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Characterization of type 3 metallothionein-like gene (*OsMT-3a*) from rice, revealed its ability to confer tolerance to salinity and heavy metal stresses

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Highlights

- We cloned a metallothionein gene, classified as type 3 MT, from rice leaves.
- *OsMT-3a* expression was highly induced in the leaves of tolerant rice variety by NaCl.
- Na⁺-sensitive *E. coli* cells expressing *OsMT-3a* showed high tolerance to NaCl stress.
- The rice *OsMT-3a* could enhance salinity tolerance through ROS scavenging.

Abstract

Salinity is significantly impeding agricultural productivity globally. As an ameliorative strategy, the quest for salinity tolerance genes and pathways to counter this problem is on the rise. In this study, we screened a cDNA library from rice (cultivar Egyptian Yasmine) grown under salinity stress, and isolated a metallothionein-like type 3 (*OsMT-3a*) gene. The function of the gene was characterized in *Escherichia coli* cells and its expression was analyzed in two rice cultivars having contrasting salinity tolerance. Overexpression of *OsMT-3a* in KNabc, salinity-sensitive *E. coli* mutant cells, showed improved salinity tolerance. The hydrogen peroxide (H₂O₂) concentration in *OsMT-3a*-transformed cells was less than one-third of that in control cells under salinity stress conditions. Under high concentrations of external H₂O₂, *OsMT-3a*-overexpressing *E. coli* cells showed enhanced growth, whereas the growth of control cells was completely

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