ABSTRACT

River Ragati is an important habitat for diverse species of organisms, plants and micro-organisms. The larger Ragati ecosystem is surrounded by a rural and urban setting that has a population of more than 158, 960 people. The ecosystem is located in an area with intensive agricultural activities and with the largest open-air market in East Africa which produces heterogeneous wastes that may contaminate Ragati River. Though there is a sewerage treatment plant at Karatina Town in Nyeri County, there is scanty information on the efficiency of stabilization ponds and the impact of the sewer discharge on River Ragati. The study was undertaken to evaluate the impact of Karatina sewer treatment plant and its impact on physico-chemical and biological parameters along River Ragati during dry and wet seasons using quasi-experimental design. Data was analyzed using Scientific Analysis System (SAS) version 9.4. Wastewater parameters such as heavy metals. Nutrients and fecal and total coliform improved as they moved from one sedimentation to the next towards discharge. The pH during the wet season ranged from 6.54 to 7.96 and from 6.41 to 7.53 during the dry season. Temperature range of 20.17∘C to 25∘C and 23.9 to 25.7 ∘C was observed during wet season and dry seasons respectively. Concentrations of nitrates, phosphates, Zinc across sedimentation ponds differed significantly ($p < 0.05$). Nitrate concentrations range of 2.06 mg/l to 20.17 mg/l and 8.27 mg/l was observed during wet and dry season respectively. Phosphate concentrations ranged from 2.06 to 52.2 mg/l and 10.7 to 41.7 mg/l in wet and dry season respectively. Lead was below detection limit in this study in both seasons. The concentration of iron ranged from 0.56 to 30.42 mg/l and 0.06 to 22.1 mg/l during wet and dry season respectively. Total coliform and faecal coliform bacteria were significantly ($p < 0.05$) affected by seasons of the year. The levels of total coliform in the sewerage treatment plant ranged from 7.61 to 774.16 cfu/100ml and 10.453 to 1500 cfu/100ml during dry and wet season respectively. On the other hand, levels of faecal coliform bacteria ranged from 3.91 cfu/100ml to 74.19 cfu/100ml and 7.23 to 105.87 cfu/100ml in dry and wet season respectively. The pH, temperature, phosphate, iron and copper of water from River Ragati differed significantly ($p < 0.05$) between upstream, effluent discharge point and downstream. The pH in River ranged from 7.1 to 7.5 and 8.03 to 8.37 during the dry and wet season respectively. The temperature ranged from 23.16 to 23.61∘C and 21.18 to 22.55∘C during wet and dry season respectively. Nitrate concentrations ranged from 11.47 to 14.06 mg/l and from 14.83 to 18.05 mg/l during dry and wet season respectively. The concentrations of iron ranged from 0.41 to 0.63 mg/l while that of copper ranged from 0.85 to 0.11 mg/l. Nitrates were higher 16.82 mg/l in the river during the wet season. Phosphates were higher in the river during the wet season at 11.45 gm/L. Iron was higher in the river during the wet season at 0.69 gm/L. Levels of total coliform and faecal coliform bacteria was not significantly ($p > 0.05$) different in different sampling points of River Ragati during dry and wet seasons. However, the level of total coliform bacteria significantly ($p < 0.05$) differed with seasons. Based on the findings, Karatina sewerage treatment plant effectively improved quality of wastewater in terms of physico-chemical and coliform aspects sampled in the study and could further be improved using duckweeds and sand filtration methods in future studies. Further, Karatina sewerage treatment plant had no effect on River Ragati in terms of Physico-chemical and coliform constituents. Seasons of the year significantly affects the levels of chemical and physical parameters. Levels of total coliform and feacal coliform bacteria did not differ significantly ($p > 0.05$) by seasons in different sampling points of River Ragati. Levels of faecal coliform bacteria in different sampling points did not vary significantly ($p > 0.05$) in River Ragati. This study bridges the knowledge gap on the performance of Karatina sewerage treatment plant and its impact on River Ragati.