

EFFECT OF CADMIUM AND ZINC ADDITIONS ON CADMIUM CONCENTRATIONS IN SOIL AND POTATO TUBERS (*SOLANUM TUBEROSUM* L.)

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ABSTRACT

The addition of cadmium (Cd) to cultivated land from various sources could raise its concentration in foodstuff. This has recently been of great concern because of its potential health hazards. The present study was initiated to investigate the effect of addition of various levels of Cd and Zn on Cd content of soil and its concentration and uptake by potato tubers. Effect of four levels of Cd; 0, 0.5, 2.5 and 12.5 mgkg⁻¹ applied in the form of CdCl₂ and three levels of zinc (0, 5, and 20 mgkg⁻¹) applied in the form of ZnSO₄, were studied in a Lysimeter experiment. Cadmium was detected in the potato tubers besides testing its total level in the surface soil layer (0 – 15 cm) and the subsurface soil layer (15 – 30 cm), after the experiment termination.

The obtained results indicated that cadmium concentration reached 0.44, 1.18, and 9.89 mg Cd kg⁻¹ in the surface soil layer (0-15cm) as a result of addition of 0.5, 2.5 and 12.5 mg Cd kg⁻¹, respectively. Only slight increase of Cd content was detected in the second layer (15-30 cm.). The results also indicate that addition of Cd resulted in a significant increase in the uptake of Cd by Potato tubers, especially at the higher rates of addition. However, addition of Cd did not influence potato yield. Application of zinc was found to markedly decrease the Cd concentration in potato tubers, only at the higher rates of Cd addition.

INTRODUCTION

Cadmium can be easily absorbed and translocated to food crops in quantities that are not phytotoxic, yet may be harmful to human health (Chaney, 1980). Recently, much concern has been given to the cadmium content of plants. This concern arises from investigations that revealed potential harmful health effects from high dietary intake of cadmium (Oliver, 1997).

Cadmium occurs naturally in minute quantities in most soils, but can accumulate in agricultural soils from various sources such as atmospheric emissions, emissions from municipal solid waste incinerators, coal burning, road dust, fertilizers, and sewage sludge (McLaughlin and Singh, 1999).

Cadmium uptake by crops is influenced by several factors. Chief among them is the concentration of Cd in the soil solution (Kabata-Pendias and Pendias, 1992; Alloway, 1986; Mullins *et al.*, 1986). Other important factors include, soil acidity (pH) (Hahne and Kroontje, 1973), soil micronutrients content (Oliver *et al.*, 1994), soil salinity (Bingham *et al.*, 1983). Also, crop species and cultivars differ widely in their ability to absorb, accumulate and tolerate Cd.

Therefore, crop selection (Peterson and Alloway 1979) and soil management practices such as site selection (Chaney and Hornick 1978; Chaney *et al.*, 1993), fertilizers management (McLoughlin *et al.*, 1996; He