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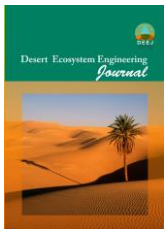

Influence of *Alhagi camelorum* and *Peganum harmala* Canopies on the Redistribution of Chemical form of Zinc in two Areas of Bajgah and Chahtiz in Fars provience

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Extended Abstract

Introduction: Zinc (Zn) is an essential nutrient for optimum plant growth and development. Zn deficiency is a constraint especially in calcareous soils located in arid and semi-arid zones of Iran. It is important to know the distribution of Zn among different chemical forms to understand the chemical reactions of this element in the soil and to develop soil testing procedures. Ziaeian and malakouti (2001) reported that due to different reasons such as high pH and exceed use of phosphorus fertilizers (Sepahvand and forghani, 2011), more than 60 percent of Iran's soils have a zinc deficiency problem, with an average product reduction of about 50 percent. Plant canopies keep a large percentage of plant and animals in itself. The characteristics of soils such as fertility and chemical forms of nutrients can be influenced by plant canopies because canopy with different mechanisms improves the nutritional status of the soil. Higher microbial activities in the soil beneath canopy is due to more rhizosphere leakage than the interspace soil resulted in increasing the organic matter mineralization, nitrogen fixation and solubility of potassium, phosphorus and zinc elements (Meena et al, 2017). Little information is available regarding the influence of plant canopies on the redistribution of chemical forms of Zin in arid and semi-arid zones. The objectives of present study are, therefore, to investigate the impact of canopies of *Alhagi camelorum* and *Peganum harmala*, two common plant species of arid and semi-arid regions on the redistribution of chemical forms of Zn using sequential extraction technique.

Material and methods: This study was conducted in Fars province at two areas with different climates, e.g., moisture and temperature. In present study, chemical forms of Zn in the soil beneath canopy and the interspaces soil of *Alhagi camelorum* and *Peganum harmala* plants in Bajgah and Chahtiz were investigated using sequential extraction method. Samples were collected from 0 to 20 cm depth under-canopy and interspace soil (about 75 cm far from the plants). Also, the values of pH and organic matter, which are effective on the chemical form of this element, were measured. Seven chemical forms of Zn including soluble and

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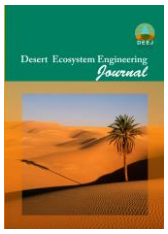

exchangeable, Zn associated to carbonates, organic materials, Mn oxides, amorphous Fe oxides and crystalline Fe oxides and also residual form were extracted using the method proposed by Singh et al. (1988). The concentration of Zn in each chemical form was measured using an atomic absorption spectrophotometer (Shimadzu-AA-670 G, Japan). Data related to the influences of plant species, canopy and location of sample collection on the chemical forms of Zn were statistically analyzed using SAS software package. Means were compared by using Duncan's multiple Range Teat at $p \leq 0.05$.

Finding and Results: Results showed that the soil under canopy had higher organic matter, but lower pH as compared to interspaces. Among different chemical forms, the values of Zn in forms of soluble and exchangeable, organic matter-bound and bound to manganese oxide was higher in the soil beneath canopy of both plants as compared to the interspaces soil. In Bajgah site for both plants the values of soil organic matter and also organic matter bound Zn and soluble and exchangeable Zn were higher than those of Chahtiz. But in Bajgah, Zn bound to crystalline Fe oxide was lower. The amounts of carbonate bound Zn, and also Zn associated with Mn oxides and residual Zn were not significantly different among two sites. In general, the relative amount of the chemical forms of zinc were as follows: residual >> crystalline iron oxide bound > amorphous iron oxide bound > Manganese oxide bound > Carbonate bound > organic matter bound > soluble and exchangeable.

Discussion and Conclusion: This study showed that most of Zn most was present in the residual form that is unavailable to plants. Comparison of the two studied regions showed that in Bajgah region available forms of Zn such as soluble and exchangeable and organic matter bound were higher than Chahtiz region. Generally, it appears that the positive effects of *Alhagi camelorum* and *Peganum harmala* plants canopies on increasing the available forms of Zn in the soil beneath canopies, was due to lower pH and higher organic matter in the soil beneath canopy in comparison with interspace soil. Also, lower pH and higher organic matter in the soil beneath canopy of Bajgah as compared to Chahtiz caused the presence of higher values of available forms in the former as compared to the latter. Overall, it appears that the presence of plant species including *Alhagi camelorum* and *Peganum harmala* caused increases in the values of Zn forms with higher availability in the soils of arid and semi-arid regions.

Keywords: Sequential extraction, Calcareous soils, Zinc availability.