

Adverse potential of elemental S in plant Cd concentration in highly calcareous and Cd contaminated soils

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Abstract

Cadmium (Cd), which may mainly present as an impurity in P fertilizers, is one of the most common toxic heavy metals which is widely distributed in crop lands. On the other hand, use of elemental S, through producing sulfuric acid and dissolving nutrients (i.e. P, Fe and Zn), is a common and practical way to improve soil nutritional problems in highly calcareous soils in Iran. Since the main sink of Cd in these soils is Octavait (cadmium carbonate) the acidifying effects of elemental S may increase Cd availability as well as other micronutrients.

To study the effects of S oxidation in Cd uptake by Spinach (*Spinacea oleracea*), which is planted in Cd calcareous and contaminated soils, a split plot experiment was conducted. Four levels (equivalent 0, 2, 4 and 6 Mg/ ha) of S were applied to two different soils which were contaminated by 20 mg Cdkg⁻¹ as cadmium sulfate in 4 replications during six weeks of incubation under green house condition. To ensure the process of S oxidation, elemental S was inoculated by *Thiobacillus* sp.

Although the rate of S oxidation, after two months incubation, was as little as 2 percent, in comparison with no S treatment, Cd concentration in plant increased significantly in a same level in all S treated soils. On the other hand, in comparison with only Cd contaminated soils, Cd concentration in spinach increased about 73 percent. This result shows and alerts the adverse effects of S application, and probably other acidifying fertilizers, in contaminated calcareous soils in order to dissolve and enter Cd to human food chain.

Key words: Cadmium, Sulfur, calcareous soils, food chain, spinach

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