17 Transgenic Tobacco Plants Expressing a Rice Cysteine Synthase Gene are Tolerant to Toxic Levels of Cadmium

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Plants tolerate heavy metals through sequestration with cysteine-rich peptides, phytochelatins. In this reaction, the rate limiting step is considered to be the supply of cysteine, which is synthesized by cysteine synthase from hydrogen sulfide and *O*-acetylserine. In this study, we transformed tobacco plants with RCS1, a cytosolic cysteine synthase gene of rice, and examined their sensitivity to cadmium. The transgenic plants had up to 3-fold higher activity of cysteine synthase and 3-fold higher amounts of cysteine than wild type plants. Upon exposure to cadmium, they exhibited obvious tolerance with much greater growth than wild-type plants. The levels of glutatione, phytochelatins and total thiols were higher in transgenic plants than in wild type plants after cadmium treatment, indicating that these might be responsible for the detoxification. In other to identify the destination of uptaken cadmium, we examined the state of trichome, which have been shown to actively secrete cadmium by forming calcium-mediated crystals. We founded that their numbers on leaves and stems of transgenic plants were 2-fold higher than those of wild-type plants. The results suggested that introduction of the cysteine synthase gene into tobacco plants resulted not only in high levels of sulfur-containing compounds that detoxify cadmium, but also in development of trichomes, through which uptaken cadmium may be actively excreted.

Keywords: tobacco, cysteine syntase gene, cadmium, phytochelatin