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Poster Abstract - L.01

ENHANCED Cd ACCUMULATION IN TOBACCO PLANTS OVEREXPRESSING PHYTOCHELATIN SYNTHASE FROM *ARABIDOPSIS THALIANA*

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Phytochelatins (PCs) are metal binding peptides involved in heavy metal detoxification. PCs are synthesized enzymatically from reduced glutathione (GSH) and the reaction is catalyzed by a transpeptidase, phytochelatin synthase (PCS), active only in the presence of metal ions. Contrasting results have been obtained by different authors about the effect of *PCS1* gene overexpression on heavy metal tolerance [1,2]. We overexpressed the Arabidopsis phytochelatin synthase gene (*AtPCS1*) in the non-accumulator plant *Nicotiana tabacum*. We transformed wild-type plants and plants harbouring the oncogene *rolB*, that induces an expansion of the root system[3]. We verified cadmium tolerance and accumulation in relation to the level of PCs and glutathione. We demonstrated that overexpression of *AtPCS1* increased PC content and enhanced Cd tolerance of *rolB* roots and of *rolB* and wild-type seedlings. This effect was greatly enhanced when reduced glutathione was added to the culture medium. An increased Cd accumulation was also observed in roots and shoots of seedlings and adult plants, matched by a higher production of PCs in both organs and also dependent on GSH supply. We demonstrated that *rolB* plants accumulate more Cd than wild-type plants and this increasedepends on the concentration of Cd but not of GSH in the medium.

We conclude that overexpression of *AtPCS1* in tobacco plants causes an increase in Cd tolerance and accumulation directly related to the availability of GSH, a rate-limiting factor for the synthesis of phytochelatins[4]. In addition *rolB* enhances Cd accumulation, and thus *rolB* plants represent a useful tool for phytoremediation strategies.

1. Lee S, Moon JS, Ko T, Petros D, Golsbrough PB, Korban SS (2003) Plant Physiol 131: 656-663
2. Gisbert C, Ros R, De Haro A, Walker DJ, Bernal MP, Serrano R, Navarro-Aviñó J (2003) Biochem And Bioph Res Comm 303: 440-445
3. Cardarelli M, Mariotti D, Pomponi M, Spanò L, Capone I, Costantino P (1987). Mol Gen Genet 209: 475-480
4. Pomponi M., Censi V., Di Girolamo V., De Paolis A., Aromolo R., Sanità di Toppi L., Costantino P., and Cardarelli M. (2005) Planta (in press)