

Physicochemical and Microbiological Evaluation of wastewater, used in Yemen vegetables production

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Abstract

The aim of this study is to evaluate the quality and suitability of canal wastewater, Shallow wells and Ponds, in Bani Al Harth area of Sana'a Yemen, when used to irrigate vegetables production. This assessment was done by the Physicochemical and Microbiological characterizations and ranking the isolated Enterobacteriaceae. The physicochemical parameters of both water tested (pH, EC, TDS, NO₃ and SO₄) showed results in agreement with the standards of FAO and WHO with, respectively, averages of 6.93, 2047 µS/cm, 1305, 10.9 mg/L and 57.3 mg/L, but COD mg/l, BOD5 mg/l and turbidity value exceeded even the maximum value for the allowable in wastewater irrigation use with the main of 362, 93.2 and 231 NTU. Microbiological analyses showed higher counts in all tested samples, with an average 1.3x10⁷ CFU/ml, 8.1x10⁶ CFU/ml, 1.3x10⁷ CFU/100ml, 5.9x10⁵ CFU/100ml, 5.4x10² CFU/100ml, 1.1x10⁴ CFU/100ml, 4.2x10³ CFU/ml and 6.7x10²CFU/ml for, respectively, Heterotrophic Plate Count at 22 °C & 37 °C, total coliforms, fecal coliforms, *Staph. spp*, *Vibrio spp*, yeasts and moulds. Also *Salmonella spp* was detected in all tested samples. Enterobacteriaceae identification results showed the presence of *Escherichia coli* (25%) then *Enterobacter* genus (21.4%) with three species *E. aerogenes* (50%), *E. Amnigenus* (33%) and *E. intenrmedius* (17%). Other genus *Klebsiella* (18%), *Citrobacter* (14.3%), *Serratia* (10.7%) and *Proteus* genes (10.7%); were also observed. On the other hand, when the microorganisms isolates were tested versus antibiotic, they showed be highly susceptible to Gentamicin and Cefotaxime; while, three isolates were observed resistant to 25µg of Amoxicillin+Ac clavulanic. And, one isolate was Cefalotin resistant. We, therefore, conclude that both waters samples examined did not meet bacteriological quality standards. Thus Sana'a wastewater effluent and its agricultural reuse under these conditions can be considered illegal.

Key words: Wastewater • suitability • *Enterobacteriaceae* • antibiotic Susceptibility •

References

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