

FIGURE S1 Subcellular localization of OsCAX2 in *N. benthamiana* leaf cells. The red arrows point to the signal of tonoplast-localized. 35S::GFP, the positive control. (Scale bar = 10 μ m).

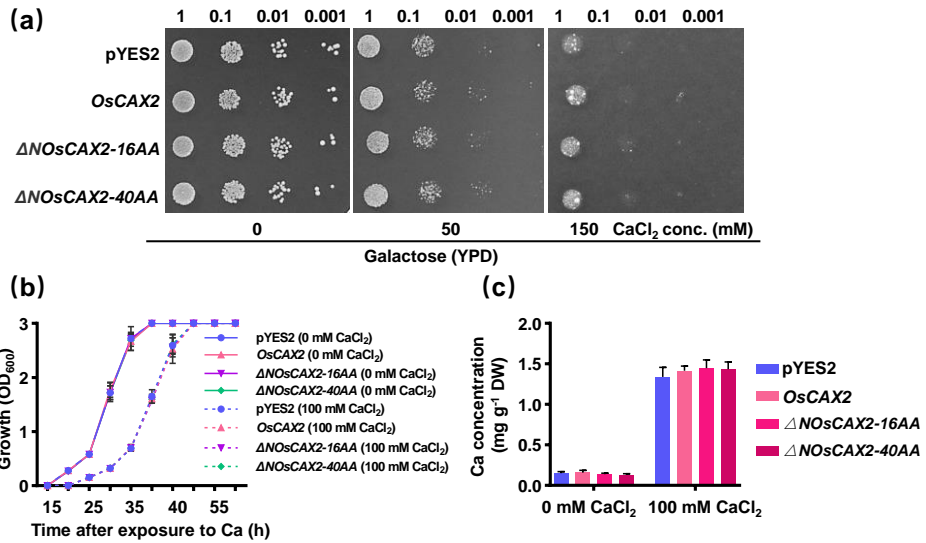


FIGURE S2 The effect of OsCAX2 on Ca tolerance and accumulation in yeast. (a) Growth of yeast strain K667 expressing empty vector (pYES2), OsCAX2 and OsCAX2 truncated versions in YPD medium containing different Ca concentrations (0, 50 or 100 mM). The plates were incubated at 30 °C for 2 days. (b) Growth of yeast cells carrying empty vector or OsCAX2 in liquid medium with or without 100 mM CaCl₂. (c) Ca accumulation in yeast strain K667 expressing empty vector or OsCAX2 in liquid medium with or without 100 mM CaCl₂ for 24 h. Values are the mean \pm SD of three independent replicates and statistical analysis was performed by ANOVA followed by planned comparison with the K667 expressing empty vector.

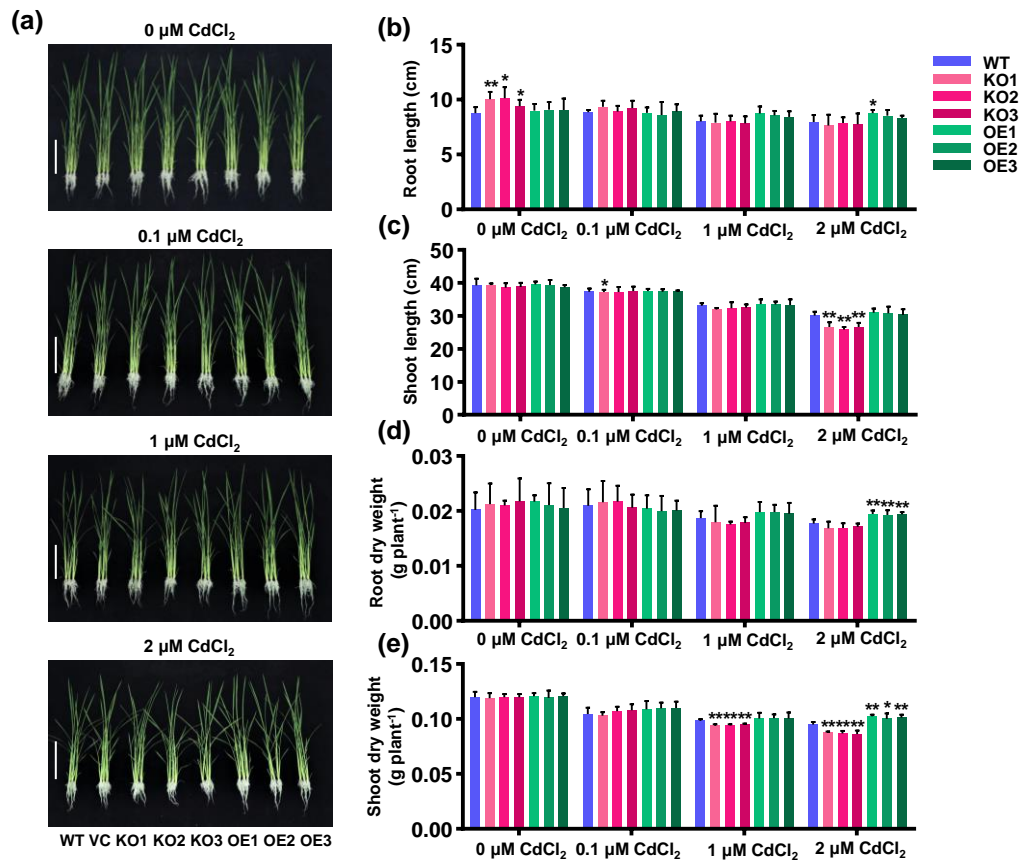


FIGURE S3 Effect of OsCAX2 on growth at seedling stage. (a) Phenotype of the WT, vector control (VC, segregated non-transgenic line), KO and OE lines (two-week-old) grown in hydroponic solution with 0, 0.1, 1 and 2 $\mu\text{M CdCl}_2$ for 7 days. (Scale bar = 10 cm). (b-e) Phenotypic analysis. Root length (b), shoot length (c), root dry weight (d), shoot dry weight (e) of all lines. The Cd-free (0 μM) treatment in this experiment was consistent with that in Figure 4. Values are the mean \pm SD of three independent replicates each containing at least 6 plants per line and statistical analysis was performed by ANOVA followed by planned comparison (* $P < 0.05$, ** $P < 0.01$).

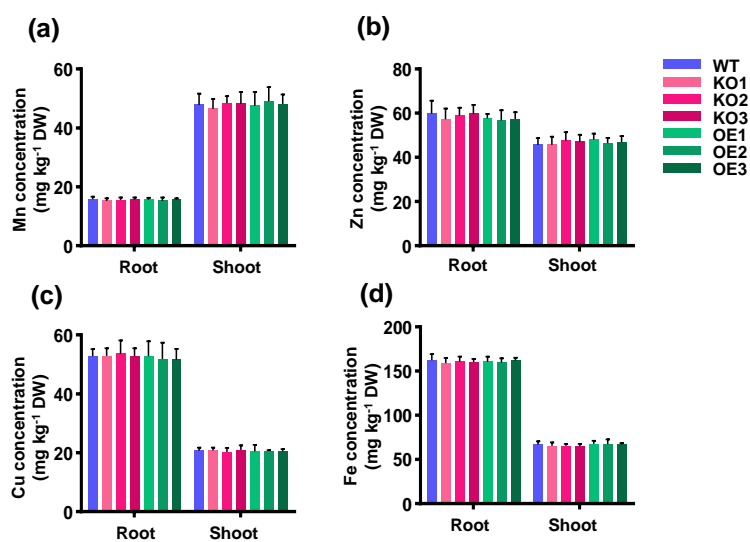


FIGURE S4 Effect of *OsCAX2* on Mn, Zn, Cu and Fe concentrations at seedling stage. Seedlings of the WT, KO and OE lines (two-week-old) were exposed to 5 μM CdCl_2 for 7 days. (a-d) Mn, Zn, Cu and Fe concentrations in roots and shoots. Values are the mean \pm SD of three independent replicates each containing at least 6 plants per line and statistical analysis was performed by ANOVA followed by planned comparison with WT.

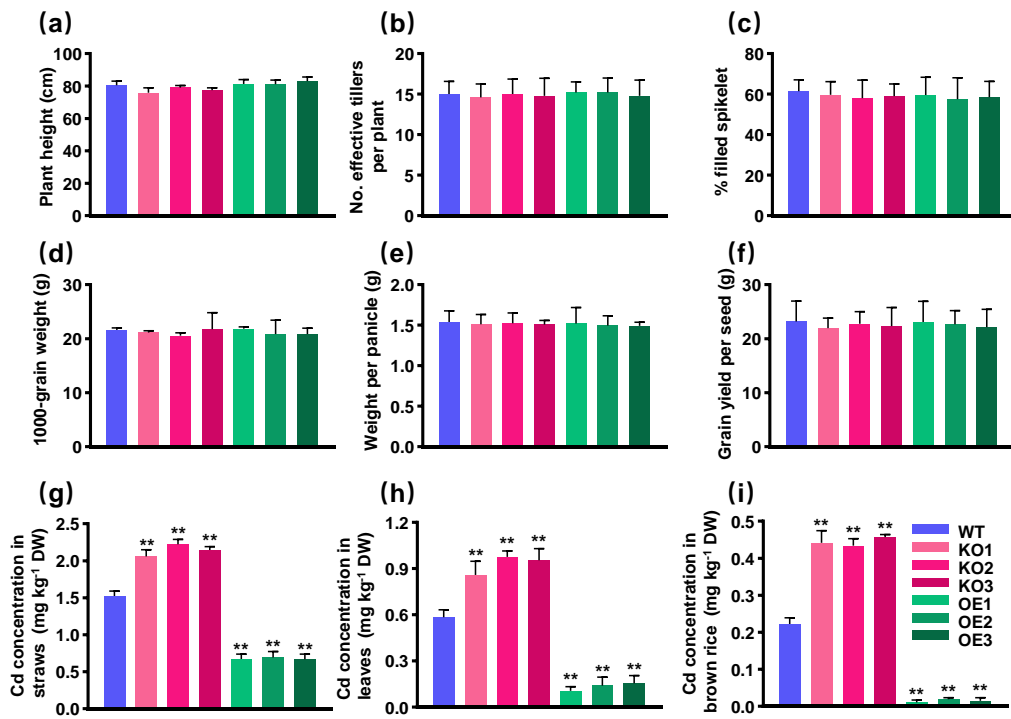


FIGURE S5 Effects of *OsCAX2* on Cd accumulation and agronomic traits at maturity in a pot experiment. (a-f) Agronomic traits. Plant height (a), No. effective tillers per plant (b), % filled spikelet (c), 1000-grain weight (d), weight per panicle (e) and grain yield per seed (f). (g-i) Cd concentration. Cd concentrations in straws (g), leaves (h) and brown rice (i). Values represent means \pm SD of biological replicates (n = 6). Statistical analysis was performed by ANOVA followed by planned comparison with WT (* P < 0.05, ** P < 0.01).

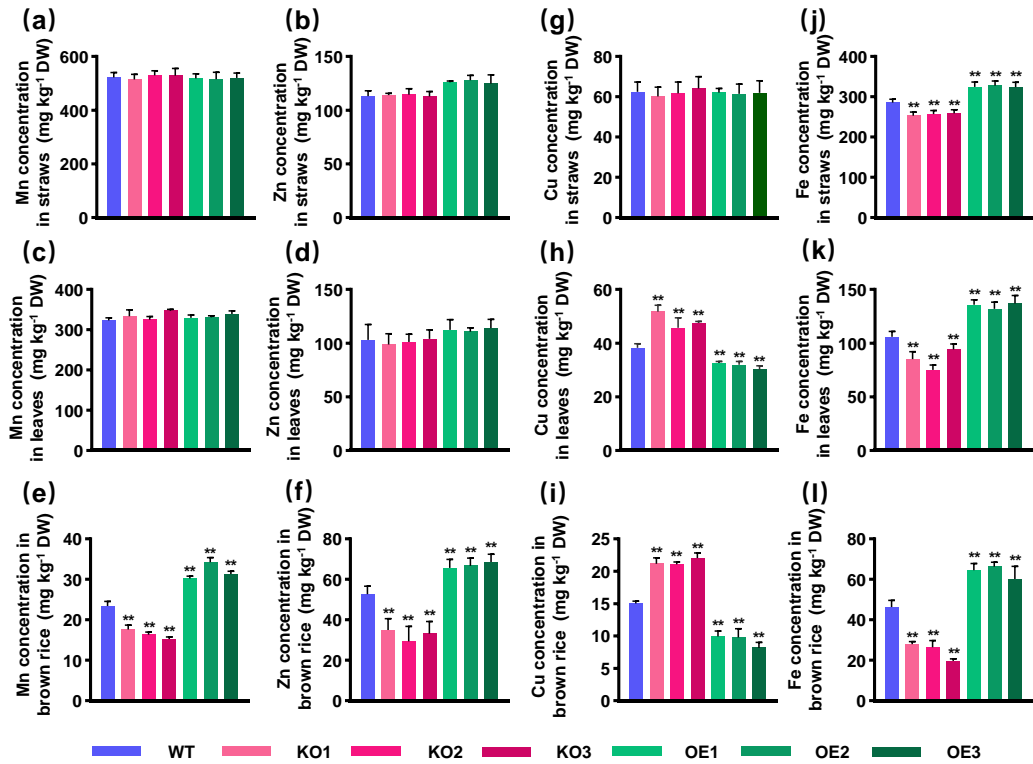


FIGURE S6 Effect of *OsCAX2* on Mn, Zn, Cu and Fe concentrations at mature stage in a field experiment. A contaminated paddy field with soil Cd content 1.8 mg kg⁻¹ and pH at 5.5 in Shenzhen, China. (a-l) Mn, Zn, Cu and Fe concentrations in straws, leaves and brown rice. Values represent means \pm SD of biological replicates (n = 6). Statistical analysis was performed by ANOVA followed by planned comparison with WT (**P* < 0.05, ***P* < 0.01).