

## Heavy metals impacts on plants fertilized by stabilized biosolids from Al-Bireh oxidation ditch

Nasser Samara<sup>1</sup> and Rashed Al-Sa'ed<sup>2,\*</sup>

<sup>1</sup>M.Sc., Association for Integrated Rural Development, Ramallah, Palestine

<sup>2</sup>Associate Professor, Institute of Environmental and Water Studies, Birzeit University, POB 14, Birzeit, Palestine

### Abstract

The study aimed to investigate the concentrations of heavy metals in biosolids of Al Bireh wastewater treatment plant (AWWTP) and to assess the impacts on plant growth and production. A total of 10 composite biosolids samples from AWWTP were collected and analyzed over a period of 1 year. Main chemical and physical properties of biosolids were identified for each sample (EC, TS, TSS). Heavy metals concentrations (Zn, Cu, Ni, Cr, Cd, Pb, As and B) were determined by Inductively Coupled Plasma-Mass Spectrophotometer. The obtained data of heavy metals in biosolids were compared with the maximum allowable limits defined in the EU, USEPA and the Israeli standards to assess its usability for soil amendment. Biosolids were dried and applied to soil in 4 application rates (0, 20, 40, and 60 tons per hectares; 1 ha equates 10 donums). The treatment plots were planted with Egyptian clover and irrigated evenly with fresh water. After 120 days, plants were mowed and weighted for green and dry biomass measurements. Results indicated that the maximum concentration of analyzed heavy metals (Zn, Cu, Ni, Cr, Cd, Pb, As and B) were 1150.3, 411.4, 115.7, 232, 9.94, 62.6 and 58.8 mg/kg dry weight, respectively. All these values did not exceed the maximum permissible concentration limits in both EPA and EU standards, and lower than the maximum permissible concentrations (except for nickel), for biosolids application compared to the Israeli standards. Biosolids application showed a significant positive impact on the growth and yield of crops at various loading rates (0, 2, 4 and 6 tons/donum). The average production values for all treatments were 769.6, 1744.4, 2957, 3335.2 kg/donum for green biomass and 85.9, 197.8, 312.2, 371.4 kg/donum for dry biomass, respectively. The results of this study indicated the economical potential of stabilized biosolids for land applications and the need for large scale intervenes to achieve sustainable biosolids recycling.

**Keywords:** Biosolids, heavy metals, land application, Egyptian clover, recycling, landfill

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\* Corresponding author: Rashed Al-Sa'ed, E-mail: [rsaed@birzeit.edu](mailto:rsaed@birzeit.edu), Telefax: +972-2-2982120