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Polyamines may influence phytochelatin synthesis during Cd stress in rice

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Highlights

- Putrescine pre-treatment increased cadmium toxicity in rice.
- In contrast, putrescine synthesis inhibition alleviated cadmium stress.
- The synthesis of higher polyamines and phytochelatins is antagonistically related.
- Putrescine may decrease phytochelatin synthesis at enzymatic and gene expression levels.

Abstract

Abbreviations: ADC: arginine decarboxylase; DAO: diamine oxidase; DAP: 1,3-diaminopropane; dcSAM: decarboxylated S-adenosylmethionine; DFMO: 2-(difluoromethyl)ornithine; GR: glutathione reductase; *gamma*-Glu-Cys: *gamma*-glutamyl-cysteine; GSH: glutathione; G-POD: guaiacol peroxidase; hmGSH: hydroxylmethyl-glutathione; ODC: ornithine decarboxylase; PCs: phytochelatins; PCS: phytochelatin synthase; PA: polyamine; PAO: polyamine oxidase; PUT: putrescine; SPD: spermidine; SAM: S-adenosylmethionine; SPM: spermine; SPDS/SPMS: spermidine/spermine synthase.

Although the metabolism of phytochelatins and higher polyamines are linked with each other, the direct relationship between them under heavy metal stress has not yet been clarified. Two approaches were used to reveal the influence of polyamine content on cadmium stress responses, particularly with regard to phytochelatin synthesis: putrescine pre-treatment of rice