The 1st International Conference on New Ideas in Agriculture
Islamic Azad University Khorasgan Branch
26-27 Jan. 2014, Isfahan, Iran

ASSESSMENT OF ZEOLITE AND PERLITE EFFICIENCY TO REMOVE HEAVY METALS OF ISFAHAN ZOB-AHAN WASTEWATER

A. Eftekhari[1], P. Najafi[2], N. Honarjo[3], K. Asgari[4] and N. Samadi[5]

[1] Ms.c , student, Department of Soil science, Faculty of Agriculture, Islamic Azad University- Khorasgan branch; [2]Associate Professor, Department of Water Engineering, Faculty of Islamic Azad University- Khorasgan branch

[3] Associate Professor, Department of Water Engineering, Faculty of Islamic Azad University- Khorasgan branch

[4]Ph.D. student, Department of Soil science, Wageningen University, Netherlands

[5]Ph.D. student, Department of Soil science, Canada

Corresponding Author E-mails: eftekhari.arezo@yahoo.com

INTRODUCTION: The pitcher irrigation method is a self-control system as one of the most efficient. This irrigation system can be more effective by using a natural Zeolite or Perlite as first stage treatment if industrial wastewater that use as irrigation water. Zeolite and perlite can be block heavy metals to reduce them from wastewaters. The impressive factors are mobile non-framwork cations in the channel walls, negative charge dentistry, particle size, cation-exchange capacity, exchangeable ions concentration (Na^{+1}, K^{+1}, Ca^{2+} and Mg^{2+}) associated wastewater, ionic radius and dissociation (Nazem et al, 2011). The main objective of this research was assessment of heavy metals adsorption when industrial wastewater use as irrigation water in pitcher irrigation system.

MATERIALS AND METHODS: This research was carried in khoradgan's farm under Olive cultured with arid and very hot, arid soil order and heavy texture. An experiment plan with 2 treatments (Clay pot included Natural Zeolite (NZ) and Perlite (P) with half of volume of total volume clay pot, 4.5 Litter) and 4 replications that irrigated by Zob-Ahan wastewater in 12 events (1500 cc per each irrigation event). All chemical and physical analyses were done at beginning and end of experiment by APHA (1995). The pH and EC of soil were 7.6 and 4.1 dS/m and these parameters in wastewater were 8.5 and 1.6 dS/m. The pH of Zeolite and Perlite were 7.95 and 8.1, whereas EC of both were 1.1 and 1.2 dS/m, respectively. Also, CEC of zeolite and perlite were 178.4 and 61.5 Meq/ 100g.

RESULTS AND DISCUSSION: Based on the figure, the Pb concentration increased from 0.01 to 225.49 and 212.58 (mgKg-1) in zeolite and perlite, respectively (At 0.1% level).Whereas, Zn primary concentration was same as Pb, but in the end of 12 irrigation events had 23.35 and 158.27 increasing for zeolite and perlite, respectively.it was clearly, perlite can adsorbed Zn about 7times more than zeolite(Fig 1.).

On the other hand, Cd secondary concentration was higher by zeolite. Fe was been in fourth place with 25.29 and 53.94 in zeolite and perlite (zeolite's Fe Adsorbed concentration was 2 times than perlite).Also, Mn was increased more in perlite than zeolite (about 20 times) like as Zn, Cu and Fe. All of treatments had significant difference at 1% level.

In additional, Ni concentration was very low and it was out off analysis sensitive. Inglezakies et al., (2005) reported the relatively poor removal of Ni^{2+}, Hg^{2+}, Cu^{2+}, Fe^{3+} and Cr^{3+} in the presence of Cl^{-}, So_4^{2-}, HPO_4^{2-} and NO_3^{-} by several zeolite including Clinoptilolite, has been attributed to the high stability of several complexes formed in the solution and surface precipitation to blockage of microprores.

We conducted this experiment to assess Natural Zeolite and Perlite to reuse industrial wastewater as irrigation water for pitcher irrigation system. Based on results, perlite has more efficiency to removal heavy metals from industrial wastewater. Also, only Pb and Cd adsorbed more by zeolite than perlite from Isfahan Zob-Ahan industrial wastewater.

Keywords: Zeolite, Perlite, Pb,Cd, Mn.

REFERENCES:

APHA, 1995. Standard method for the examination of water and wastewater. *American Public Health Association, Washington, D.C., 1566 PP.*.

Inglezakis V.J., Zorpas A.A., Loizidous M.D. and Grigoropoulou (2005). The effect of competitive cation and anions on ion exchange of heavy metals. *Serparation and Purification technology J*. 46, 202-207.

Nazem, Z,. Najafi, P., Tabatabaei, S. H. and Hajrasuliha, Sh. (2011) Adsorption of heavy metals in the compost leachate in a soil column enriched by Clinoptilolite. *Research of Chemistry and Environmental J*.,:15(3)(Malaysia).