Table S1. Primers used in this study.

Primer name	Primer sequence
TaOTU6-B-F	AGCCCACACCCACAACCTGACG
TaOTU6-B-R	CGTTGTGCTAGAGCACACTTACAAC
GFP-F	TAGCCATGGTAGATCTGATGGGCGACGCGCCCCCGCC
GFP-R	GCCTTACGTAACTAGTCTTTGGGTAGAGAATATCAT
TaOTU6-B-qRCR-F	ACAGTGCAAGAAGACACTTTCG
TaOTU6-B-qPCR-R	TCAGAAGTCGTTTGATCCCTGG
TaActin-qPCR-F	ACCTTCAGTTGCCCAGCAAT
TaActin-qPCR-R	CAGAGTCGAGCACAATACCAGTTG
TaOTU6-MT1-BSF	CGCTTGCTGCATCAGACTTGTCTGCTGCTAAGGCGGAGAGGTT
TaOTU6-MT1-F0	GTCTGCTGCTAAGGCGGAGAGGTTTTAGAGCTAGAAATAGC
TaOTU6-MT2-R0	GTAAAATGGGGCTGCCAGACCGCTTCTTGGTGCC
TaOTU6-MT2-BSR	TGCTATTTCTAGCTCTAAAACGTAAAATGGGGCTGCCAGACC
TaUBC13-F	CGCACTCATCGGAGAGGAGC
TaUBC13-R	ATCAGTCAGAAGGTGCCCCAGGGC
AD-TaOTU6-B-F	GCCATGGAGGCCAGTGAATTCATGGGCGACGCGCCCCCGCC
AD-TaOTU6-B-R	CAGCTCGAGCTCGATGGATCCTCACTTTGGGTAGAGAATAT
BD-TaUBC13-F	ATGGCCATGGAGGCCGAATTCATGGCCAACAGCAACCTTCC
BD-TaUBC13-R	ATGCGCCGCTGCAGGTCGACTCATGCACCACTGGCATACA
N-BiFC-TaOTU6-B-F	ATCTCGAGCTCAAGCTTCGAAATGGGCGACGCGCCCCCGCC
N-BiFC-TaOTU6-B-R	CCGTCGACTGCAGAATTCGAATCACTTTGGGTAGAGAATAT
C-BiFC-TaUBC13-B-F	ATCTCGAGCTCAAGCTTCGAAATGGCCAACAGCAACCTTCC
C-BiFC-TaUBC13-B-R	CCGTCGACTGCAGAATTCGAATCATGCACCACTGGCATACA
N-LUC-TaOTU6-B-F	AACACGGGGGACGAGCTCGGTACCATGGGCGACGCGCCCCCGCC
N-LUC-TaOTU6-B-R	CGTACGAGATCTGGTCGACCTTTGGGTAGAGAATATCAT
C-LUC-TaUBC13-B-F	TCGTACGCGTCCCGGGGCGGTACCATGGCCAACAGCAACCTTCC
C-LUC-TaUBC13-B-R	GAAAGCTCTGCAGGTCGACTCATGCACCACTGGCATACA
TaUBC13-qRCR-F	CGAAGGGGGAGTTTTTAAGCTGG
TaUBC13-qPCR-R	GGAGTGCCTGGATACTCAAAAGAAC

Table S2. The *OTU* genes identified in wheat.

Gene name	EnsemblPlants ID	Chromosome Location	OTU Domain	Peptidase C65 Domain	Gene length (bp)	CDS length (bp)	Amino acid Size (aa)	pI	MW (kDa)	Grand average of hydropathicity (GRAVY)	Subcellular location
TaOTU1	TraesCS2A02G290200.1	chr2A:500028064-500034221 reverse	78-209		1464	684	227	8.95	26.38	-0.646	Cytoplasm
TaOTU2	TraesCS2A02G295900.1	chr2A:509070654-509076530 forward	240-366		2157	1626	541	5.1	59.24	-0.708	Cytoplasm. Extracell.
TaOTU3	TraesCS2A02G545500.2	chr2A:754352926-754357126 forward	44-168		1749	1335	444	5.91	48.42	-0.668	Cytoplasm
TaOTU4	TraesCS2B02G306700.1	chr2B:438928546-438934193 reverse	111-242		783	783	260	8.96	29.83	-0.517	Cytoplasm
TaOTU5	TraesCS2B02G312300.1	chr2B:447740481-447746471 forward	240-366		2170	1626	541	5.06	59.26	-0.71	Extracell.
TaOTU6	TraesCS2B02G573400.1	chr2B:763315590-763321950 reverse	145-191		933	933	310	8.54	34.1	-0.503	Extracell.
TaOTU7	TraesCS2B02G576000.2	chr2B:765063856-765068560 forward	44-168		1735	1338	445	6	48.55	-0.652	Cytoplasm
TaOTU8	TraesCS2D02G288100.1	chr2D:369375327-369381038 reverse	103-234		1275	759	252	8.83	29.13	-0.525	Cytoplasm
TaOTU9	TraesCS2D02G293800.1	chr2D:376318012-376324673 forward	240-366		2167	1632	543	5.1	59.38	-0.706	Extracell.
TaOTU10	TraesCS2D02G546400.1	chr2D:622917774-622922075 forward	44-168		1727	1335	444	6.19	48.36	-0.664	Cytoplasm
TaOTU11	TraesCS3A02G394700.2	chr3A:642158665-642160126 forward	10-146		480	480	159	9.01	18.12	-0.682	Cytoplasm
TaOTU12	TraesCS3A02G465600.2	chr3A:699765633-699769363 reverse		94-315	1075	990	329	8.65	38.08	-0.512	Cytoplasm
TaOTU13	TraesCS3B02G426700.1	chr3B:665257060-665259565 forward	9-145		1289	477	158	9.01	18.02	-0.646	Cytoplasm
TaOTU14	TraesCS3B02G509600.1	chr3B:753675363-753678987 reverse		166-398	1239	1239	412	5.63	44.27	-0.464	Extracell.
TaOTU15	TraesCS3D02G388500.2	chr3D:503856663-503858513 forward	8-140		713	504	167	8.96	19.05	-0.516	Cytoplasm
TaOTU16	TraesCS3D02G460600.1	chr3D:565559751-565563768 reverse		180-419	1682	1284	427	6.26	47.03	-0.532	Extracell.
TaOTU17	TraesCS3D02G460800.1	chr3D:565606835-565610080 reverse		97-318	999	999	332	8.89	38.33	-0.528	Cytoplasm
TaOTU18	TraesCS4A02G091800.1	chr4A:98588423-98597502 reverse	63-219		844	660	219	9.24	24.75	-0.428	Cytoplasm
TaOTU19	TraesCS4A02G315200.2	chr4A:605640606-605646822 forward	202-333		1077	1077	358	5.13	39.82	-0.424	Cytoplasm
TaOTU20	TraesCS4B02G212700.1	chr4B:450917364-450932365 reverse	63-219		1170	660	219	9.24	24.84	-0.357	Cytoplasm
TaOTU21	TraesCS4D02G213700.1	chr4D:366326021-366334516 reverse	63-219		660	660	219	9.24	24.75	-0.424	Cytoplasm
TaOTU22	TraesCS5A02G066300.1	chr5A:73833710-73837490 reverse	167-322		1465	984	327	6.22	35.94	-0.785	Cytoplasm.
TaOTU23	TraesCS5A02G264600.1	chr5A:476758909-476760574 forward	162-298		933	933	310	9.04	34.26	-0.421	Cytoplasm. Extracell.
TaOTU24	TraesCS5A02G446200.1	chr5A:626084116-626089018 reverse	162-299		1309	912	303	8.48	33.91	-0.446	Cytoplasm
TaOTU25	TraesCS5B02G073000.1	chr5B:86255344-86259246 reverse	163-318		1403	972	323	6.01	35.76	-0.828	Cytoplasm
TaOTU26	TraesCS5B02G264100.2	chr5B:448302818-448306434 forward	162-324		1548	1011	336	9.08	37.25	-0.376	Cytoplasm
TaOTU27	TraesCS5B02G451200.1	chr5B:622628358-622630953 forward	162-299		1205	912	303	8.47	33.69	-0.39	Cytoplasm
TaOTU28	TraesCS5B02G564100.1	chr5B:709582596-709589096 reverse	206-337		1404	1089	362	5.32	40.41	-0.461	Cytoplasm
TaOTU29	TraesCS5D02G077300.1	chr5D:77053388-77058199 reverse	163-318		1490	972	323	6.22	35.7	-0.802	Cytoplasm
TaOTU30	TraesCS5D02G272600.1	chr5D:375451652-375454289 forward	168-304		1155	951	316	8.67	34.94	-0.376	Cytoplasm. Extracell.
TaOTU31	TraesCS5D02G454000.1	chr5D:501149911-501153222 forward	162-299		1390	912	303	8.66	33.74	-0.373	Cytoplasm.Nucleus.
TaOTU32	TraesCS5D02G550400.2	chr5D:556996777-557002448 forward	202-333		1351	1077	358	5.14	40.06	-0.451	Cytoplasm
TaOTU33	TraesCS6A02G138500.1	chr6A:109492382-109496378 forward	3-166		1155	627	208	5.05	23.13	-0.387	Cytoplasm
TaOTU34	TraesCS6A02G143100.1	chr6A:119609495-119613763 reverse	76-207		1188	675	224	8.21	25.64	-0.659	Cytoplasm
TaOTU35	TraesCS6A02G394800.1	chr6A:608077809-608082444 reverse	142-273		1684	897	298	5.43	34.66	-0.842	Cytoplasm.Extracell.
TaOTU36	TraesCS6B02G167000.1	chr6B:174968851-174972654 forward	3-166		1120	627	208	5.07	23.18	-0.374	Cytoplasm
TaOTU37	TraesCS6B02G171300.1	chr6B:183716203-183720816 reverse	76-207		1172	693	230	8.85	26.12	-0.59	Cytoplasm
TaOTU38	TraesCS6B02G434700.5	chr6B:703152543-703157549 reverse	142-257		3086	927	308	4.89	35.43	-0.631	Extracell.
TaOTU39	TraesCS6D02G127500.1	chr6D:91077954-91081760 forward	3-166		1277	627	208	5.07	23.18	-0.374	Cytoplasm
TaOTU40	TraesCS6D02G380100.2	chr6D:461391468-461398741 reverse	173-304		1484	990	329	5.73	38.26	-0.709	Cytoplasm.Extracell.
TaOTU41	TraesCS7A02G263900.1	chr7A:262459898-262464225 reverse	65-317		1502	960	319	4.62	35.38	-0.391	Cytoplasm
TaOTU42	TraesCS7A02G470800.1	chr7A:666986256-666990193 forward	79-210		1270	684	227	8.6	26.24	-0.628	Cytoplasm
TaOTU43	TraesCS7B02G157400.1	chr7B:212776017-212780309 forward		177-408	1441	1233	410	4.56	45.53	-0.473	Extracell.
TaOTU44	TraesCS7B02G161900.2	chr7B:222300313-222304702 reverse	65-317		1596	960	319	4.62	35.38	-0.426	Cytoplasm
TaOTU45	TraesCS7B02G231500.1	chr7B:434360614-434364738 reverse		183-410	1348	1242	413	4.5	45.7	-0.526	Extracell.
TaOTU46	TraesCS7B02G372600.1	chr7B:638485451-638489190 forward	79-210		980	684	227	8.81	26.28	-0.622	Cytoplasm
TaOTU47	TraesCS7D02G264800.1	chr7D:246023581-246028882 reverse	65-317		1511	960	319	4.62	35.46	-0.407	Cytoplasm
TaOTU48	TraesCS7D02G327300.1	chr7D:418052094-418057181 reverse		49-281	1308	855	284	4.68	32.91	-0.296	Cytoplasm
TaOTU49	TraesCS7D02G458200.1	chr7D:576173719-576177698 forward	79-210		1295	684	227	8.81	26.26	-0.632	Cytoplasm

Table S3. The homologous name of the *TaOTU* genes.

Gene name	Homologous gene name
TaOTU1	TaOTU15-2A
TaOTU2	TaOTU3-2A
TaOTU3	TaOTU1-2A
TaOTU4	TaOTU15-2B
TaOTU5	TaOTU3-2B
TaOTU6	TaOTU12-2B
TaOTU7	TaOTU1-2B
TaOTU8	TaOTU15-2D
TaOTU9	TaOTU3-2D
TaOTU10	TaOTU1-2D
TaOTU11	TaOTU9-3A
TaOTU12	TaOTU4-3A
TaOTU13	TaOTU9-3B
TaOTU14	TaOTU4-3B
TaOTU15	TaOTU9-3D
TaOTU16	TaOTU4-3D1
TaOTU17	TaOTU4-3D2
TaOTU18	TaOTU8-4A
TaOTU19	TaOTU13-4A
TaOTU20	TaOTU8-4B
TaOTU21	TaOTU8-4D
TaOTU22	TaOTU7-5A
TaOTU23	TaOTU10-5A
TaOTU24	TaOTU11-5A
TaOTU25	TaOTU7-5B
TaOTU26	TaOTU10-5B
TaOTU27	TaOTU11-5B
TaOTU28	TaOTU13-5B
TaOTU29	TaOTU7-5D
TaOTU30	TaOTU10-5D
TaOTU31	TaOTU11-5D
TaOTU32	TaOTU13-5D
TaOTU33	TaOTU2-6A
TaOTU34	TaOTU16-6A
TaOTU35	TaOTU14-6A
TaOTU36	TaOTU2-6B
TaOTU37	TaOTU16-6B
TaOTU38	TaOTU14-6B
TaOTU39	TaOTU2-6D
TaOTU40	TaOTU14-6D
TaOTU41	TaOTU6-7A
TaOTU42	TaOTU17-7A
TaOTU43	TaOTU5-7B2
TaOTU44	TaOTU6-7B
TaOTU45	TaOTU5-7B1
TaOTU46	TaOTU17-7B

TaOTU47	TaOTU6-7D
TaOTU48	TaOTU5-7D
TaOTU49	TaOTU17-7D

Table S4. Identification of *OTU* family genes in other species.

Species	Gene name	Gene ID	Transcript ID	chr	start	end	strand
Arabidopsis thaliana	AtOTU1	AT2G28120	AT2G28120.1	2	11985687	11987836	forward
	AtOTU2	AT1G50670	AT1G50670.1	1	18774805	18777012	reverse
	AtOTU3	AT2G38025	AT2G38025.1	2	15914958	15916807	reverse
	AtOTU4	AT3G57810	AT3G57810.1	3	21415760	21417948	forward
	AtOTU5	AT3G62940	AT3G62940.1	3	23262795	23264709	reverse
	AtOTU6	AT2G27350	AT2G27350.1	2	11699569	11704232	reverse
	AtOTU7	AT5G67170	AT5G67170.1	5	26799766	26802067	forward
	AtOTU8	AT2G39320	AT2G39320.1	2	16417477	16418517	reverse
	AtOTU9	AT5G04250	AT5G04250.1	5	1176008	1179008	forward
	AtOTU10	AT5G03330	AT5G03330.1	5	806964	810401	forward
	AtOTU11	AT3G22260	AT3G22260.1	3	7870836	7873597	forward
	AtOTU12	AT3G02070	AT3G02070.1	3	360921	363775	forward
Oryza sativa	OsOTU1	Os08t0537800	Os08t0537800-01	8	26883126	26887362	reverse
	OsOTU2	Os04t0414100	Os04t0414100-01	4	20457962	20462940	forward
	OsOTU3	Os04t0670400	Os04t0670400-02	4	34201068	34205659	reverse
	OsOTU4	Os04t0402300	Os04t0402300-00	4	19933241	19937491	forward
	OsOTU5	Os02t0168600	Os02t0168600-01	2	3705886	3709904	reverse
	OsOTU6	Os06t0669800	Os06t0669800-01	6	27743193	27747053	forward
	OsOTU7	Os02t0819500	Os02t0819500-01	2	35179248	35184150	reverse
	OsOTU8	Os03t0859800	Os03t0859800-01	3	36286355	36289213	reverse
	OsOTU9	Os04t0619500	Os04t0619500-01	4	31474399	31477315	forward
	OsOTU10	Os02t0164800	Os02t0164800-01	2	3473348	3474123	forward
	OsOTU11	Os01t0900900	Os01t0900900-01	1	39216719	39218757	reverse
	OsOTU12	Os08t0506000	Os08t0506000-01	8	25023316	25026380	forward
	OsOTU13	Os09t0487700	Os09t0487700-01	9	18805788	18808713	forward
	OsOTU14	Os03t0266000	Os03t0266000-01	3	8790747	8795463	forward
	OsOTU15	Os02t0521500	Os02t0521500-00	2	19011509	19012299	forward
	OsOTU16	Os02t0521600	Os02t0521600-00	2	19018861	19020302	forward
	OsOTU17	Os02t0522700	Os02t0522700-01	2	19058884	19063009	forward
	OsOTU18	Os02t0513800	Os02t0513800-01	2	18501234	18509632	reverse
	OsOTU19	Os03t0589300	Os03t0589300-01	3	21784848	21791170	reverse
	OsOTU20	Os04t0652600	Os04t0652600-01	4	33245194	33251252	forward
Zea mays	ZmOTU1	Zm00001eb421610	Zm00001eb421610_T002	10	115128554	115133359	reverse
	ZmOTU2	Zm00001eb233000	Zm00001eb233000_T001	5	86095399	86099165	reverse
	ZmOTU3	Zm00001eb210360	Zm00001eb210360_T002	5	908373	911787	forward
	ZmOTU4	Zm00001eb259070	Zm00001eb259070_T001	5	224369930	224373267	reverse
	ZmOTU5	Zm00001eb212540	Zm00001eb212540_T001	5	3805738	3809356	forward
	ZmOTU6	Zm00001eb389980	Zm00001eb389980_T001	9	115674470	115684495	forward
	ZmOTU7	Zm00001eb011830	Zm00001eb011830_T001	1	38545775	38550093	forward
	ZmOTU8	Zm00001eb034890	Zm00001eb034890_T001	1	192174559	192178199	forward
	ZmOTU9	Zm00001eb421980	Zm00001eb421980_T001	10	117016687	117023205	forward
	ZmOTU10	Zm00001eb101860	Zm00001eb101860_T001	2	194854038	194856872	forward
	ZmOTU11	Zm00001eb066800	Zm00001eb066800_T001	2	2825553	2830197	forward
	ZmOTU12	Zm00001eb083750	Zm00001eb083750_T001	2	58261499	58267294	reverse
	ZmOTU13	Zm00001eb144440	Zm00001eb144440_T001	3	171116329	171118732	forward
	ZmOTU14	Zm00001eb423140	Zm00001eb423140_T001	10	121695449	121698631	reverse

Hordeum vulgare	HvOTU1	HORVU.MOREX.r3.5HG0490710	HORVU.MOREX.r3.5HG0490710.1	5H	477497213	477500093	forward
	HvOTU2	HORVU.MOREX.r3.5HG0537310	HORVU.MOREX.r3.5HG0537310.1	5H	585327186	585333798	reverse
	HvOTU3	HORVU.MOREX.r3.5HG0520520	HORVU.MOREX.r3.5HG0520520.1	5H	550199338	550202696	forward
	HvOTU4	HORVU.MOREX.r3.2HG0166630	HORVU.MOREX.r3.2HG0166630.1	2H	464172729	464178457	forward
	HvOTU5	HORVU.MOREX.r3.6HG0630050	HORVU.MOREX.r3.6HG0630050.1	6H	554553589	554558252	reverse
	HvOTU6	HORVU.MOREX.r3.6HG0566290	HORVU.MOREX.r3.6HG0566290.1	6H	100544275	100548169	forward
	HvOTU7	HORVU.MOREX.r3.2HG0164950	HORVU.MOREX.r3.2HG0164950.2	2H	451457433	451468717	reverse
	HvOTU8	HORVU.MOREX.r3.7HG0685210	HORVU.MOREX.r3.7HG0685210.1	7H	214391937	214396259	reverse
	HvOTU9	HORVU.MOREX.r3.5HG0438100	HORVU.MOREX.r3.5HG0438100.1	5H	63300255	63304038	reverse
	HvOTU10	HORVU.MOREX.r3.3HG0315190	HORVU.MOREX.r3.3HG0315190.1	3H	587173969	587177592	reverse
	HvOTU11	HORVU.MOREX.r3.6HG0567490	HORVU.MOREX.r3.6HG0567490.1	6H	108399325	108403287	reverse
	HvOTU12	HORVU.MOREX.r3.7HG0708360	HORVU.MOREX.r3.7HG0708360.1	7H	449354461	449360193	reverse
	HvOTU13	HORVU.MOREX.r3.6HG0548160	HORVU.MOREX.r3.6HG0548160.1	6H	20527789	20532754	reverse
	HvOTU14	HORVU.MOREX.r3.3HG0305280	HORVU.MOREX.r3.3HG0305280.1	3H	558346567	558348488	forward
	HvOTU15	HORVU.MOREX.r3.4HG0389480	HORVU.MOREX.r3.4HG0389480.1	4H	484425963	484431084	reverse
	HvOTU16	HORVU.MOREX.r3.7HG0736920	HORVU.MOREX.r3.7HG0736920.1	7H	596855823	596859538	forward
	HvOTU17	HORVU.MOREX.r3.2HG0212580	HORVU.MOREX.r3.2HG0212580.1	2H	652053061	652058380	reverse
Sorghum bicolor	SbOTU1	SORBI_3001G426300	EER95126	1	70583682	70586502	reverse
	SbOTU2	SORBI_3001G047100	EER90693	1	3467542	3472283	forward
	SbOTU3	SORBI_3001G003000	EER90465	1	270920	275933	forward
	SbOTU4	SORBI_3002G246500	KXG35901	2	63463969	63467096	forward
	SbOTU5	SORBI_3003G391200	OQU88052	3	70243043	70245195	reverse
	SbOTU6	SORBI_3004G010600	OQU84203	4	878232	881276	reverse
	SbOTU7	SORBI_3004G347800	OQU85964	4	67706028	67708680	reverse
	SbOTU8	SORBI_3004G051700	EES04574	4	4167282	4171364	forward
	SbOTU9	SORBI_3004G158500	KXG30290	4	50471908	50476470	reverse
	SbOTU10	SORBI_3004G054300	EES06337	4	4410651	4414587	reverse
	SbOTU11	SORBI_3006G260600	KXG27396	6	59577136	59580228	reverse
	SbOTU12	SORBI_3006G073200	KXG26267	6	43572712	43578266	forward
	SbOTU13	SORBI_3006G062800	OQU81468	6	42003777	43008785	forward
	SbOTU14	SORBI_3007G211300	OQU80947	7	64028382	64032659	reverse
	SbOTU15	SORBI_3007G189000	OQU80811	7	62166848	62174483	forward
	SbOTU16	SORBI_3010G223900	EER88792	10	56567398	56571947	forward
Setaria italica	SiOTU1	SETIT_017945	KQL32143	1	41517383	41521144	reverse
	SiOTU2	SETIT_018275	KQL28567	1	6741146	6744841	forward
	SiOTU3	SETIT_018240	KQL28609	1	7009232	7012540	reverse
	SiOTU4	SETIT_030622	KQL25042	2	35558344	35560937	forward
	SiOTU5	SETIT_024571	KQL12990	3	1992387	1995498	reverse
	SiOTU6	SETIT_007228	KQL12047	4	38454350	38458547	reverse
	SiOTU7	SETIT_036442	KQK86075	1X	183928	186775	forward
	SiOTU8	SETIT_036633	KQK86545	1X	2559010	2562312	forward
	SiOTU9	SETIT_037866	KQK91536	1X	50431550	50433618	forward
	SiOTU10	SETIT_003132	KQL08168	5	43916735	43918783	reverse
	SiOTU11	SETIT_013636	KQL02700	6	34058357	34063456	reverse
	SiOTU12	SETIT_014172	KQL02422	6	32419659	32422532	forward
	SiOTU13	SETIT_009769	KQK97201	7	19577476	19582015	forward
	SiOTU14	SETIT_010273	KQK97080	7	18837897	18843526	forward

Table S5. Duplication events of *TaOTUs* in wheat genome.

EnsemblPlants ID	Gene name	Chr.	Start	End	EnsemblPlants ID	Gene name	Chr.	Start	End	Ka	Ks	Ka_Ks	P-Value (Fisher)	Duplications
TraesCS2A02G290200.1	TaOTU15-2A	2A	500028064	500034221	TraesCS2B02G306700.1	TaOTU15-2B	2B	438928546	438934193	0.005681845	0.054944469	0.103410689	6.00E-173	Segmental
TraesCS2A02G295900.1	TaOTU3-2A	2A	509070654	509076530	TraesCS2B02G312300.1	TaOTU3-2B	2B	447740481	447746471	0.008128509	0.048134136	0.16887202	0	Segmental
TraesCS2A02G545500.2	TaOTU1-2A	2A	754352926	754357126	TraesCS2B02G576000.2	TaOTU1-2B	2B	765063856	765068214	0.019503781	0.117961766	0.16533985	0	Segmental
TraesCS2B02G306700.1	TaOTU15-2B	2B	438928546	438934193	TraesCS2D02G288100.1	TaOTU15-2D	2D	369375327	369381038	0.019327063	0.041126799	0.469938429	0	Segmental
TraesCS2B02G312300.1	TaOTU3-2B	2B	447740481	447746471	TraesCS2D02G293800.1	TaOTU3-2D	2D	376318012	376324673	0.008538992	0.049483183	0.172563508	0	Segmental
TraesCS2B02G576000.2	TaOTU1-2B	2B	765063856	765068214	TraesCS2D02G546400.1	TaOTU1-2D	2D	622917774	622922075	0.012644164	0.105308628	0.120067692	0	Segmental
TraesCS2D02G288100.1	TaOTU15-2D	2D	369375327	369381038	TraesCS2A02G290200.1	TaOTU15-2A	2A	500028064	500034221	0.003780726	0.06224769	0.060736814	3.00E-174	Segmental
TraesCS2D02G293800.1	TaOTU3-2D	2D	376318012	376324673	TraesCS2A02G295900.1	TaOTU3-2A	2A	509070654	509076530	0.004054886	0.045316913	0.089478421	0	Segmental
TraesCS2D02G546400.1	TaOTU1-2D	2D	622917774	622922075	TraesCS2A02G545500.2	TaOTU1-2A	2A	754352926	754357126	0.010669433	0.078925803	0.135183079	0	Segmental
TraesCS3A02G394700.2	TaOTU9-3A	3A	642158665	642160126	TraesCS3B02G426700.1	TaOTU9-3B	3B	665257060	665259565	0.005633829	0.099845085	0.056425705	2.00E-114	Segmental
TraesCS3A02G465600.2	TaOTU4-3A	3A	699765633	699769363	TraesCS3B02G509600.1	TaOTU4-3B	3B	753675363	753678987	0.195590487	0.236768867	0.826081951	2.00E-138	Segmental
TraesCS3B02G426700.1	TaOTU9-3B	3B	665257060	665259565	TraesCS3D02G388500.2	TaOTU9-3D	3D	503857338	503858513	0.05688511	0.277280943	0.205153335	1.00E-102	Segmental
TraesCS3D02G388500.2	TaOTU9-3D	3D	503857338	503858513	TraesCS3A02G394700.2	TaOTU9-3A	3A	642158665	642160126	0.064897174	0.219082593	0.296222412	3.00E-101	Segmental
TraesCS3D02G460600.1	TaOTU4-3D1	3D	565559751	565563768	TraesCS3A02G465600.2	TaOTU4-3A	3A	699752856	699756783	0.020921859	0.049741982	0.42060766	0	Segmental
TraesCS4A02G091800.1	TaOTU8-4A	4A	98588423	98597502	TraesCS4B02G212700.1	TaOTU8-4B	4B	450917364	450932365	0.00818004	0.110589548	0.07396757	8.00E-159	Segmental
TraesCS4A02G315200.2	TaOTU13-4A	4A	605640606	605646822	TraesCS5D02G550400.2	TaOTU13-5D	5D	556996777	557002448	0.018680916	0.089415638	0.208922247	0	Segmental
TraesCS4B02G212700.1	TaOTU8-4B	4B	450917364	450932365	TraesCS4D02G213700.1	TaOTU8-4D	4D	366326021	366334516	0.010249562	0.069450215	0.147581424	1.00E-157	Segmental
TraesCS4D02G213700.1	TaOTU8-4D	4D	366326021	366334516	TraesCS4A02G091800.1	TaOTU8-4A	4A	98588423	98597502	0.002034589	0.083330015	0.024416043	1.00E-161	Segmental
TraesCS5A02G066300.1	TaOTU7-5A	5A	73833710	73837490	TraesCS5B02G073000.1	TaOTU7-5B	5B	86255344	86259246	0.009457455	0.089942152	0.105150416	0	Segmental
TraesCS5A02G264600.1	TaOTU10-5A	5A	476758909	476760574	TraesCS5B02G264100.2	TaOTU10-5B	5B	448302818	448306434	0.036173376	0.080742187	0.448010855	0	Segmental
TraesCS5A02G446200.1	TaOTU11-5A	5A	626084116	626089018	TraesCS5B02G451200.1	TaOTU11-5B	5B	622628358	622630953	0.01676251	0.101851156	0.164578495	0	Segmental
TraesCS5B02G073000.1	TaOTU7-5B	5B	86255344	86259246	TraesCS5D02G077300.1	TaOTU7-5D	5D	77053388	77058199	0.009453197	0.046062056	0.205227432	0	Segmental
TraesCS5B02G264100.2	TaOTU10-5B	5B	448302818	448306434	TraesCS5D02G272600.1	TaOTU10-5D	5D	375451652	375454289	0.040408955	0.092537158	0.436678146	0	Segmental
TraesCS5B02G451200.1	TaOTU11-5B	5B	622628358	622630953	TraesCS5D02G454000.1	TaOTU11-5D	5D	501149911	501153222	0.027958117	0.103783714	0.269388289	0	Segmental
TraesCS5D02G077300.1	TaOTU7-5D	5D	77053388	77058199	TraesCS5A02G066300.1	TaOTU7-5A	5A	73833710	73837490	0.008110014	0.079575737	0.10191566	0	Segmental
TraesCS5D02G272600.1	TaOTU10-5D	5D	375451652	375454289	TraesCS5A02G264600.1	TaOTU10-5A	5A	476758909	476760574	0.044333563	0.088548932	0.500667398	0	Segmental
TraesCS5D02G454000.1	TaOTU11-5D	5D	501149911	501153222	TraesCS5A02G446200.1	TaOTU11-5A	5A	626084116	626089018	0.027218875	0.14444483	0.188437864	0	Segmental
TraesCS5D02G550400.2	TaOTU13-5D	5D	556996777	557002448	TraesCS4A02G315200.2	TaOTU13-4A	4A	605640606	605646822	0.018680916	0.089415638	0.208922247	0	Segmental
TraesCS6A02G138500.1	TaOTU2-6A	6A	109492382	109496378	TraesCS6B02G167000.1	TaOTU2-6B	6B	174968851	174972654	0.006283856	0.072564106	0.086597304	5.00E-156	Segmental
TraesCS6A02G143100.1	TaOTU16-6A	6A	119609495	119613763	TraesCS6B02G171300.1	TaOTU16-6B	6B	119609495	119613763	0.038459247	0.097192895	0.395700193	1.00E-158	Segmental
TraesCS6A02G394800.1	TaOTU14-6A	6A	608077809	608082444	TraesCS6B02G434700.5	TaOTU14-6B	6B	703152543	703157536	0.064363937	0.203244795	0.316681849	0	Segmental
TraesCS6D02G127500.1	TaOTU2-6D	6D	91077954	91081760	TraesCS6A02G138500.1	TaOTU2-6A	6A	109492382	109496378	0.006283856	0.072564106	0.086597304	5.00E-156	Segmental
TraesCS6D02G380100.2	TaOTU14-6D	6D	461393517	461396718	TraesCS6A02G394800.1	TaOTU14-6A	6A	608077809	608082444	0.005725219	0.088012952	0.065049728	0	Segmental
TraesCS7A02G263900.1	TaOTU6-7A	7A	262459898	262464225	TraesCS7B02G161900.2	TaOTU6-7B	7B	222300313	222304702	0.00550335	0.040641997	0.135410415	0	Segmental
TraesCS7A02G470800.1	TaOTU17-7A	7A	666986256	666990193	TraesCS7B02G372600.1	TaOTU17-7B	7B	638485451	638489190	0.005686333	0.129429647	0.043933773	1.00E-170	Segmental
TraesCS7B02G161900.2	TaOTU6-7B	7B	222300313	222304702	TraesCS7D02G264800.1	TaOTU6-7D	7D	246023581	246028882	0.008265495	0.069146826	0.119535424	0	Segmental
TraesCS7B02G372600.1	TaOTU17-7B	7B	638485451	638489190	TraesCS7D02G458200.1	TaOTU17-7D	7D	576173719	576177698	0.007588998	0.153539463	0.049427016	6.00E-171	Segmental
TraesCS7D02G264800.1	TaOTU6-7D	7D	246023581	246028882	TraesCS7A02G263900.1	TaOTU6-7A	7A	262459898	262464225	0.008265495	0.036083622	0.229065012	0	Segmental
TraesCS7D02G458200.1	TaOTU17-7D	7D	576173719	576177698	TraesCS7A02G470800.1	TaOTU17-7A	7A	666986256	666990193	0.005671105	0.122870231	0.046155236	1.00E-171	Segmental

Table S6. Synteny analysis among wheat, rice and barley.

EnsemblPlants ID	Gene name	Chr.	Start	End	EnsemblPlants ID	Gene name	Chr.	Start	End	Ka	Ks	Ka/KS	Duplications
TraesCS2A02G295900.1	TaOTU3-2A	2A	509070654	509076530	AT2G27350.3	AtOTU6	2	11699549	11704238	0.30030292	2.792555	0.107536976	WGD or Segmental
TraesCS2B02G312300.1	TaOTU3-2B	2B	447740481	447746471	AT2G27350.3	AtOTU6	2	11699549	11704238	0.30094757	2.8792333	0.104523508	WGD or Segmental
TraesCS2D02G293800.1	TaOTU3-2D	2D	376318012	376324673	AT2G27350.3	AtOTU6	2	11699549	11704238	0.30097353	2.889333	0.104167132	WGD or Segmental
TraesCS5A02G264600.1	TaOTU10-5A	5A	476758909	476760574	AT3G57810.3	AtOTU4	3	21415760	21417948	0.47101926	2.9725554	0.158456006	WGD or Segmental
TraesCS5B02G264100.2	TaOTU10-5B	5B	448302818	448306434	AT3G57810.3	AtOTU4	3	21415760	21417948	0.4636056	2.488545	0.186295848	WGD or Segmental
TraesCS5D02G272600.1	TaOTU10-5D	5D	375451652	375454289	AT3G57810.3	AtOTU4	3	21415760	21417948	0.50635085	2.21265882	0.228842716	WGD or Segmental
TraesCS2A02G290200.1	TaOTU15-2A	2A	500028064	500034221	Os04t0402300-00	OsOTU4	4	19933241	19937491	0.03194031	0.58808922	0.054312015	WGD or Segmental
TraesCS2A02G295900.1	TaOTU3-2A	2A	509070654	509076530	Os04t0414100-01	OsOTU2	4	20457962	20462940	0.08543567	0.65656916	0.130124408	WGD or Segmental
TraesCS2B02G306700.1	TaOTU15-2B	2B	438928546	438934193	Os04t0402300-00	OsOTU4	4	19933241	19937491	0.03690065	0.51336684	0.071879684	WGD or Segmental
TraesCS2B02G312300.1	TaOTU3-2B	2B	447740481	447746471	Os04t0414100-01	OsOTU2	4	20457962	20462940	0.08907543	0.60319065	0.147673756	WGD or Segmental
TraesCS2D02G288100.1	TaOTU15-2D	2D	369375327	369381038	Os04t0402300-00	OsOTU4	4	19933241	19937491	0.0338986	0.50850882	0.066662765	WGD or Segmental
TraesCS2D02G293800.1	TaOTU3-2D	2D	376318012	376324673	Os04t0414100-01	OsOTU2	4	20457962	20462940	0.08743723	0.61166746	0.142948961	WGD or Segmental
TraesCS3A02G394700.2	TaOTU9-3A	3A	642158665	642160126	Os01t0900900-01	OsOTU11	1	39216719	39218757	0.05927811	0.87810644	0.067506746	WGD or Segmental
TraesCS3B02G426700.1	TaOTU9-3B	3B	665257060	665259565	Os01t0900900-01	OsOTU11	1	39216719	39218757	0.05910571	0.7630592	0.077458874	WGD or Segmental
TraesCS3D02G388500.2	TaOTU9-3D	3D	503857338	503858513	Os01t0900900-01	OsOTU11	1	39216719	39218757	0.11845731	1.08505348	0.109171863	WGD or Segmental
TraesCS4A02G091800.1	TaOTU8-4A	4A	98588423	98597502	Os03t0266000-01	OsOTU14	3	8790747	8795463	0.07682617	0.60703397	0.126559917	WGD or Segmental
TraesCS4A02G315200.2	TaOTU13-4A	4A	605640606	605646822	Os03t0859800-01	OsOTU8	3	36286355	36289213	0.20322376	0.7851986	0.258818289	WGD or Segmental
TraesCS4B02G212700.1	TaOTU8-4B	4B	450917364	450932365	Os03t0266000-01	OsOTU14	3	8790747	8795463	0.09023746	0.65201438	0.138397952	WGD or Segmental
TraesCS4D02G213700.1	TaOTU8-4D	4D	366326021	366334516	Os03t0266000-01	OsOTU14	3	8790747	8795463	0.0802905	0.63961276	0.125529854	WGD or Segmental
TraesCS5A02G264600.1	TaOTU10-5A	5A	476758909	476760574	Os09t0487700-01	OsOTU13	9	18805788	18808713	0.1868975	0.60683657	0.307986549	WGD or Segmental
TraesCS5A02G264600.1	TaOTU10-5A	5A	476758909	476760574	Os08t0506000-01	OsOTU12	8	25023316	25026380	0.25222322	1.01113607	0.249445381	WGD or Segmental
TraesCS5B02G264100.2	TaOTU10-5B	5B	366326021	366334516	Os09t0487700-01	OsOTU13	9	18805788	18808713	0.18649691	0.63123337	0.295448431	WGD or Segmental
TraesCS5B02G564100.1	TaOTU13-5B	5B	709582596	709589096	Os03t0859800-01	OsOTU8	3	36286355	36289213	0.2012745	0.90737844	0.221819791	WGD or Segmental
TraesCS5D02G272600.1	TaOTU10-5D	5D	73833710	73837490	Os09t0487700-01	OsOTU13	9	18805788	18808713	0.20057539	0.57719166	0.347502233	WGD or Segmental
TraesCS5D02G272600.1	TaOTU10-5D	5D	73833710	73837490	Os08t0506000-01	OsOTU12	8	25023316	25026380	0.26104485	1.04175921	0.250580791	WGD or Segmental
TraesCS6A02G138500.1	TaOTU2-6A	6A	109492382	109496378	Os02t0164800-01	OsOTU10	2	3473348	3474123	0.0849447	0.65660155	0.129370243	WGD or Segmental
TraesCS6A02G394800.1	TaOTU14-6A	6A	608077809	608082444	Os02t0819500-01	OsOTU7	2	35179248	35184150	0.09132243	0.37731523	0.242032194	WGD or Segmental
TraesCS6B02G167000.1	TaOTU2-6B	6B	174968851	174972654	Os02t0164800-01	OsOTU10	2	3473348	3474123	0.07887697	0.58594084	0.134615928	WGD or Segmental
TraesCS6B02G171300.1	TaOTU16-6B	6B	183716386	183720816	Os06t0669800-01	OsOTU17	6	27743193	27747053	0.12320524	0.88972762	0.138475229	WGD or Segmental
TraesCS6B02G434700.5	TaOTU14-6B	6B	703152543	703157536	Os02t0819500-01	OsOTU7	2	35179248	35184150	0.13282254	0.48466234	0.274051693	WGD or Segmental
TraesCS6D02G127500.1	TaOTU2-6D	6D	91077954	91081760	Os02t0164800-01	OsOTU10	2	3473348	3474123	0.07887697	0.58594084	0.134615928	WGD or Segmental
TraesCS6D02G380100.2	TaOTU14-6D	6D	461393517	461396718	Os02t0819500-01	OsOTU7	2	35179248	35184150	0.08599298	0.36368476	0.236449231	WGD or Segmental
TraesCS7A02G263900.1	TaOTU6-7A	7A	262459898	262464225	Os08t0537800-01	OsOTU1	8	26883126	26887362	0.05263875	0.42053683	0.125170374	WGD or Segmental
TraesCS7B02G161900.2	TaOTU6-7B	7B	222300313	222304702	Os08t0537800-01	OsOTU1	8	26883126	26887362	0.05605464	0.42983928	0.130408377	WGD or Segmental
TraesCS7B02G372600.1	TaOTU17-7B	7B	638485451	638489190	Os06t0669800-01	OsOTU6	6	27743193	27747053	0.05869052	0.50537718	0.116132105	WGD or Segmental
TraesCS7D02G264800.1	TaOTU6-7D	7D	246023581	246028882	Os08t0537800-01	OsOTU1	8	26883126	26887362	0.05687194	0.39893037	0.142561075	WGD or Segmental
TraesCS7D02G458200.1	TaOTU17-7D	7D	576173719	576177698	Os02t0168600-01	OsOTU5	2	3705886	3709904	0.08601058	0.84436864	0.101863783	WGD or Segmental
TraesCS2A02G290200.1	TaOTU15-2A	2A	500028064	500034221	HORVU.MOREX.r3.2HG0164950.2	HvOTU7	2H	451457433	451468717	0.00757343	0.10719758	0.070649275	WGD or Segmental
TraesCS2B02G306700.1	TaOTU15-2B	2B	438928546	438934193	HORVU.MOREX.r3.2HG0164950.2	HvOTU7	2H	451457433	451468717	0.0136983	0.08055253	0.170054247	WGD or Segmental
TraesCS2D02G288100.1	TaOTU15-2D	2D	369375327	369381038	HORVU.MOREX.r3.2HG0164950.2	HvOTU7	2H	451457433	451468717	0.01180637	0.06630362	0.178065308	WGD or Segmental
TraesCS2A02G295900.1	TaOTU3-2A	2A	509070654	509076530	HORVU.MOREX.r3.2HG0166630.1	HvOTU4	2H	464172729	464178457	0.0159624	0.11929852	0.13380219	WGD or Segmental
TraesCS2B02G312300.1	TaOTU3-2B	2B	447740481	447746471	HORVU.MOREX.r3.2HG0166630.1	HvOTU4	2H	464172729	464178457	0.01969075	0.10880029	0.180980641	WGD or Segmental
TraesCS2D02G293800.1	TaOTU3-2D	2D	376318012	376324673	HORVU.MOREX.r3.2HG0166630.1	HvOTU4	2H	464172729	464178457	0.01676619	0.109842	0.152639123	WGD or Segmental
TraesCS2A02G545500.2	TaOTU1-2A	2A	754352926	754357126	HORVU.MOREX.r3.2HG0212580.1	HvOTU17	2H	652053061	652058380	0.02443611	0.17240168	0.141739384	WGD or Segmental
TraesCS2B02G576000.2	TaOTU1-2B	2B	765063856	765068214	HORVU.MOREX.r3.2HG0212580.1	HvOTU17	2H	652053061	652058380	0.03046603	0.18002072	0.169236238	WGD or Segmental
TraesCS2D02G546400.1	TaOTU1-2D	2D	622917774	622922075	HORVU.MOREX.r3.2HG0212580.1	HvOTU17	2H	652053061	652058380	0.02348912	0.15419481	0.152334022	WGD or Segmental
TraesCS3A02G394700.2	TaOTU9-3A	3A	642158665	642160126	HORVU.MOREX.r3.3HG0305280.1	HvOTU14	3H	558346567	558348488	0.01704215	0.20332113	0.083818898	WGD or Segmental
TraesCS3B02G426700.1	TaOTU9-3B	3B	665257060	665259565	HORVU.MOREX.r3.3HG0305280.1	HvOTU14	3H	558346567	558348488	0.01128636	0.19415837	0.058129679	WGD or Segmental
TraesCS3D02G388500.2	TaOTU9-3D	3D	503857338	503858513	HORVU.MOREX.r3.3HG0305280.1	HvOTU14	3H	558346567	558348488	0.06632489	0.3027102	0.219103577	WGD or Segmental
TraesCS3B02G509600.1	TaOTU4-3B	3B	753675363	753678987	HORVU.MOREX.r3.3HG0315190.1	HvOTU10	3H	587173969	587177592	0.14898436	0.17895913	0.832504906	WGD or Segmental
TraesCS3D02G460600.1	TaOTU4-3D1	3D	565559751	565563768	HORVU.MOREX.r3.3HG0315190.1	HvOTU10	3H	587173969	587177592	0.0959046	0.09403306	1.019902961	WGD or Segmental

TraesCS4A02G091800.1	TaOTU8-4A	4A	98588423	98597502	HORVU.MOREX.r3.4HG0389480.1	HvOTU15	4H	484425963	484431084	0.00413153	0.18771738	0.022009313	WGD or Segmental
TraesCS4B02G212700.1	TaOTU8-4B	4B	450917364	450932365	HORVU.MOREX.r3.4HG0389480.1	HvOTU15	4H	484425963	484431084	0.00206647	0.21055276	0.009814513	WGD or Segmental
TraesCS4D02G213700.1	TaOTU8-4D	4D	366326021	366334516	HORVU.MOREX.r3.4HG0389480.1	HvOTU15	4H	484425963	484431084	0.00621229	0.17148885	0.036225606	WGD or Segmental
TraesCS5A02G066300.1	TaOTU7-5A	5A	73833710	73837490	HORVU.MOREX.r3.5HG0438100.1	HvOTU9	5H	63300255	63304038	0.00941928	0.10876615	0.086601173	WGD or Segmental
TraesCS5B02G073000.1	TaOTU7-5B	5B	86255344	86259246	HORVU.MOREX.r3.5HG0438100.1	HvOTU9	5H	63300255	63304038	0.0094532	0.09513925	0.099361698	WGD or Segmental
TraesCS5D02G077300.1	TaOTU7-5D	5D	77053388	77058199	HORVU.MOREX.r3.5HG0438100.1	HvOTU9	5H	63300255	63304038	0.00810636	0.09468822	0.085611086	WGD or Segmental
TraesCS5A02G264600.1	TaOTU10-5A	5A	476758909	476760574	HORVU.MOREX.r3.5HG0490710.1	HvOTU1	5H	477497213	477500093	0.04146008	0.13445075	0.308366273	WGD or Segmental
TraesCS5B02G264100.2	TaOTU10-5B	5B	448302818	448306434	HORVU.MOREX.r3.5HG0490710.1	HvOTU1	5H	477497213	477500093	0.04200953	0.12849746	0.326928876	WGD or Segmental
TraesCS5D02G272600.1	TaOTU10-5D	5D	375451652	375454289	HORVU.MOREX.r3.5HG0490710.1	HvOTU1	5H	477497213	477500093	0.03900265	0.12348147	0.31585833	WGD or Segmental
TraesCS5A02G446200.1	TaOTU11-5A	5A	626084116	626089018	HORVU.MOREX.r3.5HG0520520.1	HvOTU3	5H	550199338	550202696	0.03856509	0.18717234	0.206040567	WGD or Segmental
TraesCS5B02G451200.1	TaOTU11-5B	5B	622628358	622630953	HORVU.MOREX.r3.5HG0520520.1	HvOTU3	5H	550199338	550202696	0.03779044	0.15557451	0.242908913	WGD or Segmental
TraesCS5D02G454000.1	TaOTU11-5D	5D	501149911	501153222	HORVU.MOREX.r3.5HG0520520.1	HvOTU3	5H	550199338	550202696	0.04400417	0.18287421	0.240625334	WGD or Segmental
TraesCS4A02G315200.2	TaOTU13-4A	4A	605640606	605646822	HORVU.MOREX.r3.5HG0537310.1	HvOTU2	5H	585327186	585333798	0.04450111	0.15421837	0.288559082	WGD or Segmental
TraesCS5B02G564100.1	TaOTU13-5B	5B	709582596	709589096	HORVU.MOREX.r3.5HG0537310.1	HvOTU2	5H	585327186	585333798	0.0474206	0.15100604	0.314031134	WGD or Segmental
TraesCS5D02G550400.2	TaOTU13-5D	5D	556996777	557002448	HORVU.MOREX.r3.5HG0537310.1	HvOTU2	5H	585327186	585333798	0.04718228	0.14956199	0.315469693	WGD or Segmental
TraesCS6A02G138500.1	TaOTU2-6A	6A	109492382	109496378	HORVU.MOREX.r3.6HG0566290.1	HvOTU6	6H	100544275	100548169	0.0190151	0.11159155	0.170399126	WGD or Segmental
TraesCS6B02G167000.1	TaOTU2-6B	6B	174968851	174972654	HORVU.MOREX.r3.6HG0566290.1	HvOTU6	6H	100544275	100548169	0.0168576	0.07282855	0.231469688	WGD or Segmental
TraesCS6D02G127500.1	TaOTU2-6D	6D	91077954	91081760	HORVU.MOREX.r3.6HG0566290.1	HvOTU6	6H	100544275	100548169	0.0168576	0.07282855	0.231469688	WGD or Segmental
TraesCS6A02G143100.1	TaOTU16-6A	6A	119609495	119613763	HORVU.MOREX.r3.6HG0567490.1	HvOTU11	6H	108399325	108403287	0.00192926	0.1436355	0.013431648	WGD or Segmental
TraesCS6B02G171300.1	TaOTU16-6B	6B	119609495	119613763	HORVU.MOREX.r3.6HG0567490.1	HvOTU11	6H	108399325	108403287	0.0364275	0.18415393	0.197810041	WGD or Segmental
TraesCS6A02G394800.1	TaOTU14-6A	6A	608077809	608082444	HORVU.MOREX.r3.6HG0630050.1	HvOTU5	6H	554553589	554558252	0.00574991	0.08801295	0.065330252	WGD or Segmental
TraesCS6B02G434700.5	TaOTU14-6B	6B	703152543	703157536	HORVU.MOREX.r3.6HG0630050.1	HvOTU5	6H	554553589	554558252	0.05327915	0.18623151	0.286090956	WGD or Segmental
TraesCS6D02G380100.2	TaOTU14-6D	6D	461393517	461396718	HORVU.MOREX.r3.6HG0630050.1	HvOTU5	6H	554553589	554558252	0.00718741	0.1121488	0.064088115	WGD or Segmental
TraesCS7A02G263900.1	TaOTU6-7A	7A	262459898	262464225	HORVU.MOREX.r3.7HG0685210.1	HvOTU8	7H	214391937	214396259	0.0055084	0.08335478	0.06608382	WGD or Segmental
TraesCS7B02G161900.2	TaOTU6-7B	7B	222300313	222304702	HORVU.MOREX.r3.7HG0685210.1	HvOTU8	7H	214391937	214396259	0.00827785	0.0981945	0.084300534	WGD or Segmental
TraesCS7D02G264800.1	TaOTU6-7D	7D	246023581	246028882	HORVU.MOREX.r3.7HG0685210.1	HvOTU8	7H	214391937	214396259	0.0110512	0.1034095	0.106868278	WGD or Segmental
TraesCS7A02G470800.1	TaOTU17-7A	7A	666986256	666990193	HORVU.MOREX.r3.6HG0567490.1	HvOTU11	6H	108399325	108403287	0.09458123	0.77340533	0.122291933	WGD or Segmental
TraesCS7A02G470800.1	TaOTU17-7A	7A	666986256	666990193	HORVU.MOREX.r3.7HG0736920.1	HvOTU16	7H	596855823	596859538	0.0094923	0.23096148	0.041099043	WGD or Segmental
TraesCS7B02G372600.1	TaOTU17-7B	7B	638485451	638489190	HORVU.MOREX.r3.6HG0567490.1	HvOTU11	6H	108399325	108403287	0.09919936	0.76234564	0.130123861	WGD or Segmental
TraesCS7B02G372600.1	TaOTU17-7B	7B	638485451	638489190	HORVU.MOREX.r3.7HG0736920.1	HvOTU16	7H	596855823	596859538	0.01143242	0.25597737	0.044661846	WGD or Segmental
TraesCS7D02G458200.1	TaOTU17-7D	7D	576173719	576177698	HORVU.MOREX.r3.6HG0567490.1	HvOTU11	6H	108399325	108403287	0.09672701	0.77490637	0.12482413	WGD or Segmental
TraesCS7D02G458200.1	TaOTU17-7D	7D	576173719	576177698	HORVU.MOREX.r3.7HG0736920.1	HvOTU16	7H	596855823	596859538	0.01140164	0.23126057	0.049302156	WGD or Segmental

Table S7. Tissue-specific expression profiles of *TaOTU* genes across wheat organs.

Gene name	EnsemblPlants ID	root_Z10	root_Z13	root_Z39	stem_Z30	stem_Z32	stem_Z65	leaf_Z10	leaf_Z23	leaf_Z71	spike_Z32	spike_Z39	spike_Z65	grain_Z71	grain_Z75	grain_Z85
TaOTU11-5A	TraesCS5A02G446200.1	0.277365	0.084599	0.062415	0.584874	0.527814	0.255409	0.72745	0.085748	0.183617	0.814903	0.414167	1.12337	2.32468	0.40897	0.811761
TaOTU11-5B	TraesCS5B02G451200.1	0.818288	0.246476	0.297089	1.73784	1.41465	0.538305	2.13806	0.402167	0.597927	2.35114	2.35146	3.69098	5.35507	1.01512	2.06257
TaOTU11-5D	TraesCS5D02G454000.1	0.032563	0.039775	0.028143	0.264448	0.135674	0.086429	1.42225	0.298523	0.927443	0.204555	0.284038	0.386624	2.05039	1.10431	0.664889
TaOTU10-5D	TraesCS5D02G272600.1	1.19634	1.01977	0.983794	1.28594	2.09539	2.86741	2.85149	1.37803	1.98584	2.45509	3.01576	2.69187	2.19602	0.234652	1.28709
TaOTU10-5A	TraesCS5A02G264600.1	1.14365	0.79848	1.40667	2.31846	2.53236	4.91371	5.58692	3.88036	2.51556	4.68742	3.98987	4.90254	2.68818	0.321017	1.86605
TaOTU10-5B	TraesCS5B02G264100.2	0.559012	0.895278	1.06985	1.58841	2.71379	3.71171	5.00951	2.61789	1.92731	2.20972	2.59141	3.23378	2.59901	0.260825	4.15311
TaOTU9-3D	TraesCS3D02G388500.2	0.381889	0.818639	0.878808	2.38032	4.66276	7.78796	1.90032	14.7608	30.7351	1.80133	2.31903	94.9744	2.12305	0.500116	1.33378
TaOTU9-3A	TraesCS3A02G394700.2	1.17424	0.859799	1.34282	0.66366	1.50173	0.70385	0.249775	0.464558	1.35644	2.0822	1.946	2.2688	2.80815	0.404421	2.33013
TaOTU9-3B	TraesCS3B02G426700.1	0.644883	1.01577	0.765015	3.09741	19.5661	28.0018	1.86732	12.0106	44.797	3.07732	4.22021	77.2125	8.17912	0.597903	8.67721
TaOTU8-4B	TraesCS4B02G212700.1	3.02795	4.85567	4.14197	8.01595	6.49622	10.8157	22.9106	11.588	10.6073	6.42929	6.13355	9.01256	6.5513	0.545572	2.52092
TaOTU8-4D	TraesCS4D02G213700.1	6.39026	4.39309	4.80943	9.33508	7.23507	11.3047	26.6053	9.60979	9.60235	9.97166	6.04334	14.3506	6.7883	1.56452	6.45247
TaOTU8-4A	TraesCS4A02G091800.1	3.28059	2.02035	2.59486	4.07324	6.32922	12.5326	17.6256	9.14127	9.16858	6.77938	5.22692	12.387	5.94304	0.667303	4.79258
TaOTU7-5A	TraesCS5A02G066300.1	4.28301	4.61654	4.98612	5.46648	4.44342	2.72143	4.16206	4.98917	3.85112	4.19262	3.58396	4.95468	4.55484	1.31125	16.7057
TaOTU7-5B	TraesCS5B02G073000.1	3.29487	3.13646	3.18758	6.48861	3.55545	3.1875	7.84935	5.22684	2.76011	3.15102	3.18365	4.89936	4.36845	1.40565	11.4806
TaOTU7-5D	TraesCS5D02G077300.1	3.69239	3.12808	3.74728	4.20604	2.4431	2.20853	3.61052	3.3114	1.92918	2.21453	2.34589	3.83436	3.11558	0.637641	7.80734
TaOTU4-3A	TraesCS3A02G465600.2	0.17918	0.563119	0.380632	3.64531	3.66376	2.71696	0.873144	2.19423	1.15359	5.91356	4.25645	4.81233	1.89809	0.048227	0.168115
TaOTU4-3D2	TraesCS3D02G460800.1	0.541439	0.453793	0.630621	1.50662	1.41516	1.22916	0.3929	0.688336	0.598686	2.4281	1.82914	1.87471	0.657092	0.033238	0.211484
TaOTU4-3B	TraesCS3B02G509600.1	0.170898	0.298967	0.157071	0.638758	0.488154	0.304933	0.141667	0.389417	0.161782	1.27774	0.878332	0.789876	0.444665	0.016949	0.073401
TaOTU4-3D1	TraesCS3D02G460600.1	0.948549	1.39406	1.05913	1.3077	1.43929	2.08394	0.731676	1.28178	0.649258	3.12987	2.12646	2.57328	0.829044	0.061626	0.386034
TaOTU6-7D	TraesCS7D02G264800.1	17.3826	15.6082	13.7119	17.5377	12.6158	5.96896	7.09125	8.26558	6.64073	11.7835	15.4449	10.0944	15.2861	2.16787	10.5823
TaOTU6-7B	TraesCS7B02G161900.2	17.4374	14.4859	13.4621	17.0372	12.1281	6.91045	7.05676	7.4514	8.25118	12.9699	14.5553	10.5817	15.402	3.91825	12.6869
TaOTU6-7A	TraesCS7A02G263900.1	22.5697	19.4261	18.0759	21.5363	14.4213	8.68947	9.67579	9.59112	10.9064	18.868	23.1431	15.2276	21.4363	3.88555	10.631
TaOTU5-7B2	TraesCS7B02G157400.1	0	0.023418	0.021322	0.121835	0.075573	0	0.018957	0	0	0.423024	0.473523	0.040095	0.033711	0.051312	0
TaOTU5-7B1	TraesCS7B02G231500.1	0	0	0.01161	0.051431	0	0.0228	0	0	0	0.191338	0.233903	0.010563	0.075056	0	0
TaOTU5-7D	TraesCS7D02G327300.1	1.65164	1.82512	1.84094	3.15515	2.66919	1.78194	1.98469	1.49283	0.983789	3.21633	4.50491	2.81631	3.97395	0.165286	3.35387
TaOTU12-2B	TraesCS2B02G573400.1	0.017662	0	0	0	0.020619	0.035806	0.034653	0.028404	0.396013	0.055877	0	0.051856	0.077851	0.017007	0
TaOTU13-4A	TraesCS4A02G315200.2	7.67266	2.36408	2.60026	0.835904	2.91346	0.369192	0.604346	1.02514	4.61937	1.89275	2.44727	1.13593	5.6028	0.817278	6.80347
TaOTU13-5D	TraesCS5D02G550400.2	6.77105	3.03673	3.45695	2.43935	4.37409	2.35178	1.25119	2.13279	4.49452	2.98813	5.55717	5.06749	6.87325	0.523952	8.18004
TaOTU13-5B	TraesCS5B02G564100.1	1.17424	0.859799	1.34282	0.66366	1.50173	0.70385	0.249775	0.464558	1.35644	2.0822	1.946	2.2688	2.80815	0.404421	2.33013
TaOTU14-6D	TraesCS6D02G380100.2	13.5459	33.8998	37.4644	19.5672	76.3831	175.582	8.36714	34.5022	55.714	13.3331	14.6037	72.3658	38.4898	3.66324	5.20878
TaOTU14-6B	TraesCS6B02G434700.5	6.94145	15.5953	17.0006	11.004	17.2658	45.1128	4.6414	24.7841	24.5879	7.59779	7.7343	22.4455	10.8434	2.44126	4.66379
TaOTU14-6A	TraesCS6A02G394800.1	13.768	34.6068	37.9257	18.7393	41.1325	74.1982	8.40646	29.148	27.2512	14.6536	14.4929	44.6381	20.97	2.55297	5.38834
TaOTU15-2B	TraesCS2B02G306700.1	9.44724	9.65404	7.68112	4.18536	10.4856	4.43134	3.04497	4.33549	5.94139	10.7903	8.89482	6.03238	8.80468	1.21291	1.78433
TaOTU15-2D	TraesCS2D02G288100.1	9.75098	7.49781	6.15262	4.49073	9.5929	2.04731	2.3861	2.7393	3.77293	10.5373	6.61991	4.92048	10.1159	0.816551	1.93878
TaOTU15-2A	TraesCS2A02G290200.1	11.8751	7.04562	8.0382	6.30109	11.1629	4.29416	3.23312	3.62616	4.50802	9.62553	7.50373	4.53693	10.4639	0.958654	0.998356
TaOTU16-6A	TraesCS6A02G143100.1	8.22393	8.88745	9.62965	9.08259	6.77767	5.78731	4.06958	3.01124	4.25046	7.92929	9.17079	5.59845	2.98807	0.84274	3.60557
TaOTU16-6B	TraesCS6B02G171300.1	11.2164	11.9523	12.3116	11.0529	7.88192	6.32005	4.32511	3.70801	4.49819	10.241	11.0549	4.55407	3.96953	1.30224	4.02186
TaOTU17-7A	TraesCS7A02G470800.1	8.2597	7.16174	7.08813	5.72075	10.2359	8.23774	1.20876	1.757	5.13085	4.67846	7.51955	10.9428	7.80889	0.527061	2.8787
TaOTU17-7B	TraesCS7B02G372600.1	7.60123	7.05254	7.28099	6.92772	9.53975	6.5356	1.51442	1.55846	5.3246	5.08287	8.17904	10.8642	6.67265	0.655422	4.37135
TaOTU17-7D	TraesCS7D02G458200.1	12.1037	7.37877	7.38733	8.11873	16.8004	9.7297	2.08993	2.52448	6.41333	6.87027	9.20508	11.6085	8.43496	0.68167	3.38656
TaOTU3-2A	TraesCS2A02G295900.1	10.0892	10.2393	10.0513	8.74903	11.428	13.0434	5.80536	5.88308	8.51665	14.6547	17.6305	23.58	12.2931	2.6927	11.7967
TaOTU3-2D	TraesCS2D02G293800.1	10.9808	12.2065	12.3592	11.2094	15.2336	14.8765	6.96605	6.78217	10.3441	17.8773	20.8419	29.0068	14.0175	2.61142	11.5947
TaOTU3-2B	TraesCS2B02G312300.1	10.0674	11.5108	11.7966	10.3691	12.9431	12.8655	5.45807	6.18637	8.38456	15.6697	19.3907	22.1908	12.2731	2.58073	11.2365
TaOTU2-6A	TraesCS6A02G138500.1	32.6692	12.4644	13.5584	15.782	7.67907	6.4576	15.2125	6.16205	3.73632	5.38282	9.18732	10.164	5.30998	2.01063	18.1924
TaOTU2-6B	TraesCS6B02G167000.1	23.0756	11.4688	12.2602	17.4965	13.7641	14.0319	18.5273	7.73452	7.14689	5.74517	10.7848	12.9317	12.2961	1.07609	14.0878
TaOTU2-6D	TraesCS6D02G127500.1	46.3574	20.5949	21.3047	25.9783	9.75468	12.0278	23.3288	9.26653	3.52007	5.12851	12.6814	10.6395	6.27698	2.00963	12.5081
TaOTU1-2B	TraesCS2B02G576000.2	1.16823	1.57165	1.7716	1.61947	1.8096	1.55929	0.574775	0.837883	1.02373	1.92249	1.62744	1.95487	1.1993	0.221201	0.787157
TaOTU1-2A	TraesCS2A02G545500.2	1.64563	1.87118	1.67712	1.77711	1.46249	1.30509	0.941299	1.10086	1.45591	2.44183	2.02507	3.30392	1.98024	0.453039	5.27477
TaOTU1-2D	TraesCS2D02G546400.1	2.55245	2.62357	2.47782	2.35002	2.56667	2.05509	1.26506	1.04729	1.37442	3.08294	2.95355	4.22818	2.40408	0.401508	6.0276

Table S8. Hormone-responsive expression patterns of *TaOTU* genes under different hormone treatments.

Gene name	EnsemblPlants ID	CK_3h	6BA3h	CK_1h	GA1h	JA1h
TaOTU11-5A	TraesCS5A02G446200.1	0.321881	0.234685	0.298682	0.272497	0.264197
TaOTU11-5B	TraesCS5B02G451200.1	0.250767	0.193142	0.122439	0.041166	0.215989
TaOTU11-5D	TraesCS5D02G454000.1	0.134282	0.02753	0.074084	0.13039	0.097973
TaOTU10-5D	TraesCS5D02G272600.1	2.09953	2.32504	2.26713	2.1161	2.92635
TaOTU10-5A	TraesCS5A02G264600.1	1.42079	1.71551	2.9372	1.14207	2.06859
TaOTU10-5B	TraesCS5B02G264100.2	1.84218	1.73067	1.88065	1.34523	2.02625
TaOTU9-3D	TraesCS3D02G388500.2	11.496	7.57026	4.87013	4.12255	11.8949
TaOTU9-3A	TraesCS3A02G394700.2	10.0627	5.58329	4.19635	4.01572	10.274
TaOTU9-3B	TraesCS3B02G426700.1	11.2744	9.7057	5.32017	4.70693	11.5997
TaOTU8-4B	TraesCS4B02G212700.1	5.55655	4.92457	6.42455	5.17431	4.88646
TaOTU8-4D	TraesCS4D02G213700.1	5.12542	4.80513	4.3178	3.89714	4.00661
TaOTU8-4A	TraesCS4A02G091800.1	5.22687	4.58407	5.15598	4.37643	4.21729
TaOTU7-5A	TraesCS5A02G066300.1	0.991229	1.024	1.70727	0.834015	1.30768
TaOTU7-5B	TraesCS5B02G073000.1	1.34399	1.97277	2.23125	1.22996	1.66313
TaOTU7-5D	TraesCS5D02G077300.1	0.566399	1.10757	1.25504	0.523875	1.46946
TaOTU4-3A	TraesCS3A02G465600.2	0.063524	0.202549	0.756331	0.485195	0.339908
TaOTU4-3D2	TraesCS3D02G460800.1	0.103643	0.031144	0.151888	0.11307	0.128251
TaOTU4-3B	TraesCS3B02G509600.1	0.02588	0.015815	0.152227	0.066388	0.058522
TaOTU4-3D1	TraesCS3D02G460600.1	0.021349	0.132228	0.390301	0.334599	0.214469
TaOTU6-7D	TraesCS7D02G264800.1	5.96801	6.0326	6.20286	5.17867	5.29746
TaOTU6-7B	TraesCS7B02G161900.2	5.11421	5.17678	6.70077	5.24059	5.12437
TaOTU6-7A	TraesCS7A02G263900.1	5.93834	6.12031	6.10215	4.99859	5.39125
TaOTU5-7B2	TraesCS7B02G157400.1	0	0.006391	0	0	0
TaOTU5-7B1	TraesCS7B02G231500.1	0	0	0	0	0
TaOTU5-7D	TraesCS7D02G327300.1	0.358952	0.479806	0.58684	0.372535	0.440292
TaOTU12-2B	TraesCS2B02G573400.1	0.084266	0	0.049013	0.043523	0.217035
TaOTU13-4A	TraesCS4A02G315200.2	0.715112	0.680197	1.38402	0.736707	1.54182
TaOTU13-5D	TraesCS5D02G550400.2	1.22938	1.60142	1.40384	0.745428	1.29619
TaOTU13-5B	TraesCS5B02G564100.1	0.561512	0.434734	0.68792	0.439632	0.533201
TaOTU14-6D	TraesCS6D02G380100.2	10.8694	10.5883	7.31731	6.01487	11.0027
TaOTU14-6B	TraesCS6B02G434700.5	11.8061	9.26388	8.65425	7.00502	13.5247
TaOTU14-6A	TraesCS6A02G394800.1	9.17252	10.3188	4.98218	3.07877	12.0389
TaOTU15-2B	TraesCS2B02G306700.1	2.83011	2.63568	4.49301	2.06716	4.29385
TaOTU15-2D	TraesCS2D02G288100.1	3.24303	2.17263	4.07208	3.05128	4.11539
TaOTU15-2A	TraesCS2A02G290200.1	3.07475	2.59333	4.29478	2.96373	3.47038
TaOTU16-6A	TraesCS6A02G143100.1	1.65562	1.61833	1.85187	1.0544	1.54945
TaOTU16-6B	TraesCS6B02G171300.1	1.30068	1.45979	1.73935	0.972311	1.32911
TaOTU17-7A	TraesCS7A02G470800.1	0.884329	1.3027	1.27376	1.14175	0.774855
TaOTU17-7B	TraesCS7B02G372600.1	1.56552	2.11516	2.14156	1.31952	1.4407
TaOTU17-7D	TraesCS7D02G458200.1	1.07642	1.62327	1.77703	1.73762	1.13481
TaOTU3-2A	TraesCS2A02G295900.1	5.03102	4.16143	7.64043	4.78279	8.45449
TaOTU3-2D	TraesCS2D02G293800.1	6.47662	5.20074	9.58718	6.61508	12.6772
TaOTU3-2B	TraesCS2B02G312300.1	4.75164	3.64745	8.06462	4.84818	10.4122
TaOTU2-6A	TraesCS6A02G138500.1	8.70812	19.9459	4.81875	4.4233	4.68557
TaOTU2-6B	TraesCS6B02G167000.1	5.1935	5.58789	4.82912	4.87444	5.01276
TaOTU2-6D	TraesCS6D02G127500.1	5.83703	12.378	5.69443	3.40517	3.71062
TaOTU1-2B	TraesCS2B02G576000.2	0.376186	0.49016	0.848303	0.421807	0.710877
TaOTU1-2A	TraesCS2A02G545500.2	0.564319	0.541948	1.09337	0.514343	0.750778
TaOTU1-2D	TraesCS2D02G546400.1	0.425436	0.93644	0.852713	0.550521	0.623785

Table S9. Relative expression levels of *TaOTU* genes during grain development in cultivars PD34 and MY11847.

Gene name	EnsemblPlants ID	PD3d	MY3d	PD7d	MY7d	PD11d	MY11d
TaOTU11-5A	TraesCS5A02G446200.1	0.33293	0.29776	0.37098	0.10079	0.23004	0.07924
TaOTU11-5B	TraesCS5B02G451200.1	1.09149	0.82500	0.92104	0.51888	0.52662	0.40406
TaOTU11-5D	TraesCS5D02G454000.1	0.09445	0.12563	0.10703	0.02798	0.05810	0.08437
TaOTU10-5D	TraesCS5D02G272600.1	1.21050	1.09593	1.31270	1.11793	1.22539	1.22110
TaOTU10-5A	TraesCS5A02G264600.1	1.27699	1.28177	1.38319	1.44319	1.29782	2.23575
TaOTU10-5B	TraesCS5B02G264100.2	1.51850	1.04924	1.05018	0.09957	0.05812	0.07612
TaOTU9-3D	TraesCS3D02G388500.2	0.09265	0.08145	0.28764	0.41538	0.22841	0.38053
TaOTU9-3A	TraesCS3A02G394700.2	0.62570	1.00980	0.62615	0.90919	0.86293	0.86430
TaOTU9-3B	TraesCS3B02G426700.1	1.63337	5.28140	4.60280	5.59055	6.11782	5.21838
TaOTU8-4B	TraesCS4B02G212700.1	6.71519	7.57672	5.31289	4.68819	3.19953	2.92435
TaOTU8-4D	TraesCS4D02G213700.1	4.74830	4.56583	6.65738	5.97836	5.05192	4.50438
TaOTU8-4A	TraesCS4A02G091800.1	4.92806	5.76196	4.98695	4.64025	4.85218	3.16088
TaOTU7-5A	TraesCS5A02G066300.1	3.06486	3.68946	2.68256	5.80213	4.95275	5.60923
TaOTU7-5B	TraesCS5B02G073000.1	2.77176	2.65737	2.20354	3.98937	3.89109	4.38988
TaOTU7-5D	TraesCS5D02G077300.1	3.02449	3.19158	2.20760	3.77076	3.67081	3.59102
TaOTU4-3A	TraesCS3A02G465600.2	0.63700	0.53481	0.56019	0.72704	0.59211	0.55816
TaOTU4-3D2	TraesCS3D02G460800.1	2.88074	2.10569	5.40554	3.18008	5.26651	3.63110
TaOTU4-3B	TraesCS3B02G509600.1	0.63700	0.72704	0.53481	0.59211	0.56019	0.55816
TaOTU4-3D1	TraesCS3D02G460600.1	0.75911	0.65812	1.09620	0.52030	0.58990	0.53038
TaOTU6-7D	TraesCS7D02G264800.1	11.28760	11.15679	17.53602	17.21541	14.01985	13.94841
TaOTU6-7B	TraesCS7B02G161900.2	10.32063	9.46098	15.94877	19.74502	15.92425	19.27883
TaOTU6-7A	TraesCS7A02G263900.1	15.34333	14.74992	17.34467	22.14829	20.13939	21.36271
TaOTU5-7B2	TraesCS7B02G157400.1	0.05926	0.06658	0.07292	0.19476	0.18804	0.10687
TaOTU5-7B1	TraesCS7B02G231500.1	0.02052	0.01352	0.01914	0.02186	0.01502	0.07034
TaOTU5-7D	TraesCS7D02G327300.1	0.66922	0.53010	0.36311	0.31815	0.49574	0.49605
TaOTU12-2B	TraesCS2B02G573400.1	0.34219	0.50712	0.32461	0.42610	0.54174	0.59533
TaOTU13-4A	TraesCS4A02G315200.2	0.51068	0.50285	0.61229	1.04400	1.42879	1.18784
TaOTU13-5D	TraesCS5D02G550400.2	2.33441	1.77501	2.62013	2.09482	2.82987	2.47142
TaOTU13-5B	TraesCS5B02G564100.1	2.40292	2.38723	2.65271	3.76090	3.60549	2.96054
TaOTU14-6D	TraesCS6D02G380100.2	17.08126	21.34672	18.88554	22.18390	26.45165	28.79243
TaOTU14-6B	TraesCS6B02G434700.5	9.18496	8.85905	11.06957	11.42778	12.95391	16.04771
TaOTU14-6A	TraesCS6A02G394800.1	9.07386	5.87333	11.71531	10.07964	20.23848	11.71171
TaOTU15-2B	TraesCS2B02G306700.1	1.42777	2.03111	1.53810	2.32314	1.94562	2.40978
TaOTU15-2D	TraesCS2D02G288100.1	1.42048	1.77022	2.00347	1.83448	1.87989	1.64249
TaOTU15-2A	TraesCS2A02G290200.1	1.88903	2.21461	1.69786	2.40368	2.10212	2.27933
TaOTU16-6A	TraesCS6A02G143100.1	1.80293	1.48812	3.05836	1.49956	1.91897	2.72919
TaOTU16-6B	TraesCS6B02G171300.1	4.60684	4.75954	4.75862	4.20489	4.95368	4.54168
TaOTU17-7A	TraesCS7A02G470800.1	4.80663	6.72099	4.21279	5.66007	5.03209	5.65396
TaOTU17-7B	TraesCS7B02G372600.1	3.84526	2.33157	2.55701	2.23518	4.48223	1.70079
TaOTU17-7D	TraesCS7D02G458200.1	4.19624	4.91898	5.00067	4.28942	6.85083	4.28942
TaOTU3-2A	TraesCS2A02G295900.1	9.32047	8.64564	8.58447	6.06014	8.19135	8.44998
TaOTU3-2D	TraesCS2D02G293800.1	1.42048	1.77022	2.00347	1.83448	1.87989	1.64249
TaOTU3-2B	TraesCS2B02G312300.1	11.64260	9.16521	12.95696	8.57361	10.60769	11.65541
TaOTU2-6A	TraesCS6A02G138500.1	3.67521	4.37521	2.78042	6.94158	8.10244	6.44581
TaOTU2-6B	TraesCS6B02G167000.1	2.88074	2.10569	5.40554	3.18008	5.26651	3.63110
TaOTU2-6D	TraesCS6D02G127500.1	2.91304	2.09762	3.80459	3.43339	5.78757	4.84738
TaOTU1-2B	TraesCS2B02G576000.2	0.97066	0.35053	1.56764	0.79052	2.44375	1.18932
TaOTU1-2A	TraesCS2A02G545500.2	1.48992	1.87728	1.64258	2.78998	2.98814	3.28071
TaOTU1-2D	TraesCS2D02G546400.1	1.83489	2.45619	2.96553	3.96045	3.48020	4.46590

Table S10. T_0 generation mutant editing type.

T_0 plant ID	Editing type		
	A	B	D
T_0-04	WT/WT	WT/-2	WT/WT
T_0-06	WT/-39	WT/+1	WT/-2
T_0-13	WT/-3	WT/+1	WT/WT
T_0-20	WT/-39	WT/WT	WT/WT
T_0-23	WT/-16	WT/WT	WT/WT
T_0-27	WT/WT	WT/WT	WT/-3
T_0-29	WT/WT	WT/WT	WT/-21
T_0-32	WT/WT	WT/+1	WT/WT
T_0-33	WT/WT	WT/WT	WT/-4
T_0-43	WT/WT	WT/+7, -39	WT/WT
T_0-60	WT/WT	WT/WT	WT/-11
T_0-70	WT/-3	WT/WT	WT/WT
T_0-90	WT/WT	WT/-2	WT/WT
T_0-91	WT/WT	WT/WT	WT/+1
T_0-92	WT/WT	WT/WT	WT/+1
T_0-95	WT/-5	WT/WT	WT/WT
T_0-116	WT/+743	WT/+26, -34	WT/+1