

ABSTRACT

The use of treated wastewater (TWW) in irrigation is one of the important things in countries that suffer from a shortage of water resources, since it is an additional source of water and nutrients for the plants; it is also a safe way to get rid of wastewater without harmful effects on the environment. Using TWW can lead to toxic effects on humans and animals, because it may contain high concentrations of chemical and biological contaminants. Interest in studying the positive and negative impacts of this water resource is one of the priorities in the studies concerned with the future of agriculture in Palestine.

This research was conducted in the research field of Birzeit University (BZU) - Palestine, in order to study the effect of using secondary TWW from Al-Bireh wastewater treatment plant (WWTP) in comparison with tap water on corn intended to be used for animal feeding as well as the impact on the physical and chemical properties of soil, especially on its content of heavy elements. Corn seeds were planted in plastic pots filled with agricultural soil brought from the area of Qalqilia in the West Bank. The experiment includes five treatments of irrigation and fertilization, as follows: **1-** Irrigation with Tap Water (TpW) only, **2-** Irrigation with TpW + full fertilization, **3-** Irrigation with TWW only, **4-** Irrigation with TWW + full fertilization. **5-** Irrigation with TWW + half-fertilization. Each treatment was repeated six times and the experimental units were randomly distributed according to Complete Randomized Block Design (CRBD). Results show the following:

Irrigation water: pH of irrigation water was slightly alkaline (7.9) and it was within the acceptable range of the Palestinian Environmental Quality Authority (EQA) standards. **Na** in the TWW was almost up to the highest allowable value according to the Palestinian standards. The average concentrations of heavy metals were considerably lower than the maximum allowable values for the unrestricted irrigation according to the EQA standards. Results showed high numbers of coliform bacteria in the TWW, which exceeded the recommended range.

Soil: soil pH was significantly decreased in all treatments at the end of the experiment compared to its value before planting. On the other hand, TWW increased soil EC by 18.5% in comparison to TpW. There has been no significant change in the texture of the soil between treatments at the end of the experiment, while, soil Cation Exchange Capacity (CEC) increased significantly due to irrigation with TWW. The results indicated that the use of treated sewage water led to a significant increase in the level of P and K in the soil compared to TpW, while there is no significant difference in the concentration of N in the soil. Concentrations of soil Ag, Cd and Pb after cultivation were not detected. In general, the use of TWW from Al-Bireh did not result in an increased content of heavy metals in the soil compared to TpW.

Plant: high growth rate was observed as a result of irrigation with TWW and there was significant difference in the number of leaves of plants irrigated with wastewater compared to those irrigated with TpW. On the other hand, there was no significant difference in the number of fruits compared with TpW, while the difference in dry

weight was significantly higher (~doubled). Fertilization led to significant increase in plant height and fruit weight. *E.coli* bacteria was absent in the fruits from all treatments units. Ag, Al, As, Cd, Co, and Pb concentrations were lower than the detection limit for all corn grains samples of the experiment. On the other hand, heavy metals, Cu, Fe, Ni and Zn were detected without significant difference between their concentrations on the original corn seeds before plantation and after harvesting. However, Fe dropped to 50-60% of its original concentration, while Na dropped also to 40-50% of its original concentration. Results showed also an increase in the chlorophyll and proline content of leaves when using TWW in irrigation, and fertilizer also led to the same result.