Pollution assessment and removal from manzala lake area

Mohamed Mohsen El-Kholy

This work was carried out to :1-Evaluate pollution along Bahr El-Baqer drain and Manzala lake. This was performed through collecting water, sediment mud, aquatic macrophytes from the drain, together with soils and crop plants from locations irrigated with Bahr El-Baqerdrainage water.2-Removal of pollutants which are presented in both wastewater as well as polluted soils through ;•investigate the ability of grown plant (such as Maize, Berseem, Bean, Sugar beet, Peas and Radish) as well as Aquatic macrophytes (water hyacinth and Reed plants) to phytoextract the common heavy metals from soils andwastewater.•Low cost exchangeable rnaterials(such as heavy clay soil) for purifying chemical pollutants particularly heavymetals.•Investigate some fillers used for biological remediation of wastewater such as : (rice straw, charcoal , Bio-charcoal, bentonite and limestone), in the reductions of N, P (contributors to eutrophication) as well as organic pollutants in order to reduce the pollutant levels up to a desired level from both the agricultural system and general environmental point of view.5- Summary &Conclusion.126The results could be summarized as follows:-1. Chemical and biological characteristics of Bahr El- Bacier drainage water and Manzala lake:1.1.The EC of the main drain of Bahr El- Bacier drainage water ranged between 1.34 to 4.05 dS / m. Reuse of Bahr El-Bacier drainage water for irrigation is in slight to moderate but for the last reach it is in severe level in the degree of restriction according to Ayers and westcot (1985). While at Manzala lake water samples EC ranged between 5.6.to 5.9dS/ m.1.2.Along Bahr El- Bacier drain, Na+ is the dominant cation followed by Ca2+ and Mg2+ whereas K+ was the lowest one. On the other hand, the dominant anions can be arranged in the following descending order; HC0-3 < Cl- < S02-4 except the location No.(9 and 10) which has the following dominant anions order; cr> Fico-3> S02-4_ .Concerning the examined ions in Manzala lake, the data showed that Na+ represented the dominant cation followed by Mg2+ and Ca2+ whereas K+ was the lowest one. Anions can be arranged in the following descending order; Cl- > S02-4> HCO-3.1.3.SAR values ranging from 4.14 to 6.29 for most of the examined locations give a slight restriction on the re-use of such drainage water for irrigation, while location (No .10) has an average 20.23 which give a high degree of restiction in use. RSC has low values in different loctations along Bahr El-Bacier drain except location No.3 which have a high value.5- Summary &Conclusion.1271.4. pH values ranged between 7.8 to 8.70 and 7.20 to 7.40 for both Bahr El-Bacier drain and Manzala lake, respectively.1.5.Generally, ammonium is found in markedly higher concentration than nitrate. It exceeds FAO guidelines (1992) along Bahr El-Bacier drain. Nitrate and ammonium varied from 1.95 to 2.26 mg1-1 and 0.0 — 1.26 mg1-1, for Manzala lake, respectively.1.6.Phosphorus concentration along Bahr El-Bacier drain and Manzala lake is presented in high level depending upon source of pollution , i.e. high levels were linked to the first polluted location. In Manzala lake it exceeds the limits given by Bauer (1979).1.7.Micronutrients and trace metals (Fe, Mn, Zn, Cu, B, Cd, Pb, Co, Ni and Cr) are represented below the recommended limits adapted by pratt (1972). For both Bahr El-Bacier and Manzala lake.1.8.Total and faecal coliforms showed a similar trend along Bahr El-Baler drain and generally, exceed the permissible limits for reusing such water for irrigation. Water samples at Manzala lake showed a gradual decrease from southern part of the lake, 10 kilometers, in direction to the north.1.9.Salmonella and Shigella showed low numbers in locations (2 and 4) and were not detected along Bahr El — Baler drain and Manzala lake,

respectively.1.10.Chemical and biological oxygen demand values as well as suspended solids along Bahr El — Baler drain are exceeding the maximum limits in the degree of wastewater treatment for agriculture reuse in Egypt by committee (1995).Concerning COD,BOD and SS, values are ranged between 36.5 to 50,23 to 27 and from 25.0 to 30.5 mg/1 ,respectively.2. Evaluation of sediment mud in Baher El-Bacier drainand Manzala lake2.1.The maximum concentrations of available (Fe, Zn, Cu, B, Cd, Co, Ni and Cr) was recorded in locations (9 and 10) while Mn and pb showed the highest values in locations (5 and 3); respectively. — Total contents of such elements had the highest values in locations No.(9 and 10) except Fe and Co which gave the highest values in location (5). The highest value of Mn was observed in location No (4).2.2.The highest values of (EF) were 2.75, 5.01, 5.09, 12.15, 6.69 and 4.24 for Fe, Zn, Cu, Cd, Pb and Cr along all locations of Bahr El-Bager drain, respectively. At Manzala lake, thehighest (EF) value is 7.96 for Cd.2.3.In location (9) 80% Zn and Cu , 85% pb , 76% Cr , 64% Fe in location (5) , 92% Cd in location (10) while in Manzala lake it was 86% Cd of total heavy metals concentration werederived from anthropogenic source.3. Monitoring of aquatic macrophytes :-The content of micronutrients and heavy metals in water hyacinth and reed plant parts (shoot and root) reveal that , with the exception of boron , all the tested elements tended to be accumulated in roots than in shoots. In addation , water hyacinth plant was distinct for adsorbing Fe , Mn , Co , Ni , B , Cr and Cd while reed plant was distinct for adsorbing Zn , Cu , and Pb.5- Summary &Conclusion. 1294.Evaluating of soils as well as some plants grown around Bahr EL - Bacier drain.4.1.Evaluation of soils irrigated with Bahr EL-BacierdrainThe extractable and total content of (Fe , Mn , Zn , Cu , B , Co , Ni , Cr , pb and Cd) in all studied soils irrigated with Bahr EL-Bacier drain water cultivated with maize , berseem, bean, sugar beat , peas and radish showed a higher values of such elements than those soil irrigated with normal fresh water(control).4.2.Evaluation of Plants grown around Bahr El-Bailer drain:4.2.1. The impacts of using Bahr EL- Bacier drainage water for land irrigation on concentration of Fe , Mn , Zn , Cu , Cd , Pb, Co, Ni, B and Cr in Maize , Berseem , Bean , sugar Beet , Peas and Radish . The data showed that Fe was the highest concentration among the studied elements in all investigated plant species except maize plants in which Zn showed the highest concentration .Concentration of Cd and Pb were the lowest elements in all investigated plant species . In addition, the data also reveal that, except of boron , the accumulation of the concerned elements occurred mainly in roots than in shoots in all investigated plant species .4.2.2.Concerning ,BCR in different plant species grown on soil irrigated with Bahr El-Bacier drainage water, The capacitiesof such plants for adsorbing and accumulating of the concerned elements could be arranged in the following descending order ;Iron:Radish < Sugar Beet < Berseem < Bean < Peas =Maize.Manganese:Maize > Bean > Berseem > Sugar Beet > Radish > Peas.Zinc:Sugar Beet > Bean > Maize > Berseem > Peas > Radish.Copper :Peas > Maize > Sugar beet > Berseem > Bean.Boron :Peas > Radish > Sugar beet = Maize > Berseem > Faba Bean.Cobalt :Bean > Berseem > Peas > Radish > Sugar Beet.Nikel :Bean > Sugar Beet > Peas > Berseem > Radish > Maize.Chromium :Bean>Berseem>Sugar beet >Radish > Peas = Maize.Lead :Sugar Beet.Cadmium :Peas > Berseem > Radish > Sugar beet.5. Removal of some heavy metals and organic pollutant :5.1.Removal of some heavy metals from polluted water by using low cost materials such as heavy clayey soils that could stand as a reliable substrate for purifying heavy metals from polluted solution . Generally, all types of filters used soil filter, soil-sand (3 : 1) and soil — sand (1 : 1) are suitable for removing the investigated heavy metals (Cd, Co, and Ni). The result also showed higher durability of soil filter to remove such elements than others used filters.5.2.It is necessary to develop low cost performance equipment to reduce polluting elements concentrations of COD, BOD, suspended solids and synthetic detergents, therefore we started to develop equipment containing only natural materials. Our purpose was at three folds: (1) to ensure microbial habitation for the promotion of organic decomposition and biochemical reactions; (2) to adsorb inorganic ions dissolved in the treated water; and (3) to encourage easier and safer restoration of saturated adsorbents to soils for the benefit of the earth,s naturalcirculatory system.5.2.ConclusionBased on the work carried out herein one may conclude that:The heavy metals are the main source of pollution occurred in some locations through the upper parts of Bahr El-Baler drain due mainly to the wastewater of the different plants that usually find its way to the drain.Fortunately, the hyper accumulator macrophytes (water hyacinth and reed

plants) as well as sediments in the drain bottom act as effective traps for heavy metals.Bahr El Bager drain after its connection with Belbies drain showed another type of pollution which was mainly biological due to sanitary wastewater principally coming from Belbies drain.Accordingly it is recommended that pollution remediation should be dealt with on location at its initial sources. A filter depending on natural native sources was developed and tested for efficiency and durability to remove heavy metals pollutants. It is easy to use such type of filters through the different plants.Another system almost similar to a Japanese one modified according to our local facilities and resources to eliminate biological and chemical pollution. Again it is suggested to separate the solids sanitary waste effluents from the liquids also in location i.e. houses and buildings to restrict the dependence on the developed system to be use for the actually polluted areas.