

Additional file 1

**(A) List of *NIP* genes in plants**

NIPs	Protein ID	Gene ID	Chromosome	Gene length	CDS length	AA length	Gene structure	cDNA	NPA motif1	NPA motif2	ar/R filter	Reference
OsNIP1;1	BAD27715	AP004070	2	2994	855	284		AK068806	NPA	NPA	W, V, A, R	1,3,4
OsNIP1;2	BAD73177	AP003105	1	3547	912	303			NPA	NPA	W, V, A, R	1,3
OsNIP1;3	AAV44140	AC135918	5	4553	861	286		AK062320	NPA	NPA	W, V, A, R	1,3
OsNIP1;4	BAD53665	AP003682	6	1113	822	273			NPA	NPA	W, V, A, R	1,3
OsNIP2;1	BAD16128	AP005297	2	3609	897	298		AK069842	NPA	NPA	G, S, G, R	1-4,8,13
OsNIP2;2	BAD37471	AP003569	6	4567	897	298		AK112022	NPA	NPA	G, S, G, R	1,3,4,13
OsNIP3;1	AAG13499	AC068924	10	1573	726	241			NPS	NPV	A, I, G, R	1,3,4
OsNIP3;2	BAC99758	AP005467	8	1366	918	305			NPA	NPA	A, A, A, R	1,3,8
OsNIP3;3	BAC65382	AP005467	8	1426	837	278			NPA	NPA	A, I, A, R	1,3
OsNIP3;5	BAC98553	AP004461	8	3021	852	283			NPA	NPA	A, A, P, R	1,3
OsNIP4;1	BAB61180	AP003219	1	1124	861	286		AK106825	NPA	NPA	C, G, G, R	1,3
ZmNIP1;1	AAK26750	AF326483	AC215509.2	1852	849	282		AF326483	NPA	NPA	W, V, A, R	5
ZmNIP2;1	AAK26751	AF326484	AC196472.2	3103	888	295		AF326484	NPA	NPA	G, S, G, R	5
ZmNIP2;2	AAK26752	AF326485	AC206502.3	3272	885	294		AF326485	NPA	NPA	G, S, G, R	5
ZmNIP2;3	AAK26849	AF342810	AC216219.3	3088	906	301		AF342810	NPA	NPA	G, S, G, R	5
ZmNIP3;1	AAK26753	AF326486	AC209805.3	2752	909	302		AF326486	NPS	NPV	A, I, G, R	5
AtNIP1;1	CAA16760	AL021711	4	1681	927	308			NPA	NPG	W, V, A, R	6,7,9
AtNIP1;2	CAA16748	AL021711	4	1968	885	294			NPA	NPG	W, V, A, R	6,7,9
AtNIP2;1	AAC26712	AC004077	2	1176	867	288			NPA	NPA	W, V, A, R	6,7,11,12
AtNIP3;1	AAG50717	AC079041	1	1124	810	269			NPA	NPA	W, I, A, R	6,7
AtNIP4;1	BAB10360	AB016873	5	2575	852	283			NPA	NPA	W, V, A, R	6,7
AtNIP4;2	BAB10361	AB016873	5	1281	852	283			NPA	NPA	W, V, A, R	6,7
AtNIP5;1	CAB39791	AL049488	4	2980	915	304			NPS	NPV	A, I, G, R	6-9
AtNIP6;1	AAF14664	AC011713	1	1375	918	305			NPA	NPV	A, I, A, R	6-8
AtNIP7;1	AAF30303	AC018907	3	1546	825	274			NPS	NPA	A, V, G, R	6,7,14

CpNIP2;1	CAD67694	AJ544830	---	---	867	288	---	AJ544830	NPA	NPV	G, S, G, R	
CaNIP2;1	CAG34223	AJ746344	---	---	822	273	---	AJ746344	NPA	NPA	G, S, G, R	
VuNIP1;1	ABS72446	EF514501	---	---	822	273	---	EF514501	NPA	NPV	W, V, A, R	
LjNIP6;1	ABY19374	EU294215	---	---	942	313	---	EU294215	NPA	NPV	T, I, A, R	8
MtNIP2	AAS48064	AC152446	---	2018	810	269		AY539750	NPA	NPA	W, V, A, R	10
AnNIP1;1	AAQ11826	AF544251	---	---	903	300	---	AF544251	NPS	NPV	A, I, A, R	
PpNIP3;1	94322	94322	Scaffold_258	1732	906	301			NPA	NPV	A, I, A, R	15
PpNIP5;1	115513	115513	Scaffold_13	1272	687	228			NPA	NPA	F, A, A, R	15
PpNIP5;2	186237	186237	Scaffold_91	1617	714	237			NPA	NPA	F, A, A, R	15
PpNIP5;3	179749	179749	Scaffold_37	2505	696	231			NPA	NPA	F, A, A, R	15
SbNIP1;1	4882657	5111844	4	2861	864	287			NPA	NPA	W, V, A, R	
SbNIP1;2	4804466	5033653	3	1091	816	271			NPA	NPA	W, V, A, R	
SbNIP1;3	5060249	5289436	9	3306	852	283			NPA	NPA	W, V, A, R	
SbNIP2;1	4757201	4986388	4	3781	894	297			NPA	NPA	G, S, G, R	
SbNIP2;2	149942	149942	10	4774	888	295			NPA	NPA	G, S, G, R	
SbNIP3;1	4742451	4971638	1	4668	906	301			NPS	NPV	A, I, G, R	
SbNIP3;2	5043039	5272226	7	1187	894	297			NPA	NPA	A, A, A, R	
SbNIP3;3	4840652	5069839	7	907	870	289			NPA	NPA	A, A, A, R	
SbNIP3;5	5043032	5272219	7	1078	894	297			NPA	NPA	A, A, P, R	
PtNIP2;1	577637	577637	XVII	3290	837	278			NPA	NPA	G, S, G, R	
PtNIP4;1	566501	566501	X	1433	792	263			NPA	NPA	W, V, A, R	
PtNIP4;2	756079	756079	II	2042	840	279			NPA	NPA	W, V, A, R	
PtNIP5;1	708017	708017	I	4931	900	299			NPS	NPV	A, I, G, R	
PtNIP5;2	823094	823094	XI	3914	903	300			NPS	NPV	A, I, G, R	
PtNIP6;1	757987	757987	III	2410	912	303			NPS	NPV	S, I, A, R	
PtNIP6;2	797136	797136	I	2848	912	303			NPS	NPV	T, I, A, R	
PtNIP7;1	803915	803915	VIII	2253	729	242			NPA	NPA	A, V, G, R	
GmNIP1;1	Gm0003x00182	—	Scaffold_3	4078	732	243			NPA	NPV	W, V, A, R	
GmNIP1;3	Gm0022x00351	—	Scaffold_22	3302	816	271			NPA	NPA	W, V, A, R	

GmNIP1;4	Gm0022x00350	—	Scaffold_22	2387	825	274			NPA	NPA	W, V, A, R	
GmNIP1;5	Gm0003x00181	—	Scaffold_3	2100	813	270			NPA	NPA	W, V, A, R	
GmNIP1;6	Gm0030x00284	—	Scaffold_30	2434	822	273			NPA	NPA	W, V, A, R	
GmNIP2;1	Gm0021x00508	—	Scaffold_21	5064	888	295			NPA	NPA	G, S, G, R	
GmNIP3;1	Gm0131x00049	—	Scaffold_131	5663	912	303			NPS	NPV	A, I, G, R	
GmNIP6;1	Gm0088x00395	—	Scaffold_88	3652	915	304			NPA	NPV	T, I, G, R	
GmNIP6;2	Gm0113x00121	—	Scaffold_113	4120	921	306			NPA	NPV	N, I, S, R	
PitNIP1;1	—	TA9262_3352	---	1290	819	272	---		NPA	NPA	W, V, A, R	
PitNIP1;2	—	TA21380_3352	---	1330	789	262	---		NPA	NPA	W, V, A, R	
PitNIP1;3	—	TA13914_3352	---	816	714	237	---		NPA	NPA	W, V, A, R	
PitNIP1;4	—	AY055751	---	1065	795	264	---		NPA	NPA	W, V, A, R	
PitNIP2;1	—	TA24411_3352	---	904	681	226	---		NPA	NPA	S, S, G, R	
PitNIP3;1	—	TA8714_3352	---	1752	885	294	---		NPS	NPV	G, I, G, R	
PitNIP3;2	—	TA16960_3352	---	1770	912	303	---		NPA	NPV	S, I, G, R	
VvNIP1;1	CAO48005	CU459298	10	1891	789	262			NPA	NPA	W, V, A, R	
VvNIP2;1	CAO15462	CU461115	Scaffold_2214	2268	738	245			NPA	NPA	G, S, G, R	
VvNIP4;1	CAO70192	CU459401	Scaffold_184	37269	741	246			NPA	NPA	W, V, A, R	
VvNIP5;1	CAO62847	CU459322	2	3306	897	298			NPS	NPV	A, I, G, R	
VvNIP6;1	CAO45476	CU459286	Scaffold_69	2268	1065	354			NPA	NPV	T, I, A, R	
VvNIP7;1	CAO71103	CU459219	5	1263	882	293			NPS	NPA	G, V, G, R	
CsNIP1;1	—	—	Scaffold000020	1518	831	276			NPA	NPA	W, V, A, R	
CsNIP2;1	—	—	Scaffold002257	4156	867	288			NPA	NPV	G, S, G, R	
CsNIP2;2	—	—	Scaffold001348	2898	786	261			NPA	NPA	C, S, G, R	
CsNIP4;2	—	—	Scaffold000444	3817	810	269			NPA	NPA	W, V, A, R	
CsNIP5;1	—	—	Scaffold000511	4801	897	298			NPS	NPV	A, I, G, R	
CsNIP6;1	—	—	Scaffold000151	2347	915	304			NPA	NPV	T, V, A, R	
CsNIP7;1	—	—	Scaffold000085	1595	603	200			NPA	NPA	A, V, A, R	
galgaNIP	XP_001420576	XM_001420539	12	949	813	270		XM_001420539	NPS	NAA	Y, L, G, R	

Note: The “—” indicates that no accession number was assigned to the corresponding genes in the GenBank database at present. “---” indicates that the corresponding data is

unavailable now. The predicted protein and nucleotide sequences of SbNIPs, PtNIPs, GmNIPs, and VvNIPs were downloaded from JGI (<http://genome.jgi-psf.org>). The *Cucumis sativus* NIPs were personally communicated with the Chinese Academy of Agricultural Sciences. To identify the species of origin for each NIP, a species acronym is included before the protein name: An, *Atriplex nummularia*; At, *Arabidopsis thaliana*; Ca, *Cicer arietinum*; Cp, *Cucurbita pepo*; Cs, *Cucumis sativus*; galga, *Ostreococcus lucimarinus*; Gm, *Glycine max*; Lj, *Lotus japonicus*; Mt, *Medicago truncatula*; Os, *Oryza sativa*; Pit, *Pinus taeda*; Pp, *Physcomitrella patens*; Pt, *Populus trichocarpa*; Sb, *Sorghum bicolor*; Vu, *Vigna unguiculata*; Vv, *Vitis vinifera*; Zm, *Zea mays*.

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**(B) The exon/intron lengths for each *NIP* gene in plants**

NIPs	Exon1	Intron1	Exon2	Intron2	Exon3	Intron3	Exon4	Intron4	Exon5	Intron5	Exon6
OsNIP1;1	146	95	422	184	61	1364	222				
OsNIP1;2	159	931	259	1269	215	85	61	355	213		
OsNIP1;3	164	621	422	1709	61	1366	210				
OsNIP1;4	173	111	419	74	61	110	165				
OsNIP2;1	149	143	224	1606	194	105	61	350	264		
OsNIP2;2	158	159	224	2094	194	113	61	713	255		
OsNIP3;1	41	199	487	651	195						
OsNIP3;2	287	104	419	114	61	234	147				
OsNIP3;3	206	373	419	98	61	122	147				
OsNIP3;5	251	768	389	1303	61	102	147				
OsNIP4;1	173	106	686								
ZmNIP1;1	134	186	422	93	61	728	228				
ZmNIP2;1	143	156	224	1581	194	113	61	370	261		
ZmNIP2;2	158	134	224	2036	194	124	61	98	243		
ZmNIP2;3	167	120	224	1386	194	117	61	564	255		
ZmNIP3;1	224	1598	425	119	61	130	195				
AtNIP1;1	167	113	224	425	218	116	97	105	216		
AtNIP1;2	158	134	224	712	218	138	61	104	219		
AtNIP2;1	146	128	440	81	61	104	216				
AtNIP3;1	194	237	280	80	333						
AtNIP4;1	131	109	224	461	197	664	61	494	234		
AtNIP4;2	131	107	224	135	197	88	61	104	234		
AtNIP5;1	236	1726	419	265	61	78	195				
AtNIP6;1	242	97	224	207	194	78	61	80	192		
AtNIP7;1	140	177	224	237	183	211	72	101	201		
MtNIP2	116	94	230	461	199	357	62	291	208		
PpNIP3;1	231	147	225	151	195	437	62	92	193		

PpNIP5;1	228	207	195	232	61	147	202				
PpNIP5;2	255	227	195	244	61	147	202				
PpNIP5;3	246	195	195	140	61	154	190				
PpNIP6;1	222	205	192	133	61	122	145				
SbNIP1;1	146	521	422	120	61	940	231				
SbNIP1;2	239	108	203	133	61	134	213				
SbNIP1;3	155	455	422	1777	61	77	210				
SbNIP2;1	146	158	224	1753	194	105	61	458	264		
SbNIP2;2	155	277	224	2257	194	129	61	755	249		
SbNIP3;1	221	2865	425	108	61	75	195				
SbNIP3;2	263	95	419	91	61	111	147				
SbNIP3;3	434	146	61	122	144						
SbNIP3;5	683	93	61	94	147						
PtNIP2;1	102	253	225	1465	195	152	61	584	253		
PtNIP4;1	105	120	222	137	198	280	61	105	205		
PtNIP4;2	138	106	222	897	198	79	61	121	220		
PtNIP5;1	209	1877	420	83	61	1147	209				
PtNIP5;2	225	2102	420	245	61	555	196				
PtNIP6;1	225	117	224	90	195	628	61	664	205		
PtNIP6;2	225	122	225	89	195	1167	61	559	205		
PtNIP7;1	24	588	225	96	195	736	61	105	223		
GmNIP1;1	44	460	224	371	243	2356	3	164	213		
GmNIP1;3	116	462	224	376	197	1443	61	124	213		
GmNIP1;4	116	181	224	619	197	345	61	247	222		
GmNIP1;5	116	224	224	470	197	350	61	248	210		
GmNIP1;6	125	608	224	145	197	339	61	177	210		
GmNIP2;1	155	373	224	3068	194	208	61	225	249		
GmNIP2;2	143	2926	194	222	61	224	249				
GmNIP3;1	221	4252	431	74	61	76	195				

