

SUPPLEMENT

Arabidopsis_thaliana	..... CSSSEPNGEDSAPLSSSSSSSTSEVST	29
Solanum_lycopersicum	..... CSSRCVGDAAETESKVVLPDTPAD	25
Theobroma_cacao	..... ASLD	4
Populus_trichocarpa	..... S	1
Ricinus_communis	.....	0
Prunus_persica	..... SSSSEPNQCNADSDAKTAPLS	21
Fragaria_vesca_subsp_vesca	..... ASEPNQNAESEPETTS. S	17
Cucumis_sativus	..... SSSDGINQDTQPEPESI STPSSSSSSSSSSSSPSI	36
Glycine_max	..... CSSLEPETAPPP	12
Cicer_arietinum	..... CSPSSSDSE. TS	11
Phyllostachys_edulis	..... CCVEPSSPEQESPAPPT. PPRKPPAPSSSL	30
Medicago_truncatula	..... CSSSSSEPE. TS	11
Zea_mays	..... ADSSSQCEEI SGAPPAPPLKRSARSPPSSL	30
Oryza_sativa_Indica_Group	..... AEPSSPEQENPSTPA. PPPVKPPASPSSL	28
Brachypodium_distachyon	..... ASRFRCCEAPPSPEQETPAPTPTPI PPPGEHPASPSSL	37
Setaria_italica	..... AEPSSQCEQETSAAPTTPPEKPERASPSSL	30
Sorghum_bicolor	..... SSTSEPSGPLPYHRLGLLQLAAHSLCRRGGP	32
Hordeum_vulgare_subsp_vulgare	..... AARFRCCEAPPSPEQETSAPP. PPP. PAPPSSL	32
Picea_sitchensis	AKSFPDGVGESKPAQLSPEKPEDASSLLNYSDEKCNEND	40
Vitis_vinifera	..... SSSSSPSI	8
Selaginella_moellendorffii	..... SGSPSVSI QPE	11
Physcomitrella_patens_subsp_patens	.....	0
Consensus	.....

Arabidopsis_thaliana	SNSSTYNWYTGIGGI GMLDTAYLTYLKVITGSDAF CPI GGG	69
Solanum_lycopersicum	TGI SAYNWCAALGGI GFLETSYLTFIKLINSAAF CPVGGD	65
Theobroma_cacao	SRNSMYNWSAGLGAI GFVETAYLTYLKLSDDAFCPLGGG	44
Populus_trichocarpa	SSVSTYNWCAALGGVGFLETA YLTFIKLINSDAFCPI GGG	41
Ricinus_communis	..... CAALGSI GFLETA YLTYLKLINSDAFCPI GGG	32
Prunus_persica	SSSLTEKLYVGLGGVGFLETT YLTYLKLINSDAFCPI GGG	61
Fragaria_vesca_subsp_vesca	SSELTYKLCAGI GGI GFLETT YLTFIKLINSDAFCPTGGG	57
Cucumis_sativus	SSNSTYTLCAALGGI GFVETAYLSYLKL TDSAAF CPGGG	76
Glycine_max	PFDWTHKLI AGVAGVGFLETS YLTYLKL TGA DAF CPVGGG	52
Cicer_arietinum	TTDWTFLI SGI ACTGFI ETSYLTYLKL TGSVFCPI GGG	51
Phyllostachys_edulis	LGI STSTWSAGAAGL GFLETC YLTYLKL TGEAF CPVGGG	70
Medicago_truncatula	TI DWYTKLI SGI AGI GFI ETSYLA YLKL TGEAF CPVGGD	51
Zea_mays	LGI STSTWSAGVACL GFLETC YLTYLKL TGEAF CPTGA	70
Oryza_sativa_Indica_Group	VGI STSTWSAGVACL GFLETA YLSYI KL TGEAF CPVSGG	68
Brachypodium_distachyon	VGVTSTWSAGVACL GFLETS YLSYI KL TGEAF CPVGGG	77
Setaria_italica	LGI STSTWSAGVACL GFLETC YLTYLKL TGEAF CPTSGG	70
Sorghum_bicolor	LPWLSSTWTAGVACL GFLETC YLTYLKL TGEAF CPTGA	72
Hordeum_vulgare_subsp_vulgare	VGVTSTAWTAGVACL GLETC YLSYI KL TGEAF CPVAGG	72
Picea_sitchensis	VGI SVYGVGAGLAGL GFEMTT YLTFIKVINSVFCPVGGG	80
Vitis_vinifera	S. . . AYSWCAGLGGI GFLETT YLTYLKLINSDAFCPI GGG	45
Selaginella_moellendorffii	PRKI PYGLI TSLSLGAI ETAYLSYI KL TGEAF CPASGP	51
Physcomitrella_patens_subsp_patens	PSKLRGLI TGLATA GFVETAYLTYLKL TGEAF CPGGG	39
Consensus	g t yl k cp	

Arabidopsis_thaliana	... TCGEVLNSDYAVVFGVPLPVI GFVNYGVVTA LSAELG	106
Solanum_lycopersicum	... ASCGDI LNSYSANVFCVPLPLI GNVAYGVVAI LGL CLG	103
Theobroma_cacao	... SCGEVLNSDFAVVFGVPLPLVGLVAYGFVTA LSLQLS	81
Populus_trichocarpa	... NCGEVLNSDYAVVFGVPLPLI GMSGLVAALGLQVS	78
Ricinus_communis	... SCGEVLNSDYAVVFGVPLPVI GIVAYGLVASLGLLLP	69
Prunus_persica	... SCGDI LNSDYAVVFGVPLPLF GNVAYGLVATLGVQLL	98
Fragaria_vesca_subsp_vesca	... GSCGDI LNSDYAVVFGVPLPLF GMAAYGLVATLGVQLL	95
Cucumis_sativus	... GCLNVLNSDYAAVFGVPLPLI GNVAYGLVAVSLCLA	113
Glycine_max	... TCSKI LNSDYALVFGIPLPLI GMAAYGLVAALGVCLA	89
Cicer_arietinum	... TCSDI LNSDYALVFCVPLPLI GNVAYGFVAALSLCLA	88
Phyllostachys_edulis	... CGGEVLNSDYAVVFGIPLPLVGLVAYGLVATLSQLCEN	107
Medicago_truncatula	... TCSDI LNSDYAVVFGVPLPLI GMAAYSFVAALSLCLT	88
Zea_mays	... CGGEVLNSDYAVVFGIPLPI GNVAYGLVATLSQLCEN	107
Oryza_sativa_Indica_Group	... CGGEVLNSDYAVVFGIPLPLVGLVAYGLVATLSQLCEN	105
Brachypodium_distachyon	... CGGEVLNSDYAVVFGIPLPLVGLVAYGLVAALSQLCEN	114
Setaria_italica	... CGGDI LNSDYAVVFGIPLPLVGLVAYGLVATLSQLCEN	107
Sorghum_bicolor	... CGGEVLNSDYAVVFGIPLPLVGLVAYGLVATLSQLCEN	109
Hordeum_vulgare_subsp_vulgare	... CGGEVLNSDYAVVFGIPLPLVGLVAYGLVATLSQLCEN	109
Picea_sitchensis	... SCGEVLNSDYAVVFGVPLSLI GMAAYGLVATLSQLCEN	117
Vitis_vinifera	... TCSDI LNSDYAVVFGVPLPLI GMAAYGLVATLSQLCEN	82
Selaginella_moellendorffii	GH. CCNVLNSAYSTL FCTPLSLI GNVAYSSISLLGFNSI	90
Physcomitrella_patens_subsp_patens	. T. CGEVLNSKYGTI FGVPLSLVGLVAYGLVATLSQLCEN	77
Consensus	c l s fg pl g y	

Arabidopsis_thaliana	ECN. LPFGI SKSNGRFALFGI TTAMASASAYFLYI LSTKL	145
Solanum_lycopersicum	QKS. RPLGTGEANGRLVLLGTTTSMASASAYFLYI LSTKF	142
Theobroma_cacao	AKS. SPFGI SESYGRLLLLGTTTSMASASAYFLYI LSTCF	120
Populus_trichocarpa	GKK. FPFGEESNGRLLLLGCTTSMASASAYFLYI LSTKF	117
Ricinus_communis	GKN. LPFGI GEANGRLI LLASTTSMASASAYFLYI LSTKF	108
Prunus_persica	TAKKLPFGI GESNARLVLLGTTTSMASASACFLYI LSTKF	138
Fragaria_vesca_subsp_vesca	AAKSLPFGI GKSEASLVLLGI TTSMAASASACFLYI LSTCF	135
Cucumis_sativus	AKK. LPFGI DESGRLVLLGTTTSMASASAYFLYI LNTCF	152
Glycine_max	SKN. FRFGI EKPTAEAVLLGATTSMASASAYFLYI LTRF	128
Cicer_arietinum	TKENLPFGI NI SNAQLI LLASSTSMATASAYFLYI LTTTF	128
Phyllostachys_edulis	GKE. LLPGLNLEI RL TLLLI ATSMATASAYFLYI LSTKF	146
Medicago_truncatula	TKKNLPFGVNRSNACL VLLGTTTSMATASAYFLYI LTTAF	128
Zea_mays	GKD. LLCGSDLEVRLLI LLLVATSMATASVYFLYI LSTKF	146
Oryza_sativa_Indica_Group	GKN. FLPGI DDLEI RL TLLLI STSMATASSYFLYI LNTRF	144
Brachypodium_distachyon	GKE. LLPGLDDLEI RL VLLLI ATSLATASAYFLFI LSTKF	153
Setaria_italica	GAD. LLPGLDDLEI RL TLLLLATSMATASAYFLYI LSTKF	146
Sorghum_bicolor	GKD. LLPGSDLEI RL I LLLVATSMATASAYFLYI LSTKF	148
Hordeum_vulgare_subsp_vulgare	GDE. LLPGLDDLEI RL TLLLLATSLATASAYFLFI LNTKF	148
Picea_sitchensis	KRK. TVFGI DGEKARVIFLGTI SSMAASAYFAYLLI VKL	156
Vitis_vinifera	GKN. VPFGEI GETNGRLLLLGTTTSMASASAYFLYI LSTCF	121
Selaginella_moellendorffii	CS. . . LFPEDD. . VRVLLGGTTALVSASSYFLYLLTFKL	125
Physcomitrella_patens_subsp_patens	TNPKDRFI EEEGLVKVLLLASTTVMGVASTYFAYI LNDKL	117
Consensus		

Arabidopsis_thaliana	SGSCLYGLVSAFLSFLFFLS. . . VKDVKLQEI QCVVG	181
Solanum_lycopersicum	TGEFCPYGLASVLLSFLFFI SS. . . MKLGFQEVQKLVG	178
Theobroma_cacao	AGASCSYGLMSALLSFLFFI S. . . LKDVGLQEI QKVVG	156
Populus_trichocarpa	SGTSCYGLLSAFLSFLFFI T. . . LKDFGLEEI QKFLG	153
Ricinus_communis	SGVSCSYGLFSAFLSFLFFI T. . . LKDFGLQDI QKVLG	144
Prunus_persica	SGASCSYGLLSALLSFLFFI T. . . LKDLGLEKVKQEVG	174
Fragaria_vesca_subsp_vesca	SGTSCYGLLSAFLSFLFFI T. . . LKDFCFEKVQKEAG	171
Cucumis_sativus	SGVTCSYGLVSAFLSFLFFAT. . . LKDFGLDESRRRLA	188
Glycine_max	SDSSCSYGLLSAFLSFLFFVT. . . LKDI GLQEVSKQLG	164
Cicer_arietinum	SGSSCSYGLLSVLLSFLFFI T. . . LKDI GLQEKYKQLG	164
Phyllostachys_edulis	VGTSCAYGLLSAFLSFLFFI R. . . VKDFGLEQI QKVLG	182
Medicago_truncatula	PESSCSYGLLSVLLSFLFFLT. . . LKDI GLQEKYKQLG	164
Zea_mays	IGVSCSYGLLSAFLSFLFFI R. . . VKDI GFERI QKFAG	182
Oryza_sativa_Indica_Group	IGTSCYGLLSAFLSFLFFI R. . . VKDLGLERVQKFFVG	180
Brachypodium_distachyon	VGTSCYGLSSALI SFLFFI R. . . VKDFGLARI QKFVQ	189
Setaria_italica	VGLSCSYGLLSAFLSFLFFI R. . . VKDFGKRI QKFAG	182
Sorghum_bicolor	VGVSCSYGLLSAFLSFLFFI R. . . VKDFGFERI QKFAG	184
Hordeum_vulgare_subsp_vulgare	VGTSCYGLSSAFI SFLFFI RLKELLCI GLARI QKFVQ	188
Picea_sitchensis	EGASCAYCVTSALLSCLLLI A. . . LRFRYRELQCVAA	192
Vitis_vinifera	PGASCSYGLVSAFLSFLFFTS. . . LKDFQLKDI QKTVV	157
Selaginella_moellendorffii	ENASCAYCVASVLLSFLFFI ST. . . LKGFKWKDVPRAG	161
Physcomitrella_patens_subsp_patens	GGASCTYGVSAI LSI SLLCT. . . LVSEFNGDLRNVAG	153
Consensus		

Arabidopsis_thaliana	LQI CLAI I VVASI TASYSTACPI PSRSG. DI ELPYFRTEI	220
Solanum_lycopersicum	IQLLI VLLVVS T LNSYSDSQPTNTGSA. LAENEYFTAETI	217
Theobroma_cacao	LQI CI ASLVVATL SASYSTTSLVPSLLA. NVDLPHYTTEI	195
Populus_trichocarpa	LQLCI ASVVI FSLNTSYATLQRASSVA. DI NLEYFTTEI	192
Ricinus_communis	LQI CVASLVVAALNASYGTSPPI SSSLA. EVDLPYVYETI	183
Prunus_persica	LLL CI ASLVFVTLNRSYAYPPVSSSPS. EI DLPYFTTEI	213
Fragaria_vesca_subsp_vesca	LLVCLAVLVAVTLNRSYSA. PVSSSPA. DVDLPHYVATEI	208
Cucumis_sativus	TQI I MAGI VFFTLSTSYG. SLPI SRSA. ELDLPYFETEL	226
Glycine_max	LQLLVASLVI LSLNASYSNSKSASSSLA. ENDLPHYFATEI	203
Cicer_arietinum	LQLFI ASLVI L T LNTSYSSAKSASSSMA. KI ELPYFATEI	203
Phyllostachys_edulis	LQLAVAVI VALAL TNSYNSATTQLKGT. DFVLEPYETEI	221
Medicago_truncatula	LQLVI ASLVI L T LNTSYSSAKSASSSMA. KI ELPYFATEI	203
Zea_mays	IQLAVAVI I ALAL TNSYSSATTQLKGT. DFVLCPYETEI	221
Oryza_sativa_Indica_Group	LQLSVAI I VALAL TNSYSSATTQLNGT. DFVLEREYETEI	219
Brachypodium_distachyon	IQLAVAVI VALAL TNSYSSATTQLKGT. DFVLEPYETEI	228
Setaria_italica	IQLAVAVI I ALAL TNSYSSATTQLKGT. DFVLEPYETEI	221
Sorghum_bicolor	IQLAVAVI I ALAL TNSYSSATTQLKGT. DFVLEPYETEI	223
Hordeum_vulgare_subsp_vulgare	LQLAVAVI VALAL TNSYSSATTQLKGT. DFVLEPYKTEV	227
Picea_sitchensis	LQI STAALVI AALSTAYNTSGSALAGLD. NI DLPVPEPVV	231
Vitis_vinifera	LQLCI ASLVVATLSTSYN. TLPVSTSLA. EI DLPYFTTEI	195
Selaginella_moellendorffii	LQLVVGAAVI FTLSTGFAAAGPALAGSSEDI DLPPI EPEV	201
Physcomitrella_patens_subsp_patens	IQLTAGVVALVLSAAFNDI DSASFRS. DI DLPYESPVEV	192
Consensus		

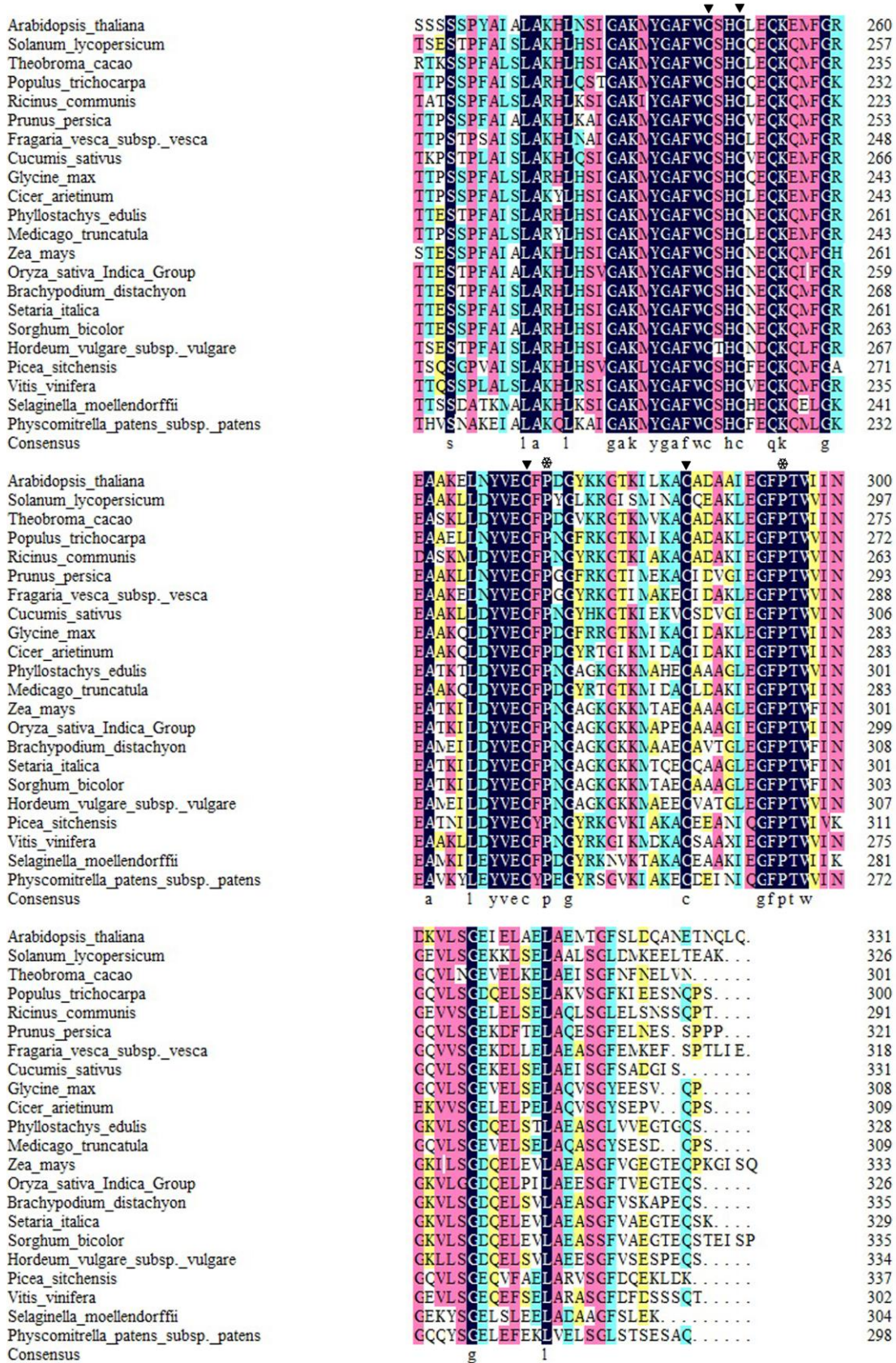


Fig. S1. Multiple sequence alignment of diverse plant VKORs. Horizontal bars represented five transmembrane segments (a1-5) predicted using SWISS-MODEL online software. Reversed triangles mark the position of conserved cysteines. Asterisk

represents the conserved serine. Snowflake symbols indicated the conserved proline residues. Plant VKORs include *Arabidopsis thaliana* (At4g35760), *Solanum lycopersicum* (JF951971), *Theobroma cacao* (EOX90725.1), *Populus trichocarpa* (XP_002327630.1), *Ricinus communis* (XP_002530730.1), *Prunus persica* (EMJ03281.1), *Fragaria vesca* subsp. *vesca* (XP_004287759.1), *Cucumis sativus* (XP_004135011.1), *Glycine max* (NP_001241213.1), *Cicer arietinum* (XP_004512236.1), *Phyllostachys edulis* (CCI55444.1), *Medicago truncatula* (XP_003612272.1), *Zea mays* (NP_001132492.1), *Oryza sativa Indica Group* (EEC74452.1), *Brachypodium distachyon* (XP_003558888.1), *Setaria italica* (XP_004985834.1), *Sorghum bicolor* (XP_002468573.1), *Hordeum vulgare* subsp. *vulgare* (BAJ90381.1), *Picea sitchensis* (ABK24448.1), *Vitis vinifera* (CAN72958.1), *Selaginella moellendorffii* (XP_002975947.1), *Physcomitrella patens* subsp. *patens* (XP_001762495.1).