

**Figure S7. Specificity determining positions (SDP) analysis of the *Bpe*AQPs transporting non-aqua substrates from *Betula pendula*.** SDP were predicted from alignments with putative amino acid sequences of the AQPs predicted to transport non-aqua substrates (marked in red). Multiple alignments were performed using ClustalX. The SDPs are highlighted in yellow. The Genbank accession numbers of the representative sequences used for alignments: *At*PIP1;2 (Q06611), *At*PIP2;1 (P43286), *At*PIP2;4 (Q9FF53), *At*TIP1;1 (P25818), *At*TIP1;2 (Q41963), *At*TIP2;1 (Q41951), *At*TIP2;3 (Q9FGL2), *At*TIP4;1 (O82316), *At*NIP1;2 (Q8LFP7), *Cp*NIP1 (CAD67694), *Gm*NOD26 (P08995), *Hv*PIP1;3 (BAA23745), *Hv*PIP1;4 (BAF33068), *Hv*PIP2;1 (BAA23744), *Nt*AQP1 (O24662), *Nt*TIPa (Q9XG70), *Os*NIP2;1 (Q6Z2T3), *Ta*TIP2;1 (AAS19468), *Ta*TIP2;2 (AAS19469), *Zm*PIP1;1 (Q41870), *Zm*PIP1;5 (Q9AR14).

\*The *Bpe*XIP2;1 sequence used for the analyses was the redefined sequence (redefinition detailed in the Figure S4)

## Ammonia transporters

### TIP

	110	120	130	140	150	160	170	180	190	200
<i>At</i> TIP2;1	VNPAVTFGLAVGGQITVITGVFYWIAQLL	GSTAACFLLKYVTGGGLAVP	THSVAAGLGSIEGVVMEIIITFALVYTVYATAADPKK	SLGTIAPLAIGLIV						
<i>At</i> TIP2;3	LNPVAVTLGLAIGGNITLITGFFYWIAQCLGSIVACLLLVFVTNGKSVPTHGVSAGLGAVEGVVMEIVVTFALVYTVYATAADPKK	SLGTIAPIAIGFIV								
<i>Ta</i> TIP2;1	VNPAVTFGLALGGQITILTGFIFYWVAQLLGAIVGAFVLVQFCTG-VATP	THGL-SGVGAFEGVVMEIIVTFGLVYTVYATAADPKK	SLGTIAPIAIGFIV							
<i>Ta</i> TIP2;2	VNPAVTFGLALGGQITILTGFIFYWVAQLLGAIVGAFVLVQFCTG-VATP	THGL-SGVGAFEGVVMEIIVTFGLVYTVYATAADPKK	SLGTIAPIAIGFIV							
<i>Gm</i> NOD2;6	FNPAVTIAFASTRRFPLIQVPAYVVAQLLGSILASGTLRLLFMGNHDQFSGTVPNGTNLQAFVFEFIMTFFLMFVICGVATDNR--AVGEFAGIAIGSTL									
<i>Bpe</i> TIP1;1	VNPAVTFGAFIGGNITLLRGIVYWIAQLLGS	TVACLKLLKFATNGLTTSAFSLSSGVGVWNAFVLEIVMTFGLVYTVYATAVDPKRG	SVGVIAPIAIGFIV							
<i>Bpe</i> TIP1;2	VNPAVTFGAFLLGGHISLIRGLLYWVAQLLGS	VVACLKLLKFSTGGLET	PAFSLSSDVSVWNAVLEIVMTFGLVYTVYATAVDPKKNIGILAPIAIGLIV							
<i>Bpe</i> TIP1;3	VNPAVTFGAFIGGNITLLRTILYWIAQLLGS	VVACLKLLKFATGGLET	SAFSLSSGVSVWNAVFEIVMTFGLVYTVYATAVDPKKNVGTVPAPIAIGFIV							
<i>Bpe</i> TIP2;1	VNPAVTFGLALGGQITLLTGFIFYWIAQLLGS	IAACFLLKAVTG-LAIP	THSVASGVGAIEGVVMEIIITFALVYTVYATAADPKK	SLGTIAPIAIGFIV						
<i>Bpe</i> TIP2;2	LNPVAVTFGLALGGNITILTGFIFYWIAQCLGSIVACLLLVFVTNGLSIP	THGVSAGMNAVEGVVMEIIVTFALVYTVYATAADPKK	SLGTIAPIAIGFIV							
<i>Bpe</i> TIP3;1	VNPAVTFGTLGGRISVLRVAFYWIAQLLGA	VVASLLRLVTNNMRPVG	FYVTSGVGEWHGLIFEIVMTFGLVYTVYATAIDPKR	SLGTIAPLAIGFIV						
<i>Bpe</i> TIP4;1	LNPVAVTLGLLAGGHITIFRSFLYWIDQLLAASAACIILYYITGGLTTP	IHSLASGVGLQGVIVEVILTFSL	LFTVYATIVDPKKGALDGLGPTLTGFVV							
<i>Bpe</i> TIP5;1	VNPAVTFGMAVGGHISVPTALFYWLSQMLASV	MASLLLKMTVVGQHP	TYVIAEEMTGF	GASLM	EGVLT	FALVYTVYA-AGDTRRGT	MGAIGPIAIGSIA			

	210	220	230	240	250	260	270
<i>At</i> TIP2;1	GANILAAGPFSGGSMNPARSFGPAVAAGDFSGHWVYVWG	PPLIGGGLAGLIYGNVFMG----	SSEHVPLASADF-----				
<i>At</i> TIP2;3	GANILAAGPFSGGSMNPARSFGPAVVS	GDLSQIWIYVWG	PVGGALAGLIYGDVFIG----	SYEAVETREIRV-----			
<i>Ta</i> TIP2;1	GANILVAGPFSGGSMNPARSFGPAVASGDF	TNIWVYVWG	PVGGGLAGVYRYLYMC----	D-DHSSVAGNDY-----			
<i>Ta</i> TIP2;2	GANILVAGPFSGGSMNPARSFGPAVASGDF	TNIWIYVWG	PVGGGLAGVYRYVYMC----	D-DHSSVAGNDY-----			
<i>Gm</i> NOD2;6	LLNVIIGGPVTGASMNPARSLGPAFVHGEYEGIWIY	YLLAPVVGAIAGAWVY	IVRYT----	DKPLSETTKSASFLKGRAASK			
<i>Bpe</i> TIP1;1	GANILAGGAFD	GASMNPAVSFGPALVSWT	WENHWVYVWG	PVGGGLAGLVYEFFFI----	SHNTHEQLP	TTDY-----	
<i>Bpe</i> TIP1;2	GANILAGGAFD	GASMNPAVSFGPAVVS	SWDNHWVYVWG	PVGGGLAGLVYEFFFI----	SPN	THEPLPATDF-----	
<i>Bpe</i> TIP1;3	GANILVGGAFD	GASMNPAVSFGPAVVS	SWT	NHWVYVWG	PVGGGLAGLVYEFFFI----	EP	THEPLPTNDF-----
<i>Bpe</i> TIP2;1	GANILAAGPFSGGSMNPARSFGPAVASGDF	HDNWIYVWG	PVGGGLAGLIYGNVFMG----	SQHAPL	TN-DF-----		
<i>Bpe</i> TIP2;2	GANILAAGPFSGGSMNPARSFGPAVVS	GDFSQNIWYVWG	PVGGGLAGLVYGGIFIG----	SYEPL	PPSODYA-----		
<i>Bpe</i> TIP3;1	GANILAGGPF	DGACMNPARAFGPALV	WRWRNHWIYVWG	PVGGGLAGLVY	EYMVIP	TEVPHHT	HOPLAPEDY-----
<i>Bpe</i> TIP4;1	GANILAGGAFS	GASMNPARSFGPALIS	GDWTDHWVYVWG	PVGGGLAGFIYENFFIVR---	SHVPI	PTEERY-----	
<i>Bpe</i> TIP5;1	GANVLAAGPFSGGSMNPARCAF	GS	AVTAGSFKNQAVYVWG	PVGGGLAGLVYD	NVVFPS---	SQA	PEGVGV-----

**NIP**

110 120 130 140 150 160 170 180 190 200

*At*TIP2;1 KLTSDAALDTPGLVAIAVCHGFALFVAVAIGANISGGHVNPAVTFGLAVGGQITVITGVFYWIAQLLGS TAACFLLKYVTGGGLAVPTHSVAAGLGSIEGV  
*At*TIP2;3 KLTSDGALDPAGLVAIAIAHAFALFVGVSAANISGGHLNPAVTLGLAIGGNITLITGFFYWIAQCLGSIVACLLLVFVINGKSVPTHGVSAGLGAVEGV  
*Ta*TIP2;1 KVSGGAPLDPSGLIAVAIICHGFGLFVAVAIGANISGGHVNPAVTFGLALGGQITILTGFYWVAQLLGAIVGAFVQFCT-GVATPTHGLS-GVGA FEGV  
*Ta*TIP2;2 KVSGGAPLDPSGLIAVAIICHGFGLFVAVAIGANISGGHVNPAVTFGLALGGQITILTGFYWVAQLLGAIVGAFVQFCT-GVATPTHGLS-GVGA FEGV  
*Gm*NOD2;6 NYYN-----MITFPGIAIVWGLVLTVLVYTVGHISGGHFNPAVTIAFAS' TRRFPLIQVPAYVVAQLLGSILASGTLRLLFMGNHDQFSGTVPNGTNLQAF  
*Bpe*NIP1;1 IYGS-----VTFPGICVTWGLIVTVMYTVGHISGAHFNPAVTITSAIFRRFPYKEVPLYIAAQLMGSILASGTLALVFDVTPDAYFGTVP TGSNSQSL  
*Bpe*NIP4;1 IYGS-----VSFPGICVVWGLIVMVMYTVGHISGAHFNPAVTITFAIFRRFPLKQVPLYIVAQMIGSTLASATLCA LFPVDKKSFFGTAPVGSNFQAL  
*Bpe*NIP1;2 GNDK-----VVTAPGVSIVWGLAVMVLVYTVGHISGAHFNPAVTIAFATCRRFPWKQVPAYVSAQVLGSTMASGTLRLIFNGHENRFVGTIPAGSNLQSF  
*Bpe*NIP2;1 ADEN-----KVKLAASVAGGLIVTVMYAVGHISGAHMNPAVTLAFAAVRHF PWKQVPLYAAAQLAGAI SAAF' TLRVILNPIKE-LGTTSP' TGTEIEAL  
*Bpe*NIP5;1 KYQG-----AESLIGNAACAGLAVMVMVILSTGHISGAHLNPSLTIAFATLRHF PWLQVPAYIAAQVSGSICASFALKGVFHPYMSG-GVTVPSVTEGQAF  
*Bpe*NIP5;2 KYQG-----AETLIGSAACAGLAVMVMVILSTGHISGAHLNPSLTIAFATLRHF PWLQVPAYIAAQVSGSICAAF' TLKGVFHPFMSG-GVTVPSVTEGQAF  
*Bpe*NIP6;1 KTHG-----SETLLGCAASSGLAVMVMVILSTGHISGAHLNPSLTIAFAALRHF PWKHVPMYIGAQVVASFCAAFALKGIFHPIMGG-GVTVPSGSYGQAF  
*Bpe*NIP7;1 LSKG-----EVGLLEYAATAGLTVVVVIFSI GHISCAHVNPAVTIAFATFGHFPWSKVPLYILAQTLG SVLATCIGQSVYD-VKSEFMTTRPLRGSSAF

210 220 230 240 250 260 270 280 290 300

*At*TIP2;1 VMEI IITFALVYTVYATAADPKKGS LGTIAPLAIGLIVGANILAAGPFSGGSMNPARSFGPAVAAGDFSGHWVYVWG PLI GGGLAGLIYGNVFMGSSEHV  
*At*TIP2;3 VMEIVVTFALVYTVYATAADPKKGS LGTIAPIAIGFIVGANILAAGPFSGGSMNPARSFGPAVAVSGDLSQIWIYVWG PLVGGALAGLIYGDVFIGSYEAV  
*Ta*TIP2;1 VMEI IIVTFGLVYTVYATAADPKKGS LGTIAPIAIGFIVGANILVAGPFSGGSMNPARSFGPAVASGDF'TNIWVYWAGPLI GGGLAGVVYRYLYM-CDDHS  
*Ta*TIP2;2 VMEI IIVTFGLVYTVYATAADPKKGS LGTIAPIAIGFIVGANILVAGPFSGGSMNPARSFGPAVASGDF'TNIWIYWAGPLI GGGLAGVVYRYVYM-CDDHS  
*Gm*NOD2;6 VFEFIMTFFLMFVICGVATDNR--AVGEFAGIAIGSTLLLNVIIGGPV'TGASMNPARSLGPAFVHGEYEGIWIYLLAPVVGAIAGAWVYNI VRYTDKPLS  
*Bpe*NIP1;1 VLEILCSFLLMFVISGVTTDSR--AISEVAGIAVGMTITLLNVFIAGPVSGASMNPARSIRPAVIKHVYKGLWVYIVGPIIGTIAGAFAYNLIRSTDKPLQ  
*Bpe*NIP4;1 IIEI IISFLLMFVICGVATDNR--AIGELAGLAVGMTITLLNVFVAGPVSGASMNPARSLGPAIVHNKYESIWVYLVATTLGAIAGGMVYNIIRFTDKPLR  
*Bpe*NIP1;2 ALEFIITFYLMFVISGVATDNR--AIGELAGLAVGSAVCITSILAGPISGGSMNPAR' TIGPAIASASYKGIWVYLVGPV'TGTLLGAWSYKLIRVSD' EPLY  
*Bpe*NIP2;1 VMEIVVTF'TMMFTASAVATD'TK--AIGELAGLAVGSAVCITSILAGPISGGSMNPAR' TIGPAIASASYKGIWVYLVGPV'TGTLLGAWSYKLIRVSD' EPLY  
*Bpe*NIP5;1 ALEFIITFNLLFVVTAVATD'TR--AVGELAGIAVGATVLVNILVAGPSSGGSMNPAR' TIGPAIAAGNYKSLWIYLVAP'TLGAL'TGAGVYTA VKLREDEV-  
*Bpe*NIP5;2 ALEFIVTFTLLFVITAVATD'TC--AVGEFAGIAIGGTVMLN' ILVAGT'TTGASMNPAR' TIGPAIAAGTYKGFWIYMVAP' ILGALAGAGTYTFVKLAE'DGV-  
*Bpe*NIP6;1 ALEFIISFNLMFVVTAVATD'TR--AVGELAGIAVGATVMLN' ILIAGP'TTGASMNPAR' TIGPAVAANNYKAIWVYLTAP' ILGALCGAGIYS' AVKLPEEDGG  
*Bpe*NIP7;1 WVELIATFIIMFLAASV'TYQHQ--SVGHL'SGFVVGIAISLAV----PVSGGSMNPAR' ARSLGPAIISGKFNDIWIYMTAP'TIGAVAGALLFRILRLQQRRC

	310	320
<i>Gm</i> NOD2;6	ETTKS-ASF-LKGRAASK-	
<i>At</i> TIP2;1	PLASADF-----	
<i>At</i> TIP2;3	ETREIRV-----	
<i>Ta</i> TIP2;1	SVAGNDY-----	
<i>Ta</i> TIP2;2	SVAGNDY-----	
<b><i>Bpe</i></b> NIP1;1	HLPRSTGSF-LRL-----	
<b><i>Bpe</i></b> NIP4;1	ELTKS-GSF-LKTCPKNGF-	
<b><i>Bpe</i></b> NIP1;2	EITKS-GSF-LKASRNNNSV	
<b><i>Bpe</i></b> NIP2;1	PMSKEGHSKEMVNKYPNNSV	
<b><i>Bpe</i></b> NIP5;1	--EAPRQVRSFRR-----	
<b><i>Bpe</i></b> NIP5;2	--EGQDN-----	
<b><i>Bpe</i></b> NIP6;1	IHEKPSTTSSFRR-----	
<b><i>Bpe</i></b> NIP7;1	NPTS-----	



**NIP**

	110	120	130	140	150	160	170	180	190	200					
<i>HvPIP1</i> ; 3	SGSKCGTVGIQGI	AWSF	GGMIFVLVYCTAGI	SSGGHINPAVTFGLFLARKLSL	TRAVFYIVM	QCLGAICGAGVVKGFQTTLYQGN	GGGANSVAAGYTKGDG								
<i>HvPIP1</i> ; 4	SGSKCGTVGIQGI	AWSF	GGMIFVLVYCTAGI	SSGGHINPAVTFGLFLARKLSL	TRAVFYIVM	QCLGAICGAGVVKGFQTTLYQGN	GGGANSVAAGYTKGDG								
<i>ZmPIP1</i> ; 1	STSKCATVGIQGI	AWSF	GGMILALVYCTAGISG	HINPAVTFGLFLARKLSL	TRAVFYIIM	QCLGAICGRGVVKGFQQGLYMG	NGGRRNVVAPGYTKGDG								
<i>OsNIP2</i> ; 1	GSDL-SRISQLGQSI	AGGLIVT	VMIYAVGHI	SGAHMNP	AVTLAF	AVFRHFPW	IQVPHYWAAQFTGAICASFV	LKA----	VIH-PVDVIGTTTPV	GPHWHS					
<b><i>BpeNIP1</i></b> ; 1	KIYG-SV-TFPGIC	VTWGLIV	TVMIYTVGHI	SGAHFNPAVT	TITSAIFRR	FPYKEVPLYIAA	QLMGSI	LASGTLAL----	VFDVTPDAYFGT	VP					
<b><i>BpeNIP1</i></b> ; 2	LGND-KVVTAP	GVSI	VWGLAVM	VLVYVSGHI	SGAHFNPAVT	IAFATCRRFP	WKQVPAYV	SAQVLG	STMASGTLRL----	IFNGHENRFVGT					
<b><i>BpeNIP2</i></b> ; 1	AADE-NKVS	KLAASV	AGGLIV	TVMIYAVGHI	SGAHMNP	AVTLAFA	AVRHFP	WKQVPLY	AAAQLAGAI	SAAFTLRV----	ILN-PIKELGTT				
<b><i>BpeNIP4</i></b> ; 1	KIYG-SV-SFP	GCIVW	GLIVM	VMIYSV	GHI	SGAHFNPAVT	ITFAIFRR	FPLKQV	PLYIVAQM	IGSTLASATLCA----	LFPVDKKSFFGT				
<b><i>BpeNIP5</i></b> ; 1	QKYN-GAES	LIGNAAC	AGLAV	MVILSTGHI	SGAHLNPS	LTI	AFATLR	HFPWLQ	VPAYIAA	QVSGSICASFAL	KG----	VFH-PYMSGGV			
<b><i>BpeNIP5</i></b> ; 2	EKYQ-GAET	LIGSAAC	AGLAV	MAMVILSTGHI	SGAHFNPS	V	TI	FAALRH	FPWVQ	PGYLVAQV	SASICA	AAFTLKG----	VFH-PFMSGGV		
<b><i>BpeNIP6</i></b> ; 1	QKTH-GSET	LLGCAAS	SGLAV	MVILSTGHI	SGAHLNPA	LTI	FAAL	KHFP	WKHP	MPYIGA	QVVAS	FCAAFAL	KG----	IFH-PIMGGGV	
<b><i>BpeNIP7</i></b> ; 1	QLSK-GEV	GLLEYA	AATAGL	TVVVVIF	SIGHI	SCAHVNP	AVT	IAFAT	FGHFP	WSKVPLY	I	LAQTLG	SVL	ATCIGQS----	VYD-VKSEFMTTR

	210	220	230	240	250	260	270	280	290	300					
<i>HvPIP1</i> ; 3	LGAEIVGTFVLVY	TVFSAT	DAKRSARD	SHVPI	LAPLP	IGFAVFLVHL	LATIPIT	TGTGIN	PARSLGAAI	IYNKKQ	AWDDHWI	FWVGP	FIGAALAA-IYHVVV		
<i>HvPIP1</i> ; 4	LGAEIVGTFVLVY	TVFSAT	DAKRSARD	SHVPI	LAPLP	IGFAVFLVHL	LATIPIT	TGTGIN	PARSLGAAI	IYNKKQ	AWDDHWI	FWVGP	FIGAALAA-IYHVVV		
<i>ZmPIP1</i> ; 1	LGAEIVGTFILVY	TVFSAT	DAKRRARD	SHVPI	LAPLP	IGFAVFLVHL	ATMGIT	TGTGIN	PARSLGAAV	IYNQHH	AWADHWI	FWVGP	FIGAALAA-IYHQVI		
<i>OsNIP2</i> ; 1	LVVEIVTFTN	MMFVTL	AVATD	TRAVGE-----	LAGLAVGSA	VCITSL	IFAGAI	SGGSMN	PARTLGP	ALASNK---	FDGLWI	YFLGP	VMGTL	SGAWTYTFIR	
<b><i>BpeNIP1</i></b> ; 1	LVLEIILCS	FLLMFV	ISGVT	TDSRAISE-----	VAGIAV	GMTILL	NVFI	AGP	VSGAS	MNP	PARSIR	PAVIKHV---	YKGLW	VYIVGPI	
<b><i>BpeNIP1</i></b> ; 2	FALEFIIT	FYLMFV	ISGVAT	DNRAIGE-----	LAGLAVG	STILL	NVMF	AGP	ISGAS	MNP	PARSLG	PAIVHNK---	YESI	WVYL	
<b><i>BpeNIP2</i></b> ; 1	LVMEIVV	TFTMM	FASAVAT	DTKAIGE-----	LAGLAVG	SAVCIT	SLAGP	ISG	SMN	PARTIG	PAIASAS---	YKGI	WVYL	VGPVT	
<b><i>BpeNIP4</i></b> ; 1	LIIEIIIS	FLLMFV	ICGVAT	DNRAIGE-----	LAGIAV	GMTITL	NVFI	AGP	VSGAS	MNP	PARSIG	PALLTHM---	YKGL	WYIL	
<b><i>BpeNIP5</i></b> ; 1	FALEFIIT	FNLLFV	VAVATD	TRAVGE-----	LAGIAV	GATV	LVN	ILVAG	PSSG	SMN	PVRTL	GP	IAAAGN---	YKSL	
<b><i>BpeNIP5</i></b> ; 2	FALEFIV	TFTLLF	VITAVAT	DTCAVGE-----	FAGIA	IGGT	VMLN	ILVAG	TTT	GAS	MNP	PVRTL	GP	IAAAGT---	YKGF
<b><i>BpeNIP6</i></b> ; 1	FALEFIIS	FNLMFV	VAVATD	TRAVGE-----	LAGIAV	GATV	MLN	ILVAG	P	TGAS	MNP	PVRTL	GP	VAANN---	YKAI
<b><i>BpeNIP7</i></b> ; 1	FWVELI	ATFI	IMFLAAS	VTYQH	QSVGH-----	LSGFV	VV	GIAISL---	AVP	VSG	SMN	PARSLG	PAI	ISGK---	FNDI

## CO<sub>2</sub> Transporters

### PIP1

	10	20	30	40	50	60	70	80	90	100
AtPIP12	-MEGKEEDVRVGANKFPERQPIGTS	QSD---	KDYKEPPPAPLFEPGELASWSFWRAGIAEF	IATFLFLYITVLTVMGVKRSPNM-----	CASVGIQ					
NtAQP1	MAENKEEDVKLGANKFRETQPLGTAAQTD---	KDYKEPPPAPLFEPGELSSWSFYRAGIAEF	MATFLFLYITILTVMGLKRSDSL-----	CSSVGIQ						
BpePIP11	-MEGKDEDVRLGANRYRERQPIGTAAQSQDT-	KDYQEPPAAPFFEPGELSSWSFYRAGIAEF	VATFLFLYITVLTVMGVSKSPSK-----	CSTVGIQ						
BpePIP13	-MEGKEEDVRLGANRFPERQPIGTAAQSQDEG	KDYIEPPPAPLFEPSELTSWSFYRAGIAEF	VATFLFLYITVLTVMGVAKSPSK-----	CSTVGIQ						
BpePIP12	-MEGKEEDVRLGANRYTERQPLGTAAQTD---	KDYKEPPPAPLFEPGELCSWSFYRAGIAEF	VATFLFLYITVLTVMGVKRSSSV-----	CASVGIQ						
BpePIP14	-MEGKEEDVKVGASKFPERQAIGTSAQTD---	KDYKEPPPAPLFEPGELQSWFWRAGIAEF	IATFLFLYITLLTVMGVSRAPSK-----	CASVGVQ						
HvPIP2_1	-----MAKDIEAAPQGGFSSKDYS	SDPPPAPIVDFEELTKWSLYRAVIAEF	VATLLFLYITVATVIGYKHQSDPTVNTT	DAACSGVGTL						
BpePIP21	-----MSKEVSEEGQSHQ-HGKDYVD	PPPAPLLDLAELKLWSFYRSLIAEF	IATLLFLYITVATVIGHKKATGP-----	CDGVGLL						
BpePIP22	-----MSKEVTEEREASQ-PVKDYVD	PPATPLFDVAEFTMWSFYRAVIAEF	IAALLFLYITVATVIGYKKQTD-----	CETVGLL						
BpePIP23	-----MSKEVTEEAASQ-PVRDYVD	PPPAPLFDVEELTEWSFYRAVIAEF	ISTLLFLYITVATVIGYKKQNDQ-----	CETVGLL						
BpePIP24	-----MAKDAEVPEH-GSFTAKDYH	DDPPPAPLFDVAVELTKWSFYRALIAEF	IATLLFLYITVLTVIGYKSQIDPAND	GEA--CGGVGVL						
BpePIP25	-----MAKDVEVAEHQGEYS	AKDYHDDPPPAPLIDYDELIKWSFYRALIAEF	IATLLFLYITVLTVIGYKSQTDPSK	NPDQ--CGGVGIL						
BpePIP26	-----MAKDMEVGGQSG-FSAKDYH	DDPPPAPLIDAEELTKWSFYRAIAEF	IATLLFLYITVLTVIGYRAQSDTTR	GGDD--CGGVGIL						

  

	110	120	130	140	150	160	170	180	190	200
AtPIP12	GIAWAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSL	TRAVFYIVMQLGAI	CGAGVVKGFQPKQYQALGGGANTIAHGYTKGSGLGAEI	IGTFVL						
NtAQP1	GVAWAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSL	TRAFYIVMQLGAI	CGAGVVKGFQKQYERLGGGANTISSGYSKGDGLGAEI	IGTFVL						
BpePIP11	GIAWAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSL	TRAVFYIVMQLGAI	CGAGVVKGFQKQYERLGGGANTISSGYSKGDGLGAEI	IGTFVL						
BpePIP13	GIAWAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSL	TRAFYIVMQLGAI	CGAGVVKGFQKQYERLGGGANTISSGYSKGDGLGAEI	IGTFVL						
BpePIP12	GIAWAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSL	TRAFYIVMQLGAI	CGAGVVKGFQKQYERLGGGANTISSGYSKGDGLGAEI	IGTFVL						
BpePIP14	GIAWAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSL	TRAFYIVMQLGAI	CGAGVVKGFQKQYERLGGGANTISSGYSKGDGLGAEI	IGTFVL						
HvPIP2_1	GIAWAFGGMIFVLYCTAGVSGGHINPAVTFGLFLARKVSL	LIRALYIIAQCLGAI	CGVGLVKGFQSSYVRYGGGANELSAGYSKGTGLAAE	IIGTFVL						
BpePIP21	GIAWAFGGMIFVLYCTAGISGGHINPAVTFGLFLARKVSL	LIRAVSYMVAQCLGAI	CGVGLVKAFMKHDYNMGGGANSVSPGYSTGTALGAEI	IIGTFVL						
BpePIP22	GVAWAFGGMIFVLYSTAGISGGHINPAVTFGLFLARKVSL	LIRACYMVAQCLGAI	CGAGLVKGMKDSYDAFGGGTNTVSPYTKGTALGAEI	IIGTFVL						
BpePIP23	GVAWAFGGMIFVLYSTAGISGGHINPAVTFGLFLARKVSL	LIRACYMVAQCLGAI	CGAGLVKGMKDYDALGGGNTVSPYTKGTALGAEI	IIGTFVL						
BpePIP24	GIAWAFGGMIFVLYCTAGISGGHINPAVTFGLFLARKVSL	VRVSYMVAQCLGAI	ISGVLVKAFNKAHYTRYGGGANTLADGYSTGVGLGAEI	IIGTFVL						
BpePIP25	GIAWAFGGMIFVLYCTAGISGGHINPAVTFGLFLARKVSL	LIRALYIMVAQCLGAI	CGVGLVKAFQKSDYNRYGGGANELSVGYNKGVGLGAEI	IIGTFVL						
BpePIP26	GIALAFGGMIFVLYCTAGISGGHINPAVTFGLFLARKVSL	VRALYIMVAQCLGAI	CGGLVKAFQRAHYTRYGGGANELSVGYNKGTGLAAE	IIGTFVL						

210	220	230	240	250	260	270	280	290	300	310	320
<i>AtPIP12</i>	VYTVFSATDAKRNARDSHVP	ILAPLP	IGFAVFLVHLATIPITGTGINPARSLGAAIIFNKD	NAWDDH	WVFWVGPFIGAALAALYHVIVIRAI	PFKSR	---				
<i>NtAQP1</i>	VYTVFSATDAKRNARDSYVP	ILAPLP	IGFAVFLVHLATIPITGTGINPARSLGAAI	IYNTDQ	AWDDH	WVFWVGPFIGAALA	AVYHQI	IIRAI	PFHK	---	
<i>BpePIP11</i>	VYTVFSATDAKRNARDSHVP	ILAPLP	IGFAVFLVHLATIPITGTGINPARSLGAA	LIFNKEQ	AWHNH	WVFWVGPFIGAALA	ALYHQ	IVIRAI	PFK	---	
<i>BpePIP13</i>	VYTVFSATDAKRSARDSHVP	ILAPLP	IGFAVFLVHLATIPITGTGINPARSLGAA	IYNRD	RAWDDH	WVFWVGPFIGAALA	ALYHQ	VVIRAI	PFK	---	
<i>BpePIP12</i>	VYTVFSATDAKRNARDSHVP	ILAPLP	IGFAVFLVHLATIPITGTGINPARSLGAA	IYNKD	HAWDDH	WVFWVGPFIGAALA	AVYHQ	IVIRAI	PFK	---	
<i>BpePIP14</i>	VYTVFSATDAKRNARDSHVP	LLAPLP	IGFAVFLVHLATIPITGTGINPARSLGAA	IYNKD	HAWDDQ	WVFWVGPFIGAALA	ALYHQ	IVIRAMP	FKTR	---	
<i>HvPIP2_1</i>	VYTVFSATDPKRNARDSHIP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSLGAA	VIYNTD	KAWDDQ	WVFWVGPFIGAA	IAAA	YHQV	VLRA	SAAK-LGS	//
<i>BpePIP21</i>	VYTVFSATDPKRSARDSHVP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSLGAA	VIYNNKI	WDDQ	WVFWVGPFIGAL	AAA	YHQ	ILRA	AAIKAL	GSF//
<i>BpePIP22</i>	VYTVFTATDPKRNARDSYVP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSFG	VAVIYNN	KVWDDQ	WVFWVGPFIGAL	AAA	LYQ	FILRA	TAMKAL	GSF//
<i>BpePIP23</i>	VYTVFSATDPKRKARDSHVP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSFG	AAVIYNN	KVWDDQ	WVFWVGPFIGAL	AAA	YHQ	HILRA	TAIKAL	GSF//
<i>BpePIP24</i>	VYTVFSATDPKRNARDSHVP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSLGAA	LIYNNK	AWDDQ	WVFWVGPFIGAA	IAAF	YHQ	FILRA	GAAKAL	GSF//
<i>BpePIP25</i>	VYTVFSATDPKRSARDSHVP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSFG	AAVIYNN	KAWDDQ	WVFWVGPFIGAA	IAAF	YHQ	FILRA	GAAKAL	GSF//
<i>BpePIP26</i>	VYTVFSATDPKRSARDSHVP	VLAPLP	IGFAVFMVHLATIPITGTGINPARSFG	AAVMY	GKTKAWDDQ	WVFWVGPFIGAA	IAAF	YHQ	FILRA	GAAKAL	GSF//

## H<sub>2</sub>O<sub>2</sub> Transporters

### PIP2

	110	120	130	140	150	160	170	180	190	200
<i>AtPIP2;1</i>	WAFGGMIFILVYCTAGISGGHINPAVTFGLFLARKVSLPRALLYIIAQCLG	AICG	VGVKAFQ	SSYYTRYGGGANS	LADGYSTGTGLAAE	IIGTFVLVYT				
<i>AtPIP2;4</i>	WAFGGMIFVLVYCTAGISGGHINPAVTFGLFLARKVSLVRTVLYIVAQCLG	AICG	CGFVKAFQ	SSYYTRYGGGANEL	LADGYNKGTGLGAE	IIGTFVLVYT				
<i>AtNIP1;2</i>	IVWGLTVMVLVYSLGHISGAHFNPVTFIAFASCGRFPLKQVPAYVISQVIG	STLAA	ATLRLFLGLDQDVC	SGKHDV	FVGTLP	SGSNLQSFVIEFIITFYL				
<i>AtTIP1;1</i>	VAHAFGLFVAVSVGANISGGHVNPAVTFGAFIGGNITLLRGILYWIAQLLGS	VVA	CLLKFATGGL	AVP	AFG----	LSAGVGLN	AVFEIV	MTFGLVYT		
<i>AtTIP1;2</i>	LAHAFGLFVAVSVGANISGGHVNPAVTFGVLGGNITLLRGILYWIAQLLGS	VVA	CLLFSFATG	GEP	IPAFG----	LSAGVGLN	ALVFEIV	MTFGLVYT		
<i>AtTIP2;3</i>	IAHAFALFVGVSAANISGGHLNPAVTLGLAIGGNITLITGFFYWIAQCLGS	IVAC	LLVFTNGK	SVPTHG----	VSAGL	GAVEGV	VMEIV	VTFALVYT		
<i>BpePIP1;1</i>	WAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSLTRAVFYIVMQCLG	AICG	AGVVKGFQ	KNQYERLGGGANT	ISSGYSKGDGLGAE	IVGTFVLVYT				
<i>BpePIP1;2</i>	WAFGGMIFALVYCTAGISGGHINPAVTFGLLLARKLSLTRAVFYIIMQCLG	AICG	AGVVKGFQ	KTPFEINGGGAN	VVNHGYTKGDGLGAE	IVGTFVLVYT				
<i>BpePIP1;3</i>	WAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSLTRALFYIVMQCLG	AICG	AGVVKGFQ	KSQYEILGGGAN	FVNP	PGYTKGDGLGAE	IVGTFVLVYT			
<i>BpePIP1;4</i>	WAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSLTRALFYIVMQCLG	AICG	AGVVKGFQ	KTQYERVGGGAN	VVNHGYSKGDGLGAE	IVGTFVLVYT				
<i>BpePIP2;1</i>	WAFGGMIFVLVYCTAGISGGHINPAVTFGLFLARKVSLIRAVSYMVAQCLG	AICG	AGLVKAFM	KDYNDFGGGNT	VSPTYSKGTALGAE	IIGTFVLVYT				
<i>BpePIP2;2</i>	WAFGGMIFVLVYCTAGISGGHINPAVTFGLFLARKVSLIRAI	ICYMVAQCLG	AICG	AGLVK	IMKDSYDALGGGNT	VSPTYNKGTALGAE	IIGTFVLVYT			
<i>BpePIP2;3</i>	WAFGGMIFILVYCTAGISGGHINPAVTFGLFLARKVSLIRAI	ICYMVAQCLG	AICG	AGLVK	IMKDSYDALGGGNT	VSPTYNKGTALGAE	IIGTFVLVYT			
<i>BpePIP2;4</i>	WAFGGMIFVLVYCTAGISGGHINPAVTFGLFLARKVSLVRAVS	YMVAQCLG	AIS	GVGLV	KAFNKAHYTRYGGGANT	LADGYSTGVGLGAE	IIGTFVLVYT			

**BpePIP2;5**  
**BpePIP2;6**

WAFGGMIFVLVYCTAGISGGHINPAVTFGLFLARKVSLIRALLYMVAQCLGAIICGVGLVKAFQKSDYNRYGGGANELSVGYNKGVGLGAEIIGTFVLVYT  
LAFGGMIFVLVYCTAGISGGHINPAVTFGLFLARKVSLVRAILYMVAQCLGAIICCGLVKAFQRAHYTRYGGGANELSVGYSKGTGLAAEIIIGTFVLVYT

210 220 230 240 250 260 270 280 290 300

**AtPIP2;1** VFSATDPKRSARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSFGAAVIYNKSKPWDDHWIFWVGPFFIGAAIAAFYHQFVLR-----SGSKSLGS  
**AtPIP2;4** VFSATDPKRNARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSFGAAVIYNNEKAWDDQWIFWVGPMIGAAAAAFYHQFILRA-----AAIKALGS  
**AtNIP1;2** MFVISGVATDNRA--IGELAGLAVGSTVLLNVI IAGPVS GASMNPRSLGPAMVYS---CYRGLWIIYIVSP IVGAVSGAWVYNMVRITDKPLREITKSGS  
**AtNIP1;1** VYATA---IDPKNGSLGTIAPIAIGFIVGANILAGGAFSGASMNPAVAFGPAVVSW---TWTNHVVYVWAGPLVGGGIAGLIYEVFFIN-TTHEQLPPTDY  
**AtTIP1;2** VYATA---VDPKNGSLGTIAPIAIGFIVGANILAGGAFSGASMNPAVAFGPAVVSW---TWTNHVVYVWAGPLVGGGIAGLIYEVFFIN-TTHEQLPPTDY  
**AtTIP2;3** VYATA---ADPKKSLGTIAPIAIGFIVGANILAAGPFSGGSMNPARSFGPAVVS G---DLSQIWIYVWVGLVGGALAGLIYGDVFIG-SYEAVETREI  
**BpePIP1;1** VFSATDAKRNARDSHVPILAPLPVGFVFLVHLATIPITGTGINPARSLGAALIFNKEQAWHNHWIFWVGPFFIGAALAALYHQIVIRA-----IPFKSK--  
**BpePIP1;2** VFSATDAKRNARDSHVPILAPLPVGFVFLVHLATIPITGTGINPARSLGAAI IYNKD HAWDDHWIFWVGPFFIGAALAAYHQIVIRA-----IPFKARG--  
**BpePIP1;3** VFSATDAKRSARDSHVPILAPLPVGFVFLVHLATIPITGTGINPARSLGAAI IYNRDRWDDHWIFWVGPFFIGAALAALYHQVVIRA-----IPFKSK--  
**BpePIP1;4** VFSATDAKRNARDSHVP LLAPLPVGFVFLVHLATIPITGTGINPARSLGAAI IYNKD HAWDDQWIFWVGPFFIGAALAALYHQIVIRA-----MPFKTRA--  
**BpePIP2;1** VFSATDPKRSARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSLGAAVIYNNGKIWDDQWIFWVGPFVFGALAAAAYHQYILRA-----AAIKALGS  
**BpePIP2;2** VFTATDPKRNARDSYVPVLAPLPVGFVFMVHLATIPITGTGINPARSFGVAVIYNNDKVVDDQWIFWAGPFAGALAAALYHQFILRA-----TAMKALGS  
**BpePIP2;3** VFSATDPKRKARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSFGAAVIYNNDKVVDDQWIFWVGPFAGALAAALYHQHILRA-----TAIKALGS  
**BpePIP2;4** VFSATDPKRNARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSLGAALIYNKAKAWDDQWLFWVGPFFIGAAIAAFYHQFILRA-----GAAKALGS  
**BpePIP2;5** VFSATDPKRSARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSFGAAVIYNKD KAWDDQWIFWVGPFFIGAAIAAFYHQFILRA-----GAIKALGS  
**BpePIP2;6** VFSATDPKRSARDSHVPVLAPLPVGFVFMVHLATIPITGTGINPARSFGAAVMYKTKAWDDQWIFWVGPFFIGAAIAAFYHQFILRA-----GAAKALGS

**TIP & XIP**

110 120 130 140 150 160 170 180 190 200

**AtTIP1;2** AHAFGLFVAVSVGANISGGHVNPAVTFGVLLGGNITLLRGILYWIAQLLGSVAACFLLSFATGGEPIPAFGLSAGVGS LN-----ALVF  
**AtTIP2;3** AHAFALFVGVSIAANISGGHLNPAVTLGLAIGGNITLITGFFYWIAQCLGSIVACL LLVFVTNGKSVPTHGVSAGLGAVE-----GVVM  
**AtPIP2;1** AFGGMIFILVYCTAGISGGHINPAVTFGLFLARKVSLPRALLYIIAQCLGAIICGVGFVKAFQSSYYTRYGGGANSLADGYSTGT-----GLAA  
**AtPIP2;4** AFGGMIFVLVYCTAGISGGHINPAVTVGLFLARKVSLVRTVLYIVAQCLGAIICCGFVKAFQSSYYTRYGGGANELADGYNKGT-----GLGA  
**AtNIP1;2** VWGLTVMVLVYSLGHISGAHFNPAVTIAFASCGRFPLKQVPAYVISQVIGSTLAAATLRLFLGLDQDVCSGKHDV FVGTLP SGN-----LQSFVI  
**BpeTIP1;1** AHAFGLFVAVSISANISGGHVNPAVTFGAFIGGNITLLRGIVYWIAQLLGS TVACL L LKFATNGLTTSAFSLSSGVGVWN-----AFVL  
**BpeTIP1;2** AHGFGLFVAVSIGANISGGHVNPAVTFGAF LGGHISLIRGLLYWVAQLLGSVVAACL L LKFSTGGLET PAFSLSSDVS VWN-----AVVL  
**BpeTIP1;3** AHAFALFVAVSVGANISGGHVNPAVTFGAFIGGNITLLRITILYWIAQLLGSVVAACL L LKFATGGLETSAFSLSSGVSVWN-----AVVF  
**BpeTIP2;1** CHGFALFVAVAVGANISGGHVNPAVTFGLALGGQITLLTGIFYWIAQLLGS IAACFL L KAVT-GLAIP THSVASGVGAIE-----GVVM  
**BpeTIP2;2** AHAFALFVGVSIAANISGGHLNPAVTFGLALGGNITILTGFYWIAQCLGSIVACL L LQFVTNGLSIP THGVASGMNAVE-----GVVM  
**BpeTIP3;1** AHAFSLFAVAASLNISGGHVNPAVTFGTLGGRI SVLRAV FYWIAQLLGA VVASL L LRLVTNNMRPVGFYVTSGVGEWH-----GLIF  
**BpeTIP4;1** THALVVAVMISAG-HISGGHLNPAVTLG LLAGGHITIFRSFLYWIDQLLAASAACIILYYITGG L TTP IHSLASGVGYLQ-----GVIW  
**BpeTIP5;1** TNAFALSAAVYVAANISGGHVNPAVTFGMVGGHISVPTALFYWLSQMLASVMA S L LKMTVVGQHVPTYVIAEEMTGF-----ASLM  
**BpeXIP2;1\*** LIAIITAILLLAANPISGGHMNPVITLAAALVGVISVSRAAVYILAQCAGAVL GALALKAVNSTIEDT FSLGGCTLTVIAPGPNGPISVGLGTSOGLWL  
**BpeXIP1;1** AVFIIAFLFLATIPLSGGHMNPILTFIACLKGLITLARASYVLAQCLGSIIIGFFI IKNVMNHQTGHNYFLGGCTISALNRGT-----ALVL

<b>BpeXIP1;2</b>	AVFIIAFLFLMATAPLSGGHMSPIFTFIACLKGLITLARASIYVLAQCLGSSIIIGFFIIKKNVMNHQIGHKYFLGGCTISALSRTG-----ALVL
<b>BpeXIP1;3</b>	AVFIIAFLFLMATVPLSGGHMSPIFTFIACLKGLITLARASMYVLAQCLGSSIIIGFFIIKKNVMNHQTGHKYFLGGCTISTLSRTG-----ALVL
	210 220 230 240 250 260 270 280 290 300
<b>AtPIP2;4</b>	EIIGTFVLVYTVFSATDPKRNARDSHVPVLAPL---PIGFVFMVHLAT--IPITGTGINPARSFGAAVIYNNEKAWDDQWIFWVGPMIGAAAAFYHQF
<b>AtTIP23</b>	EIVVTFALVYTVYATAADPKKG-----SLGTIAPIAIGFIVGANILAAG--PFSGGSMNPARSFGPAVVSGD---LSQIWIYWVGPLVGGALAGLIYGD
<b>AtNIP1;2</b>	EFIIITFYLMFVISGVATDNR-----AIGELAGLAVGSTVLLNVIAG--PVSGASMNPGRSLGPAMVYSC---YRGLWIYIVSPIVGAVSGAWVYNM
<b>AtTIP11</b>	EIVMTFGLVYTVYATAIDPKNG-----SLGTIAPIAIGFIVGANILAGG--AFSGASMNPVAFGPAVVSWT---WTNHVVYWAGPLVGGGIAGLIYEV
<b>AtTIP12</b>	EIVMTFGLVYTVYATAVDPKNG-----SLGTIAPIAIGFIVGANILAGG--AFSGASMNPVAFGPAVVSWT---WTNHVVYWAGPLIGGGLAGLIYDF
<b>BpeTIP1;1</b>	EIVMTFGLVYTVYATAVDPKRG-----SVGVIAPIAIGFIVGANILAGG--AFDGASMNPVAVSFGPALVSWT---WENHWVYWAGPLIGGGLAGLVYEF
<b>BpeTIP1;2</b>	EIVMTFGLVYTVYATAVDPKKG-----NIGILAPIAIGLIVGANILAGG--AFDGASMNPVAVSFGPAVVSWT---WDNHVVYWVGPLIGSAIAAIVYEL
<b>BpeTIP1;3</b>	EIVMTFGLVYTVYATAVDPKKG-----NVGTVAPIAIGFIVGANILVGG--AFDGASMNPVAVSFGPAVVSWT---WTNHVVYWLGPVGGAAIAAIVYDT
<b>BpeTIP2;1</b>	EIIITFALVYTVYATAADPKKG-----SLGTIAPIAIGFIVGANILAAG--PFSGGSMNPARSFGPAVASGD---FHDNWIYWAGPLVGGGLAGLIYGN
<b>BpeTIP2;2</b>	EIVITFALVYTVYATAADPKKG-----SLGIIAPIAIGFIVGANILAAG--PFSGGSMNPARSFGPAVVSGD---FSQNWIIYWVGPLIGGGLAGLVYGG
<b>BpeTIP3;1</b>	EIVMTFTLVYTVFATAIDPKRG-----SLGTIAPLAIGFIVGANILAGG--PFDGACMNPVAFGPAVVGWR---WRNHVIYWVGPLIGGGLAGLVYEY
<b>BpeTIP4;1</b>	EVILTFSLFVTVYATIVDPKKG-----ALDGLGPTLTGTFVVGANILAGG--AFSGASMNPVAVSFGPALISGD---WTDHWVYWVGPLIGGGLAGFIYEN
<b>BpeTIP5;1</b>	EGVLTFFALVYTVYA-AGDTRRG-----TMGAIGPIAIGSIAGANVLAAG--PFSGGSMNPACAFGSAVTAGS---FKNQAVYWVGPLIGAAAAGLVYDN
<b>BpeXIP2;1*</b>	EIICTFVLLFASIWIALDHRQARALGRVIFSVIGIVVGLLVFVSTTVTGTAKGYAGAGMNPACLGPVAVRGGHL-WNGHWVFWAGPSIASVAFYLYTKI
<b>BpeXIP1;1</b>	EFCCTFVLLFVGVTVAFDKKRCKELGLAVVCAVVAALAVFVSI'VTGTQVGYAGVGLNPARCLGPALLHGGVL-WDGHVWVFWVGPFLACIVYYGYSMS
<b>BpeXIP1;2</b>	EFCCTFVVLVFGVTVAFDKKRCKELGLAVVCVVVAGAMALAVFVSI'VTGTQASYAGVGLNPARCLGPVLLQGGVL-WDGHVWLWVGPFLACIVYYGYSMN
<b>BpeXIP1;3</b>	EFCCTFVVLVFGVTVAFDKKRCKELGVAVVCVVVAGAMALAVFVSI'VTGTQAGYAGVGLNPARCLGPVLLQGGVL-WDGHVWVFWVGPFLACIVYYGYSMN

## Silicic Acid Transporters

### NIP

	10	20	30	40	50	60	70	80	90	100
<i>Hv</i> NIP2;1	-MASNSRSNSRATFSSEIHDIGTVQNSTTPSMVYYTERS	IADYFPPHLLK	KVVSEVVSTFLLV	FVTCGAAAIS	AHADVTRIS	QLGQSVAGGLI	VVMIYAV			
<i>Zm</i> NIP2;1	-MSTNSRSNSRANFNNEIHDIGTAQNSSMPPT-YY-DRSLADIFPPHLLK	KVVSEVVSTFLLV	FVTCGAAGIY	GSDKDRIS	QLGQSVAGGLI	VTVMYAV				
<i>Os</i> NIP2;1	MASNNSRTNSRANYSNEIHDLSTVQNGTTPM-YYGEKAIADFFPPHLLK	KVVSEVVATFLLV	FMTCGAAGIS	GSDLRIS	QLGQSIAGGLI	VTVMYAV				
<b><i>Bpe</i>NIP2;1</b>	-MATDPKPKNLAEANEFVSLNPISRKPKPGLL---RALLEEHYP	PGFLSKVVAETI	IATYLLV	FVTCGSAALS	AADENKVS	KLAASVAGGLI	VTVMYAV			
	110	120	130	140	150	160	170	180	190	200
<i>Hv</i> NIP2;1	GHISGAHMNPAVTLAFAIFRHF	PWIQVPFYWAAQFTGAI	CASFVLKAVLHPITVIGTTE	PVGP	HWHALVIEVVVTFNMMFVTLAVATDTRAVGELAGLAV					
<i>Zm</i> NIP2;1	GHISGAHMNPAVTLAFAVFRHF	PWIQVPFYWAAQFTGSI	CASFVLKAVLHPIAVLGTTTP	TGPHW	SLVIEIIVTFNMMFVTLAVATDTRAVGELAGLAV					
<i>Os</i> NIP2;1	GHISGAHMNPAVTLAFAVFRHF	PWIQVPFYWAAQFTGAI	CASFVLKAVIHPVDVIGTTP	VGPHW	SLVVEIVTFNMMFVTLAVATDTRAVGELAGLAV					
<b><i>Bpe</i>NIP2;1</b>	GHISGAHMNPAVTLAFAAVRHFP	WKQVPLYAAAQLAGAI	SAFTLRVILNPIKELGTTSP	TGTEIEALVMEIVVTF	TMMFTASAVATDTKAIGELAGLAV					
	210	220	230	240	250	260	270	280	290	300
<i>Hv</i> NIP2;1	GSAVCITSIFAGAVS	GGSMNPARTLGPALASNLYTGLWL	YFLGPVLGTL	SGAWTYTYIRFEDPP--KDAPQKLSSFKLRR	LQSQ-SVAADD-DELDHIPV					
<i>Zm</i> NIP2;1	GSAVCITSIFAGAVS	GGSMNPARTLGPALASNLYTGLWI	YFLGPVLGTL	SGAWTYTYIRFEEAPSHKDMSQKLSSFKLRR	LQSQ-SVAVDD-DELDHIQV					
<i>Os</i> NIP2;1	GSAVCITSIFAGAIS	GGSMNPARTLGPALASNKFDGLWI	YFLGPVMGTL	SGAWTYTFIRFEDTPK-EGSSQKLSSFKLRR	RSQSQSIAADDVDEMENIQV					
<b><i>Bpe</i>NIP2;1</b>	GSAVCITSILAGPIS	GGSMNPARTIGPAIASASYKGIWVYL	VGPVGTLLGAWSYKLIRVSD	EPLYPMSKEGHSKEMVNKYPNN-SV-----						



**TIP & XIP**

	110	120	130	140	150	160	170	180	190	200																																																																											
<i>Cp</i> NIP1	AAALNGSDAQRVS-----	QLGASVAGGLIVTVM	IYAVGHI	ISGAHMN	PAVTTAF	AATRHF	PWKQV	PLYAAA	QLSGAT	CAAF	TLRLLL	HP	IKHL	GT-----																																																																							
<i>At</i> NIP6;1	TAIVNQKTDGAET-----	LIGCAASAGLAVM	IVILST	GHISGA	HLNPAV	TIAFAA	LKHFP	PWKHV	PVYIGA	QVMAS	VSAAF	ALKAV	FEP	TMSS	GGV-----																																																																						
<i>At</i> NIP2;1	AIAVNAQHNHVVT-----	LVGI	AVVW	GIVIM	VLVY	CLGHLS	-AHF	NPAV	TLAL	ASSQ	RFP	LNQ	VPAY	ITVQ	VIGST	LASAT	LRLL	FDLN	NDV	CS	SKKH	DVF																																																															
<i>Nt</i> AQP1	TVMGLKRSDSLSS--	VGIQ	GVAV	AFGG	MIFAL	VYCTAG	ISGG	HINPA	VTFGL	FLARK	LSL	TRAI	FYIV	MQCL	GAIC	GAGV	VKGF	M---	VGP	YQ	RL	GGGA																																																															
<i>At</i> TIP4;1	SAMATDSLVGNLTV---	GLFA	VAVAH	AFV	VAVM	ISAG	-HIS	GGHL	NPAV	TLGL	LLGG	HISV	FRAF	LYW	IDQL	LASSA	ACF	LLS	YLT	TGG	MGT	TPVH	-----																																																														
<i>Nt</i> TIPa	SAMAANKLNGD-----	AMAH	LVAV	VTIS	AGFR	ISGG	HLNPA	VTLGL	CMGG	HITV	FRS	ILY	WID	QLL	ASVA	ACALL	NLY	TAG	LE	TP	VH	-----																																																															
<i>Bpe</i> TIP1;1	SGMAFNK	LDNGS	TTPS	GLVQA	ALAH	AFGLF	VAVS	ISANI	ISGG	HVNP	PAVTF	GAFI	GGNI	TLLR	GIVY	WIAQ	LLGS	TVAC	LLLK	FAT	NGL	T	TS	AF	-----																																																												
<i>Bpe</i> TIP1;2	SGVAFN	KLTDN	GSTTP	PAGL	VAAAL	AHGF	GLFV	AVSIG	ANI	ISGG	HVNP	PAVTF	GAFI	GGHI	SLIR	GLLY	WVAQ	LLGS	VVAC	LLLK	FST	G	GL	E	TP	AF	-----																																																										
<i>Bpe</i> TIP1;3	SGMAFN	KLTDN	GSTTP	PAGL	VAAAL	AHAF	FVAV	SVGAN	ISGG	HVNP	PAVTF	GAFI	GGNI	TLLR	TILY	WIAQ	LLGS	VVAC	LLLK	FAT	G	GL	E	T	S	AF	-----																																																										
<i>Bpe</i> TIP3;1	SLLALI	-YKDT	GGST	-PSEL	VAI	ALAH	AFSL	FAVA	ASLN	ISGG	HVNP	PAVTF	GTL	GGRI	SVLRA	VFYW	IAQ	LLG	AVAS	LLLRL	V	TNN	M	R	P	V	G	F	-----																																																								
<i>Bpe</i> TIP2;1	SAIAYN	KLTSNA	ALDPS	GLV	GAIC	HGFAL	FVAV	AVGAN	ISGG	HVNP	PAVTF	GLAL	GGQI	TLLT	GIFY	WIAQ	LLGS	IAAC	FLLK	AVT	-GLA	I	P	T	H	-----																																																											
<i>Bpe</i> TIP2;2	SAISYK	LTSDA	ALDP	PAGL	VAVAV	AHAF	FVGV	IAANI	ISGG	HLNPA	VTFGL	ALGG	NITIL	TGIFY	WIAQ	CLGS	IVAC	LLLQ	FV	TN	GLS	I	P	T	H	-----																																																											
<i>Bpe</i> TIP4;1	SAMAAD	KLD	SGSLV	---GLF	AVAI	THAL	VAVM	ISAG	-HIS	GGHL	NPAV	TLGL	L	AGGH	ITIF	RSFLY	WIDQ	LLA	ASA	ACI	I	L	Y	I	T	G	G	L	T	P	I	H	-----																																																				
<i>Bpe</i> TIP5;1	SAMSSR	KLMPD	VASD	ASSL	VVVA	ITNA	FALSA	AVYVA	ANI	ISGG	HVNP	PAVTF	GMAV	GGHI	SVPT	ALFY	WLSQ	MLAS	VMA	LLLK	M	T	V	V	G	H	V	P	T	Y	-----																																																						
<i>Bpe</i> XIP1;1	SIIACL	DSQ	EVD	PK--LL	---V	PLAV	FIIA	FLFL	LATIP	LSGG	HMN	PILTF	IA	CKGL	ITLAR	SIYV	LAQ	CLGS	IIG	FFI	I	K	N	V	M	N	H	Q	T	G	H	N	Y	F	L	G	G	C	T																																														
<i>Bpe</i> XIP1;2	SIIACL	DSHEV	NPK--LL	---V	PLAV	FIIA	FLFL	MATAP	LSGG	HMS	P	IFTF	IA	CKGL	ITLAR	SIYV	LAQ	CLGS	IIG	FFI	I	K	N	V	M	N	H	Q	I	G	H	K	Y	F	L	G	G	C	T																																														
<i>Bpe</i> XIP1;3	SIIACL	DSHEV	DPK--LL	---V	PLAV	FIIA	FLFL	MATV	PLSGG	HMS	P	IFTF	IA	CKGL	ITLAR	SMYV	LAQ	CLGS	IIG	FFI	I	K	N	V	M	N	H	Q	T	G	H	K	Y	F	L	G	G	C	T																																														
<i>Bpe</i> XIP2;1	IVISSF	ETKTE	SPK--LI	---MS	L	LIAI	ITAIL	LLAAN	PISGG	HMN	PAITL	AAAL	VGVI	SVS	RAAV	YILA	QCAG	AVL	GAL	AL	KAV	N	S	T	I	E	D	T	F	S	L	G	G	C	T																																																		
	210	220	230	240	250	260	270	280	290	300																																																																											
<i>Cp</i> NIP1	--TTPS	GS	SDL-----	QALV	MEIV	VTF	SMMF	VTCA	VATD	TK--A	-----	VGEL	AGL	AVG	S	AVC	ITS	ILAG	--P	V	S	G	S	M	N	P	V	R	T	L	G	P	A	M	A	S	D	---N																																															
<i>At</i> NIP6;1	--TVPT	VGLS	-----	QAF	ALE	FII	SFNL	MFV	VTA	VATD	TR--A	-----	VGEL	AGI	AVG	ATV	M	LN	IL	IAG	--P	A	T	S	A	S	M	N	P	V	R	T	L	G	P	A	I	A	A	N	---N																																												
<i>At</i> NIP2;1	LGSSP	SGSDL	-----	QAF	VME	FII	TGFL	M	LVCA	VTT	TKR--T	-----	TEE	LEGL	I	IGAT	V	TLN	VIF	AG	--E	V	S	G	A	S	M	N	P	A	R	S	I	G	P	A	L	V	W	---C																																													
<i>At</i> TIP4;1	-TLAS	GVSYT	-----	QGI	I	WEI	I	LTF	SLLF	T	VYAT	I	VDP	PKKS	-----	LDG	F	G	P	L	T	G	F	V	G	A	N	I	L	A	G	--A	F	S	G	A	S	M	N	P	A	R	S	F	G	P	A	L	V	S	---N																																		
<i>Nt</i> AQP1	NVVNH	GYTKG	-----	DGL	GAE	I	IGT	FV	LVY	TVF	SAT	DAK	R	NARD	---S	YV	P	I	L	A	P	L	P	I	G	F	A	V	F	L	V	H	L	A	T	--I	P	I	T	G	T	G	I	N	P	A	R	S	L	G	A	A	I	I	Y	N	T	D	Q	A																									
<i>Nt</i> TIPa	-TLAN	GSYG	-----	QGI	I	MEV	I	LTF	SLLF	T	VYTT	I	VDP	PKKI	-----	LEG	M	G	P	L	L	T	G	L	V	G	A	N	I	M	A	G	--P	F	S	G	A	S	M	N	P	A	R	S	F	G	P	A	F	V	S	---I																																	
<i>Bpe</i> TIP1;1	-SLSS	GVGVW	-----	NAF	V	LEI	V	M	T	F	GLV	Y	T	V	Y	A	T	A	V	D	P	K	R	G	S	-----	VG	V	I	A	P	I	A	I	G	F	I	V	G	A	N	I	L	A	G	--A	F	D	G	A	S	M	N	P	A	V	S	F	G	P	A	L	V	S	W	---T																			
<i>Bpe</i> TIP1;2	-SLSS	DVSVW	-----	NAV	V	LEI	V	M	T	F	GLV	Y	T	V	Y	A	T	A	V	D	P	K	K	G	N	-----	I	G	I	L	A	P	I	A	I	G	L	I	V	G	A	N	I	L	A	G	--A	F	D	G	A	S	M	N	P	A	V	S	F	G	P	A	V	V	S	W	---S																		
<i>Bpe</i> TIP1;3	-SLSS	GVSVW	-----	NAV	V	F	E	I	V	M	T	F	GLV	Y	T	V	Y	A	T	A	V	D	P	K	K	G	N	-----	V	G	T	V	A	P	I	A	I	G	F	I	V	G	A	N	I	L	V	G	--A	F	D	G	A	S	M	N	P	A	V	S	F	G	P	A	V	V	S	W	---S																
<i>Bpe</i> TIP3;1	-YVTS	GVGEW	-----	HGL	F	E	I	V	M	T	F	TLV	Y	T	V	F	A	T	A	I	D	P	K	R	G	S	-----	L	G	T	I	A	P	I	A	I	G	F	I	V	G	A	N	I	L	A	G	--P	F	D	G	A	C	M	N	P	A	R	A	F	G	P	A	L	V	G	W	---R																	
<i>Bpe</i> TIP2;1	-SVAS	GVGAI	-----	EGV	V	M	E	I	I	T	F	ALV	Y	T	V	Y	A	T	A	A	D	P	K	K	G	S	-----	L	G	T	I	A	P	I	A	I	G	F	I	V	G	A	N	I	L	A	G	--P	F	S	G	S	M	N	P	A	R	S	F	G	P	A	V	A	S	G	---D																		
<i>Bpe</i> TIP2;2	-GVAS	GMNAV	-----	EGV	V	M	E	I	V	T	F	ALV	Y	T	V	Y	A	T	A	A	D	P	K	K	G	S	-----	L	G	I	A	P	I	A	I	G	F	I	V	G	A	N	I	L	A	G	--P	F	S	G	S	M	N	P	A	R	S	F	G	P	A	V	V	S	G	---D																			
<i>Bpe</i> TIP4;1	-SLAS	GVGYL	-----	QGV	I	WEV	I	LTF	SLLF	T	VYAT	I	VDP	KKA	-----	LDG	L	G	P	L	L	T	G	F	V	G	A	N	I	L	A	G	--A	F	S	G	A	S	M	N	P	A	R	S	F	G	P	A	L	I	S	---D																																	
<i>Bpe</i> TIP5;1	-VIAE	EMTGF	-----	GAS	L	M	E	G	V	L	T	F	ALV	Y	T	V	Y	A	-A	G	D	T	R	R	G	T	-----	M	G	A	I	G	P	I	A	I	G	S	I	A	G	A	N	V	L	A	A	G	---P	F	S	G	S	M	N	P	A	C	A	F	G	S	A	V	T	A	G	---S																	
<i>Bpe</i> XIP1;1	ISAL	NRGT	-----	ALV	L	E	F	C	T	F	V	L	F	V	G	V	T	V	A	F	D	K	R	C	K	E	L	G	L	V	A	V	C	V	V	V	A	G	A	M	A	L	A	V	F	V	S	I	T	V	T	G	Q	V	G	Y	A	G	V	L	N	P	A	R	C	L	G	P	A	L	L	H	G	-G	V	L									
<i>Bpe</i> XIP1;2	ISALS	RGT	-----	ALV	L	E	F	C	T	F	V	L	F	V	G	V	T	V	A	F	D	K	R	C	K	E	L	G	L	V	A	V	C	V	V	V	A	G	A	M	A	L	A	V	F	V	S	I	T	V	T	G	Q	A	S	Y	A	G	V	L	N	P	A	R	C	L	G	P	V	L	L	Q	G	-G	V	L									
<i>Bpe</i> XIP1;3	ISTL	SRGT	-----	ALV	L	E	F	C	T	F	V	L	F	V	G	V	T	V	A	F	D	K	R	C	K	E	L	G	V	A	V	C	V	V	V	A	G	A	M	A	L	A	V	F	V	S	I	T	V	T	G	Q	A	G	Y	A	G	V	L	N	P	A	R	C	L	G	P	A	L	L	Q	G	-G	V	L										
<i>Bpe</i> XIP2;1	LTVI	APG	PNGP	ISV	L	G	T	S	Q	L	W	L	E	I	I	C	T	F	V	L	L	F	A	S	I	W	I	A	L	D	H	R	Q	A	R	A	L	G	R	V	I	F	S	V	I	G	I	V	V	G	L	L	V	F	V	S	T	T	V	T	G	A	K	Y	A	G	A	G	M	N	P	A	R	C	L	G	P	A	I	V	R	G	-G	H	L

**NIP**

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110      120      130      140      150      160      170      180      190      200
NtAQP1      VMGLKRSDSLCSSVGIQGVAVAFGGMIFALVYCTAGISGGHINPAVTFGLFLARKLSLTRAIFYIVMQCLGAICGAGVVKGFVMPYQRLGGG----ANVV
NtTIPa      AMAANKLNG-D-----AMAHALVVAVTISAGFRISGGHLNPAVTLGLCMGGHITVFRSILYWIDQLLASVAACALLNYLTAG----LETP---VHTL
AtTIP4;1    AMATDSLVG-NTLVGLFAVAVAHAFVVMISAG-HISGGHLNPAVTLGLLLGGHISVFRFLYWIDQLLASSAACFLLSYLTGG----MGTP---VHTL
AtNIP6;1    AIVNQKTDGAETLIG---CAASAGLAVMIVILSTGHISGAHLNPAVTLAFALKHF PWKHVPVYIGAQVMASVSAAFALKAVFEP'TMSG-----GVT
AtNIP2;1    IAVNAQHNHVVTLVG---IAVWGVIVIMVLVYCLGHLS-AHFNPAVTLALASSQRFPLNQVPAYITVQVIGSTLASATLRLFFDLNNDVCSKKHDVFLGS
CpNIP1      AALNGSDAQRVSQLG---ASVAGGLIVTVMIVAVGHISGAHMNPAVTLAFAATRHF PWKQVPLAAAAQLSGATCAAF'TLRLLLHP'IKH-----LGT
BpeNIP1;1  VAVNKIYGSV-TFPG---ICVTWGLIVTVMIVTVGHISGAHFNPAVTTITSAIFRRFPYKEVPLYIAAQLMGSILASGTLALVFDVTPDA-----YFGT
BpeNIP4;1  VVVNKIYGSV-SFPG---ICVVWGLIVMVMIVSVGHISGAHFNPAVTTITFAIFRRFPYKQVPLYIVAQMIGSTLASATLALFPVDKKS-----FFGT
BpeNIP1;2  VVVNLGNDKVVTPAG---VSIVWGLAVMVLVYSVGHISGAHFNPAVTLAFATCRRFPWKQVPAYVSAQVLGSTMASGTLRLIFNGHENR-----FVGT
BpeNIP2;1  AALSAADENKVSCLA---ASVAGGLIVTVMIVAVGHISGAHMNPAVTLAFAAVRHFPWKQVPLAAAAQLAGAISAAFTLRVILNPIKE-----LGT
BpeNIP5;1  PIVNQKYNGAESLIG---NAACAGLAVMVLVILSTGHISGAHLNPSLTIAFATLRHF PWLQVPAYIAAQVSGSICASFALKGVFHPYMSG-----GVT
BpeNIP5;2  PIVNEKYQGAETLIG---SAACAGLAVMAMVLSTGHISGAHFNPSVTIAFAALRHFPWVQVPGYLVAQVSASICAAFTLKGVFHPFMSG-----GVT
BpeNIP6;1  AMVNQKTHGSETLLG---CAASSGLAVMVLVILSTGHISGAHLNPAVTLAFAALKHF PWKHVPMYIGAQVVASFCAAFALKGIFHPIMGG-----GVT
BpeNIP7;1  IACTQLSKGEVGLLE---YAATAGLTVVVVFISIGHISCAHVNPAVTLAFAATFGHFPWVSKVPLYILAQTLGSLVATCIGQSVYDVKSE-----FMTT

210      220      230      240      250      260      270      280      290      300
NtAQP1      NHGYTKGDGLGAEIIGTFVLYVYTVFSA-TDAKRNARDSYVPI LAPLP IGFVFLVHLATIPITGTGINPARSLGAAI IYNTDQAWDDHWI FWVGPFIGAA
NtTIPa      ANGVSYGQGIIMEVILTFSLLF'FTVYTTIVDPKKGILEGMGPLLTGLVVGANI----MAGGPFSGASMNPARSFGPAFVSGI---WTDHWVYVWVGPLIGGG
AtTIP4;1    ASGVSYTQGI IWEIILTFSLLF'FTVYATIVDPKKGSLDGFGLLTGFVVGANI----LAGGAFSGASMNPARSFGPALVSGN---WTDHWVYVWVGPLIGGG
AtNIP2;1    SPSGSDLQAFVMEFIIITGFLMLVVCVAVT'TTKRT-----TEELEGLIIGATVTLNLFIFAGEVSGASMNPARSIGPALVWGC---YKGIWIYLLAPTIGAV
AtNIP6;1    VPTVGLSQAFALEFIIISFNLMFVV'TAVATDTRA-----VGELAGIAGVATVMLNILIAGPATSASMN'PVRTLGP'AI'AANN---YRAIWVYLTAPILGAL
CpNIP1      TPSGSDLQALVMEIVVTFSMFMFVTCVAVTDTKA-----VGELAGLAVGSAVCITSILAGPVS'GSMN'PVRTLGP'AMASDN---YKGLWVYFVGPV'TGTL
BpeNIP1;1  VPTGSNSQSLVLEILCSFLLMFVISGVT'TDSRA-----ISEVAGIAGVMTILLNVFIAGPVS'GASMN'PARSIRPAVIKHV---YKGLWVYIVGPIIGTI
BpeNIP4;1  APVGSNFQALIEIIISFLLMFVICGVATDNRA-----IGELAGIAGVMTITLNVFVAGPVS'GASMN'PARSIGPALLTHM---YKGLWIYILGPLAGTI
BpeNIP1;2  IPAGSNLQSFALFIIITFYLMFVISG VATDNRA-----IGELAGLAVGSTILLNVMFAGPIS'GASMN'PARSLGPAIVHNK---YESIWVYLVATTLGAI
BpeNIP2;1  SPTGTIEI EALVMEIVVTF'TMMFTASAVATDTKA-----IGELAGLAVGSAVCITSILAGPIS'GSMN'PARTIGPAIASAS---YKGIWVYLVGPV'TGTL
BpeNIP5;1  VPSVTEGQAFALFIIITFNLLFVV'TAVATDTRA-----VGELAGIAGVATV'LVN'ILVAGPSS'GSMN'PVRTLGP'AI'AAGN---YKSLWIYLVAP'TL'GAL
BpeNIP5;2  VPAVGIGQAFALFIVTFTLLFVITAVATDTCA-----VGEFAGIAIGGTV'MLN'ILVAGT'TT'GASMN'PVRTIG'PAIAAGT---YKGFWIYMVAP'IL'GAL
BpeNIP6;1  VPSGSYQAFALFIIISFNLMFVV'TAVATDTRA-----VGELAGIAGVATV'MLN'ILVAGP'TT'GASMN'PVRTLGP'AVAANN---YKAIWVYLTAP'IL'GAL
BpeNIP7;1  RPLRGCSAFAWVELIATFIIIMFLAASV'TYQHQS-----VGHL'SGFV'V'GIAISL---AVPVS'GSMN'PARSLGPAIISGK---FNDIWIYMTAP'TIGAV
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