ABSTRACT

The prevention of rivers and other water sources from pollution and the protection of public health by safeguarding water supplies against exposure to pollutants and the spread of diseases are the two major foundamental reasons for treating waste water.The conventional methods of treatment are inefficient, costly, unsustainable, outdated and oftenly results in an effluent heavily loaded with pollutants. Excess nitrates and phosphates causes eutrophication of the receiving water bodies and when taken up by human and animals it may cause food digestion associated diseases and methaemoglobin. Phycoremediation is an alternative way of waste water treatment which involves the use of algae for the removal or biotransformation of pollutants from the waste water. This study was justified because most of the tea, coffee and sugar factories found in Nandi,Bungoma and Kakamega counties don't effectively treat their waste water. The objectives of this study were to determine the phycoremediation efficacy of *Chlorella vulgaris,Synechocystis salina* and *Gloeocapsa gelatinosa* on the physicochemical parameters of coffee, tea and sugar waste water from Nandi,Bungoma and Kakamega counties,and to assess the phycoremediation efficacies of *Chlorella vulgaris, Synechocystis salina* and *Gloeocapsa gelatinosa* on nitrates and phosphates in coffee, tea and sugar effluents aganist WHO permissible standards.Purposive and random sampling were used to obtain four replicate samples from the 26 coffee,tea and sugar factories. 10ml of serial dilutes of pure *C.vulgaris, S.salina and G.gelatinosa* in test tubes were mixed with 100ml of the waste water in a beaker from the three types of waste water then incubated at 25^0c and monitored for nutrient absorption which had an effect on the concentrations of TDS,BOD, COD, pH and conductivity levels.The BOD and the COD were determined using the BOD/COD track machine and pH meter for estimation of pH, while the phosphate and nitrate contents were determined using the colorimetric method before and after specific algal inoculation, while STATISTICA V.8.0 was used in data analysis.Results showed significant differences in TDS Phycoremediation of p = 0.00001,p = 0.0000,p= 0.00006 and p = 0.00864,p =0.00260 and p=0.00662 between day 0 and day 5 in tea and sugar effluents for *S.salina,C.vulgaris* and *G.gelatinosa* respectively.While between day 10 and 15 a non significant difference of TDS and conductivity phycoremediation efficacy of p =1.0000 was recorded in coffee, tea and sugar effluents.The phycoremediation efficacy of BOD was significantly different in the sugar effluent only between day 5 and day 10 with p = 0.03066 and p =0.000905 for *S.salina* and *C.vulgaris* respectively. While between day 10 and 15 the BOD and COD phycoremediations were not siginificantly different (p-value=1.0000) in all the effluents.The phycoremediation efficacy of all the species in the three effluents showed an increase in pH levels of the effluents between day 0 and day 5and no effect between day 10 and day 15.The comparison of the phycoremediation efficacy of *Chlorella vulgaris, Synechocystis salina* and *Gloeocapsa gelatinosa* in the three effluents showed insignificant difference in phycoremediation of p>0.05 in the physiochemical parameters except for TDS and conductivity with p =0.015 in the tea effluent and p=0.004 for sugar effluent. The phycoremediation efficacy of nitrates, phosphates, COD,BOD, pH TDS and conductivity was in the order of *Chlorella vulgaris> Synechocystis salina >Gloeocapsa gelatinosa*. The phycoremediation of nitrates and phosphorus by *S.salina, C. vulgaris and G.gelatinosa* against the WHO standards (10mg/l,5mg/l) in the tea effluent showed a phycoremediation significant difference of p=0.00001 and a non significant difference in the sugar effluent nitrates of p = 0.082571,p = 0.057716 and p =0.090334 for *S.salina,C.vulgaris and G.gelatinosa* respectively. In conclusion *S.salina, C.vulgaris* and *G.gelatinosa* were all found to be efficacious and therefore should be recommended in public health phycoremediation of coffee, tea and sugar waste water.