Phenomics and metabolomics responses of root to cadmium revealed contrasting resistance strategies in two rice cultivars (*Oryza sativa* L.)

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Text S1. UPLC-Q-TOF/MS conditions

Untargeted metabolic profiling was performed by a liquid chromatography system (ACQUITY UPLC, Waters, USA) coupled to a hybrid Q-TOF-MS (SYNAPT G2-Si, Waters, USA) with an electrospray ionization (ESI) source. The column temperature was 40 °C. Buffer A (0.1%, formic acid in water) and buffer B (0.1% formic acid in acetonitrile) constitutes the mobile phase. The gradient (flow rate: 0.4 mL min^{-1}) were as follows: 0–6 min 0.5–70 % B, 6–7 min 70–75 % B, 7–10 min 75–100 % B, and 100%-100 % B for 2 min, and 12–15 min, 100–5 % B.

The MS and MS-MS were operated by SYNAPT G2-Si (50–1200 Da, scan time = 0.2 s) in ESI^- mode. The conditions applied for ESI^- were: source temperature, 120 °C; desolvation temperature, 350 °C; desolvation gas flow, 650 L h^{-1}; cone gas flow, 40 L h^{-1}; capillary voltage, –2.5 kV; sampling cone voltage, –35 V.

Table S1. The composition of the modified Yoshida's solution

Components	Concentration (mM)
NH_4NO_3	2.9
NaH_2PO_4	0.32
K_2SO_4	1.0
$CaCl_2$	1.0
$MgSO_4 \cdot 7H_2O$	1.7
$MnCl_2 \cdot 4H_2O$	9.1×10^{-3}
$(NH_4)_6MoO_{24} \cdot 4H_2O$	5.2×10^{-4}
H_3BO_3	1.8×10^{-2}
$ZnSO_4 \cdot 7H_2O$	1.5×10^{-4}
$CuSO_4 \cdot 5H_2O$	1.6×10^{-4}
$FeCl_3 \cdot 6H_2O$	3.6×10^{-2}

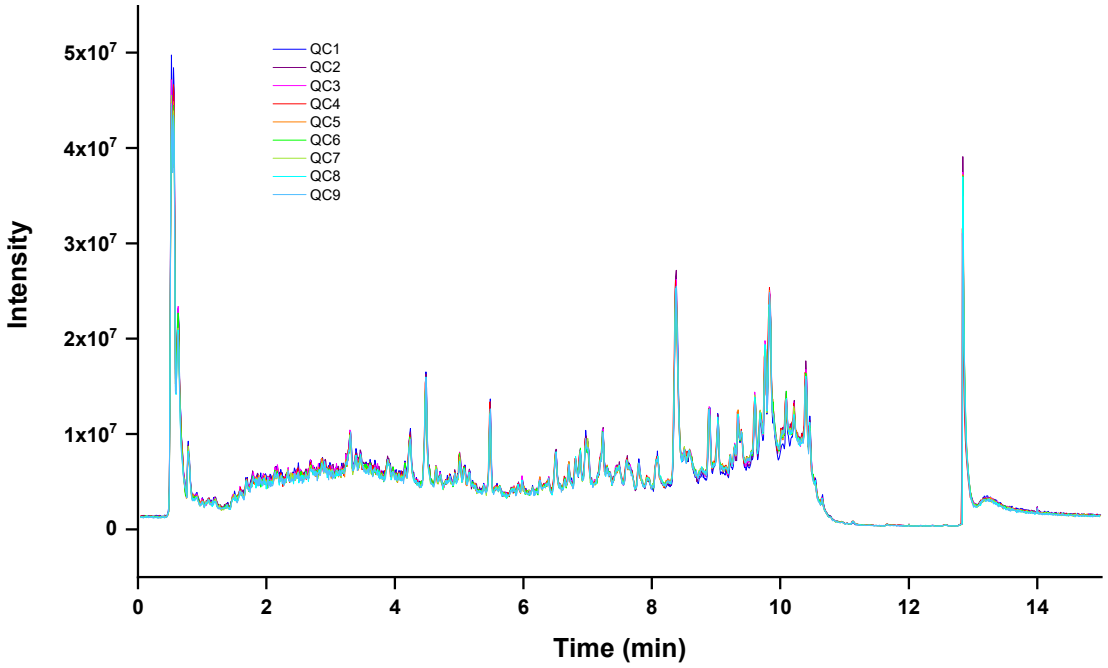

Fig. S1 Total ions chromatograph of quality control samples.

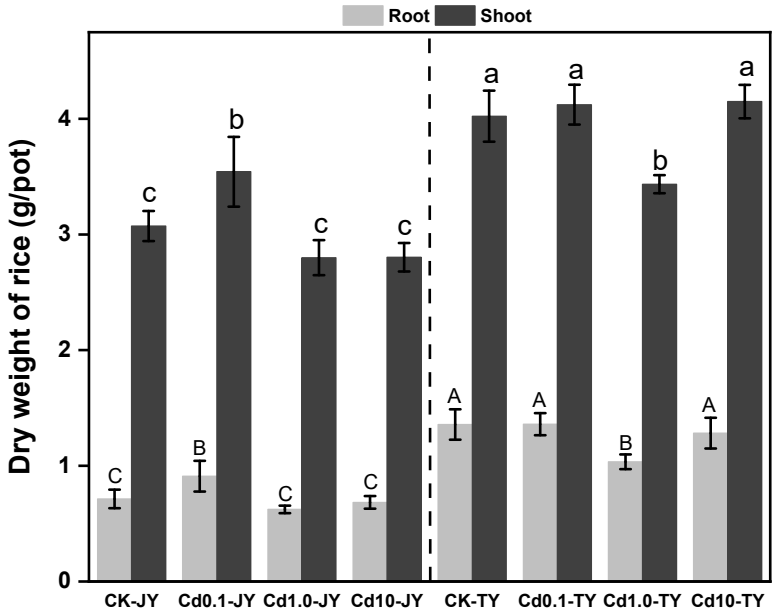

Fig. S2 Biomass of two rice cultivars under different treatments. Different letters represent significant difference between treatments. CK-JY/TY, Cd0.1-JY/TY, Cd1.0-JY/TY, Cd10-JY/TY represent the control, 0.1 μM, 1.0 μM, 10 μM Cd treatment in JY841 or TY816, respectively.

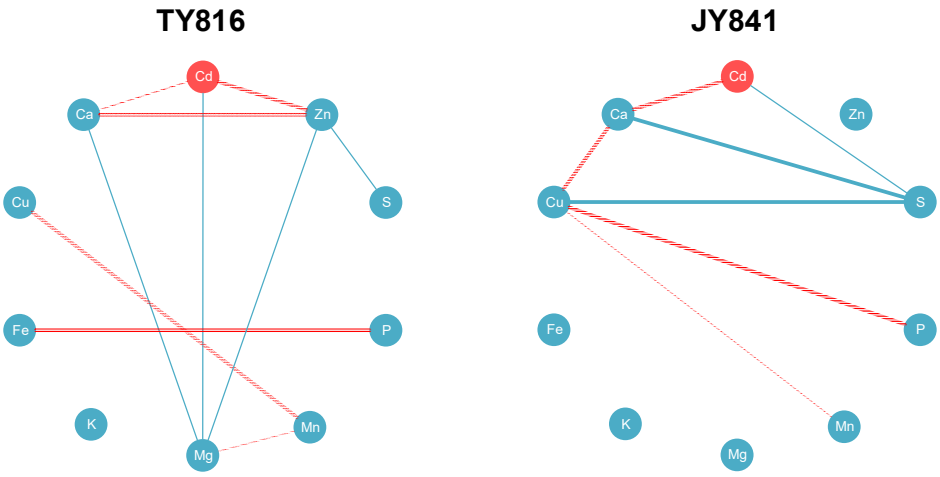

Fig. S3 Ionome correlation analyses between elements varied in root of different rice cultivars. Pearson's correlation analysis of 10 elements concentrations in root t of rice. Positive correlations are denoted by red lines; negative correlations are denoted by blue lines. Thick solid lines indicate $P < 0.01$, thin solid lines indicate $P < 0.05$, dotted lines indicate no significant correlations.

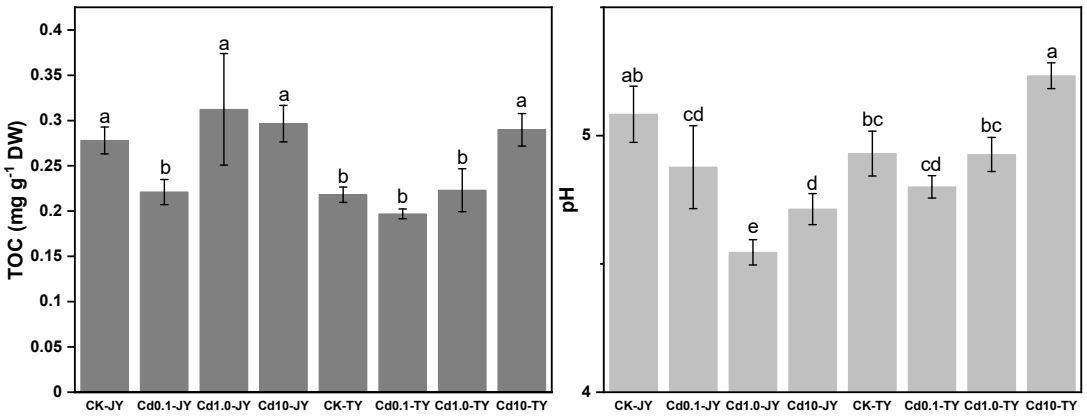

Fig. S4 TOC concentration and pH value of root exudate of JY841 and TY816 rice cultivars. CK-JY/TY, Cd0.1-JY/TY, Cd1.0-JY/TY, Cd10-JY/TY represent the control, 0.1 μM, 1.0 μM, 10 μM Cd treatment in JY841 or TY816, respectively.

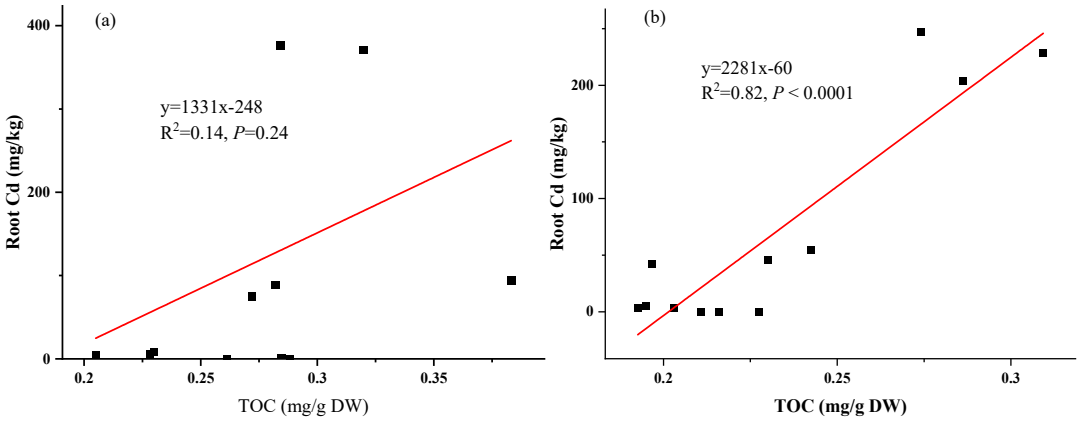

Fig. S5 Relationships between the concentrations of Cd in root and TOC in root exudate of (a) JY841 and (b) TY816 rice cultivars.

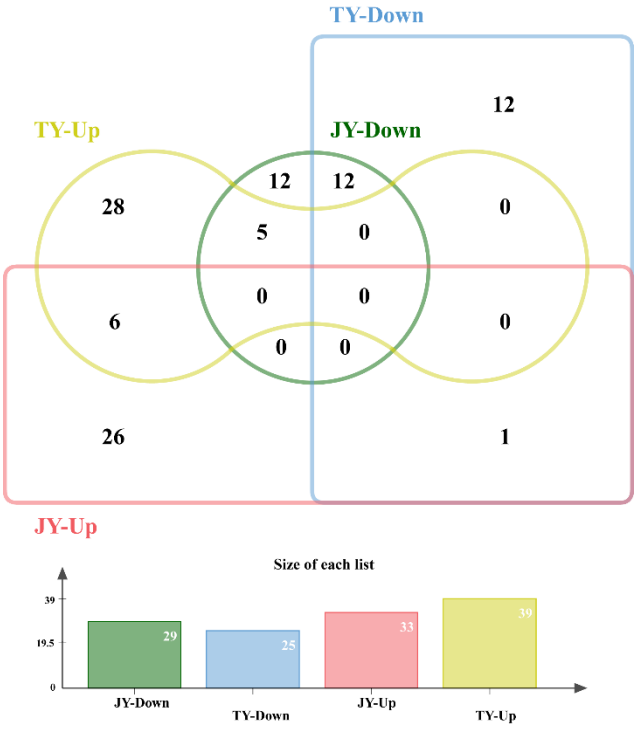

Fig. S6. Specific and shared SCMs in two rice cultivars under 10 μM Cd treatment. The total number of Cd-induced SCMs in JY841 and TY816 were 62 and 64, respectively.