





<i>Citrus sinensis</i>	AER---	RKALLEVQALAAALGS--	HENIVGYSSWFE---	NEQLYIQMELCD---	HSLSD--	KKASQ
<i>Eucalyptus grandis</i>	WER---	RKALMEVQSLAALGS--	HENIVGYSSWFE---	NEHLYIQMELCD---	YSLSS--	OKSTR
<i>Gossypium hirsutum</i>	TER---	RKALMEVQALAAALGS--	HENIVGYSSWFE---	NEQLYIQMELCD---	YSLSR--	KSSTQ
<i>Theobroma cacao</i>	TER---	RKALMEVQALAAALGS--	HENIVGYSSWFE---	NEQLYIQMELCD---	YSLSR--	NTSLQ
<i>Hevea brasiliensis</i>	AEK---	RKALMEVQALAAALGC--	HENIVGYSSWFE---	NEQLYIQMELCD---	CSLSI--	NKSSK
<i>Selaginella moellendorffii</i>	GDR---	RKALREVOALSCLGY--	HENVVRYFSSWFE---	NDFLYIQMELCE---	TNLRDE--	SLAW
<i>Physcomitrium patens</i>	VER---	RQALTEVQALAAVGF--	HENVVRYTAWFE---	DEYCYIQTELCE---	SNLTQLR--	DADPN
<i>Chlamydomonas reinhardtii</i>	QAR---	NMWLNEMQALAAVQP--	HPNIVGLYDTWFE	PGGDAEQAYIKQELCG---	ESLRDM--	FKRRV
<i>Schizosaccharomyces pombe</i>	PK---	ERNRLQEVSV--	IQRALKGHDHIVELMDSWEH---	GGFLYMQVELCENGSLDRFLEEQ--	GQLS	
<i>Saccharomyces cerevisiae S288C</i>	LKRILLE	KILNEVTNQITMDQ	EGKEYIIDYISSWKF---	QNSYYIMTELCENGLDGFLOEQVI	AKKK	
<i>Drosophila melanogaster</i>	SFE---	KRALNEVWAHAVLGR--	HDNVVRYSAWAE---	DDHMLIQNEFCDDGGSLHARIQD---	H	
<i>Danio rerio</i>	VDE---	QNALREVVYAHAVLGR--	HPHVRYSAWAE---	DDHMLIQNEYCNGGTLSDVIAEN--	RRRMH	
<i>Mus musculus</i>	VDE---	QNALREVVYAHAVLGR--	HPHVRYSAWAE---	DDHMLIQNEYCNGGSLADAISEN--	YRVMS	
<i>Homo sapiens</i>	VDE---	QNALREVVYAHAVLGR--	HSHVVRYSAWAE---	DDHMLIQNEYCNGGSLADAISEN--	YRIMS	

ATP-Bs

	220	230	240	250	260	270	280
<i>Medicago truncatula</i>	LLAEGQVLEVLVYQVANALRFI	HDKGI	IAHLDL	KPDNIYVKN	-----	G	
<i>Trifolium pratense</i>	FLAEGQVLKAFYQVANALRFM	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Pisum sativum</i>	LLSEGQLLEVLVYQVANALRFI	HEKGI	IVHLDV	KPDNIYVKN	-----	G	
<i>Vicia faba</i>	LLSEGQLLEVLVYQIANALRFI	HEKGI	IVHLDV	KPDNIYVKN	-----	G	
<i>Cicer arietinum</i>	LLAEGQALEVLVYQVANALQFI	HEKGI	VAHLDV	KPDNIYVKN	-----	S	
<i>Lotus japonicus</i>	LLTEGQVLDALYQVANALRFI	HEKGI	IAHLDV	KPDNIYIKN	-----	G	
<i>Lupinus angustifolius</i>	LFTEGQALEALYQVANALRFI	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Glycine max (Chr3)</i>	LFTEGQVLDALFQVANALQFI	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Glycine max (Chr13)</i>	LVTAGHEIEALYQVASALQFI	HKKG	IAHLDV	KPENIYVKN	-----	G	
<i>Phaseolus vulgaris</i>	AFSEAQVLDALFQVANALRFI	HAKGI	MAHLDV	KPDNIYVKN	-----	G	
<i>Vigna unguiculata (Chr1)</i>	AFTEAQVLDALFQIANALRFI	HEKGI	MAHLDV	KPNNIYVKS	-----	G	
<i>Vigna unguiculata (Chr6.1)</i>	LLTERHEIQVLYQVSSALQFI	HEKGI	IAHLHV	KPQNIYVKD	-----	G	
<i>Vigna unguiculata (Chr6.2)</i>	SLSQRYEIEVLVYQISSALQFI	HGKG	IAHLDV	KPENIYVKS	-----	G	
<i>Arachis hypogaea (Chr16)</i>	SLTEGQVLEALYQIANALRFI	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Arachis hypogaea (Chr6)</i>	SFTEGQVLEALYQIANALRFI	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Cajanus cajan</i>	LFTEGQVLDALFQVAKALRFI	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Prosopis alba</i>	MFTEGQVLEALHQVAKALLFI	HERG	IAHLDV	KPDNIYVKN	-----	G	
<i>Arabidopsis thaliana</i>	KVSEREILVIMHQIAKALHFV	HEKGI	IAHLDV	KPDNIYIKN	-----	G	
<i>Brassica napus</i>	RISEREILVIMHQIAKALQV	HEKGI	IAHLDV	KPDNIYIKN	-----	G	
<i>Nicotiana tabacum (1)</i>	LSSEVAVLEAMYQVAKALQYI	HQRG	VAHLDV	KPDNIYVKS	-----	G	
<i>Nicotiana tabacum (2)</i>	LFSEVEVLEAMYQVAKALQYI	HQRG	VAHLDV	KPDNIYVKS	-----	G	
<i>Nicotiana tomentosiformis</i>	LSSEVAVLEAMYQVAKALQYI	HQRG	VAHLDV	KPDNIYVKS	-----	G	
<i>Nicotiana sylvestris</i>	LFSEVEVLEAMYQVAKALQYI	HQRG	VAHLDV	KPDNIYVKS	-----	G	
<i>Solanum lycopersicum</i>	LFSEVEVLEAMYQVANALQFI	HQRG	VAHLDV	KPDNIYVKN	-----	G	
<i>Brachypodium distachyon</i>	LLKHEEALELLYQVSKGLDFI	HGRG	IAHLDV	KPDNIYVKN	-----	G	
<i>Triticum dicoccoides</i>	PLEFGDALELLYQICKGLDFI	HGRG	VAHLDV	KPDNIYVRN	-----	G	
<i>Oryza sativa</i>	PLKCGEALELLYQICKGLDFI	HERG	IAHLDV	KPDNIYVRN	-----	G	
<i>Zea mays</i>	PVKRGEALELLYQICKGLDFM	HERG	IAHLDV	KPDNIYVRN	-----	G	
<i>Sorghum bicolor</i>	PVKHGEAMELLYQICKGLDFM	HERG	IAHLDV	KPDNIYVRN	-----	G	
<i>Daucus carota</i>	LYTEGEVLEAMHQIAKALRYI	HERG	VAHLDV	KPENIYVKN	-----	G	
<i>Helianthus annuus</i>	ICSEGEVLEAMHQIAKALQFI	HEKGI	IVHLDV	KPENIYVKN	-----	G	
<i>Cynara cardunculus</i>	LCLEGEVLEAMHQIAKALQFI	HEKGI	IVHLDV	KPENIYVKN	-----	G	
<i>Populus trichocarpa</i>	SITEGEALQVLLQIAKALKFI	HERG	IAHLDV	KPDNIYFKN	-----	G	
<i>Malus domestica</i>	PFKEGEILEALYQISKALQLI	HGRG	IAHLDV	KPDNIYVKN	-----	G	
<i>Prunus persica</i>	TFTEGEILEVLVFIQAKALQFI	HKKG	IAHLDV	KPDNIYVKN	-----	G	
<i>Quercus suber</i>	LFTEAEVLQALHQIAKALQFI	HGRG	IAHLDV	KPDNIYVKN	-----	G	
<i>Juglans regia</i>	LLAEQEVLLALYQVAKALQFI	HERG	IAHLDV	KPDNIYVKN	-----	G	
<i>Vitis vinifera</i>	LFTEGEVLEAMHQIAKALQF	THEKG	IAHLDV	KPDNIYVKD	-----	G	
<i>Citrus sinensis</i>	FFAEGEVLKALHQIAQALQFI	HEKGI	IAHLDV	KPDNIYVKN	-----	G	
<i>Eucalyptus grandis</i>	-LTEWDALTALYQLAKALLFM	HERG	IAHLDV	KPDNIYVKN	-----	G	
<i>Gossypium hirsutum</i>	LFTEGEFLRAMHQAKALQFI	HEKGI	IVHLDV	KPDNIYVKN	-----	G	
<i>Theobroma cacao</i>	LFTEAEVLRALLQIAKALQFI	HERG	IAHLDV	KPDNIYVKN	-----	G	
<i>Hevea brasiliensis</i>	SITEDIKVLVHLHQIAKALHFI	HGCG	IAHLDV	KPDNIYVKN	-----	G	
<i>Selaginella moellendorffii</i>	TFTEKKLTEAMFQLLNALKHL	SHHG	LAHLDV	KPDNIYIRK	-----	G	
<i>Physcomitrium patens</i>	VSKESSLLEIMRQMASALS	SAIHSKG	LVHLDV	KPDNIYVLN	-----	G	
<i>Chlamydomonas reinhardtii</i>	QFKEVEVLEIILRQMASALKRI	HDLG	MVHLDI	KPDNIYLAAPSPADLALRAASGANASSAGSSSGSS--			
<i>Schizosaccharomyces pombe</i>	RLDEFVRWKILVEVALGLQFI	HHKN	VVHLDL	KPANVMITFEG			
<i>Saccharomyces cerevisiae S288C</i>	RLEDWRIWKIIVELSALRFI	HDSCH	IVHLDL	KPANVMITFEG			
<i>Drosophila melanogaster</i>	CLGEAELKIVLMHVI	EGRLYIHSND	LVHMDL	KPENIFSTMPNAHKLVEVQPQQT--	KDDDGMDSVYEEL		
<i>Danio rerio</i>	FLSELELDKDLLLQVSRGLYI	HSTA	LVHMDI	KPSNIFISRK--	PAASVEEFE	DEEDGPT	
<i>Mus musculus</i>	YLTEVELKDLLLQVGRGLRYI	HSMS	LVHMDI	KPSNIFISRTSIPNAVSEEG--		DEDDWIS	
<i>Homo sapiens</i>	YFKEAELKDLLLQVGRGLRYI	HSMS	LVHMDI	KPSNIFISRTSIPNAASEEG--		DEDD AS	

Catalytic segment

	290	300	310	320	330	340	350
<i>Medicago truncatula</i>	-----	VYKLGDFGCATLTDSS--	LP--	IEEGDARYMPQ	EILNEN	-----	YDHLDKVDIFSLGVSITVQLVRK



<i>Nicotiana tomentosiformis</i>	--SPLPESGPHFLNLRREGKLP LLP-GHS LQ-----FQNL LKVMMD PDPTRRP
<i>Nicotiana glauca</i>	--SPLPESGPHFLNLRREGKLP LLP-GHS LQ-----FQNL LKVMMD PDPTRRP
<i>Solanum lycopersicum</i>	--SSLPESGPHFLNLRREGKLP LLP-GHS LQ-----FQNL LKAMMD PDPTRRP
<i>Brachypodium distachyon</i>	--TPLPLSGPQFTSLREGKLFALLP-GRPIQ-----FQNL IKLMMD PDPTRRP
<i>Triticum dicoccoides</i>	--TPLPVSGHQFASLREGKISLLP-GHPMQ-----FQSL IKSMMD PDPVRRP
<i>Oryza sativa</i>	--TQLPDSGPQFTSLREGKIALLP-GCPMQ-----FQSL IKSMMD PDPVRRP
<i>Zea mays</i>	--TPLPESGSHFTSIREGKIALLP-GCPMQ-----FQSL IKSMMD PDPVRRP
<i>Sorghum bicolor</i>	--TPLPESGPHFTSIREGKIALLP-GCPMQ-----FQSL IKSMMD PNPVRRP
<i>Daucus carota</i>	--STLPESGPHFLHLREGKLP LLP-GHSVQ-----FQSL LKAMMD PDPMRRP
<i>Helianthus annuus</i>	--STLPDSGPYFQNLREGKLP LLP-GHSVQ-----FQNL IKAMLD PDPVRRP
<i>Cynara cardunculus</i>	--STLPESGPYFQNLREGKLP LLP-GHSVQ-----FQNL VKAMLD PDPVRRP
<i>Populus trichocarpa</i>	--STLPQSGSHLFLNLRREGKLP LLP-GHS LQ-----LQNL LKAMVC PDPVRRP
<i>Malus domestica</i>	--SPLPESGPQILNLRREGKLP LLP-GHS LQ-----FQNL LKFM LD PNPVWRP
<i>Prunus persica</i>	--LPLPESGPQILNLRREGKLP LLP-GHS LQ-----FQNL LKVM LD PNPVWRP
<i>Quercus suber</i>	--SPLPEAGSQFT--KEGKLALLP-GHS LQ-----FQNL LKVMVD PDPVRRP
<i>Juglans regia</i>	--SPLPESRSQFNLNLRREGKLP LLP-GHS LQ-----FQNL LKAMVD PDPVRRP
<i>Vitis vinifera</i>	--SHLPESGYQFNLNLRREGKLP LLP-GYS LQ-----FQNL LKAMLD PDPVQRP
<i>Citrus sinensis</i>	--SPLSESGPQFNLNLRREGKLP LLP-GHS LQ-----FQNL LKVMVD PDPVQRP
<i>Eucalyptus grandis</i>	--SPLPESGPQFNLNLRREGKLP LLP-GHSLH-----FQNL LKVMMD PDPVTRRP
<i>Gossypium hirsutum</i>	--SPLPESGPQFNLNLRREGKLP LLP-GYS LQ-----FQNL LKAMVD PDPVRRP
<i>Theobroma cacao</i>	--SPLQESGRQFT--REGKLP LLP-GHS LQ-----FQNL LKVMVD PDPVRRP
<i>Hevea brasiliensis</i>	--SPLPKSGSQFNLNLRREGKLP LLP-GHSLH-----FQNL LKVM LD PDPVQRP
<i>Selaginella moellendorffii</i>	--SPLPASGSQYQAIRQKLP LLP-GFSLV-----FQSL IKSLMHPAAKNRP
<i>Physcomitrium patens</i>	--LPLPTSQAQFNLNLRREGKLP LLP-GYS LQ-----LQNL LKALLNPDASARP
<i>Chlamydomonas reinhardtii</i>	--TELPKNGQSYHDIRQKLP-FLP-SASTR-----IINLLKMMSPDPAQRP
<i>Schizosaccharomyces pombe</i>	--IVLPDNGSQWQKLRSGDLSADAPRLSSTD-NGSSLTSSSRET PANSIIGQGGLDRVVEWMLSPEPRNRP
<i>Saccharomyces cerevisiae S288C</i>	--VVLPDNGNAWHKLRSGDLSADAPRLSSTD-IHSESLFSDITKVD TNDLDFDE-FDNISGNSNAGTSTVH
<i>Drosophila melanogaster</i>	--GPLPKNGPEWHNLRDQKVPILP-SLSRD-----FNELIAQMMHPYDKRP
<i>Danio rerio</i>	--EPLPTNGDKWHKIRQGILPHIPQVLSQE-----FLSLLKLMIHDPTRRP
<i>Mus musculus</i>	--EPLPRNGEQWHEIRQGRLPRIQVLSQE-----VTELLRVMIHDPERRP
<i>Homo sapiens</i>	--EPLPRNGDQWHEIRQGRLPRIQVLSQE-----FTELLKVMIHDPERRP

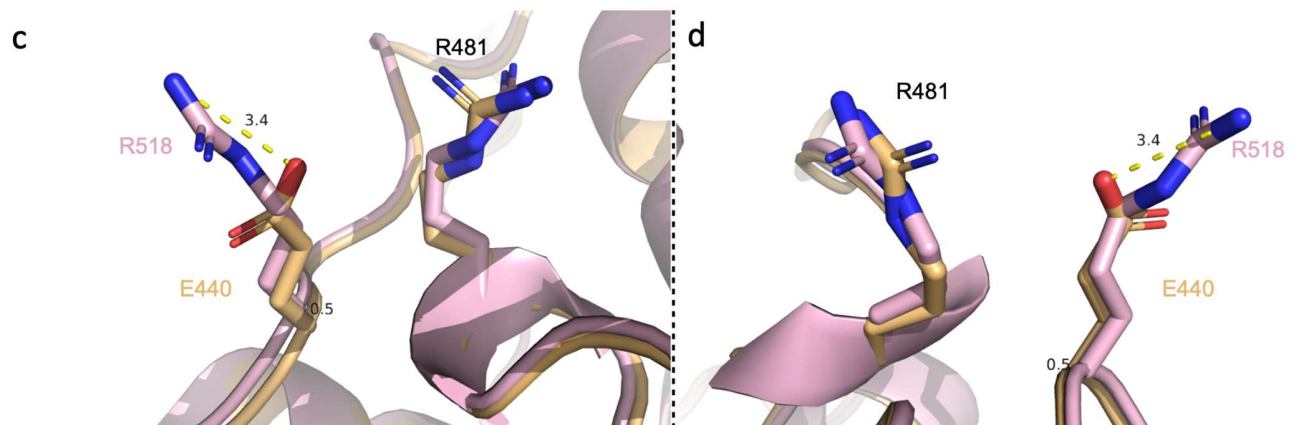
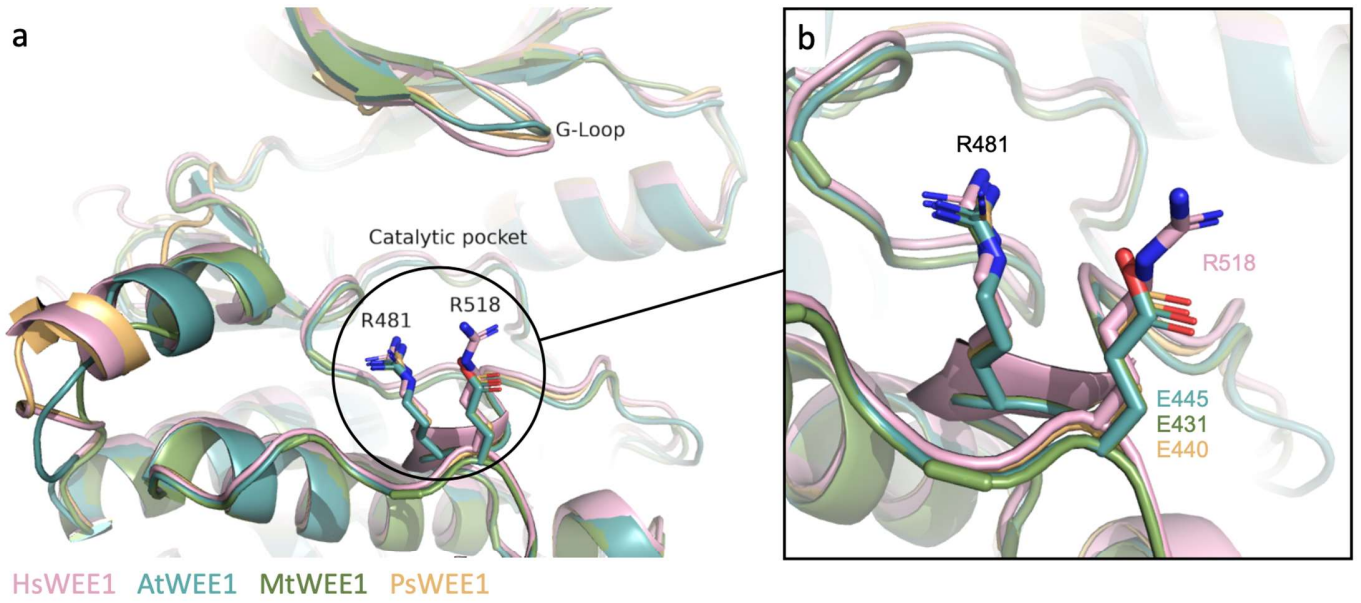
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<i>Medicago truncatula</i>	SARELVENPIF
<i>Trifolium pratense</i>	SARELVENPIF
<i>Pisum sativum</i>	SARELVENPIF
<i>Vicia faba</i>	SARELVENPIF
<i>Cicer arietinum</i>	SARELVENPIF
<i>Lotus japonicus</i>	SARELVENPIF
<i>Lupinus angustifolius</i>	SARELVENPIF
<i>Glycine max (Chr3)</i>	SAKELIENPIF
<i>Glycine max (Chr13)</i>	SATKLLKRVL-
<i>Phaseolus vulgaris</i>	SAKELVENPIF
<i>Vigna unguiculata (Chr1)</i>	SARELVENPIF
<i>Vigna unguiculata (Chr6.1)</i>	SATEILGNSIF
<i>Vigna unguiculata (Chr6.2)</i>	SATEILGNSIF
<i>Arachis hypogaea (Chr16)</i>	SARELIENPIF
<i>Arachis hypogaea (Chr6)</i>	SARELIENPIF
<i>Cajanus cajan</i>	SAKELVENPIF
<i>Prosopis alba</i>	SARELVENPIF
<i>Arabidopsis thaliana</i>	SARELLDHMPF
<i>Brassica napus</i>	SARELVEHMPF
<i>Nicotiana tabacum (1)</i>	SAKDLDVNPFI
<i>Nicotiana tabacum (2)</i>	YAKDLVDNPIF
<i>Nicotiana tomentosiformis</i>	SAKDLDVNPFI
<i>Nicotiana glauca</i>	YAKDLVDNPIF
<i>Solanum lycopersicum</i>	SAKGVVDNPIF
<i>Brachypodium distachyon</i>	SAKEILRHPIF
<i>Triticum dicoccoides</i>	SAKEILRHPIF
<i>Oryza sativa</i>	SAKEVLRHPIF
<i>Zea mays</i>	SAKEILRHPSF
<i>Sorghum bicolor</i>	SAKEILRHPSF
<i>Daucus carota</i>	SAKEVVENQLF
<i>Helianthus annuus</i>	SAKELVVNPIF
<i>Cynara cardunculus</i>	SAKELVVNPIF
<i>Populus trichocarpa</i>	SAKELIENPMF
<i>Malus domestica</i>	SAKDLDVENPIF
<i>Prunus persica</i>	SAKDLDVENPIF
<i>Quercus suber</i>	SAKELLENPIF
<i>Juglans regia</i>	SAKELVQNTIF
<i>Vitis vinifera</i>	SAKELVENPIF
<i>Citrus sinensis</i>	SAKELVENPIF
<i>Eucalyptus grandis</i>	SAKELVANPIF
<i>Gossypium hirsutum</i>	SAKELVENPIF
<i>Theobroma cacao</i>	SAKELIENPIF
<i>Hevea brasiliensis</i>	SAKELLENPIF

<i>Selaginella moellendorffii</i>	SAAQALKNALF
<i>Physcomitrium patens</i>	SAAE LLNHSVF
<i>Chlamydomonas reinhardtii</i>	TADGILRSTLL
<i>Schizosaccharomyces pombe</i>	TIDQILATDEV
<i>Saccharomyces cerevisiae S288C</i>	NNSNINNPNN
<i>Drosophila melanogaster</i>	TSQSIFSHPII
<i>Danio rerio</i>	STSELVRHPVL
<i>Mus musculus</i>	SAMELVKHSVL
<i>Homo sapiens</i>	SAMALVKHSVL

Supplementary Figure 2



### Supplementary Figure 3

