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Algal Infestation of River Ganga at Shuklaganj, Unnao and Their Role in Self-Purification of Ganga Water

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ABSTRACT: Present investigation deals with the study of algae in Ganga waterat Shuklaganj, Unnao (U.P.). During presentstudy, a total number of 316 algal species spread over 83 chlorophyceae, 108 cyanophyceae, 121 bacillariophyceae, and 4 euglenophyceae were recorded from Ganga water at Shuklaganj, Unnao. The river Ganga has been a perennial source of waters for vast multitude of humanity from times immemorial.The pristine purity of ganga water is linked with its historical reverence. Algae perform great service in self-purification of water and makes it healthier by increasing dissolved oxygen after reaching a short distance. In this way algae play a very important role in maintaining the holinessof river Ganga. Algae remove nitrogen, phosphorous, heavy metals, pesticides, organic and inorganic toxins, pathogens from surrounding water by accumulating or using these materials in their cells. Algae are able to accumulate highly toxic substances as Selenium, Zinc, Arsenic etc in their cells thus eliminatingthese metalsfrom aquatic environments. Observations of several researchers showed that certain heavy metals as well as radioactive metals may be removed successfullyfrom aquatic environment by these algae. Some important elements removed by algae are Molybdenum by *Scenedesmus,* Chromium by *Oscillatoria,* Cadmium, Copper and Zinc by *Chlorella*, radio phosphorous by *Spirogyra* etc. The studies suggest that algae may be used successfully for wastewater treatment as a result of their bioaccumulation abilities.

KEYWORDS: Chlorophyceae, Cyanophyceae, Bacillariophyceae, Euglenophyceae, Self-purification,

I.INTRODUCTION

The life of Indo-Gangetic plains pulsates through ganga as a perennial source of water from times immemorial. The lotic water of river Ganga is closely wedded to human life that it is difficult to discern the service of river to the vast humanity. Ganga has been always looked upon with a sentiment of religious fervor for its pristine purity of water.
Shuklaganj, Unnao is situated at 26.58° N latitude and 80.34°E longitude at an elevation of 110 meters from level on the Bank of river Ganga. The river receives domestic and industrial wastes and the water shows high degree of pollution. Algae have been reported from different localities of Kanpur. Algae are the organisms with multiple significance, more so they are looked upon as organisms for excellence in environmental studies. The environmental requirements of algae are little known. There are plenty of species capable of tolerating varying degree of organic pollution and hence can be used as indicators of organic pollution. But little is known about algae as soure of toxin (Hughes, Gorban and Zehander 1958; Aziz 1979; Miechael 1981). Significance of such pollution indicators have wide application for creation of cleaner water. Utilization of diatoms as biological indicators of water quality (Whitton 1975; Palmer 1980; Tripathi and Shukla 2001) are in nascent stage and need greater attention for monitoring and abatement of river pollution. Diatoms have been reported from flowing water by Nair 1967; Shukla 1983; Tripathi and Shukla 1989; Tripathi, Gupta and Tiwari 1989; Tripathi 1991 from river Ganga water; Nigam 1980 from Agra canal Delhi.

Self-purification deals with chemical composition of the water and of the sediments in flowing waters. The term 'purification' obviously means the elimination of dissolved or particulate matter with 'polluting' properties in a river. The chemical compounds present in water support ecological factors for associations of the organisms growing at any location in a water body. Self-purification, therefore, induces secondary effects such as biological gradients and gradients of oxygen concentration. The basic cause for these effects is a moving ratio between photo-synthetic oxygen production and community respiration in the length profile of a polluted water. The algae *Vacuoliviride*, *Stigonema*and*Closterium,* and *Nostoc* showed the highest bioaccumulation activity for the removal of cesium, strontium, and iodine from the environment, respectively.Cesium, strontium, and iodine were regarded as the most hazardous of the radionuclides diffused into the environmently. These elements are easily absorbed by living organisms through water and air or indirectly through food and result in an increased health risk by internal exposure. The indirect uptake of these nuclides through food is more serious because the strength of the activity may be increased by biological concentration via food chain.(S. Fukuda, K.Wamoto, , T.Nakayama, K. Ishida, I.InouyeM.Atsumi, A.YokoyamaY.Shiraiwa ;2014; K. Iwamoto and A. Minoda ,2018)

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II.MATERIAL AND METHODS

An exhaustive collection of algae from different localities of river Ganga between waterat Shuklaganj, Unnao was made to prepare an algal profile listing indicator organism. Samples were collected fortnightly from river Ganga. The algae were collected in specimen tubes. They were then brought to the laboratory in living condition and preserved in 4 percent formalin. The samples were examined microscopically, camera Lucida figures prepared and on the basis of morphology, structure and measurements these algae were identified using standard texts.

Monthly water sampling was also carried out in Ganga water. One litre of sample was filtered through a bolting silknet of 20 xxx. Ten ml of plankton concentrate obtained was preserved in 5-6 percent formalin. The concentrate was assayed for plankton quantity using haemocytometer. Nygard's algal indices (1949) and Palmer's algal pollution indices (1969) and some recent research literatures for genera and species were to express the nature of water quality.

III.RESULTS AND DISCUSSION

Algal infestation in Ganga waterat Shuklaganj, Unnao is enormous. Both benthic and planktonic algae are found during various months. During present study, a total number of 316 algal species spread over 83 chlorophyceae, 108 cyanophyceae, 121 bacillariophyceae, and 4 euglenophyceae were recorded from Ganga water waterat Shuklaganj, Unnao

The waste water coming from different industries domestic channels tannery and agricultural washout is constantly discharged into the river Ganga without any treatment. The Kinds of pollutants impregnated into the river basically constituted particulate matter dissolved
chemicals gases domestic and industrial waste agricultural washouts human fecal matter and animal excreta. The industrial and soluble chemical pollutants includes large number of metals like Na,K, Ca,As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, Zn, Hg, Co, So_4,Po_4etc. which changes the complexion of river water to a very large extent. Besides them certain products of tannery poured continuously organic matter of fleshy hair bark extract along with high content of lime.
The tannery industrialization in North India has converted the Ganga river into a dumping ground.The tanning industry discharges different types of waste into the environmentprimarily in the form of liquideffluents containing organic matterschromiumsulphide ammonium and other salts. As per an estimateabout 80-90% of the tanneries use chromium as a tanning agent. Of thisthe hides take up only 50-70% while the rest is discharged as effluent.Pollution becomes acute when tanneries are concentrated in clusters in small area like Kanpur. Consequently,the Leather-tanning sector is included in the Red categoryof industries due to the potential adverse environmental impact caused by tannery wastes.
These industrial and domestic waste watersz Zn,etc. were observed. Their average concentrationand the range are given in Table- 10. In generaltrace metal levels in sediment collected fromdownstreamJajmau area were higher than upstream area. The increase in concentration ranged from 1.5- to2-fold for most of the metals with the exception of As and Pb which showed no change and Cr which showeda dramastic increase in concentration in sediment from downstream area.

Observations show that due to photosynthesis all autotrophic algae explicit production of oxygen and intake of CO2as such algae have the potential to give more oxygen during its growth and development and this induces higher oxygen level. Algae during their lifetime also absorb micro and macro elements as nutrients. Thus, they consume and eliminate chemical pollutants. In this regard references may be made to Cyanophyceae which are excellent users of $Ca(NO_3)_2$, K_2HPO_4, $MgSO_4$, Na_2CO_3, Citric acid and Ferric ammonium citrate: Chlorophyceae $CaCl_2$, $FeCl_3$, KNO_3, K_2HPO_4, $MgSO_4$, etc. : Bacillariophyceae $FeCl_3$, $CaCl_2$, $NaNO_3$, K_2HPO_4, $MgSO_4$ NaCl, and euglenophyceae Sodium acetate $CaCl_2$, etc. Beside this there is also absorption of certain other chemicals at the expence of these substances. Their accumulation in algal cells transformationdistruction or conversation as material brings about elimination of pollutants from river Ganga water. Thus, all these chemicals may be removed or eliminated in the form of algal structure. The algae are then either consumed by fishdestroyed by death or mechanically removed.The algae *Vacuoliviride*, *Stigonema*and*Closterium,* and *Nostoc* showed the highest bioaccumulation activity for the removal of cesium, strontium, and iodine from the environment, respectively. Cesium, strontium, and iodine were regarded as the most hazardous of the radionuclides diffused into the environmently. These elements are easily absorbed by living organisms through water and air or indirectly through food and result in an increased health risk by internal exposure. The indirect uptake of these nuclides through food is more serious because the strength of the activity may be increased by biological concentration via food chain.

Thus, algae perform great service in self-purification of water and makes it healthier by increasing dissolved oxygen after reaching a short distance. In this way algae play a very important role in maintaining the holiness of river Ganga.

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