

A study of the impact of dairy effluents on the Kipsonoi river water at Sotik, Bomet district, Kenya

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Abstract:

This study assessed the status of the quality of the Kipsonoi River waters at Sotik area. It further evaluated the impact of the effluent disposed into the river from the dairy processing plant located at Sotik town. The water samples were collected from six sampling stations established on the Kipsonoi River; two stations at the upstream, one at the effluent disposal zone and three others downstream. The samples were collected monthly from March to June 1993. A total of twenty-four water quality parameters were monitored. The results were graphically represented based on the mean and monthly data across the stations. The results were further subjected to analysis of variance (ANOVA) and factor analysis (FA). The finding of the study showed that Kipsonoi River waters had generally low mineral and nutrient contents. The levels of the anions were also low with chloride being predominant. This suggested that the river water was generally of acceptable quality. However, the levels of the iron nitrate - nitrogen and BOD were found to pose a health risk. The mean concentrations (upstream and downstream values considered) of iron ranged 0.57-070mg/l, nitrate - nitrogen, 10.9-17.7 mg/l and BOD, 48.0-52.5 mg/l O₂ and these concentrations exceeded the Kenya Bureau of Standard (KBS) and World Health Organisation (WHO) recommended maximum allowable limits for potable waters. Further the dairy effluent was found to significantly increase the levels of the parameters at the disposal zone, but permissible limits were not exceeded except again for the iron, nitrate- nitrogen, BOD and manganese. The increased concentrations of the parameters did not persist downstream due to the dilution and self-purification in the river. The ANOVA results showed significant differences between sampling stations with respect to pH, conductivity, dissolved solids, nitrite - nitrogen, sulphate, alkalinity, iron, sodium, potassium and BOD. The correlation analysis from the FA suggested geographical and/or anthropogenic factors played part in the levels of the physical-chemical and biological parameters in the river. The correlations also showed the point source for the most of the parameters at the effluent disposal zone. Recommendations to improve on the quality of the Kipsonoi River waters include; the use of the environment-friendly technologies in the effluent treatment at the Dairy Processing Plant, reinforcing environmental legislation, enforcing soil and water conservation measures along the banks of the river, environmental education among the community, and regular monitoring of the water quality in the river. Recommendations for further research include investigation of chemical oxygen demand (COD), ammonia - nitrogen, soaps and detergents, oil and grease and faecal matter; analysis of the effluents and longer period of monitoring to determine the detailed picture of the seasonal variation on the quality of the Kipsonoi River Waters.