Low cadmium (LCD), a novel gene related to cadmium tolerance and accumulation in rice

Hugo Shimo, Yasuhiro Ishimaru, Gynheung An, Takashi Yamakawa, Hiromi Nakanisih, and Naoko K Nishizawa

Table S1. Down regulated (ratio 0.5 or less) genes in microarray analysis in both shoots and roots of *lcd*. Signal, signal intensity in WT (cv. Hwayoung) for roots and shoots; *lcd*/WT, ratio of *lcd* in relation to WT in roots and shoots; *tos*/WT, ratio of *lcd-tos17* in relation to WT in roots and shoots.

		Signal (WT;HW)		*lcd*/WT		*tos*/WT	
Locus	Description	Root	Shoot	Root	Shoot	Root	Shoot
Os01g0956700	LCD	411	417	0.0	0.0	0.0	0.0
Os01g0702500	Dehydrin RAB25.	34	106	0.1	0.5	0.1	0.7
Os08g0176000	Integrase domain containing protein.	60	8	0.2	0.7	0.2	1.2
Os05g0297000	Hypothetical protein.	6	3	0.3	0.7	0.2	1.0
Os05g0372300	Cytochrome P450 monooxygenase.	96	9	0.5	0.8	0.2	0.7
Os07g0641500	Reverse transcriptase (Fragment).	22	8	0.4	0.6	0.3	1.2
Os05g0160600	Peptidase, trypsin-like.	3040	701	0.2	0.5	0.3	0.7
Os07g0641400	Hypothetical protein.	590	144	0.4	0.2	0.3	0.3
Os05g0161500	RelA/SpoT domain containing protein.	662	14859	0.2	1.2	0.4	0.8
Os01g0339500	Conserved hypothetical protein.	25	83	0.2	0.2	0.4	0.1
Os10g0432200	ATP-binding cassette sub-family E.	6745	3401	0.3	0.2	0.4	0.3
Os12g0444500	Conserved hypothetical protein.	105	205	0.1	0.5	0.4	0.6
Os02g0139500	Cycloartenol synthase (EC 5.4.99.8).	675	499	0.3	0.2	0.4	0.4
Os02g0725900	Transcription factor CBF/NF-Y/archaeal	144	7	0.0	0.6	0.4	1.2
Os10g0392900	Lipolytic enzyme, G-D-S-L family protein.	468	3	0.4	1.2	0.4	1.7
Os12g0406000	Hypothetical protein.	48	3741	0.3	0.0	0.5	0.4
Os09g0329000	BURP domain containing protein.	7	7	0.3	0.8	0.5	1.1
Os05g0212900	Chalcone synthase J .	293	9	0.4	1.4	0.5	1.6
Os12g0187800	Hypothetical protein.	34	4	0.3	0.7	0.5	0.7
Os02g0616600	Conserved hypothetical protein.	78	9	0.3	0.4	0.5	0.5
Os04g0503200	CDPK11.	11	345	1.0	0.0	0.7	0.3
Os04g0667300	Hypothetical protein.	45	45	0.4	0.4	0.8	0.4
Os12g0152200	Cyclin-like F-box domain containing protein.	2	56	1.1	0.5	1.2	0.3
Os07g0136300	Conserved hypothetical protein.	2	5	1.1	0.4	1.2	0.4

Table S2. Up regulated (ratio 2 or more) genes in microarray analysis in both shoots and roots of *lcd*. Signal, signal intensity in WT (cv. Hwayoung) for roots and shoots; *lcd*/WT, ratio of *lcd* in relation to WT in roots and shoots; *tos*/WT, ratio of *lcd-tos17* in relation to WT in roots and shoots.

		Signal (WT;HW)		*lcd*/WT		*tos*/WT	
Locus	Description	Root	Shoot	Root	Shoot	Root	Shoot
Os01g0533900	Multidrug resistance protein 1 homolog.	1650	88	3	3	2	2
Os01g0567200	Conserved hypothetical protein.	11	68	61	15	65	5
Os01g0909500	Nucleosome binding protein 1	26	15	3	3	3	3
Os02g0252400	Zn-finger, Dof type domain containing protein.	2	5	25	14	56	8
Os03g0115800	Conserved hypothetical protein.	2	3	173	201	247	242
Os03g0629800	Conserved hypothetical protein.	36	5	70	95	161	69
Os03g0714800	En/Spm-like transposon family protein.	2	3	119	153	37	28
Os07g0511100	Glycine-rich protein precursor.	176	494	24	4	504	94
Os11g0282700	Homeodomain-like containing protein.	2	3	16	11	94	18

Table S3. Differences in gene expression in different genetic backgrounds of rice. Signal, signal intensity in WT (cv. Nipponbare and Hwayoung) for roots and shoots. Nip/Hw, ratio of Nipponbare in relation to Hwayoung in roots and shoots.

		Signal (root)		Ratio	Signal (shoot)		Ratio
Locus	Description	Nip	Hw	Nip/Hw	Nip	Hw	Nip/Hw
Os07g0258400	OsNramp1	9157	766	12.0	2124	189	11.2
Os07g0232800	OsZIP8	2237	573	3.9	3094	978	3.2
Os12g0581600	OsNramp7	280	530	0.5	187	347	0.5
Os03g0411800	OsZIP2	3479	4354	0.8	788	1751	0.4
Os01g0972200	OsZIP1	11088	17093	0.6	99	222	0.4
Os05g0472700	OsZIP5	5686	5880	1.0	345	823	0.4
Os03g0571900	MatE (PEZ1)	271	252	1.1	258	702	0.4
Os07g0257200	OsNramp5	14056	20642	0.7	148	800	0.2

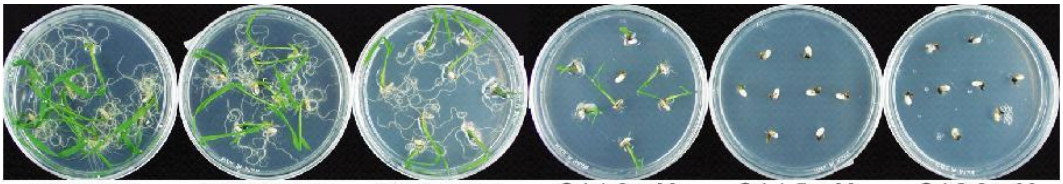
Supplementary Figure Legends

Figure S1. WT seeds were sown in MS medium containing Cd concentrations at 0, 0.25, 0.5, 1.0, 1.5 and 2.0 mM for 7 days.

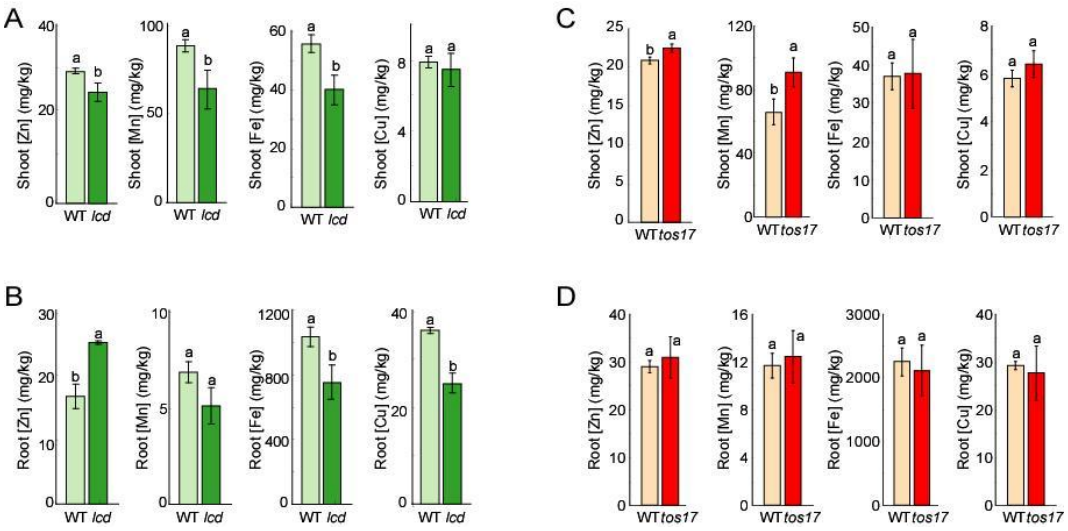
Figure S2. Root and shoot metal concentration. WT and *lcd/lcd-tos17* were grown in nutrient solution for 1 week then transferred to nutrient solution with 10 μM Cd for another week. A) Shoot and B) root metal concentrations of WT (cv. Hwayoung) and *lcd*. C) Shoot and D) root metal concentrations of WT (cv. Nipponbare) and *lcd-tos17* (n=3). The values followed by different letters are statistically different according to student N-newman-keuls test.

Figure S3. Field grain and leaf metal concentration. WT and *lcd* were grown in an experimental field until harvest. A) Grain and B) leaf metal concentrations of WT (cv. Hwayoung) and lcd. (n=25). The values followed by different letters are statistically different according to student N-newman-keuls test.

Supplementary Figure 1.



Supplementary Figure 2.



Supplementary Figure 3.