

**CAPACITY OF OMBEYI WETLANDS IN IMPROVING WATER QUALITY
IN OMBEYI RIVER, WITH SPECIAL EMPHASIS TO THE USE OF
COLIFORMS AS BIO-INDICATORS OF POLLUTION IN LAKE VICTORIA
BASIN, KENYA.**

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ABSTRACT

The significance of this study lies in the potential for conservation of existing natural wetlands to provide inexpensive treatment of wastewater by intercepting excess pollutants. Wetlands are known to remove pollutants through various processes e.g. adsorption, sedimentation, chemical reaction, ammonification, deactivation, microbial nitrification, denitrification as well as plant uptake (Moshiri, 1993). The increasing levels of pollutants in Ombeyi River System and its wetlands as a result of agricultural, industrial, urban and domestic waste is an issue of concern on water quality, human health and quality of aquatic environment. Inadequate treatment of water results in potential danger posed by water-borne bacteria e.g. Escherichia coli that cause diarrhoea.

Examination of the presence of Total coliforms (TC) and Faecal coliforms (FC) and the prevailing physico-chemical characteristics were undertaken to verify their removal by Ombeyi wetland System. Bacteriological, physical and chemical analyses of water using standard methods were carried out by running a series of laboratory experiments to generate data for assessing the role of Ombeyi wetland system in water quality improvement. Data of microbiological and other determinations were collected fortnightly for a period of eight months between March and November 2000 and were examined statistically. The results of laboratory analysis of samples indicate the presence of organisms, which varied significantly along the river regime. The highest numbers of TC and FC were 594 and 212 per 100mL respectively. Numbers as low as 47 and 16 per 100mL respectively were recorded in the effluent water at the river mouth. Distribution determinants showed that there was a reduction of 11.5% of TC in the upper wetlands, which increases to about 92.5% in the wetlands located downstream. The removal capacity for FC was found to be similar to that of TC both in the river upstream and downstream. Though there were general reductions of coliform organisms, an increase of 25.2 % and 51.9 % of TC and FC respectively were observed at some points along the wetland system.

The results also indicate an increasing level of BOD₅ between some sampling sites thus an indication of substantial loading of organic substances in the water. The highest BOD₅ of $16.39 \pm 5.93 \text{mgL}^{-1}$ concentration was recorded at Site 4 (S4), a site receiving discharge from Miwani Sugar Factory (MSF). The observed rise in BOD₅ however drops to the lowest level of $1.88 \pm 0.71 \text{mgL}^{-1}$ in the effluent water at river mouth amounting to 88.5% reduction. Most other parameters (chloride, nitrate, phosphate, calcium carbonate, nitrite, sodium chloride, potassium and magnesium) recorded a significant reduction above 28.4% in the final effluent in the lower wetlands. The results of simple linear regression analysis tested at 95%

confidence limit showed significant linear relationship between rainfall and FC ($r = +0.55$) and pH ($r = +0.55$) indicating that rainfall can affect the levels of some of these parameters. TC ($r = +0.45$), Dissolved Oxygen ($r = +0.47$) and PO_4 ($r = +0.45$) showed little correlation with rainfall however other parameters showed insignificant relationship with relatively low r -values.

From the results of this study, the average concentrations for water quality parameters were greatly improved downstream thus provide convincing evidence on the role of Ombeyi wetland system in treatment of polluted stream water. Though there were substantial reduction in most of the analysed parameters, the river water displayed characteristics that demand for treatment before domestic use. The major concern is on relatively high microbiological levels. Other water quality parameters also require frequent monitoring since the composition of surface water is subject to change.

Key words: *Total coliforms; Faecal coliforms; Physico-chemical parameters; Wetland; Ombeyi River; Removal capacity; Lake Victoria basin.*