PHYTOCHELATIN CONTENTS AND CADMIUM UPTAKE OF *Triticum aestivum* IN RESPONSE TO VARIOUS CONCENTRATIONS OF CADMIUM

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**Abstract:** Cadmium contamination of the environment resulting from mining, agricultural activities, and exhaust gases is a major environmental concern because of its impact on human health, the food supply chain, and the aquatic and terrestrial ecosystems. A cost-effective technology has emerged as an alternative method to expensive engineering-based techniques. This technique, commonly referred to as phytoremediation involves the use of plants to remediate cadmium-contaminated soil and water. The objective of this study was to evaluate the growth and cadmium uptake of wheat (*Triticum aestivum* L. cv. TAM 109) plants exposed to cadmium (supplied as cadmium nitrate) at different periods, and assess whether phytochelatin (PC) synthesis in the plant can partly or fully explain the tolerance mechanism of wheat to cadmium. Wheat seeds were grown in a sand medium for a 30-day pre-metal treatment period at the Jackson State University greenhouse. The wheat plants were then exposed to different concentrations of Cd (0, 0.1, 1.0, 5.0, 10.0, 15.0, and 20.0µM) using hydroponic systems. Plants were harvested at 0, 2, 5, 8, 12, and 15 days after initial Cd exposure. Harvested plants were separated into roots and shoots, dried in an oven at 75°C for 2 days, weighed for dry biomass, and acid-digested for cadmium uptake determinations. Cadmium uptake was quantified by ICP-OES. Phytochelatin contents of roots and shoots were quantified using established procedures. Results indicated that shoot and root biomass increased with exposure time, and this increasing trend with time was more pronounced in the shoot than in the roots. For each exposure period, shoot and root biomass decreased with increasing concentrations of Cd treatment, especially at 12 and 15 days after initial exposure. Wheat shoot heights increased with exposure time except for plants exposed to 20 µM Cd. For each exposure time, discernible reductions in wheat shoot heights were evident beginning at 8 days until 15 days, specifically with 10 – 25 µM Cd. Generally, there were no differences in root lengths among exposure times, 0 to 12 days. However, root lengths were shortest at 15 days after initial Cd exposure, especially at the higher Cd treatments. Cadmium uptake by wheat shoots steadily increased from initial period (0 day) until 12 days, and then slightly declined at 15 days. For each exposure period, Cd uptake increased with increasing concentrations of Cd treatments, except at days 8, 12, and 15 wherein Cd uptake was very minimal especially at 20 µM. This reflects the sensitivity of the wheat shoots to 20 µM Cd. Likewise, root Cd uptake increased with increasing exposure periods and concentrations of Cd treatments. The syntheses of total acid soluble thiols (as indirect measures of PC synthesis) in shoots were significantly enhanced only at 20 µM Cd. In contrast, there were no significant differences in quantity of total acid – soluble thiols of the roots, regardless of Cd treatments. It can be interpreted that a higher threshold level of Cd in the roots must be reached to trigger PC synthesis.