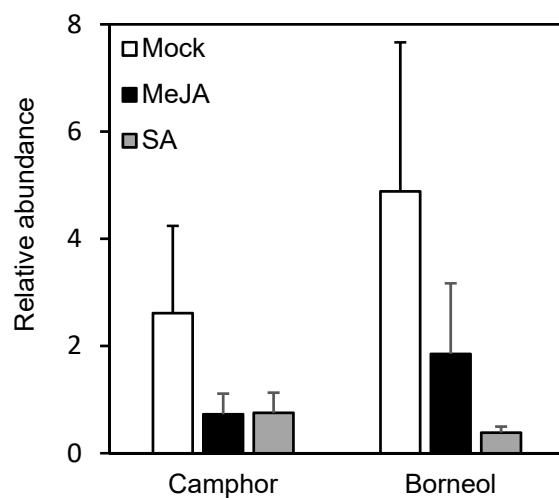




Supplementary Figure S1. SPME-GC-MS analysis of camphor and borneol emission following MeJA and SA treatment. Volatile compounds were analyzed in triplicate from detached pooled root material of 5-week old plants. Samples were normalized to an internal standard (1-bromodecane) and gram FW. Compound identification was based on matches with authentic standards (Sigma).

Supplementary Figure S2. Amino acid sequence alignment of switchgrass mono-TPSs and sesqui-TPSs. The multiple sequence alignment was generated using Clustal Omega (<http://www.ebi.ac.uk/Tools/msa/clustalo/>) with sequences from Supplementary Table S2 and visualized using BoxShade (http://www.ch.embnet.org/software/BOX_form.html).

```

PvTPS15      1  MARAVKLLAAAGSHPLKACLGSGG-----
PvTPS106     1  -----
PvTPS13      1  -----
PvTPS02      1  -----
PvTPS28      1  -----
PvTPS27      1  -----
PvTPS12      1  -----MSLKVTAGWPAA--AA-
PvTPS73      1  -----MATPKWFQV--QRP
PvTPS52      1  -----MYTY-----IINAC---AVPGVAMATPKWFQV--RRP
PvTPS01      1  -----
PvTPS85      1  -----
PvTPS19      1  -----
PvTPS14      1  -----
PvTPS11      1  -----
PvTPS26      1  --MQASVMTTSLSLRPEGQCNGSFL-----LASSTSRRPCISWSRRQQRPT
PvTPS04      1  -MEGS-VMTTFSLRP-GHCNGSFL-----VAPATSRRPCISWRPRQQRQT
PvTPS83      1  -MQGTVTMTTSLSLRPAGQCNGSCL-----LAPATARQPRISWRRQQRQT
PvTPS03      1  -ME-GSVMTTSLSLRPAGQCNGSCL-----LAPATARQPRISWRRQQRQT
PvTPS62      1  MRGCTTLMATTSTFKPQRN-----FHVAA---AATASTQCPSISWRQG--QKR
PvTPS08      1  MHSGSTVMTTFSSKPP-QC---SSRRSCHVHIGAAAASPPPLIRRCPSVSWRWLEQR--
PvTPS36      1  -----MTTFSFKPPPPCSS--SRRRSCNVHVGAAAASPPPLIRRCPSVSWRW--RLRR
PvTPS81      1  -----MTTFSFKPPPPCSSSSSSSSRRSCHVHIGAAAASPPPLIRRCPSVSWRWLQRLRR
PvTPS18      1  -----
PvTPS16      1  -----
PvTPS109     1  -----MEVWNRDVBHQQT
PvTPS69      1  -----
PvTPS94      1  -----
PvTPS17      1  -----
PvTPS20      1  -----
PvTPS10      1  -----
PvTPS71      1  -----
PvTPS79      1  -----
PvTPS56      1  -----
PvTPS05      1  -----
PvTPS09      1  -----
PvTPS50      1  -----
PvTPS54      1  -----MQPA-----ASPEWIGMANVTWNVARGQVA
PvTPS33      1  -----MAYVTRCRVP
PvTPS53      1  -----MAYVTWNVARCQVP
PvTPS101     1  -----
PvTPS07      1  -----
PvTPS06      1  -----
PvTPS55      1  -----
PvTPS104     1  -----

```

PvTPS15	25	-----GQ--R---LGSLPRRTTT-----	
PvTPS106	1	-----MAATPARTFSMPSVEPLLRSA-----	SPAAT
PvTPS13	1	-----MAAAPARTFSVRSVEPLPVSA-----	SLAAT
PvTPS02	1	-----MAAAPARTFSVRSVEPLPVSA-----	SLAAT
PvTPS28	1	-----MAAAPAHVVFSTSVQLLLRSV-----	SPAAA
PvTPS27	1	-----MAAHIFFVTSVRPLLLSA-----	SPAAR
PvTPS12	15	---TGRS--SR-----RHKLWC-----	LSA
PvTPS73	13	CPPAGRSAVGK-----NTPARC-----	
PvTPS52	28	CPAAR--PAGA-----NTPVRC-----	
PvTPS01	1	-----M--ASPMIT	
PvTPS85	1	-----MG-----TYS--GSPVLA	
PvTPS19	1	-----MG-----TCR--GSPVLA	
PvTPS14	1	-----MG-----I-S--GSPVLA	
PvTPS11	1	-----MA-----T-C--GSHVLA	
PvTPS26	44	K-----LHRQQMQ-----QRSVATVHHDN	
PvTPS04	43	T-----LRRQQMQ-----QRSVVTD-HDN	
PvTPS83	45	T-----LHRQQMQ-----QCSAATL-HND	
PvTPS03	44	T-----LHRQQMQ-----QCSAATL-HND	
PvTPS62	43	R-----HIRLQCH-----QLQH-----	
PvTPS08	54	R-----HTRLQCG-----QSSPQ-QISNL	
PvTPS36	50	H-----TCRLQCG-----QQSPQ-QNSNL	
PvTPS81	54	H-----TCRLQCG-----QQSPQ-QNSNL	
PvTPS18	1	-----MSA	
PvTPS16	1	-----MALTPPVCS	
PvTPS109	13	Y-----KQONQRSAREIIQVNKADGEKMALTPPVCS	
PvTPS69	1	-----MALTPPVCS	
PvTPS94	1	-----MAPASV---	
PvTPS17	1	-----MASGHEDGP	
PvTPS20	1	-----MASGHEDDS	
PvTPS10	1	-----	
PvTPS71	1	-----MVA--PREVGSSSMGLGSRV-I	
PvTPS79	1	-----MSSAIK--AT--SPVIQKIGSPME-	
PvTPS56	1	-----MAASEA--AS-----PPFS-	
PvTPS05	1	-----MAASEA--AS-----PPVS-	
PvTPS09	1	-----	
PvTPS50	1	-----M-ENTNT	
PvTPS54	26	----IILGTGTQEHFYPR-----	
PvTPS33	11	HPENVIPGTRTHEHFHFLKTFYKY--RTMFPPFHISRSNR--PG--NLVSMGM-ASSNA	
PvTPS53	15	HPENNISGTGMQKHFPHLAKPFFRY--RTTFPPFHISRSNR--PG--NLVSMGM-ASCNA	
PvTPS101	1	-----MA-SCRAR	
PvTPS07	1	-----MKSHNFHSRLANSRHPIISPLLLLYPGPSLVR--PT--RFSAVHI-KCTSA	
PvTPS06	1	-----	
PvTPS55	1	-----M-APRTT	
PvTPS104	1	-----	

PvTPS15	38	-----MPTTTRRASRP	GVNGVTQAH	---KTFEV-EEHSNSPAK	-----
PvTPS106	27	R-----NGRPRGRSII	PW-AAAAS	-----NTLLPSN	-----
PvTPS13	27	R---NNDQGRGRPRGRSII	AS--A-AAS	-----KTLLPSD	-----
PvTPS02	27	R---NNDQGRGRPRGRSII	AS--A-AAS	-----KTLLPSD	-----
PvTPS28	27	G---G--IGRRGGR-IRPS	---T-A	-----SNRPPSD	-----
PvTPS27	24	N---GRRGGRPGGC-IRTL	---PAS	-----RTLPPSD	-----
PvTPS12	30	AES-PDHQQPRRRSANYRPS	SWDYDALLSLK	-----GGGG	-----
PvTPS73	30	-SS-LPPPEPIRRSANYQPN	SWSYASMESL	-----AAAN	-----
PvTPS52	43	-SS-LPPPEPIRRSANYQPN	SWSYASMESLL	-----EAAN	-----
PvTPS01	8	LAP-QSQ---CNQFREYS	SPSPWGDDFFL	-----NHATCTPS	-----
PvTPS85	12	LAP-QDEDLLQKPRPYTPS	IWGDFFL	-----QHQPCTPS	-----
PvTPS19	12	LAS-HDE---ERKPRS	YTPSIWGDFFL	-----KHQPCTPS	-----
PvTPS14	11	LAS-QDE---ERKPRPYTPS	IWGDFFL	-----QHQPCTPS	-----
PvTPS11	11	LAS-QQEGLLQKPRPYTPS	IWGDFFL	-----KHQPCTPS	-----
PvTPS26	63	L-E-EVDDRLGKNPCNFHPS	IWGDFFL	-----HYYDAAAA	-----
PvTPS04	61	L-E-ERKDGLGKNPCNFOPS	IWGDFFL	-----HYYDTAAS	-----
PvTPS83	63	---KVDDRLGKNPCNFHPS	IWGDFFL	-----HYYDAAAS	-----
PvTPS03	62	---KVDDRLGKNPCNFHPS	IWGDFFL	-----HYYDAAAS	-----
PvTPS62	55	--D-DADNRLTRNTGIFHPS	LWGDDFFI	-----GYSNPAAAP	-----
PvTPS08	72	--D-EDDSRLSQNAGIFHPS	IWGDFFL	-----GYSNPAAA	-----
PvTPS36	68	V-D-EDDSRLSQNAGIFHPS	IWGDFFL	-----GYSNPAAA	-----
PvTPS81	72	V-D-EDDSRLSQNAGIFHPS	IWGDFFL	-----GYSNPAAA	-----
PvTPS18	4	L-H-SNSDEGLAKAPT	FHPSLWGDDFFL	-----TYQPPTAP	-----
PvTPS16	10	V-N-DVHQGQRKDRPT	FHPSLWGDDFFL	-----TYQPPTAP	-----
PvTPS109	44	V-N-DVHHGQRKDRPT	FHPSLWGDDFFL	-----TYQPPTAP	-----
PvTPS69	10	V-N-DVHHGQRKDRPT	FHPSLWGDDFFL	-----TYQPPTAP	-----
PvTPS94	7	D-H-DQKAEELRKATT	FHPSLWGDDFFL	-----TYQPPTAP	-----
PvTPS17	10	G-S-GQEEIKKPSAST	FHPTLWGDDFFL	-----SHKPPTLP	-----
PvTPS20	10	G-S-GQEQTKKPSAST	FHPTLWGDDFFL	-----SHEPPTSL	-----
PvTPS10	1	---MEHVNPAKRPTVIVED	SKWTGFFI	-----ELOPLPC	-----
PvTPS71	20	AQG-YEVLDEERHAVDYRPS	VWGDHFIKD	-----PTLPHTN	-----
PvTPS79	21	---T-IATTGAEDCPFEP	SLWDDFF-V	-----TYAPPSIS	-----
PvTPS56	13	---VEMMMGAAGLTGFEP	CAWGDFFFI	-----THAPPLS	-----
PvTPS05	13	---VEMMMGAAGLTGFEP	CVWGDFF-I	-----TLAPPFS	-----
PvTPS09	1	-----	-----	-----	-----
PvTPS50	7	TKGFVVVNKLGRKTANYTPS	RWSEFFFI	-----DYVPEPLV	-----
PvTPS54	40	-----LRASDFHRTVWGN	FFFI	-----NHSPEPLQAIHVHL	---EMLVLK
PvTPS33	64	NV-----PE--RASDFHRTV	WGDIFI	-----NYSPEPSQAWLTVYDSELLGLE	-----
PvTPS53	68	NV-----PETERASN	FHRTVWGDFFI	-----NHSPEPLQ	-----
PvTPS101	8	RAK-EEEAGWKKMRGKRRGEE	WDGPTASVLTGLPVDNSGGGGGRK	-----	-----
PvTPS07	47	NKT-TASD---TVPVFHPS	LWNDFI	-----FI---NYTEPPS	-----
PvTPS06	1	-MA-TSVATTI-PAPVFHPT	VWGDYFI	-----NFTPEPL	-----
PvTPS55	7	SSD-EAATSWK-AAPEVHPS	VWGDFFFI	-----NYIPEPL	-----
PvTPS104	1	MAP-EAATSWK-AAPEVQPS	VWGGFFFI	-----NYIPEPL	-----

PvTPS15	73	-----KFS-----SHGISRQHNKGT--SSDTAMRKQLEQVDVLQN
PvTPS106	52	-----FDSL-----QHQILQQR-----ESGREMMATIDNLKR
PvTPS13	55	-----FDLQLOE-----GLTSVQKILQERR--NSGREMMATIDNLKR
PvTPS02	55	-----FDLQLO-----ERR--NSAREIMATIDNLKR
PvTPS28	49	-----LD--IQR-----SIMDVQEALRPCW---KRGREMVAAVDSLKR
PvTPS27	49	-----HD--LQK-----SIMSVQKTLHGHP---KSGREVMAAVDNLKR
PvTPS12	64	-----GRD---L--VCQFSHDQLKNSVKDMLLGKS---EESSCKATLIGTMQR
PvTPS73	62	-----KYD---HNLADPSIFDKLMFRI RHLLH-E---MELLPKLRVIDTLQR
PvTPS52	76	-----KCD---HNQADPSIFDKLKLFLVRHQLH-E---MELLPKLRVIDTLQR
PvTPS01	39	-----QLLTMKERAQVKEENVRRRIILESFASS--DLAQKLELVDTLQR
PvTPS85	46	-----QLLSMKESARIKQEEVRQIVLETTAS--RELVKLELVDTLQR
PvTPS19	43	-----QLVSMKERARSKQEEVRQILLDTIAASS-ELVHKLELVDTLQR
PvTPS14	42	-----QLLSMEERAWSKQEEVRRIILDTIAASSELVVRKLELVDTLQR
PvTPS11	45	-----QLLSMKESARIKQEEVRQIILETTASC--ELVLKLELVDTLQR
PvTPS26	96	-----S-SKQQTWMAERA-EVKEDVAKILASSVAW--DL DHRLOLIDALER
PvTPS04	94	-----S-KQQTWMAAERADKVKQDVAKIVASSVAW--DLHHRLOLIDALER
PvTPS83	94	-----S-KQQQTWMVEQADEVKQDVAKIVASSVAW--DLHHRLOLIDALER
PvTPS03	93	-----S-K-QQTWMVEQADEVKQDVAKIVASSVAW--DLHHRLOLIDALER
PvTPS62	87	-----QQORMEERADQLREEVAEIMAASSFS---SLHARLHMIDTLES
PvTPS08	104	-----SSQ-QQTQMAERADKLKEQVAEMIASSTFR--GQHERLHLIDTLER
PvTPS36	101	-----SSQQQQTQMAERADKLKEEVAGMIASSTVG--GQHGRLHLIDTLER
PvTPS81	105	-----SSQ-QQTQMAELADRLKEEVAEMIACSTIG--GQHGRLHLIDTLER
PvTPS18	37	-----QHAYMKERAKVLKEEVRKIINGTN----ELPKILDLIITLQR
PvTPS16	43	-----KRAYMTERAEVLKEEVRKMKVKAAN----EIPSILELIITLQR
PvTPS109	77	-----KRAYMTERAEVLKEEVRKMKVKGAN----EIPDILDLIITLQR
PvTPS69	43	-----KRAYMTERAEVLQEEVRKMKVKGAN----EIPDILDLIITLQR
PvTPS94	40	-----QHEYMKERAVVLREDVRKIVNGST----DLRETMDLIITLQR
PvTPS17	43	-----KEIQMRERA AVLREEVRKIIKGSN----DLPAMLDLIIMLQR
PvTPS20	43	-----QEIQMRERA AVLREEVRKIIKGSN----DLPAMLELIITLQR
PvTPS10	32	-----SHQQSEVRITDRRDELVQKVRCCI QDF-GE-KENLLQGMKTVDALER
PvTPS71	55	-----KKSLEWMEERDALVSEAKKALTGTH----DPMAEMKLIDAVQR
PvTPS79	50	-----QRSEKWMRERA AHLKKEVRHMF D--AHK-GLSVTNAIILVDVLER
PvTPS56	44	-----QEAEKMRERERVEQLKGELRRRVFGAAGE-AMSVADTVALVDTLER
PvTPS05	43	-----QEAEKMRERERVEQLRGELRHRVF EAAGE-AMSVADTVALVDTLER
PvTPS09	1	-----MKEEIRAMITTAI-----DTVEI IKLIDTLEH
PvTPS50	41	-----NVSEEWLVEGA AKMKEEIRAMITTAI-----GTVEIMKLIDTLEH
PvTPS54	76	YGTICQIFVFPCFKRHKSEEWMT EKANQLKKKISELFEACT-----TPVEQLELVDTLQH
PvTPS33	105	YGTIC-----HKSEEWMTKKANQLKRR ISELFEACT-----TPVEQLELVDTLQH
PvTPS53	97	-----KSEEWMT EKANQLKKKISELFEACT-----TPVEQLELVDTLQH
PvTPS101	52	-----ERSEKWMRERANKLKEEVGVLFQNC K-----NIVEKMNLVDVLQR
PvTPS07	76	-----QRSEKWMRERANKLKEEVGVLFQNC K-----NIVEKMNLVDVLQR
PvTPS06	32	-----QISDEKMAERINOLKEDVSGMFQA AKN-----NVVETMNLVDVQR
PvTPS55	39	-----QVSEKMIERADKLKG EVCGLFEACK-----NVVEKLDLVDVLQR
PvTPS104	33	-----QVSDEKMI ERVNKLKG EVCGLFEACK-----NVVEKLDLVDVLQR

PvTPS15	106	MGISRHFDGEIKRI	DMTYSWLQ-----GD-EDIIL	DAGTCAMAFRIL	LRMNGYDVSA-	
PvTPS106	80	LCIDHYFEEI	QSAMGACMHL-----IHSD	DLFDATLAFRL	MREAGHDVSAD	
PvTPS13	90	LCIDHYFQEEI	QSAMGACLDL-----IHSD	DLFDATLAFKL	VREAGHDVSAD	
PvTPS02	79	LCIDHYFQEEI	QSAMGACLDL-----IHSD	DLFDATLAFKL	VREAGHDVSAD	
PvTPS28	82	LCIDHYFQEE	EVSAMAVAKDL-----VRSD	-LDATLSFRL	MREAGHDVSSD	
PvTPS27	82	LCIDHYFEE	EVSAMAVAVDL-----VRSD	DLLDATLSFRL	LLRETGHVSD	
PvTPS12	104	LGISYHFEEDIRN	ILSSISMEIAN-----DRRVD	DVASIALKFRLL	RENGFSADPG	
PvTPS73	103	LGVAHYHFEDEI	SDLLKSVSMEGQD-----IDRMD	DAHLMTLFLFRLL	RQSKSPTSPE	
PvTPS52	117	LGVAHYHFEDEI	RAVLNSVTMEGQD-----VDRMD	DAHLMTLFLFRLL	RQNKSPSP	
PvTPS01	80	IGVDYHYKKEI	NDLLYSIYN-----DEDGGS	DLVVTSLRFYLL	RKHGYTVSA-	
PvTPS85	87	IGV-----EIDEL	LRDVHLDAQH-----EE-GCDD	DLVVTSLRFYLL	RKHGYNVSS-	
PvTPS19	85	IGVDYHYKKEI	DELRLDVVHDPQH-----EEGCDD	DELVVTSLRFYLL	RKHGYNVSS-	
PvTPS14	85	IGVDYHFKKEI	DELRLDIHGSQ-R-----EGGHDD	DELVLVSLRFYLL	RKHGYNVSS-	
PvTPS11	86	IGVNYHYRKEI	DELRLDIHGSK-H-----EEGCDD	DELVLVSLRFYLL	RKHGYNVSS-	
PvTPS26	138	LCLDHLFEDDINA	ALTQIRTS-----NVTDCY	-----GYRVSP-		
PvTPS04	137	VCLDYLFEEDINA	TLEIRTA-----NLTDC	DLHTVAMWFYQL	RKHGHRVSP-	
PvTPS83	137	LCLDHLFEDDINA	ALTQIRTV-----NLTDC	DLHTVAMWFYLL	RKHGHRVSP-	
PvTPS03	135	LCLDHLFEDDINA	ALTQIRTV-----NLTDC	DLHTVAMWFYLL	RKHGHRVSP-	
PvTPS62	127	LCLDHLFEQEI	NDALQQVVA-----DVRDC	DLGTVALWFC	LLRKHRYMVSP-	
PvTPS08	147	LCLDHLFEEDISA	ALSQIEAA-----GVSDC	DIGTVALWFC	LLRKHRYRVSP-	
PvTPS36	145	LCLDHLFEEISA	ALPQIEAA-----GVSDC	DLGTVALWFS	LLRRHRYRVSP-	
PvTPS81	148	LCLDHLFEEISA	ALPQIEAA-----GVSDC	DLGTIALWFS	LLRKHRYRVSP-	
PvTPS18	75	-----HLRFVYN	S-----GYDVN	DLNLVSLRFYLL	RKNGYDVPS-	
PvTPS16	81	LGLDNYEENEI	DEQLLFVYDS-----EYDDK	DLNLVSLRFYLL	RKNGYDVPS-	
PvTPS109	115	LGLDNYEENEI	DDKLLFVYDS-----EYDDK	DLNLVSLRFYLL	RKNGYDVPS-	
PvTPS69	81	LGLDNYEENEI	DDKLLFVYDS-----EYDDK	DLNLVSLRFYLL	RKNGYDVPS-	
PvTPS94	78	LGLDYEENEI	DKLLQDIHNL-----DYNDK	DLNLVSLRFYLL	RKNKYDVSS-	
PvTPS17	81	LSLDYHYEDEI	NKLLHIVYNS-----NHYDG	DLNIVSRRFYLL	RKSGYNVPS-	
PvTPS20	81	LSLDYHYEDEI	NEMLLIVYNS-----NHYDG	DLNVVSHRFYLL	RKSGYVPS-	
PvTPS10	77	LGVGHYHFEQEI	ATFMDVLSSRKP-----AVGDD	DLCAVALQFRLL	RQHYYDATC-	
PvTPS71	95	LGISYHFDQEI	HASLQKLK--SIE-----FDSES	LYQISLQFWLL	RQERYVSC-	
PvTPS79	92	LGIDNHFEEEI	CAVLCRVHSEEQE-----FDNSK	ELHIVALRFRLL	RQHGFVST-	
PvTPS56	88	LGVDAAHFREEI	GAAARRVVVNGESCS	DNSSGSGCPDS	DLRVVALRFRLL	RQHGYWVPT-
PvTPS05	87	LGVDSHFREEI	GAAARRVV-----NSGPG	SCKDGLRVVALR	FRLLRQHGYWVPT-	
PvTPS09	28	LCLDYHFEAEI	NDKQLQFLN--GTK-----FSD	DLHQVALRFRLL	RQRGFYVPP-	
PvTPS50	81	LCLDYHFEAEI	NDKVQFLN--GTK-----FSD	DLHQVALRFRLL	RQRGFYVPP-	
PvTPS54	131	LSIDHHFKKQI	LDISSIH--DTE-----FNSTC	LHEVALRFRLL	RQGFVWSPV	
PvTPS33	150	LSIDHHFKKQI	LAILSSIH--DTE-----FNSTC	LHEVALRFRLL	RQGLWVSP	
PvTPS53	136	LSIDHHFKKQI	IHDILSSIH--DTE-----FNSTC	LHEVALRFRLL	RQGFVWSP-	
PvTPS101	92	LGIDHHFEEQI	ITTTLHSIH--NAD-----FNSG	SLNEVSLRFRLL	RQGFVWPP-	
PvTPS07	116	LGIDHHFEEQI	ITTTLHSIH--NAD-----FNSG	SLNEVSLRFRLL	RQGFVWPP-	
PvTPS06	73	LGIDHHFEEQI	ATAARLH--SAD-----FNSS	SLHEVALRFRLL	RQGFVWSP-	
PvTPS55	79	LGIDHHFEQEI	ATTLSIHNORDE-----FNSS	DLHEVSLRFRLL	RQHGFVWPA-	
PvTPS104	73	LGIDHHFEQEI	ATTLSIHNORDE-----FNSS	NLHEVALRFRLL	RQHGFVWPA-	

PvTPS15	158	DELHHVAEALGFHPSLEGYLNDTRS	LELHKA	SKVSI	SEDES	SILDF	FIGSW	SGCL	LKEQLR
PvTPS106	127	DVLRRTDGNGE--	FTLALSKDVRGLLSLHDM	SHLDM	GVET-	SLHKAKEF	S	SKHLAS--	A
PvTPS13	137	DVLRRTDGTGE--	FKLALSKDIRGLLSLHDM	SHLDM	GEEP-	SLHKAKEF	S	SKHLAS--	A
PvTPS02	126	DVLRRTDDTGE--	FKLALSKDIRGLLSLHDM	SHLDM	GEEP-	SLHKAKEF	S	SKHLAS--	A
PvTPS28	128	DLLRRFTDAAGE--	LSL-LTKDIWALLSLHDM	SHLDM	GEEA-	SLHKANDE	S	SKHLAC--	A
PvTPS27	129	DLLRRFTDGAGE--	LSLALTE	DIWALLSLHDM	SHLDM	GEEASSL	HKAKDF	S	SKHLAS--
PvTPS12	155	LLLKHDTYAKQC--	SKGTLQ	RDVNRFLS	INEAS	YLAFRG-	EEMLD	LARKF	STKALKD--
PvTPS73	154	LLLRSLKDATGG--	FKKSLRED	TQGLLS	LYEASH	LAFGG-	EDILDE	ARVF	STEALRE--
PvTPS52	168	LLLRRLKDGKGG--	FKKSLRED	TQGLLS	LYEASH	LAFGG-	EDILDE	ARVF	STEALRE--
PvTPS01	128	DVFEKFRDKQGN--	IS---	SDDVSC	LLMLYD	AAHV	RTG-	EEILD	DMITF
PvTPS85	132	DEFVKFRDDQGN--	FAT---	SNDVKC	LLALYD	AAHL	RTG-	EEILD	NAIAF
PvTPS19	137	DVFEKFRDDCGN--	FA---	SNDVKC	LLALYD	AAHL	RTG-	EEILN	SAVVF
PvTPS14	135	DVFAKFKDDHGN--	FA---	SNDAKC	LLVLYE	AAHL	RTG-	EEILD	NAVVF
PvTPS11	137	DVFAKFKDDQGN--	FT---	SNDVKC	LLALYD	AAHL	RTG-	EEILD	NAIAF
PvTPS26	171	DVFAKFKDDQEGS--	FL---	ANNPVE	LLSLYNA	AHLG	THG-	EIILDE	AAIF
PvTPS04	184	DVFAKFKDDQEGS--	FL---	AKSLVE	LLSLYNA	AHLG	THG-	EIILDE	AAIF
PvTPS83	184	DVFAKFKDDQEGS--	FL---	ANNPVE	LLSLYNA	AHLG	THG-	EIILDE	AAIF
PvTPS03	182	DVFAKFKDDQEGS--	FL---	ANNPVE	LLSLYNA	AHLG	THG-	EIILDE	AAIF
PvTPS62	174	EVFLRFKDEKGG--	FL---	SDNPID	LLNLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS08	194	DVFAKFKNEEGG--	FL---	ADNPED	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS36	192	DVFAKFKNEEGG--	FL---	ADNPED	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS81	195	DVFAKFKNEEGG--	FL---	ADNPED	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS18	109	DVFLNFKGMEGR--	FA---	FDDIRG	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS16	128	DVFKSFKDNEGN--	FV---	ADNTKT	LLNLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS109	162	DVFKSFKDNEGN--	FV---	ADNTKT	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS69	128	DVFKSFKDNEGN--	FV---	ADNTKT	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS94	125	DVFLNFKIDQGN--	FA---	IADTRS	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS17	128	DVFLNFKDKQGN--	FV---	DADIRS	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS20	128	DVFLNFKDKQGN--	FV---	DADIRS	LLSLYNA	AHMR	TLG-	EIILDE	AAIF
PvTPS10	125	DVFKTFLLDNGD--	FKDALRS	DVDALL	SLYEA	AHVSKCN-	EDVLN	RAVVF	TVDRLS
PvTPS71	142	DVFSQFMDNQON--	LKVSLAS	DVRALL	ALYEA	AHMGTPD-	EQLL	TEAQR	OTTSLLKS--
PvTPS79	142	DVFNKFKDGTGN--	FSTGLT	GDPRGL	LSLYN	GAHMAVPG-	EDVLD	DAITF	TRSHLKA--
PvTPS56	147	DVFDREFRDATGS--	FRASLSS	DPGSL	SLYNA	AHMAIPG-	ERVL	YEAI	SFCRRHLES--
PvTPS05	137	DVFDREFRDDTGS--	FRASLSS	DPGSL	SLYNA	AHMAIPG-	ERVL	YEAI	SFCRRHLES--
PvTPS09	75	DVFNKFKDEFNG--	FKTTLIG	DTKGL	LSLYNA	THLLLPN-	ETLLE	DAIKF	AGDNLKK--
PvTPS50	128	DVFNKFKDEFNG--	FKTTLIG	DTKGL	LSLYNA	THLLLPN-	ETVLE	DAIKF	AGDNLKK--
PvTPS54	179	DEFNRFKDENG--	FIVEIT	NDARGLL	---	---	---	---	---
PvTPS33	197	DEFNRFKDENG--	FIVEIT	NDARGLL	---	---	---	---	---
PvTPS53	183	DEFNRFKDENG--	FIVEIT	NDARGLL	---	---	---	---	---
PvTPS101	139	DVFNIFKSGDGS--	FVSDIT	NDTKGL	LGLYNA	AHLLTHN-	EGALE	EAAIL	FARHHLEL--
PvTPS07	163	DVFNIFKSGDGS--	FVSDIT	NDTKGL	LGLYNA	AHLLTHN-	EGALE	EAAIL	FARHHLEL--
PvTPS06	120	DEFNKFKKEDGS--	FISGIEN	DPKGL	LSLYNA	AHLLTHD-	EGTLE	DAILF	SRRHLES--
PvTPS55	128	DEFNRFKLEDGS--	FIDSIAN	DPKGL	LSLYNA	AHLLTHN-	EGALE	EAAIL	FARHHLEL--
PvTPS104	120	DEFNRFKLEDGS--	FIYSIAN	DPKGL	LSLYNA	AHLLTHN-	EGALE	EAAIL	FARHHLEL--

PvTPS15	218	SGGLQG--TPLFREVEHALEFPFYTTLDRLD-HRWNTEFNITGEKMLKTSSMLCSTNDDI
PvTPS106	182	IRHLEP--GLARYVRQSLDHPYHLNLMQYK-ARHHLSYLQS-----LPTRN--IAM
PvTPS13	192	IRYLEP--GLARYVRQSLDHPYHLSLMQYK-ARHHLSYLQS-----LPTRD--TAM
PvTPS02	181	IRYLEP--GLARYVRQSLDHPYHLSLMQYK-ARHHLSYLQS-----LPTRD--TAM
PvTPS28	182	IRYLNP--DLARYVRQSLDHPYHLILMQYK-ARHHLSYLQS-----QPNRKSTAAI
PvTPS27	185	IRYLNP--GLARYVRQSLDHPYHMSLMQYK-ARHHLCYMQS-----LPNRKSTAAM
PvTPS12	210	MPSMPP--HTRKRVAHALDPLHWMAPRLE-TRWFIIDHCAGD-----IGLH--PLL
PvTPS73	209	MPLMRP--HLRSSVNNALAVPLHWAAPRLQATRWFIDQK-----
PvTPS52	223	MPLMRP--HLRSSVDNALAVPLHWAAPRLQA-RWFIIGHYAGD-----GGAD--QVM
PvTPS01	180	TMKNLE-PELAAEEVRCTLETPRFRRVERVE-ARLYISVYEK-----KAVHD--GTI
PvTPS85	185	IETL-D-PELAAEEVEYTLETPSYRRVERVE-ARRYISVYEK-----RATRNL--DTI
PvTPS19	189	MKTLLD-PELAAEEVEYTLETPSYRRVERVE-ARRYISLYEK-----KVTRN--DTI
PvTPS14	187	VKTL-D-PELAAEEVEYTLETPSYRRVERVE-ARRYISLYEK-----KVTRN--DTI
PvTPS11	189	IKTL-D-PELAAEEVEYTLETPSYRRVORVE-ARRYISLYEK-----KVRN--DAI
PvTPS26	223	LPSLEG--SLAHEIKCALEIPLPRRVRIFE-SKYVVS RFEN-----EITVH--DSV
PvTPS04	236	LPSLEG--SLAHEIKCALEIPLPRRVRIYE-SKYVIS RF EK-----EVTVH--KSI
PvTPS83	236	LPSLEG--SLAHEIKCALEIPLPRRVRIYE-SKYVVS TF EK-----DVTVH--DTV
PvTPS03	234	LPSLEG--SLAHEIKCALEIPLPRRVRIYE-SKYVVS TF EK-----DVTVH--DTV
PvTPS62	226	LPYLEG--SLAREVNSALETPHPRRLRIYE-SKYVISAYEK-----DGTVH--EKV
PvTPS08	246	LSNMEE-SLLAHEIKSALEIPSPRRVRIYE-SKHYISAYEK-----DATVH--ETV
PvTPS36	244	LRDMEESSLLAREIKSALEIPLPRRVRIYE-SKHYISAYEQD-----DATVH--ETV
PvTPS81	247	LRDMEESSLLAREIKSALEIPLPRRVRIYE-SKHYISAYEQD-----DATVH--ETV
PvTPS18	161	-----KSQSLQOTPLFRRVRILE-TRNYIPIYEM-----EPSQN--MAI
PvTPS16	180	LDSLES--TLADEVSHALQOTPLFRRIRILE-TRTYIPIYEK-----EAARN--EVI
PvTPS109	214	LDSLES--TLADEVSHALQOTPLFRRIRILE-TRTYIPIYEK-----EAARN--EVI
PvTPS69	180	LDSLES--TLADEVSHALQOTPLFRRIRILE-TRTYIPIYEK-----EAARN--EVI
PvTPS94	177	VEHSES--PFAKEVSSSLHTPLFRRVGILE-ARNYIPIYEK-----EATRNL--EAI
PvTPS17	180	LENLES--PLAEVSCALDTPLFRRVGILE-TRNYIPIYEK-----EATQK--EAI
PvTPS20	180	LENLES--PLAEVSCALDTPLFRRVGILE-TRNYIPIYEK-----EATRNL--EAI
PvTPS10	182	GGSLPK--PIQNKVLHALAAPTYYRRMKRLQ-AKLYISYDDD-----NEKD--HDI
PvTPS71	197	GDHLEK--PLADKVRHALQTPSFRMRKRLQ-ARQYIPLYEQD-----KEDCN--ELA
PvTPS79	197	KGNLGY--PIAGQVARALDIALPRYMPQLE-TIHYIIEYEQE-----DVHN--ATI
PvTPS56	202	RGELAS--PMAEQVSRALDIPLPRLPKRLE-TVRYIAEYARE-----EGHD--PVA
PvTPS05	192	RGELAS--PLAEQVSRALDIPLPRLPKRLE-TVRYIVEYEKE-----EGHD--PVA
PvTPS09	130	VHGLKS--PLAEQVPRALKSPLPRFMQKLE-ARFYIDEYGDE-----EDSN--DTI
PvTPS50	183	VHDLKS--PLAEQVSRALKSPLPRFMQKLE-ARFYIDEYGDE-----EDSN--DTI
PvTPS54	204	-----MNRAFHLPLSRTLRLLE-ALHYISEYKGE-----PTPN--SSI
PvTPS33	252	RNTLN-----TRE-----PTHN--SSI
PvTPS53	238	RNKLEY--PLAQOVNRALHLPLSRTLRLRVE-ALNYISEYKGE-----PTHN--SSI
PvTPS101	194	RSTLKS--PFAEQVTRALRIPLPRTLKRVE-ALNYITEYNVY--E-----QPNP--A-I
PvTPS07	218	RSTLKS--PFAEQVTRALRIPLPRTLKRVE-ALNYITEYNVY--E-----QPNP--A-I
PvTPS06	175	QSSLKP--PLADQVGRALQIPLPRTLKRVE-AISFIPEYSSSVQD-----QTYSP--EIL
PvTPS55	184	QSSLKS--PLADQVARALKIPLPRTLKRVE-AVSYMQEYSVE-----QRYNP--A-I
PvTPS104	175	QSSLES--PLADQVARALKIPLPRTLKRVE-AVSYMQEYSVD-----Q-----

PvTPS15	276	LALGIRDF	SASQV	TYQEE	ELRHLKSW	VKESRLD	QL	-PFARQKLEYFVLSAAGTIFTPELS
PvTPS106	228	EELAIAEF	FOLNKLQ	HQOEM	QOEIKRWW	MDLGLAQEI	-PVARDQVLKWMWPMSILQGSSLS	
PvTPS13	238	EGLAIAEF	FOLSKQLH	QOEM	QOEVKRWW	MDLGLSHEI	-PVVRDQVPKWYVWAMTSLQGPSLS	
PvTPS02	227	EGLAIAEF	FOLSKQLH	QOEM	QOEVKRWW	MDLGLSHEI	-PVVRDQVPKWYVWAMTSLQGPSLS	
PvTPS28	230	EELATAEF	FHLNKLH	HQKEME	EEVKR	-	-	
PvTPS27	233	EELATAEF	FHNKLH	HQKEME	EEVKRWW	MGLGLAQEV	-PVARDQVLKWMWSMTIIQGSSFS	
PvTPS12	256	LQFAKVDF	DNVQRAH	QOEE	LARLTWW	RDIGLCDKL	-TFSRDRLMECFHYANGIVWEPKHG	
PvTPS73	246	-	-	-	-	-	-	
PvTPS52	269	LRFAKIDF	NNVKKLH	QOELARIT	RWWRNAGLN	NKKL	-PFARDRLMECFYFATGVASEPSLA	
PvTPS01	227	LEFAKL	DYNILO	QATYCD	ELKELTI	WWKDLH	SKTDL-SFARDRMVEIHFWILGTIYEPYYS	
PvTPS85	231	LEFAKL	DYNILO	QALYCE	ELKALT	WWKGLQ	SQAYA-RFARDRVAEMHFWMLGIVYEPHQS	
PvTPS19	236	LEFAKL	DYNILO	QALYCE	ELKVLTA	WWKGLQ	SQACV-RFARDRVPEMHFWMLGIIQEPQRS	
PvTPS14	233	LEFAKL	DYNILO	QALYCE	ELKALT	WWKGLQ	SQAYA-RFARDRVTEMHFWMLGVIHEPCQS	
PvTPS11	235	LEFAKL	DYNILO	QALYCE	ELKALT	WWKGLQ	SQAYA-RFARDRVTEMHFWMLGVIHEPCQS	
PvTPS26	269	LQAKLN	NANITOL	HQOEL	EIVTR	WWRGLE	IESKL-PFARDRVVESYFWMLGVYFEPCHS	
PvTPS04	282	LQAKLN	SNIMQLH	HQOEL	EITR	WWKDM	DIESKL-PFARDRVIECYFWILGVYFEPCHS	
PvTPS83	282	LQAKLN	SNIMQLR	HQOEL	EITR	WWKGLE	IESKL-PFARDRVVECYFWIVGVYFEPQCS	
PvTPS03	280	LQAKLN	SNIMQLR	HQOEL	EITR	WWKGLE	IESKL-PFARDRVVECYFWIVGVYFEPQCS	
PvTPS62	272	LQAKLN	SNIMQLH	HQOEL	EITR	WWKDV	QIESRL-PFARDRVVECYLWILGVYFEPQYS	
PvTPS08	293	LQAKLN	SNIMQLH	HQHDLE	EITR	WWKGLH	VESKL-PFARDRVVECYLWILGVYFEPQYS	
PvTPS36	293	LQAKLN	SNIMQLH	HQHDLE	EITR	WWKGLH	VESRF-PFARDRVVECYLWILGVYFEPQYS	
PvTPS81	296	LQAKLN	SNIMQLH	HQHDLE	EITR	WWKGLH	VESRF-PFARDRVVECYLWILGVYFEPQYS	
PvTPS18	196	LEFAKL	NFNLLQ	LLYCE	-LKMVTL	WWKQLN	VETNL-SFIRDRIVETHFWMAGACSEPQYS	
PvTPS16	226	LEFAKL	NFNLLQ	LLYCEE	-	-	-	
PvTPS109	260	LEFAKL	NFNLLQ	LLYCEE	LKT	VTLWWKQLN	VETNL-CFIRDRIVEMHFWMTGACSEPQYS	
PvTPS69	226	LEFAKL	NFNLLQ	LLYCEE	LKT	VTLWWKQLN	VETNL-CFIRDRIVEMHFWMTGACSEPQYS	
PvTPS94	223	LEYAKL	NFYLO	QLVFCE	ELKHCTM	WWKEFL	VKSKM-TFVRDRIVEVYFWMNGACYPQYS	
PvTPS17	226	LEFAKL	NFNLLQ	LLYCEE	LKDVT	AWWKNL	NVEANF-HFVRNRIVEMYFWMNGACHEPQYS	
PvTPS20	226	LEFAKL	NFNLLQ	LLYCEE	LKDVT	AWWKNL	NVEANF-YFVRNRIVEMYFWMNGACHEPQYS	
PvTPS10	228	LELAKL	DFHILQ	QMH	HRDE	VSICLWYKDL	NPKSTIGQYIRERPVECYFWALGAFYEPHYA	
PvTPS71	244	LELAKL	DFYLLQ	RIH	REEVKE	ICEWYH	GLESPQRL-FYARHRPTEAYFWALGVYFEPQYA	
PvTPS79	243	LELARLDY	NLRRSA	HLKEL	RTFC	SWWKDI	YEDVKL-PYSRDRSVEMYFWAFGAFQREHNS	
PvTPS56	248	LELARLD	FDLVRAL	HLEEL	RALS	LWWKEV	YGDVKL-SYARDRLVENYFWTCGVFHHEEYS	
PvTPS05	238	LELARLD	FDLVRAL	HLEEL	RALS	LWWKEV	YGDVKL-SYARDRLVENYFWTCGVFHHEEYS	
PvTPS09	176	LKFAKL	DFIAVQ	REHCKE	LKALS	LWWKDL	RITETL-PYARDRIVECYFWILGVYFEPQYS	
PvTPS50	229	LKFAKL	DFIAVQ	REHCKE	LKALS	LWWKDL	RITETL-PYARDRIVECYFWILGVYFEPQYS	
PvTPS54	239	LEFAKL	DFVLLQ	RLHLK	ELKALS	RWWKDL	YNEEGL-AYSARDRVVECYLWSYTAYYETEYS	
PvTPS33	267	LEFAKL	DFVLLQ	RLHLK	ELKALS	RWWKDL	YNEEGL-AYSARDRVVECYLWSYTAYYETEYS	
PvTPS53	284	LEFAKL	DFVLLQ	RLHLK	ELKALS	RWWKDL	YNEEGL-AYSARDRVVECYLWSYTAYYETEYS	
PvTPS101	241	LELAKL	EFNLLQ	HLYLK	ELKTVS	QWWKDL	SAYIEL-DYIRDRLIEGYFYSYNVYHEQEAHA	
PvTPS07	265	LELAKL	EFNLLQ	HLYLK	ELKTVS	QWWKDL	SAYIEL-DYIRDRLIEGYFYSYNVYHEQEAHA	
PvTPS06	225	LELAKL	DFNLLQ	HLYQK	ELKALTO	QWWKDL	SIGEIGL-DYVRDRIVECYFWSYSVHYEQANA	
PvTPS55	230	LELAKL	DFNLLQ	RLH	QKELK	TISQWWKDL	SESDVGL-EYVRDRIVECYFWAYSMYEQEYA	
PvTPS104	215	-	-	-	-	-	-	

PvTPS15	334	DARILWAKNGVLT	TTIVDDFF	DVGGSKEE	LENLVTLAE	-----
PvTPS106	287	RNRIEITRKIIIS	LVYVDDIF	DLVGTLEEL	SLLTKAIAK	-----
PvTPS13	297	GYRIDTTKIISL	VYVDDIF	DLVGTPEEL	SLFTQAIAK	-----
PvTPS02	286	GYRIDTTKIISL	VYVDDIF	DLVGTPEEL	SLFTQAIAK	-----
PvTPS28	254	-YRVQLAKIIIS	LIYVDDL	FDLVGTQEEL	SLFTKAVK	-----
PvTPS27	292	RFRVQLTKIISL	IYVDDL	FDLVGTQEEL	SLFTKAVK	-----
PvTPS12	315	ACREMLARVANLI	IHLDDVY	DVYGTLDL	LILFTDAIG	-----
PvTPS73	285	ACREVVAKAFALI	AVLDDIY	DIYGTLDL	ELAVFTDAIG	-----
PvTPS52	328	ASREVVAKAFALI	IVLDDIY	DIYGTLDL	ELAVFTDAIE	-----
PvTPS01	286	YSRIVVTKFTLL	ASLDDLY	DNYCCTTE	ESTIFNT	-----
PvTPS85	290	YARMALAKWLKL	VSLMDDI	CNYSSTTEE	YD-CSFLLW	-----
PvTPS19	295	YARIALTKCFKL	VSLMDDL	CNYSSTTEE	EYE-IFMT	-----
PvTPS14	292	YARIALTKCFKL	VSLMDDF	CNYSSTTEE	EFE-IFIT	-----
PvTPS11	294	YARIALTKCFKL	VSLMDDF	CNYSSTTEE	EFE-IFIT	-----
PvTPS26	328	RGRILTMIIAII	IGLLDDM	FDSYGTME	ECELLTNCIEK	VS I
PvTPS04	341	RGRILTMVIAIA	TIFDDTF	DSYGTME	ECQLLTNCME	-----
PvTPS83	341	RGRILTMVIAII	GIFDDIF	DSYGTME	ECELLTNCVE	-----
PvTPS03	339	RGRILTMVIAII	GIFDDIF	DSYGTME	ECELLTNCVE	-----
PvTPS62	331	RGRILTMFLANL	TMLDDIY	DSYGTPE	KECEIFTKCIE	-----
PvTPS08	352	RSRIILTMVIAI	VTLLDDI	YSYATPE	ECEILTCKIE	-----
PvTPS36	352	RSRIILTMIIAI	VTLLDDI	YSYATPE	ECEILTCKIK	-----
PvTPS81	355	RSRIILTMIIAI	VTLLDDI	YSYATPE	ECEILTCKIK	-----
PvTPS18	254	LSRVILTKMTAF	ITILDDI	IDTYSTTE	EAMLLAKAIYRF	-----
PvTPS16	279	LTRVITTKMTAY	ITILDDI	MDTYSTTE	EEDKLLAEAIYS	PTPPQIDLCIFNRLQICKNPAM
PvTPS109	319	LTRVITTKMTAY	ITILDDI	MDTYSTTE	EAILLAEAIYRW	-----
PvTPS69	285	LTRVITTKMTAY	ITILDDI	MDTYSTTE	EAMLLAEAIYRW	-----
PvTPS94	282	HSRIILTKITSLV	ITILDDM	FDTYGTTE	ECIKFAEAINRW	-----
PvTPS17	285	HSRIILAKMMGF	ITILDDF	IDTYATTE	ESMQLAEAVFRW	-----
PvTPS20	285	HSRIILAKMTGF	ITILDDF	IDTYATTE	ESMQLAEAVFRW	-----
PvTPS10	288	NARMMFAKFLT	LSLSTFF	DDIFDSY	GTLDVVRQFNQAVQ	-----
PvTPS71	303	KARKLLAKFIAT	ITPYDDT	FDNYGIW	EELQPFADVMQ	-----
PvTPS79	302	RARILYSKMTAF	ISLMDDT	YDAHATF	ECEFFNEAIQ	-----
PvTPS56	307	RARILFAKTFG	MLSLMDD	TYDVYATL	EDCHILNEAIQ	-----
PvTPS05	297	RARMLFAKTFG	MLSLMDD	TYDVYATL	EECHVLNEAIQ	-----
PvTPS09	235	RARIITTKYII	LLSVLDD	TYDIYATL	DECRLLTIAFK	-----
PvTPS50	288	RARIITTKYII	LLSVLDD	TYDIYATL	DECRLLTIAFK	-----
PvTPS54	298	RARMIL--IIAII	ILTDDT	YDVRATL	EECRKFNEAIQ	-----
PvTPS33	326	RARMILAKIIAII	ILTDDT	YDVRATL	EECRKFNEAIQ	-----
PvTPS53	343	RARMILAKIIAII	ILADDT	YDVRATL	EECRKFNEAIQ	-----
PvTPS101	300	RARIILTKIFVL	WTLDDV	HFLI-----	LSA	-----
PvTPS07	324	RARIILTKIFVL	WTLDDT	FDTTHANL	EESQKLHOAIE	-----
PvTPS06	284	RARVILAKFL	LLTSLDD	TYDVHATL	EEARELNKAIE	-----
PvTPS55	289	RARMILVRLFIL	TSLLDDT	YDDHATL	EESRDLTKAIE	-----
PvTPS104	251	RARMILVRFIML	TSLLDDT	YDEHATL	GESRDLTLAIE	-----

PvTPS15	371	-----
PvTPS106	324	-----
PvTPS13	334	-----
PvTPS02	323	-----
PvTPS28	290	-----
PvTPS27	329	-----
PvTPS12	352	-----
PvTPS73	322	-----
PvTPS52	365	-----
PvTPS01	321	-----
PvTPS85	326	-----AI
PvTPS19	329	-----KGWAS
PvTPS14	326	-----SL
PvTPS11	328	-----SL
PvTPS26	369	-----SL
PvTPS04	378	-----VLRTHV
PvTPS83	378	-----
PvTPS03	376	-----
PvTPS62	368	-----
PvTPS08	389	-----
PvTPS36	389	-----
PvTPS81	392	-----
PvTPS18	293	-----
PvTPS16	339	VSTISIGSIFAYLPTDSEGGGAEGRGGGGADD CETVAAPLQIILKIVLGFFQYHLVGSHI
PvTPS109	358	-----
PvTPS69	324	-----
PvTPS94	321	-----
PvTPS17	324	-----
PvTPS20	324	-----
PvTPS10	325	-----
PvTPS71	340	-----
PvTPS79	339	-----
PvTPS56	344	-----
PvTPS05	334	-----
PvTPS09	272	-----
PvTPS50	325	-----
PvTPS54	333	-----
PvTPS33	363	-----
PvTPS53	380	-----
PvTPS101	325	-----
PvTPS07	361	-----
PvTPS06	321	-----
PvTPS55	326	-----
PvTPS104	288	-----

PvTPS15	371	-MWDEHHKIEFYSEHVEIVFS	SAIYILVTRLGEKASLLQDR-----	DVTKHLVEIW---
PvTPS106	324	-MWNTAAP-DSLPS	CMRSCYDALYTITNEIADMAQKEHGF-----	NPVNHLRKAW---
PvTPS13	334	-MWNTAVA-DSLPS	GMRSCYKAIYNTTNEIADMVEVEHGF-----	NPVNHLRNAW---
PvTPS02	323	-MWNTAVA-DSLPS	GMRSCYKAIYNTTNEIADMVEVEHGF-----	NPVNHLRNAW---
PvTPS28	290	-IWNTAAA-DSLPS	CMRSCYKALYAITNEIAHRRYGRNGAWDEPCQSS	SQKSSMLLTW---
PvTPS27	329	-MWNTAAA-DSLPS	CMRSCYKALYTITNEIADTAEKEHGM-----	NPVNHLRKAW---
PvTPS12	352	-RWDENPC-EKLPEYMKELYS	SVIYDTTNEVAENILKIHGC-----	SMHSVLGKAW---
PvTPS73	322	-RWEATAS-EQLPEYMKGIY	FTIFNFSNVVAEHVQRTCGC-----	DVRFLKKKGW---
PvTPS52	365	-RWEATAT-ELLPEYMKGIY	LTIFNFSNEVAEHVQRTCGC-----	DVRFLKKKVW---
PvTPS01	323	ERWDEQTT-EEFPAHLKPLL	IGILDITNKIEEELKLQKNR-----	HA-EVVKKLV---
PvTPS85	331	ARWDKQSS-EKLTAYMKALF	FIFMLNTISDIMEELKLQKNK-----	HA-EFVKELF---
PvTPS19	331	ERWDKQAA-EKMPAYMKDLF	FIFILNTINDIMEELKLQKNN-----	HA-EFVKELF---
PvTPS14	328	ERWDEQAA-EKLPA	YMKDLFIFTLNTINDIMEELKLQKNK-----	HA-EFVKELF---
PvTPS11	330	ERWDKQAA-EKLPA	YMKDLFIFTLNTINDIMEELKLQKNK-----	HA-EFVKELF---
PvTPS26	375	SMWDTKFG-DGLPE	GKMHALGKIFDSYETMDHELARDEKY-----	RM-PYLKNLT---
PvTPS04	378	-RWDTKFA-DGLPE	CMKHALGKILDSFETIDHELARDEKY-----	RM-RYLKNFT---
PvTPS83	378	-RWDTKFG-DGLPE	CMKHALGKIFDSYEAMDHHELARDEKY-----	RM-AYLKNFT---
PvTPS03	376	-RWDTKFG-DGLPE	CMKHALGKIFDSYEAMDHHELARDEKY-----	RM-AYLKNFT---
PvTPS62	368	-SWYTNGA-HDLPE	AMKFALRQTLDTYETIANMLHQEEKY-----	RM-SYLINFT---
PvTPS08	389	-SWDAKAA-HDLPE	CIKFALGKVLDSEFQNIENMLHQEEKY-----	RM-SYLKYFT---
PvTPS36	389	-SWDAKAA-HDLPE	CIKFALGKVLDSEFQNIENMLHQEEKY-----	RM-SYLKYFT---
PvTPS81	392	-SWDAKAA-HDLPE	CIKFALGKVLDSEFQNIENMLHQEEKY-----	RM-SYLKYFT---
PvTPS18	293	---NEDAT-ELLPD	YMKDFYLFLLKTLDSCEDELGPKNRY-----	RV-FYLKEMAKVH
PvTPS16	399	DSRIQNAE-EILPEYMKDFY	LHLLKTFDTCEDDELGPKNKSF-----	RV-FYLKELL---
PvTPS109	358	---EENAS-ELLPEY	VKDLYLHLLKTFNSCEDELGPKNKSF-----	RV-FYLKELL---
PvTPS69	324	---EENAA-ELLPEY	MKDLYLHLLKTFNSCEDELGPKNKSF-----	RV-FYLKELL---
PvTPS94	321	---NESAV-PLLPEY	MKGFFYLFLLETFFYSFEDELGPEKSY-----	RV-LYLKEAM---
PvTPS17	324	---DKDAI-TLLPEY	TRDFYLFLLKTFCSFEELGTGKSY-----	RV-FYLKKAL---
PvTPS20	324	---DKDAI-TLLPEY	TRDFYLFLLKTFCSFEELGTGKSY-----	RV-FYLKKAL---
PvTPS10	325	-SWDEEAA-RKIG	NCYAYVLSYFSDTYEAFVAD--NGASL-----	MGVDYVKEAM---
PvTPS71	340	-RWDMKEV-EKLAID	FARFMFG---TMIEIENALPKDTGR-----	RNVNFIR-----
PvTPS79	339	-RWDESAA-SILPEY	LRVFFYIKILSTFKEFENILDPSEKY-----	RV-GYVQTAF---
PvTPS56	344	-RWDESAA-STLP	QYMRFFYINLLKTFQESSEDSLOPHEKY-----	RV-SYAKKAF---
PvTPS05	334	-RWDESAA-STLP	EYMKKFYINLLKTFQECSEDSLOPDEKY-----	RV-SYAKKAF---
PvTPS09	272	-RWDKDSV-DMLPEY	IRSFYLRFINSCNEIESELEPSEKF-----	R-----T---
PvTPS50	325	-RWDKDAV-DMLPEY	IKSFYLFKFINSCNEIESELEPSEKF-----	RV-SHFQSQT---
PvTPS54	333	-RWEESAI-TLLPD	YLKKLYLKL MNIFKEFEDELKPNEKY-----	RV-AFIRKAF---
PvTPS33	363	-RWEESAI-TLLPD	YLKKLYLKL MNIFKEFEDELKPNEKY-----	RV-AFIRKAF---
PvTPS53	380	-RWEESAI-TLLPD	YLKKLYLKL TNIFKEFEDELEPNEKY-----	RV-AFIRKAF---
PvTPS101	325	-RWDESAA-CLLP	DYLTKFFLKLISNFRFDNELGPHEKY-----	RS-AYNKKAF---
PvTPS07	361	-RWDESAA-CLLP	DYLTKFFLKLISNFRFDNELGPHEKY-----	RS-AYNKKAF---
PvTPS06	321	-RWYGDV-SFLPEY	LKKFFVKVVSNFSEFEDELEPHEKY-----	RN-VYNRKGF---
PvTPS55	326	-RWDENNI-SFLPEY	MKKFFLVTRNFEEFEDELEPHEKY-----	RV-AYVRKAF---
PvTPS104	288	-RWDENDI-SFLPEY	MKKFFLVLRNFEELR-----	-----

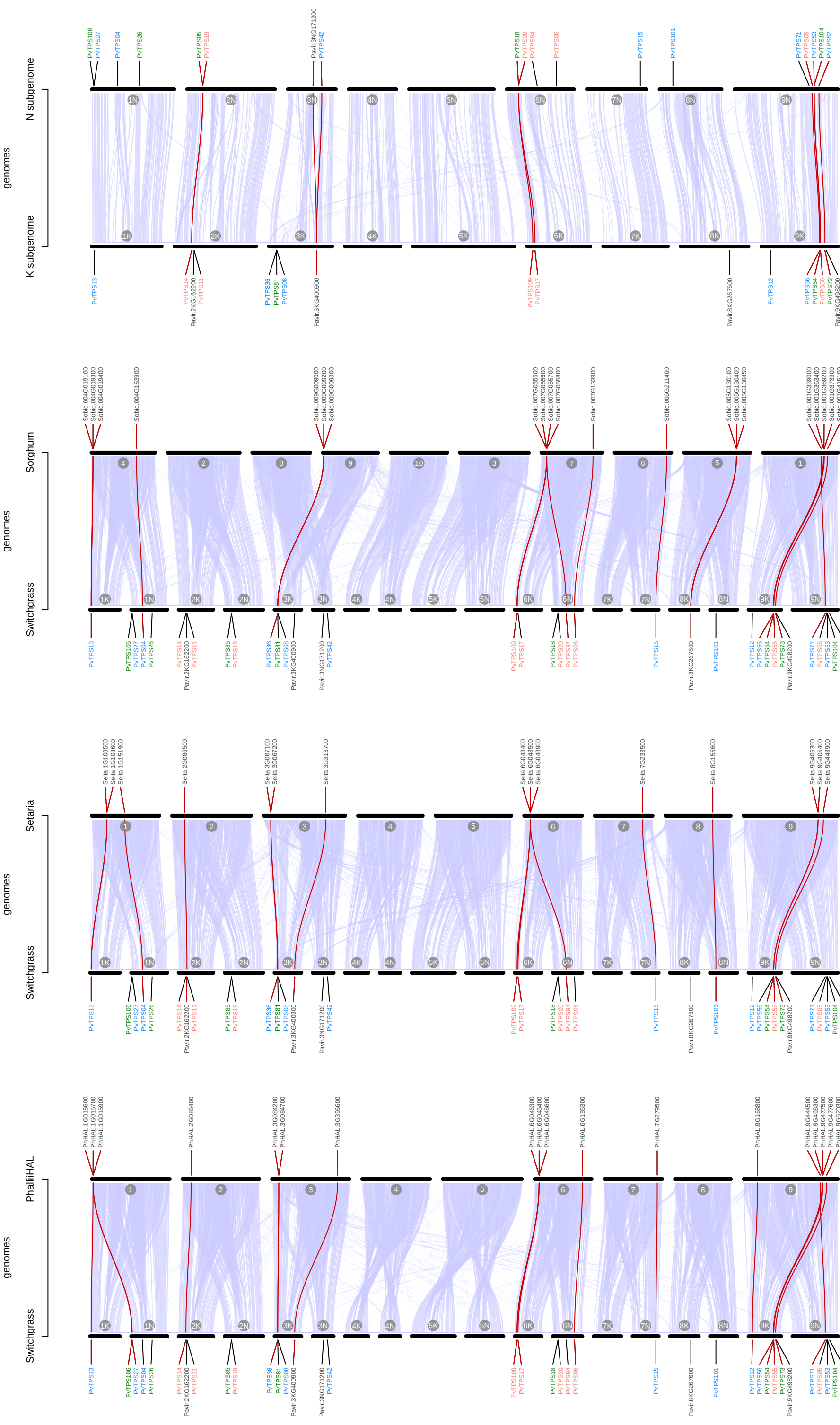
PvTPS15	420	-----LDLLKSMMTEVEWRINKYIPT-TEFYITNAALTFA
PvTPS106	372	-----AVLFDGFMAESKWLATKQAPGAEDYLRNGVVT-S
PvTPS13	382	-----AALFDGFMVEARWLATD-EAPTAEDYLRNGVVT-S
PvTPS02	371	-----AALFDGFMVEARWLATD-EAPTAEDYLRNGVVT-S
PvTPS28	345	-----AELFDGFMVESKWLAAG-LVPAAEDYLRNGVVT-S
PvTPS27	377	-----AELFDGFMVESKWLAAC-LVPAAEDYLRNGVVT-S
PvTPS12	400	-----HDISVSFLLEAKWHHG-SYRPTLREYLDNGVVS-C
PvTPS73	370	-----HDLCKAFLLEAKWHYYSNHKPTLQEYLDNGWMS-V
PvTPS52	413	-----HDLCKAFLLEAKWHYYSNHKPTLQEYLDNGWMS-V
PvTPS01	371	-----ICTAKFYHAEVNWDRDEHYVPATVDEHLEKSLRS-S
PvTPS85	379	-----IDMAKRYGAERKWRDEHYVPAKVKEHLQISVGS-S
PvTPS19	379	-----IDTVKRYGAERKWCDERYVPAKIEEHLQISVAS-S
PvTPS14	376	-----IDAVKRYGAERKWRDERYVPAKIEEHLQISVAS-R
PvTPS11	378	-----VDAVKCYGTERKWSDERYVPAKIEEHLQISVAS-S
PvTPS26	423	-----IDVIRGYNKEVVKMCEEGYIPRTVNEHLQQR----
PvTPS04	425	-----IDLVRGYNAEVKMRDEGYIPRTVNEHLQVSLRT-G
PvTPS83	425	-----IDLIRGYNKEVVKMREEGYIPRTVNEHLQVSLRT-G
PvTPS03	423	-----IDLIRGYNKEVVKMREEGYIPRTVNEHLQVSLRT-G
PvTPS62	415	-----KDIVRAYNMEAKMLEEGYIPKSVEEHLKVSLRT-G
PvTPS08	436	-----EDLVRGFSREVKMLEKGYIPKSVEEHLQVSMRT-G
PvTPS36	436	-----EDLVRGYNMEVNMLEEGYIPKFVEEHLQVSMRT-G
PvTPS81	439	-----EDLVRGYNMEVNMLEEGYIPKFVEEHLQVSMRT-G
PvTPS18	341	MYYYLRGSTTKEKKIRILYQSYCLIKILVRGYSQEIQRDEHYVPETINEHLKISGVT-I
PvTPS16	447	-----KVLVRANSQEIQRDEHYVPKTINEHLEISRAT-V
PvTPS109	403	-----KLLVRANSQEIQRDEHYVPKTINEHLEISRAT-V
PvTPS69	369	-----KVLVRANCQEIQRDEHYVPKTINEHLEISRAT-V
PvTPS94	366	-----KRLVQQYSKEVEWRDEDYVPETMCEHLQVSMES-I
PvTPS17	369	-----KQLVQAYIEELKWRDENYIPETLSEHLGLSMRS-S
PvTPS20	369	-----KQLVQAYIEELKWRDENYIPETLSEHLGLSMRS-S
PvTPS10	371	-----KEISSCMLKELVWREEROVPT-VHAYLTQAAVISV
PvTPS71	382	-----DIRDNKYIPS-LEEHLKVTTLVT-C
PvTPS79	386	-----KLISKYYLEEAKWCNEKYIPS-FKDQIEVSSMS-S
PvTPS56	391	-----QLSSKYYLDEAKWCSEKYAPS-FEEHVEVSVMS-S
PvTPS05	381	-----QLSSKYYLDEAKWSSEKYAPS-FEEHVEVSVMS-S
PvTPS09	312	-----EIMVDAYLQEAASWYAQDMFPE-VDIRKELSVVRSS
PvTPS50	372	-----EIMVDAYLQEAASWYAQDMFPE-VDIRKELSVVKSS
PvTPS54	380	-----QVLSSNYLQEAEWCHGGYRPR-FKDQVKVSTVC-S
PvTPS33	410	-----QVLSSNYLQEAEFHGGCKPR-FKDQVKVSTVC-S
PvTPS53	427	-----QVLSSNYLQEAEWCHSGYKPR-FKDQVKVSTVC-S
PvTPS101	372	-----QKLSSYYLQESEWFHKNHIPS-FKDQMDVSVMT-G
PvTPS07	408	-----QKLSSYYLQESEWFHKNHIPS-FKDQMDVSVMT-G
PvTPS06	368	-----QTLISKYYLQEAEFHQGFTPS-FKEQVSVSVIT-A
PvTPS55	373	-----QLISKSYLQEAEFWSHHEYIPS-FKDHVNVSAIS-A
PvTPS104	317	-----

PvTPS15 454 LGPIV-LPALYFVGPKIPE-----SAVKDLEYNELFRLMSTCGRLRLNDVQTYEREYR-E
PvTPS106 406 GVPLIFAHLFYLLGQDHVASTNEDAAKPLSDDIPPAISCLAKILRLWDDLGSADDEAQ-E
PvTPS13 415 GVPLTFAHIFAMLGYSK---NEAGAKLADDHIPSVISCPAKILRLWDDLGSADDEAQ-E
PvTPS02 404 GVPLTFAHIFAMLGYSK---NEAGAKLAYDHIPSVISCPAKILRLWDDLGSADDEAQ-E
PvTPS28 378 GMPLTLAHVLFLLGQDHAAYS---DVTKLTDHIPLAISCPGKILRLWDDMGSAEDEAQ-E
PvTPS27 410 GMPLALAHVLFLLGHDHAAF---DAARFTDHIPPAISCPGKILRLWDDMGSAEDEAQ-E
PvTPS12 433 SAPLLLLHAFPMNLSELNAR---TFSLI-QSNPRLLQSASLVRLCNDLSATHSAELQ-R
PvTPS73 404 SGPLMLLHAFPMNLNEAITQK---SIEQLESHYPKLVQMVSKIFRLCNDLAKHSV--R-A
PvTPS52 447 SGPLMLLHAFPMNLNEAITQN---SIEQLESHYPKLVQMVSKIFRLCNDLSATHSEELK-R
PvTPS01 405 VCMQIIIGVLISLRD-C-RE---DDVNWAFTFPKLIRGVSVVGRVGNDIVSDEREQA-S
PvTPS85 413 ASMHIVNVSFILMGD-ITTR---EAIEWAFSYPEMIRA-----REQV-S
PvTPS19 413 ACMHLANITFVLMGD-VTTG---EAIEWAFSYPEMIRAACIVARVCNDIMSHEREQA-S
PvTPS14 410 GCMHLANITFVLMGD-VTTR---LAIEWAFSYPEMIRAACIVGRICNDIMSHEREQV-S
PvTPS11 412 ACMHLANITFVLMGD-VTTR---EAIEWAFSYPEMIRAACIVGRICNDIMSHEREQV-S
PvTPS26 453 -----R---ILFDWVSSMPKIVEDLGITVRLDDLOSYEREQL-T
PvTPS04 459 ACHLLACASFVGMDD-IATK---DSFDWVSTMPKIVKALCIIILRLDDLOTYEREKM-T
PvTPS83 459 ACHLLACASFVGMDD-IATK---DSFDWVSTMPKIVKDLCCIILRLDDLOSYEREQL-T
PvTPS03 457 ACHLLACASFVGMDD-IATK---DSFDWVSTMPKIVKDLCCIILRLDDLOSYEREQL-T
PvTPS62 449 GCPILPCASFVGMHD-IATK---EFFDWVASLPNMVQALSIVLRLVDDLOTYEREKL-N
PvTPS08 470 GCPILSCASFVGMND-IATK---DCFDWISHVPNMVQALARVRLRLDDLOSYEREQL-I
PvTPS36 470 GCPLLSCASLVGMND-IATR---DCFDWVSVPNMVRALARILRLDDLOTYEREQL-I
PvTPS81 473 GCPLLSCASLVGMND-IATR---DCFDWVSVPNMVRALARILRLDDLOTYEREQL-I
PvTPS18 400 GAFQLVCSSFVGMGD-IITK---EVLDWLLAFPELLNCFPTFARLSNDIASTEREQT-R
PvTPS16 481 GGFQVACSSFVGMGD-VITK---ENLDWLLTYPELLKYFSTIARLSNDIKSTEREQI-G
PvTPS109 437 GGFQVACSSFVGMGD-IITK---EILDWLLTYPELLKCFSTIARLSNDIKSTEREQI-G
PvTPS69 403 GGFQVACSSFVGMGDDIITK---EILDWLLTYPELLKCFSTIARLSNDIKSTEREQI-G
PvTPS94 400 GSVALACAAYVGMGD-VITK---GTLEWVLSYPQFLTSFGVFVRLSNDLVSTKREQT-A
PvTPS17 403 GGSPILCASLVGMGE-IVTR---EALDWFLSYPLVRSFDTFVRLSDDMASTEREQK-G
PvTPS20 403 GGAQILCSSLVGMGE-IVTR---ETLDWFLSYPLVRSFDTFVRLSDDMASTEREQK-G
PvTPS10 405 QYVPAAVTALVGMNA---KD---EVLWSWAGSYPKIIIEIAATMCRLMDDVAGHENEKEDR
PvTPS71 404 FYWGICCAAFVVFEE-NVTE---ELLKWSMKFPQIVKDCIISRLMDDIVAHEFETE-R
PvTPS79 419 SIPVLALAAALMAAGD-EATN---EAVEWASGIPDAVHACGEIGRLRLNDISAFKKGRKNK
PvTPS56 424 GFPTLAVVLLMGAGD-LATR---EAFEWAIGEPAVVSASGEVARFLNDIASYRKGN-K
PvTPS05 414 GFPTLAVVLLMGAGD-LATR---EAFEWAIGVPVAVVSASGEVARFLNDIASYRKGN-K
PvTPS09 346 GYPELTCVSFIGMGE-VATK---EAFDWVTSIPKIVRASAEIYRFTDDIYSSEREHR-V
PvTPS50 406 GYPELSCASFIGMGE-VATK---EAFDWVTSIPKIVRASAEICRFTDDIYSIEREHR-V
PvTPS54 413 GAPFAAVGLLVGMGDDVATK---EAEWATSCTDAVKAFADVTRFMNDLCSFKRGKN-K
PvTPS33 443 GAPFASVGLLDGMGDD-----AVKAFADVTRFMNDLCSFKRGKN-K
PvTPS53 460 GAPFAAVGLLVGMGDDVATK---EAEWATSCTDAVKAFADVTRFMNDLCSFKRGKN-K
PvTPS101 405 GAQMACVGILFGMDD-VAP----DAFEWAIGCSDSAKTVGATTRYANDLAAFKNGGN-K
PvTPS07 441 GAQMACVGILFGMDD-VAP----DAFEWAIGCSDSAKTVGATTRYVNDLAAFKNGGN-K
PvTPS06 401 GAQMLSIGLLVGMGD-VATK---EAFEWVIGNSDAIWACGEVSRFMDDMSAFKNGRN-K
PvTPS55 406 GGQVMCVGSLVGMGD-VATK---EAFEWVIGNSDAIRASGEVSRFMDDMAFKRGRD-K
PvTPS104 317 --TMMCVGSLVGMGD-VATK---EAFEWAIGSTDAIRASGEVSRFMDDMAFKRGRN-K

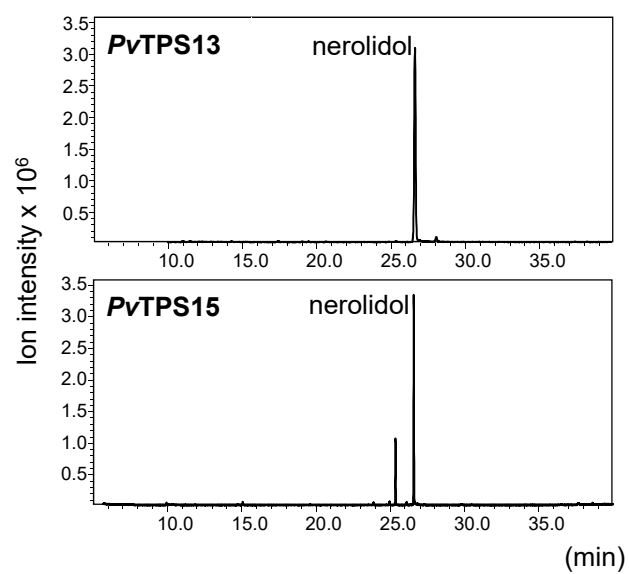
PvTPS15	506	GKVN	SVSL	LIHQ	SGGS	LSIA	EA	ARRE	LOK	PID	TCRR	DLGL	VIR	KEG	-----
PvTPS106	465	GLDGS	SYRD	LYLM	ENPS	CTPA	DAEE	YMRR	LI	KRE	WEEL	NREC	FSRR	T-----	-----
PvTPS13	471	GLDGS	SYRD	FYLM	ENPS	CTPG	DAEA	HMR	RLI	ARE	WEEL	NREC	FSRR	T-----	-----
PvTPS02	460	GLDGS	SYRD	FYLM	ENPS	CTPG	DAEA	HMR	RLI	ARE	WEEL	NREC	FSRR	T-----	-----
PvTPS28	434	GLDGS	SYRD	LYLM	ENPS	CTPA	DAEE	HMR	RM	I	KRE	WEEL	NREC	FSRR	I-----
PvTPS27	466	GLDGS	SYRD	SYLM	ENPS	CTPA	DAEE	HMR	RLI	ARE	WEEL	NREC	FSRR	T-----	-----
PvTPS12	487	GDAPS	SSIA	IH	-MSE	SGATE	EQDS	RKAME	DL	IME	AWKT	IN	QEA	FGS	CK-----
PvTPS73	457	LDAP	SSIA	IY	-MF	ENRT	METD	ARRA	MRDL	TMET	WKIV	IQDV	YNN	CQ-----	-----
PvTPS52	502	GDAPS	SSVA	IY	-MF	ENRA	METN	ARRA	MRDL	TMET	WKIV	NQDV	YDK	CQ-----	-----
PvTPS01	458	EHV	VSTV	QTC	-MK	OYGI	TAEQ	ANEK	LRV	II	EEA	WMDI	VQ	EYLD	Q-----
PvTPS85	452	KHV	ASTV	QTC	-MKE	YGIT	VDE	ANE	-	-	-	-	-	-	-----
PvTPS19	467	KHV	ASTV	QTC	-MKE	YGMT	VHQ	AYEK	LGDL	I	EA	WMDI	VQ	GCLD	Q-----
PvTPS14	464	KHV	ASTV	ETC	-MKE	YGMT	VHQ	AYEK	LRAL	I	EA	WMDI	VQ	GCLD	Q-----
PvTPS11	466	KHV	ASTV	ETC	-MKE	YGMT	VHQ	AYEK	LRAL	I	EA	WMDI	VQ	GCLD	Q-----
PvTPS26	489	PHV	ASTI	KSY	-MKE	HSVS	IQI	ARKK	I	EEL	KED	TWK	DFN	LEWL	NPN
PvTPS04	513	PHV	ASTI	KSY	-MKE	HSVS	MEI	ARKK	I	AEL	KED	TWK	DFN	REWL	NPD
PvTPS83	513	AHV	ASTI	KSY	-MKE	HVS	IQI	ARKK	I	EEL	KED	TWK	DFN	HEWL	NPD
PvTPS03	511	AHV	ASTI	KSY	-MKE	HVS	IQI	ARKK	I	EEL	KED	TWK	DFN	HEWL	NPD
PvTPS62	503	PHF	ASTI	DSY	-MKE	HVS	IEV	AREK	I	HIL	KEK	SWK	DFN	SEWL	NPD
PvTPS08	524	PHV	ASTI	DSY	-MKE	HVS	IEV	AREK	I	YKL	KEE	SWK	DFN	SEWL	NPD
PvTPS36	524	PHV	ASTI	DSY	-MKE	HVS	IEV	AREK	I	HTL	KED	SWK	DFN	SEWL	NPD
PvTPS81	527	PHV	ASTI	DSY	-MKE	HVS	IEV	AREK	I	HTL	KED	SWK	DFN	SEWL	NPD
PvTPS18	454	GHH	ASTI	QCY	-MLQ	HETT	TMHD	ACEK	I	KEL	I	ED	SWK	DMV	KLYLTPT
PvTPS16	535	AHH	ASTV	ECY	-MLQ	HRTT	MSDA	FERI	KDL	I	ED	AWK	DM	MK	FLTLPT
PvTPS109	491	AHH	ASTV	ECY	-MLQ	HRTT	TMND	AYER	I	KDL	I	ED	AWK	DM	MK
PvTPS69	458	AHH	ASTI	ECY	-MLQ	HRTT	TMND	AYER	I	KVL	I	ED	AWK	DM	MK
PvTPS94	454	DHS	ASTV	HCY	-MKE	HGT	TMND	ACEK	I	KEL	TED	LWK	DM	LEQ	CLALK
PvTPS17	457	DHS	VSTV	QCY	-MKE	HGT	TMHE	ACKRL	KEL	TED	LWK	GMV	QHHL	LAST	-----
PvTPS20	457	DHS	VSTV	QCY	-MKE	HGT	TMHE	ACKRL	QEL	TED	LWK	DMV	QRHL	LAST	-----
PvTPS10	458	SRC	FTAV	DCY	-VNE	HGAT	VQQA	KKAL	RGFL	EEH	WRR	IN	QEF	LS	NVT
PvTPS71	458	NNV	ATAV	TCY	-MKE	YKT	TKEE	ASEV	LWGS	VEN	AWK	SMN	NEY	LT	WTS
PvTPS79	474	NDV	ASSL	ECY	-MKE	YGT	RGE	EAAA	ALS	AMV	EHAW	RRIN	KAC	ME	IDR
PvTPS56	478	KDAL	SSV	ECY	-AR	ERG	VSG	EAAAA	ATAG	MAE	HA	WRT	IN	RSC	MEVGG
PvTPS05	468	KDAL	SSV	ECY	-AR	ERG	VSG	EAAAA	ATAG	MAE	HA	WRT	IN	RSC	MEVGG
PvTPS09	400	GQC	ANTF	DCY	-MK	OYN	ATSE	ETKER	FLSW	I	ED	AWRT	I	KEE	CIVET
PvTPS50	460	GQC	ASTF	DCY	-MK	OYN	ATSE	ETKER	FLSW	I	ED	AWRT	I	NEE	CIVET
PvTPS54	468	NDV	DSSV	ECY	-I	SEHG	VTAD	VACAK	IDSL	I	ED	AWKT	AN	RAR	IEQNELL
PvTPS33	483	NDV	DSSV	ECY	-I	SEHG	VTAD	VACAK	IDSL	I	ED	AWKT	AN	RAR	IEHNELPRP
PvTPS53	515	NDV	DSSV	ECY	-I	SEHG	VTAD	VACAK	IDSL	I	ED	AWKT	AN	RAR	IEHNELLP
PvTPS101	458	MDT	ANSV	ECY	-I	KEH	NVTSE	VALAK	ISDL	I	VEH	EWK	NTN	EAR	FKNR
PvTPS07	494	MDT	ANSV	ECY	-I	KEH	NVTSE	VALAK	ISDL	I	VEH	EWK	TTN	EAR	FKNR
PvTPS06	455	LDV	PSTV	ECY	-I	KEH	NVSS	DVAL	TKISS	I	FVE	DAWKT	IN	QAP	FKYP
PvTPS55	460	MDV	ATS	V	ECY	-MKE	HNV	TSE	VA	AKIG	SFV	DVAWKT	IN	QAL	FDHRS
PvTPS104	369	MDV	ATS	V	ECY	-MKE	HNV	TGE	VA	AKIG	SFV	DVAWKT	IN	QAL	FDHRS

PvTPS15	552	-VVPRPCKE-LFWKMCKVCYFFYS-RGDAFSSPDEKARE-VDAVVNL	---LLLKGSSNVS
PvTPS106	511	--FSGSFVQ-ACFNAAKMVSVMYSY--DKEQKLPVLE-DYMRMLL	-----
PvTPS13	517	--FSSRFTQ-ASLNVARMVSVMYSY--DKEQRLLVLE-DYATMLL	-----
PvTPS02	506	--FSSRCNR-PV	-----
PvTPS28	480	--FSSSFMQ-ACLNAAARMVSVMYSY--DKEQRLLVLE-DYARMMLL	-----
PvTPS27	512	--FSSSFMQ-ACLNAAARMVSVMYSY--DKEQRLLVLE-DYAKMLL	-----
PvTPS12	532	--FARPFQK-ACVNLARISQCVYH-RGDGFGEPSDVKRKQINDLFLEPAYS	-----
PvTPS73	502	--YPPSFAN-ACVNMARISHCIYQ-GGDGVSAPDDGKRKEISELFLEP	-----
PvTPS52	547	--YPPSFAN-ACVNMARISHCIYQ-GGDGLGAPDDGKRMEISELFLEPLKAAPDGGRH	---
PvTPS01	501	-KRPREFLE-KSVDVARTMDFFYK-RDDAYTLPLSIK-DTITLMYVNPCEL	-----
PvTPS85	475	----SLE-KAVNVARVMDNMYK-RDDAYTHPYSLK-DTITSMYVNSA	-----
PvTPS19	510	-YYPMEHLE-KVVNIARGMDHMYK-RDDAYTHPHSLK-DTITSMYVNSV	-----
PvTPS14	507	-PYPMEILE-KVVNIARTMDKMYK-RDDAYTDPYSLK-DTITSMYVNPV	-----
PvTPS11	509	-PYPMEILE-KVVNIARTMDKMYK-RDDAYTDPYSLK-DTITSMYVNSV	-----
PvTPS26	534	-EVPRQLE-RIFNLTRTMDFIYN-QDDNFTNCQNLK-DTIHLLFVEPFAISL	-----
PvTPS04	558	-SVPRQLE-NIFNLTRTMEFMYN-LDDNFTNCQNLK-DTIHLLFVEPFAISI	-----
PvTPS83	558	-GVPRQLE-SIFNMTRTMEFMYN-QDDNFTNSQNLK-DTIHLLFVEPFAISF	-----
PvTPS03	556	-GVPRQLE-SIFNMTRTMEFMYN-QDDNFTNSQNLK-DTIHLLFVEPFAISI	-----
PvTPS62	548	-TYPKQLE-RIFNLTRTVEFIYN-KDDNFTNCGNIR-DTIQSLFVEPFMVIL	-----
PvTPS08	569	-TYPKQVLE-RIFNLTRTMEFMYN-QEDNFTNCPNLK-DTIYLLFAEPFAN	-----
PvTPS36	569	-TYPKQVLE-RIFNLTRTMEFMYN-QEDNFTNCPNLK-DTINLLFVEPFTELI	-----
PvTPS81	572	-TYPKQVLE-RIFNLTRTMEFMYN-QEDNFTNCPNLK-DTINLLFVEPFTELI	-----
PvTPS18	498	-EQMKVVAQ-TVVDFARTGEYMYK-KTDGFTFSHTIK-DMVALLYVEPILF	-----
PvTPS16	579	-EQPKLIAK-TIVDFARTVDYIYK-KSDAFTFSHTIK-DMITMLYVDPITLF	-----
PvTPS109	535	-GQPKLIAK-TVVDFARTVDYIYK-KTDAFTFSHTIK-DMITMLYVEPTLF	-----
PvTPS69	502	-EQPKLIAK-TVVDFARTADYIYK-KTDAFTFSHTIK-DKITMLYVEPILF	-----
PvTPS94	498	-GLPKVVPR-TVFDFSRTTDNMYK-NCDAFTSSQALK-QMIELLFVEPIPE	-----
PvTPS17	501	-EQTEIVSC-MVLNLRARTGNYMYQNNVDKFTSSHTIK-EAIRRLFVEPIPV	-----
PvTPS20	501	-EQTEIVSR-MVLNLRARTGNYMYQNNVDKFTSSHTIK-DAIRRLFVEPIPV	-----
PvTPS10	503	--VPVPLLT-VLIDIVRIMDSMYID-VDAYSKCSKLA-DPIHKLNECVHH	-----
PvTPS71	503	--IPS-KLLIRVINLARMMETMYKN-IDGYTDSKILK-EWISVLLDQPIPF	-----
PvTPS79	519	--GLLPAVKLAVINLGRSNEIVYCRGNDAYTFTGDLE-GLVTSLSFLKPVPI	-----
PvTPS56	523	--ALLPAARL-VVNLTKTLEVIYLGGRDAYTFAGDLR-DLVVSLFLNGPAA	-----
PvTPS05	513	--ALLPAARL-VVNLTKTLEVIYLGGRDAYTFAGDLR-DLVVSLFLNGPAI	-----
PvTPS09	444	--VPRPLIE-RVVNWAKIMHVIYTHCDNGYSMCENLK-DYIAVLFEESLPF	-----
PvTPS50	504	--VPRPLIE-RVANWAKIMHVIYTHCDNGYNMCENLK-DYIAVLLEEPLPF	-----
PvTPS54	527	RSDPVIAVQ-RVVNITTSMPMYGDKKDAFTFSDDLK-GVIKRLFLEPVLL	-----
PvTPS33	531	-----AVQ-RVVNITTSMPMYGDKKDAFTFSDDLK-GVIKRLFLEPVLL	-----
PvTPS53	563	-----AVQ-RVVNITTSMPMYGDKKDAFTFSDDLK-GVIKRLFLEPVLL	-----
PvTPS101	502	--ELLSVVQ-RVSNLCAMCAMFYCHGMRDLYTNSKDII-GAIESHFVNPIISL	-----
PvTPS07	538	--ELLSVVQ-RVSNLCAMCAMFFCHGMRDLYTNSKDII-GTIESHFVNPIISL	-----
PvTPS06	499	--ALLPVVR-RVASLAKSMTLFLDKRDAYTYSKDFK-KTLESHFVKHI	-----
PvTPS55	505	--PPLPVLO-RVANFAMSIMIFLDQRDGYTNSKEFK-ETLESQFVKHIPL	-----
PvTPS104	414	--LPLPVLO-RVTNFAMSIMIFLDQRDGYTNSKEFK-DSGEPIRQAYSPLILEQQL	---

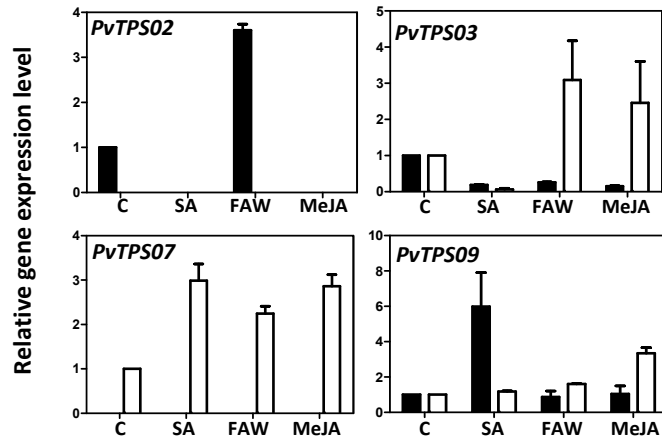
PvTPS15	606	LPILWEGSNQHAWKMCKVCYFFYS--RGDAFSSPDEKARE--VDAVVNLE--LLLKGSSNVS
PvTPS106		-----FNAAKMVSVMYSY--DKEQKLPVLE-DYMRMELL-----
PvTPS13		-----LNVARMVSVMYSY--DKEQRLLVLE-DYATMELL-----
PvTPS02		-----
PvTPS28		-----LNAARMVSVMYSY--DKEQRLLVLE-DYARMELL-----
PvTPS27		-----LNAARMVSVMYSY--DKEQRLLVLE-DYAKMELL-----
PvTPS12		-----VNLARISQCVYH-RGDGFGEPSDVKRKQINDLFLEPAYS-----
PvTPS73		-----VNMARISHCIYQ-GGDGVSAPDDGKRKEISELFLEP-----
PvTPS52		-----VNMARISHCIYQ-GGDGLGAPDDGKRMEISELFLEPLKAAPDGGRH--
PvTPS01		-----VDVARTMDFFYK-RDDAYTLPLSIK-DTITLMYVNPCEL-----
PvTPS85		-----VNVARVMDNMYK-RDDAYTHPYSLK-DTITSMYVNSA-----
PvTPS19		-----VNIARGMDHMYK-RDDAYTHPHSLK-DTITSMYVNSV-----
PvTPS14		-----VNIARTMDKMYK-RDDAYTDPYSLK-DTITSMYVNPV-----
PvTPS11		-----VNIARTMDKMYK-RDDAYTDPYSLK-DTITSMYVNSV-----
PvTPS26		-----FNLTRTMDFIYN-QDDNFTNCQNLR-DTIHLLFVEPFAISL-----
PvTPS04		-----FNLTRTMEFMYN-LDDNFTNCQNLR-DTIHLLFVEPFAISI-----
PvTPS83		-----FNMTRTMEFMYN-QDDNFTNSQNLR-DTIHLLFVEPFAISF-----
PvTPS03		-----FNMTRTMEFMYN-QDDNFTNSQNLR-DTIHLLFVEPFAISI-----
PvTPS62		-----FNLTRTVEFIYN-KDDNFTNCGNIR-DTIQSLFVEPFMVIL-----
PvTPS08		-----FNLTRTMEFMYN-QEDNFTNCPNLK-DTIYLLFAEPFAN-----
PvTPS36		-----FNLTRTMEFMYN-QEDNFTNCPNLK-DTINLLFVEPFTELI-----
PvTPS81		-----FNLTRTMEFMYN-QEDNFTNCPNLK-DTINLLFVEPFTELI-----
PvTPS18		-----VDFARTGEYMYK-KTDGFTFSHTIK-DMVALLYVEPILF-----
PvTPS16		-----VDFARTVDYIYK-KSDAFTFSHTIK-DMITMLYVDPITLF-----
PvTPS109		-----VDFARTVDYIYK-KTDAFTFSHTIK-DMITMLYVEPTLF-----
PvTPS69		-----VDFARTADYIYK-KTDAFTFSHTIK-DKITMLYVEPILF-----
PvTPS94		-----FDFSRTTDNMYK-NCDAFTSSQALK-QMIELLFVEPIPE-----
PvTPS17		-----LNLARTGNYMYQNNVDKFTSSHTIK-EAIRRLFVEPIPV-----
PvTPS20		-----LNLARTGNYMYQNNVDKFTSSHTIK-DAIRRLFVEPIPV-----
PvTPS10		-----IDIVRIMDSMYID-VDAYSKCSKLA-DPIHKLLEECVHH-----
PvTPS71		-----INLARMMEFMYKN-IDGYTDSKILK-EWISVLLDQPIPF-----
PvTPS79		-----INLGRSNEIVYCRGNDAYTFTGDLE-GLVTSFLFKVPPI-----
PvTPS56		-----VNLTKTLEVIYLGGRDAYTFAGDLR-DLVVSLFLNGPAA-----
PvTPS05		-----VNLTKTLEVIYLGGRDAYTFAGDLR-DLVVSLFLNGPAI-----
PvTPS09		-----VNWAKIMHVIYTHCDNGYSMCENLK-DYIAVLFEESLPF-----
PvTPS50		-----ANWAKIMHVIYTHCDNGYNMCENLK-DYIAVLLEEPLPF-----
PvTPS54		-----VNITTSMPLMYGDKKDAFTFSDGLK-GVIKRLFLEPVLL-----
PvTPS33		-----VNITTSMPLMYGDKKDAFTFSDGLK-GVIKRLFLEPVLL-----
PvTPS53		-----VNITTSMPLMYGDKKDAFTFSDGLK-GVIKHLFLEPVLL-----
PvTPS101		-----SNCAMCAMFYCHGMRDLYTNSKDI-GAIESHFVNPIISL-----
PvTPS07		-----SNCAMCAMFFCHGMRDLYTNSKDI-GTIESHFVNPIISL-----
PvTPS06		-----ASLAKSMTLLFLDKRDAYTYSKDFK-KTLESHFVKHI-----
PvTPS55		-----ANFAMSIMIIFLDQRDGYTNSKEFK-ETLESQFVKHIPL-----
PvTPS104		-----TNFAMSIMLIFLDQRDGYTNSKEFK-DSGEPIRQAYSPLILEQQL---



Supplementary Figure S3. Synteny and orthology of TPS gene family members between *P. virgatum*, *S. bicolor*, *S. italica*, and *P. halii*. In each plot, the genomic positions of chromosomes are plotted along the x-axis. The scale is independent for each genome and chromosomes are ordered to maximize synteny with *P. virgatum*. Chromosome IDs are printed on the inside of each line segment. Syntenic blocks between each pair of (sub)genomes are presented as light blue polygons. Characterized *P. virgatum* mono-TPS and sesqui-TPS genes (labeled PVTPS, color code according to Fig. 3) and annotated TPS genes (labeled with the alpha-numeric Phytozome gene IDs) that occur in orthologous gene networks of any of the analyzed genomes are shown. The positions of genes are indicated by a straight line. A red line indicates that there is an ortholog in the alternative genome.



Supplementary Figure S4. SPME-GC-MS analysis of volatile products produced by recombinant *PvTPS13* and *PvTPS15* with (*E,E*)-FDP as a substrate.



Supplementary Figure S5. Transcript levels of selected TPS genes induced less than 10 fold in leaves (black bars) and/or roots (white bars). Samples were analyzed in biological and technical triplicate and normalized to the expression of the control gene elongation factor 1a (*ELF1 α*). Control (C) expression levels were scaled to 1 for comparison of treatment effects. SA: salicylic acid; FAW, fall armyworm; MeJA, methyl jasmonate.