



Availability of trace metals in a saline soil under polluted irrigation with Cd and Ni

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Soil degradation due to pollution with trace metals is a problem, which affects ecosystems and reduces the environmental quality of the soils. Some of the trace metals are essential and non-essential elements. The first group plays a key role on biological processes (Navarro Pedreño et al., 1997; Chaffai y Koyama, 2011). All of them can be soil pollutants depending on the concentration and availability for the biota. Heavy metals are presented as natural components of the soil and Earth crust, in form of salts, oxides and other compounds (Navarro Pedreño et al., 1993). However, to test the toxicity for plants, it is important to determine the bioavailability of them in soils.

Fe, Mn, Cu and Zn belong to the group of essential elements for plants (microelements), while Cd and Ni should be considered as pollutants. Cd is a known mutagenic agent (Hattab et al., 2014), and Ni can influence and compete with Mn, Fe, Zn (Rahman et al., 2005), diminishing the availability for plants.

In the present work, effects due to trace metal pollution presented in the irrigation water (Cd and Ni) have been studied under two different species (alfalfa and barley). Four treatments based in the concentration of irrigation water were used for Cd (0, 10, 30 and 50 mg/l) and Ni (0, 5, 15 and 50 mg/L). The experiments have been done under controlled greenhouse conditions, in order to analyze the bioavailability of Fe, Mn, Cu, Zn, Cd and Ni in soils, by using the Lindsay-Norwell extraction. A saline soil from 'La Vega Baja del Segura' (Alicante, Spain), was used in this experiment.

The results showed that both pollutants increased their availability with the increment of their presence in the irrigation water. However, it was expected that the availability of micronutrients (Fe, Mn, Cu and Zn) were affected but no effects were found and no differences in bioavailability between blank treatments and polluted treatments were observed. Moreover, some differences were found depending on the type of cultivation in the Ni treatment. Zn and Mn were extracted in minor concentration under barley than under alfalfa.

Keywords: cadmium, nickel, bioavailability, saline soil.

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