Cadmium Toxicity in the Macrophytic Alga Chara: Role of Reactive Oxygen Species and Effect of Zinc

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INTRODUCTION

Cadmium (Cd) is a toxic heavy metal that contaminates many environments worldwide. We are developing the large, freshwater alga Chara australis as a possible biological agent for removing Cd from aqueous environments. Earlier work in our lab showed that Chara survives in sediment and water containing cadmium and translocates to the harvestable shoot. We also showed that zinc (Zn) protects against Cd toxicity. This was indicated by our work on:

1) Discover the correlation between ROS production, cadmium uptake, and glutathione synthesis. Glutathione is the plants natural way of combating reactive oxygen species; it acts as an anti-oxidant which is important for stress management. It is also a precursor of phytochelatins, which chelate heavy metals like cadmium.

2) Plants will be kept in solutions of 2ppm cadmium, and also 2ppm cadmium and 5ppm zinc. ROS will be measured at various time periods to establish a correlation.

RESULTS

The results section provides evidence for the correlation between ROS production, Cd uptake, and glutathione synthesis.

CONCLUSIONS

1. We have established that our technique for measuring ROS works. Through the confocal experiments, we have concluded that DCHF-DA does indeed cross through the cell wall and into the cytosol where it becomes trapped.

2. Through the time course experiments, we have also established that 2 hours is sufficient time for measuring fluorescence which indicates ROS production.

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REFERENCES

[1] Foote, C. S. (1957). Photosensitised Oxidation and Singlet Oxygen in 1.25mL Tris-HCl buffer (40mM, pH 7.0), shaken for 5 min, and centrifuged for 10 min. Supernatant was diluted 1:2 in buffer and fluorescence was immediately measured. The standard curve was made of DCF in ETOH.
