNRKVAGTIGDAFLSYN--	753
Noocaea_caeruleascens	D ⁺	HLMCDDCLPSVWKWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWQDGPNPLYDISGSAHFINKCDNGIVIHRNRDPEADGPLDVLQICVRVNRKVAGQIGDAYLCYD--	741
Juglans_regia	N ⁺	HLMCENDSLPSITWLWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHWVGCPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGPIDQVICVRVNRKVAGTIGDAFLSYN--	734
Eucalyptus_grandis	D ⁺	HLMCENDSLPSITWLWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHNWGEAPGPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGPIDQVICVRVNRKVAGTIGDAFLSYN--	704
Musa_acuminata	D ⁺	HLMCENDCLPSVWKWLLAKAVLBBHGVGLVIDPYNELDHQRPSC	--QTEFEYVSQMLSMIKRFAQHYSCHVFWAHPRQ--	--LQWHTGFPFNMYDISGSAHFINKCDNGIVIHRNRDAKUHGLDGQVICVRVNRKVAGTIGDAFLSYN--	679
Nicotiana_tomentosifolia	D ⁺	FLEFLR	--QTEFEYVSQMLSMIKRFAQHYSCHVFWAHPRQ--	--LQWHTGFPFNMYDISGSAHFINKCDNGIVIHRNRDAKUHGLDGQVICVRVNRKVAGTIGDAFLSYN--	540
Pyrus_x_bretschneidei	D ⁺	FYLCECDDSLPNISWLLAQAAVLRHGVRGLVIDPYNELDHQRPSC	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWHTGFPNPPLYDISGSAHFINKCDNGIVIHRNRDPEAGEMDQVQICVRVNRKVAGTIGDAFLSYD--	694
Brassica_rapa	D ⁺	FYLCECELDLSPIGWLLRAKAALRHGIRGLVIDPYNELDHQRTOR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWQDGDPNPPLYDISGSAHFINKCDNGIVIHRNRDPEAKGPLDLVQICVRVNRKVAGQIGDAYLCYD--	682
Raphanus_sativus	D ⁺	FYLCECELDLSPIGWLLRAKAALRHGIRGLVIDPYNELDHQRTOR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWQDGDPNPPLYDISGSAHFINKCDNGIVIHRNRDPEAKGPLDLVQICVRVNRKVAGQIGDAYLCYD--	686
Arabidopsis_thaliana	D ⁺	FYLCECMLSIPNWKWLLRAKAALRHGIRGLVIDPYNELDHQRTOR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWQDGDPNPPLYDISGSAHFINKCDNGIVIHRNRDPEAKGPLDLVQICVRVNRKVAGQIGDAYLCYD--	685
Theobroma_cacao	D ⁺	FYLCECMLSIPNWKWLLRAKAALRHGIRGLVIDPYNELDHQRTVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHWIGAPPNLYDISGSAHFINKCDNGIVIHRNRDPEAGFQVDQVQICVRVNRKVAGTIGDAFLSYD--	689
Phoenix_dactylifera	D ⁺	FYLCECACLPSVWKWLLRAKAALRHGIRGLVIDPYNELDHQRTVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWQDGCPNPPLYDISGSAHFINKCDNGIVIHRNRDPEAGFQVDQVQICVRVNRVNKVIGHIEGAFLSYN--	681
Gossypium_arboresum	D ⁺	FYLCECMLSIPNWKWLLRAKAALRHGIRGLVIDPYNELDHQRTVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LHWIGAPPNLYDISGSAHFINKCDNGIVIHRNRDPEAGFQVDQVQICVRVNRVNKVIGHIEGAFLSYN--	689
Ricinus_communa	D ⁺	FYLCECDDKLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPIS	--MTETEYVSRLMTRKFAQHHLCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYN--	692
Malus_domestica	D ⁺	FYLCECDDSLPNISWLLAQAAVLRHGVGLVIDPYNELDHQRPIS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	694
Manihot_esculenta	D ⁺	FYLCECDDKLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPIS	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	684
Cucumis_melo	D ⁺	FYLCEKSDSLPSISWLLRAAARLVRHGVGLVIDPYNELDHQRLPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	709
Gossypium_hirsutum	D ⁺	FYLCECENDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	689
Prunus_mume	D ⁺	FYLCECENDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	683
Marchantia_polymera	Q ⁺	FYLCECDDKLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPGLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	727
Capsicum_annuum	D ⁺	FYLCECENDCLPNTWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	676
Nicotiana_tabacum	A ⁺	FLEFLR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	540
Arachis_ipaensis	D ⁺	FYLCECDDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	676
Daucus_carota	D ⁺	FYLCECENDSLPNWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--MINWGCAPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	671
Arachis_diocrenensis	D ⁺	FYLCECENDSLPNWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	674
Oryza_sativa	F ⁺	FYLCECDDSLPSINWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	691
Solanum_bicolor	F ⁺	FYLCECDDSLPSINWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	697
Citrus_sinensis	N ⁺	FYLCECENDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	699
Cynara_cardunculus	D ⁺	FYLCECENDCLPSITWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVS	--MTLTCKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFAMPLDQVQICVRVNRVNKVAGTIGDAFLSYD--	626
Solanum_tuberosum	D ⁺	FYLCECENDLPNIDWMLWLLRAAARLVRHGVGLVIDPYNELDHQRSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	679
Solanum_pennellii	D ⁺	FYLCECENDLPNIDWMLWLLRAAARLVRHGVGLVIDPYNELDHQRSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	681
Brachypodium_distachys	F ⁺	FYLCECDDCLPSINWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	694
Setaria_italica	F ⁺	FYLCECDDCLPSINWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	698
Vigna_radiata	D ⁺	FYLCECDDLPNIRWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	679
Brassica_oleracea	D ⁺	FYLCECMLSIPNWKWLLRAAARLVRHGVGLVIDPYNELDHQRTOR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	685
Medicago_truncatula	D ⁺	FYLCECENDLPNWKWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	673
Zosteria_marina	D ⁺	FYLCEFENDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRKKG	--ETETEYVSQLSLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	673
Erythrangia_guttata	D ⁺	FYLCECENDLPNITWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGSPNPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	700
Coccomyxa_subellioides	E ⁺	FYLCECDEDDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVH	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	589
Cicer_arietinum	D ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVH	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	684
Gossypium_raimondii	D ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	689
Cucumis_sativus	D ⁺	FYLCEKSDSLPSISWMLWLLRAAARLVRHGVGLVIDPYNELDHQRLPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	697
Aegilops_tauschii	E ⁺	FYLCECDDCLPSINWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	603
Amborella_trichopoda	D ⁺	FYLCEHDDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--LTHYDVEPMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	686
Fragaria Vesca	E ⁺	FYLCECDDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	686
Sesamum_indicum	D ⁺	FYLCECENDCLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	608
Populus_euphratica	D ⁺	FYLCECDDALPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	690
Morus_notabilis	E ⁺	FYLCECDDALPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	695
Nicotiana_sylvestris	D ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	683
Capsella_rubella	E ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	691
Arabis_alpina	D ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRTIR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	674
Zea_mays	K ⁺	FYLCECDDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	749
Jatropha_curcas	D ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPIS	--MTETEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	660
Eutrema_salsugineum	D ⁺	FYLCECMLSIPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRTSR	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	667
Populus_peruviana	D ⁺	FYLCECENDCLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	597
Phaseolus vulgaris	D ⁺	FYLCECDDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	679
Populus_trichocarpa	D ⁺	FYLCECDDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	683
Citrus_clementina	N ⁺	FYLCECENDSLPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPVS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGEAPGPPLYDISGSAHFINKCDNGIVVHRNRDPEAGFIDQVQICVRVNRVNKVAGTIGDAFLSYD--	589
Genista_aurea	D ⁺	FYLCECENDLPNWKWMLWLLRAAARLVRHGVGLVIDPYNELDHQRNH	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--MINWGSNPPLYDISGSAHFINKCDNGIVVHRNRDIAEPMOLDQVQICVRVNRVNKVAGTIGDAFLSYD--	626
Ostreococcus_tauri	E ⁺	FYLCEHDEDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHKRTG	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGECEGCPPLYDISGSAHFINKCDNGIVVHRNRDDEKLGLSREVTTIVQICVRVNRVNKVAGS1GPKLEYN--	689
Micromonas_pusilla	N ⁺	FYLCEHDEDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHKRRC	--QTEFEYVSQMLTRIKKFAQHHSCHVFWAHPRQ--	--LQWNTGECEGCPPLYDISGSAHFINKCDNGIVVHRNRDDEKLGLSREVTTIVQICVRVNRVNKVAGS1GPKLEYN--	579
Selaginella_moellendorffii	N ⁺	FYLCECEENKLPSADWMLWLLRAAARLVRHGVGLVIDPYNELDHQRSS	--QTEFEYVSQMLTKRFAQHHSCHVFWAHPRQ--	--LQWNTGECEGCPPLYDISGSAHFINKCDNGIVVHRNRDREKGLPQLDVQILVKVNRVNKLAGO1GEAV/LKDYDRLVFVSCDVR	584
Ostreococcus_lucimarinus	E ⁺	FYLCEHDEDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHKRTG	--QTEFEYVSQMLTRIKKFAQHHSCHVFWAHPRQ--	--LQWNTGECEGCPPLYDISGSAHFINKCDNGIVVHRNRDREKGLPQLDVQILVKVNRVNKLAGO1GEAV/LKDYDRLVFVSCDVR	583
Micromonas_commoda	N ⁺	FYLCEHDEDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHKRPG	--QTEFEYVSQMLTRIKKFAQHHSCHVFWAHPRQ--	--LQWNTGEAEAPGLYDISGSAHFINKCDNGIVVHRNRDREKGLSREVTTIVQICVRVNRVNKVAGA1GDPKLEYN--	612
Physcomitrella_pateenae	D ⁺	FYLCEHDEDELPSVWMLWLLRAAARLVRHGVGLVIDPYNELDHQRPN	--QTEFEYVSQMLTRIKKFAQHHSCHVFWAHPRQ--	--LQWNTGEAEAPGLYDISGSAHFINKCDNGIVVHRNRDTEGFLPQDKVVLVRVNRVNKLAGO1GEAV/LKDYDRLVFVSCDVR	619

Beta_vulgaris	-----SDGNCRVT--GEFTDLT-----DPES-----	707
Camellia_sativa	--RAT--GLYSDSP-----EHPMRLNKRH-----	710
Sabicea_lowersicum	--RVT--GEFMDID-----EHPRKG-----	697
Vitis_vinifera	--RIS--GVYTDID-----EPTGK-----	705
Tarenaya_hassleriana	--RAP--GLFSDLE-----KR-----	707
Lupinus_angustifolius	--RVT--GEFMPAD-----NDMKA-----	695
Nelumbo_nucifera	--RTT--GEFKDID-----EPTPSKN-----	769
Noocsea_caeruleascens	--RAT--GVYSDCN-----VTPLTSERRSNKRS-----	765
Juglans_regia	--RVT--GEFMDID-----EPSGKR-----	750
Eucalyptus_grandis	--RVT--GEFIDID-----AAPKKK-----	720
Musa_acuminata	--RIT--GEFFEDID-----VRAISMSTTRGG-----	701
Nicotiana_tomentosif	--RAT--QFMVDE-----NTQKSR-----	540
Pyrus_x_bretschneidei	--RAT--GLFSDSP-----ITPEKPERRSSRQ-----	710
Brassica_rapa	--RAT--GLFSDSP-----ITPEKPERRSSRQ-----	706
Raphanus_sativus	--RAT--GSYSDSP-----VTPGMPPERSPKR-----	710
Arabidopsis_thaliana	--RTT--GVYTDID-----EPQKKQ-----	709
Theobroma_cacao	--RVT--GVYTDID-----DKDQRNQT-----	705
Phoenix_dactylifera	--RVT--GEFMDID-----	699
Gossypium_arboresum	--RVT--GVYNDID-----ESQKK-----	704
Ricinus_commune	--RAT--QFMVDE-----RYENHGT-----	700
Malus_domestica	--RAT--QFMVDE-----NTRKST-----	710
Manihot_esculenta	--RVT--GEFMDIA-----	694
Cucumis_melo	--RVT--GEFSDDA-----GDMKLKKSSC-----	729
Gossypium_hirsutum	--RVT--GVYNDID-----ESQKK-----	704
Prunus_mume	--RAT--QFVKDID-----IEKST-----	698
Marchantia_polymorph	--RAT--GEYADV-----	737
Capsicum_annuum	--RVT--GEFMDID-----EHPRKG-----	692
Nicotiana_tabacum	--RAT--GEFTPVD-----RKSKK-----	540
Arachis_ipaensis	--RVT--GEFTPVD-----RKSKK-----	691
Daucus_carota	--RVT--QGYVDS-----NTCAVDP-----	688
Arachis_dichotomae	--RVT--GEFTPVD-----RKSKH-----	693
Oryza_sativa	--RVT--GEFTPVD-----RKSKH-----	723
Solanum_bicolor	--RVS--GEFKDAD-----KOTAKHQAVAAANVAK-----APQRKG-----	761
Citrus_sinensis	--RVT--COYKDAG-----KSTIAAVTAQNRQNSYAKSKKVNVAIEMPFPHPVEDDSVSAEDDGNSPGLNSA-----	709
Cynara_cardunculus	--RVT--GEYMDIV-----	666
Solanum_tuberosum	--RVT--GEYLDIKPKDLK1ISTLPTSLKTPRTERTHITNPNT-----	666
Solanum_pennelli	--RVT--GEFMDID-----EHPRKG-----	695
Brachypodium_distachys	--RVT--GEYKDAD-----EHPRKG-----	697
Setaria_italica	--RVT--GEYKDAD-----KEIAVKVVKQSKKTAIRE-----	723
Vigna_radiata	--RVT--GEYKDAD-----KATIAAAATAATAGTATRKNSYKGKSTKDNVAYEMPVPHVAEDDSVSGLDLSF-----	759
Brassica_oleracea	--RAT--GLFSDSP-----SKRPIDRKK-----	698
Medicago_truncatula	--RAT--GEYSED-----	709
Zostera_marina	--RVT--GEYSDLS-----OD-----	687
Erythranthe_guttata	--RVT--GEYMDIN-----NTSGONGKRQF-----	685
Coccomyxa_subellipso	--RVT--GEYKDVL-----	721
Cicer_arietinum	--RVT--GEYVDDD-----SKR-----	599
Gossypium_raimondii	--RVT--GVYKDID-----ESQKK-----	697
Cucumis_sativus	--RVT--GEFLDAA-----GDKLKKPPS-----	704
Aegilops_tauschii	--RIT--GEYKEAD-----EAIAVKVVKQQIRQKSTSQR-----	717
Amborella_trichopoda	--RVT--GEFKDV-----EGH-----	634
Fragaria Vesca	--RAT--GRYMDIP-----KANEKG-----	689
Sesamus_indicus	--RVT--GEYSDID-----AAAEEKHRA-----	702
Populus_euphratica	--RVT--GEFNAVD-----KSTGSDNQGFKPLRR-----	628
Morus_notabilis	--RVT--GRYIDIQ-----	715
Nicotiana_sylvestris	--RVT--GEFMDID-----EHPSKG-----	705
Capsella_rubella	--RVT--GLYSDSP-----VSLVMPERRSNKR-----	699
Arabis_alpina	--RAT--GLFSDSP-----VTPERPDIRRANRRS-----	715
Zea_mays	--RVT--GEFKDAG-----KATTAPSAAKQSRKEAYKMPFQHAAEDGENSGL-----	698
Jatropha.curcas	--RVT--GEFMDID-----	794
Eutrema_salsugineum	--RVT--GRYTNW-----	670
Prunus_perseica	--RAT--QFADIG-----IKST-----	673
Phaseolus vulgaris	--RVT--GEYTFID-----KKPTDKRK-----	676
Populus_trichocarpa	--RVT--GEFNAVD-----KSTGSDNQGFKPLRR-----	657
Citrus_clementina	--RVT--GEYMDIV-----	658
Genlisea_aurea	--RVT--GEYMDIV-----	599
Ostreococcus_tauri	--RVT--GRYDIDL-----	637
Micromonas_pusilla	--LSN--GRYEDLK-----GAGEPLEE-----	699
Selaginella_moellendorffii	WLIVCSSPLNVSFLMWSLKLAFCRVT--GLFSDAGPV-----	597
Ostreococcus_lucimarinus	--VSN--GRYVDV-----	618
Micromonas_commoda	--LTM--GRYEDLK-----	592
Physcomitrella_patens	--RVT--GDYEDVR-----D-----	630

α -³²P rATP

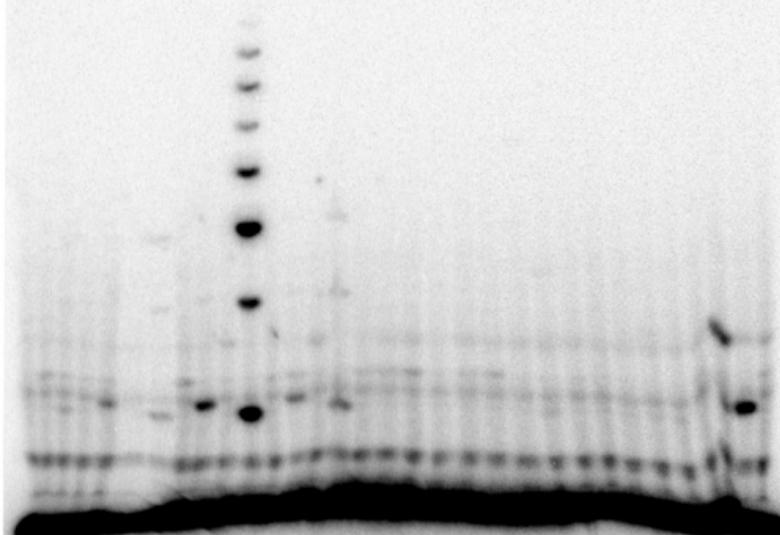
Fig S3



A

C

A	C	G	T	A	C	G	T							
1 2 3 4	5 6	7 8	9 10	11 12	13 14	15 16	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16
ACGT	AC	GT	TACGT	ACGTAC	GTAC	GT	ACGT	AC	GT	TACGT	ACGT	ACGT	ACGT	ACGT



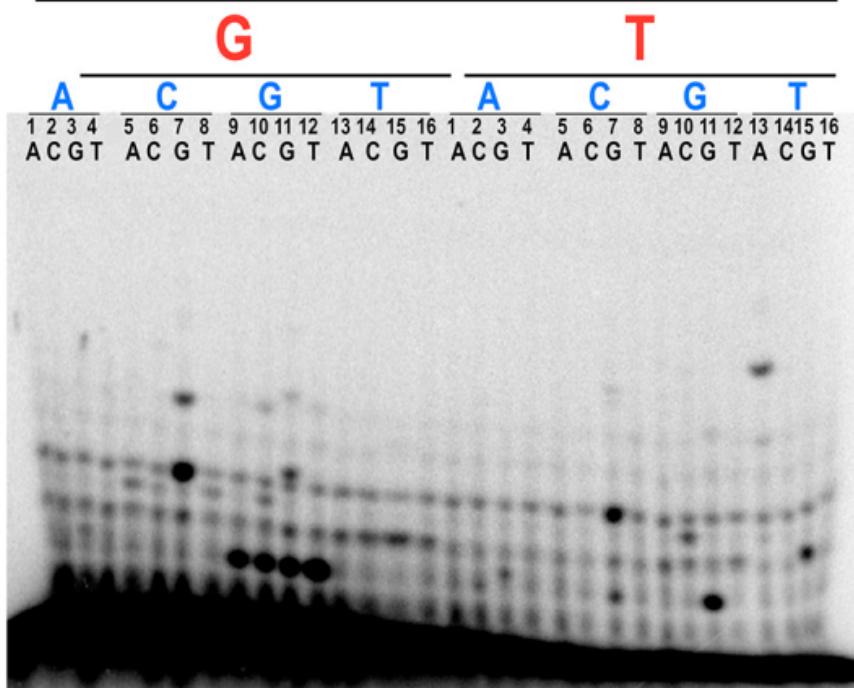
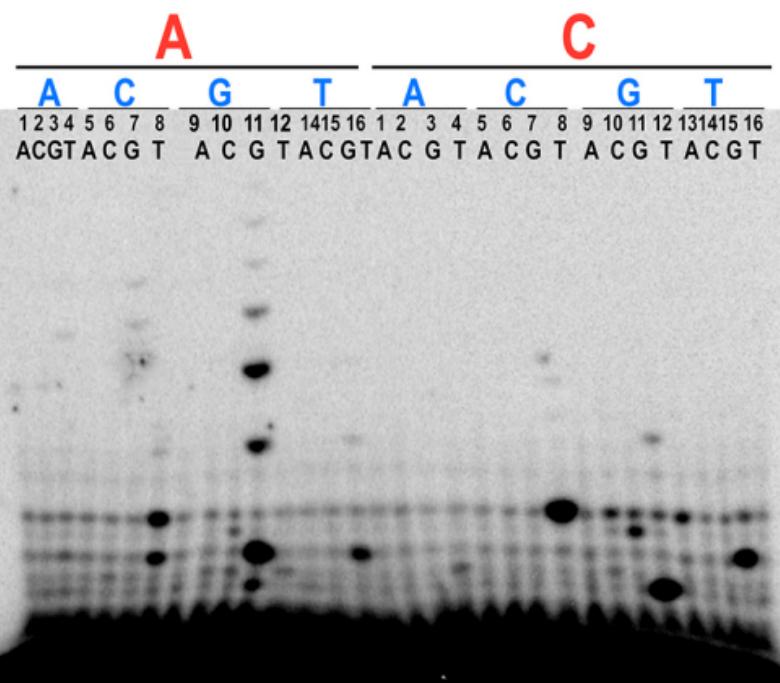
G

T

A C G T **A C G T**
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
ACGTACGTA CGTACGT ACGTACGT ACGTACGT

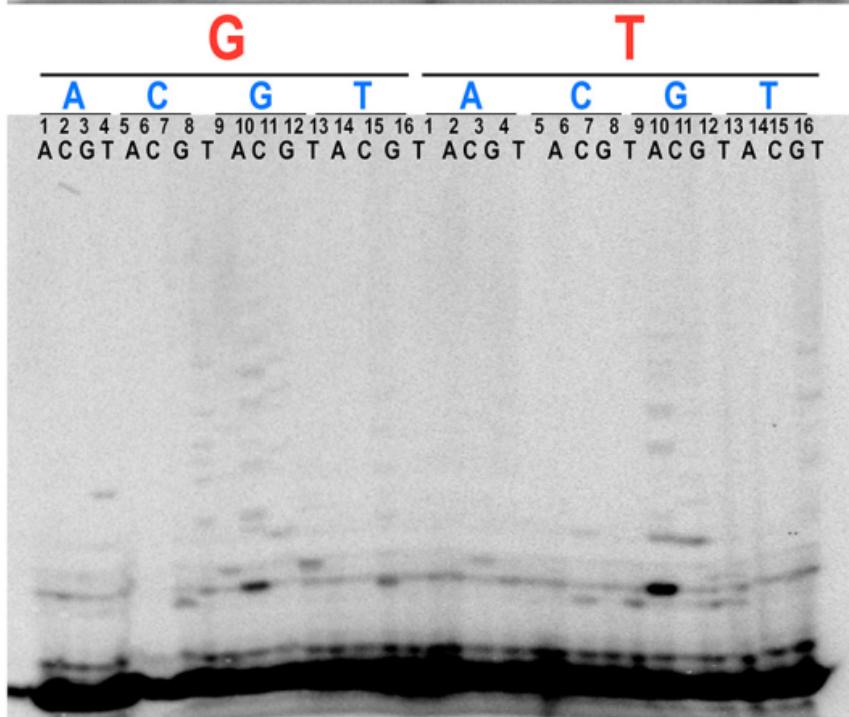
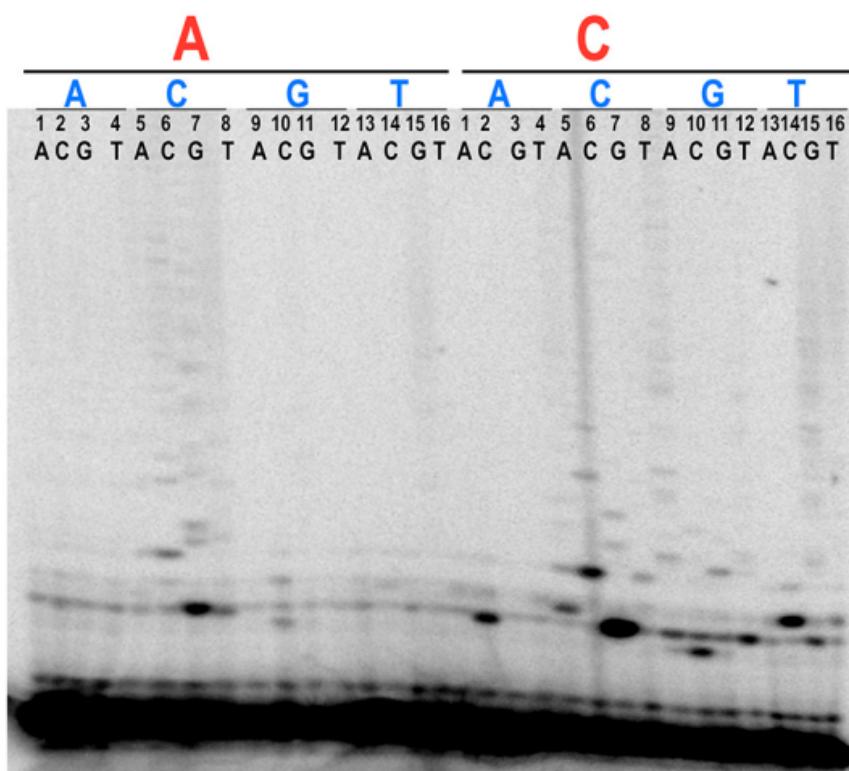
α -³²P rCTP Fig S4

$\begin{matrix} & 3' & 5' \\ & \text{p} & \end{matrix}$
 5' TTTTTT X X X TTTTTT 3'



α -32P rGTP Fig S5

3' 5' p
5' TTTTTTTT X X X TTTTTTTT 3'



α -32P UTP

Fig S6

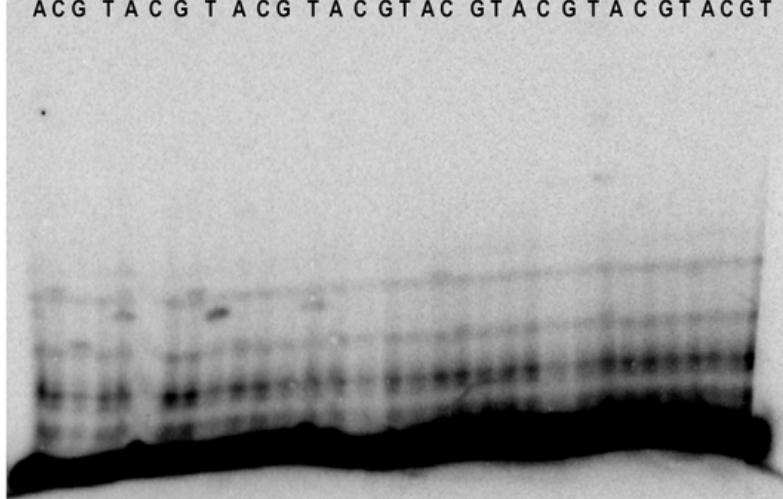
3' 5' p

5' TTTTTT X X X TTTTTT 3'

A

C

A	C	G	T	A	C	G	T
12 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	12 3 4 5 6 7 8 9 10 11 12 13 14 15 16					
ACG TAC G T A C G T A C G T A C G T A C G T A C G T	GT A C G T A C G T A C G T A C G T A C G T A C G T	GT A C G T A C G T A C G T A C G T A C G T A C G T					



G

T

A	C	G	T	A	C	G	T
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16					
AC G T A C G T A C G T A C G T A C G T A C G T A C G T	AC G T A C G T A C G T A C G T A C G T A C G T A C G T	AC G T A C G T A C G T A C G T A C G T A C G T A C G T					

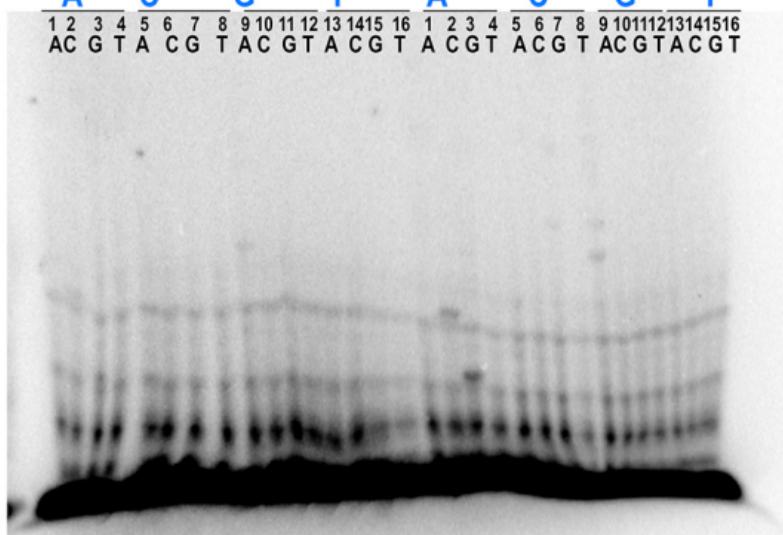


Fig S7

