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A Check List of Phytoplankton Flora in Two Industrial Effluent in Kakuri Kaduna Nigeria

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Abstract: *This study presents a first compilation of phytoplankton species composition of an industrial effluent (waste) water of coca cola and 7up bottling company of kakuri Kaduna south Nigeria. Sample collection spanned a period of 12 month April 2009 to may 2010. Phytoplankton sample were collected monthly in the open water using a plankton net mesh size 55mm towed at low speed for 10 minutes. The net hauls were transferred into two liter jar screened tight and properly labeled and samples immediately presented with 4% umbuffered formation solution and analysis at the laboratory, phytoplankton was identified microscopically and recovered following the method suggested by valenkar and Desai (2004). A seasonal pattern of phytoplankton variation was observed, the dry season cell counts were significantly ($p < 0.05$) higher than the wet season species recorded. The taxa recorded belong to three divisions namely: Bacillariophyceae (diatom), chlorophyceae (green algae) and Cyanophyceal (blue- green algae). The chlorophyceae were the predominant group and account for 55% of the total species compositions, Cyanophyceal 35%, and bacillariophyceal 9.3%. Stations B water recorded relatively higher number of species and number of individuals of each species more than stations A and C. The more noticeable phytoplankton observed species like Cymbella, Gomphonema, Navicula, Nitischia, Gyrosigma and Coscinodiscus spp in abundance.*

Key Words: *Environment, flora, industrial, effluent, monitoring, phytoplankton, kakuri.*

I. Introduction

The term phytoplankton consist of two Greek words meaning '(phyto) and 'wandere' (plankton). There are two major groups of phytoplankton- (1) fast-growing diatoms, which have no means to propel themselves through the water, and (2) flagellate and dinoflagellates, which can migrate vertically in the water column in response to light. Each group exhibits a tremendous variety of cell shapes, many with intricate designs and ornamentations. All species of phytoplankton are microscopic plants containing chlorophyll a; they float or swim on the upper surface of water or are suspended in the water column, and are at mercy of water current to areas that are suitable for their survival and growth. Phytoplankton (algae) such as diagnosis requires light, oxygen and nutrients such as nitrogen and phosphorus, to grow. Verlecar and Desai (2004), Rabalais (2002). Phytoplanktons are mostly unicellular, filamentous or aggregate of cells. They form the base of the aquatic food for Zoo plankton fish crustaceans' herring and their larvae Onyema (2008). The abundances of phytoplankton in the water column reflect the influences of the environmental factors and their processes Suthers et al. (2009). Phytoplankton growth and periodicity are known to be limited by physical and chemical variation. Phytoplanktons are bioindicators of water quality some algae such as Microcystis, Anabaena, Aphani Zomenon, Cylindrospermopsis are known to produce toxins. A bloom of the above genera may result in high risk to health, cook et al. (2004). As the most sensitive organisms, they serve as indicators of water quality of their environment, Sithill et al. (2009). They can cause odor, alter the taste of water and cause discoloration or form large mats that can interfere with boating swimming and fishing, Borgh (2004) some phycologist reported similar information on freshwater bodies such as Ezra(2000), Ezra et al. (2001), Mathias (2007), Yahuza, (2010), Swannepoe, (2007), Kadiri, (1993), Kadiri et al., (2003), Kadiri (2006), Opute, (2003), Kadiri and Omozusi (2002), Opute (2000), Nwankuwo, (1998), Davies et al., (2008), Akoma, (2007 , 2008), Akoma and Opute(2010), Ekwu and Sikoki (2006), Adesalu and Nwankwo (2010)Mustapha, (2010), Adejane and James, (2010), Adesalu and Nwankwo, (2008), Kadiri, (2002b), Nwankwo and Onyema, (2003).This study is important because it is a pioneer investigation of this nature in coca cola and 7up blotting company effluent in kakuri industrial zone of Kaduna, Nigeria. Therefore will contribute to the knowledge of phycological information in Kaduna, Nigeria.

II. Materials And Methods

Description of study area: The study site is situated in Kakuri of South Local government area of Kaduna State . It is the industrial zone of the State. It lies at Latitude 10. 4667 and Longitude 7.41667, with geographical co–ordinate 10^{o} 28' 0"N and 07^{o} 25' 0" E.

Kaduna is situated in the Northern Guinea Savanna zone with a tropical continental climate possessing distinct rainy and dry seasons. Kakuri stream is a lotic (running) water body. The effluents studied are Coca-Cola Nigeria Plc and 7- Up Bottling Companies whose waste flow into the stream across the Nnamdi Azikiwe Express Road Kaduna.

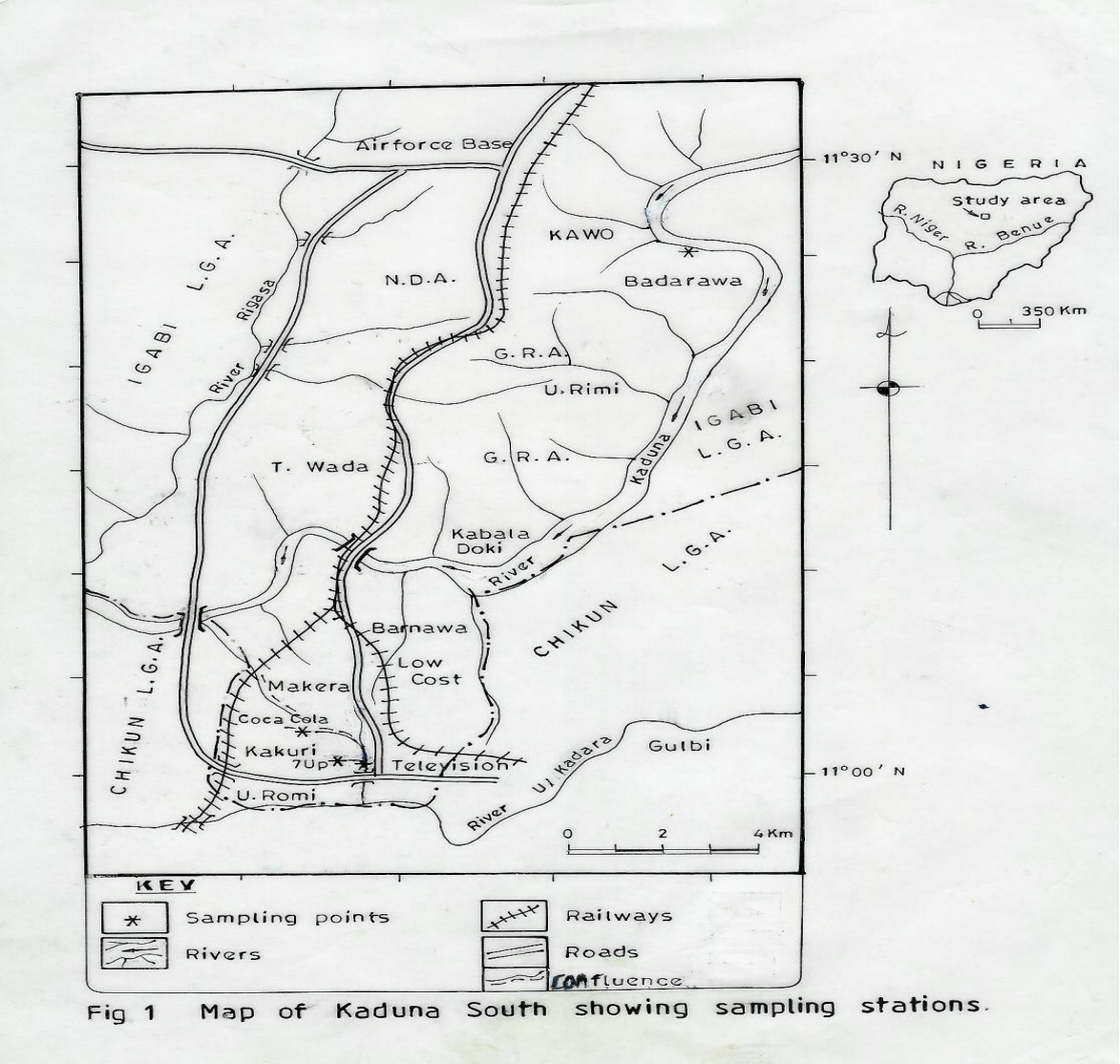

Fig 1 Map of Kaduna South showing sampling stations.

III. Methodology

Phytoplankton samples were collected by towing 55µm mesh size plankton net against the current at subsurface level for ten minutes. The samples were preserved in a solution of 4% formaldehyde. Phytoplankton sample were examined in the Laboratory using Olympus light microscope as wellas wild microscope fitted with a phase – contrast condenser. Both had caliberated eyepiece .

Identification and classification of phytoplankton were carried out with the aid of standard monographs and publications including Prescott,(1975), Kadiri, (1987) and Opute, (1990, 1991) and numerous journals.

IV. Results

Below are they Phytoplankton list identified during the study period.
In this list, algal species are arrange according to their division, classes, order and genus (species)

DIVISION: Bacillariophyta
CLASS: Bacillariophyceae
ORDER: Centrales
Cyclotella operculata (Ag) Kutz
Cosmarium botrysis Meneghini

Gomphonema abbraviatum (Ag) Kutz

ORDER: Pennales
Amphora normani Rabh
A. veneta Kutzing
Cocconeis plancentula (Ehr) Cleve
Cymbella affinis Kutzing
Closterium venus Kutzing
Diatoma elongate Ag aidh
Geminella crenulatocollis prescott
Gomphonema gracile Her
Gomphosphaeria aponina Kutzing
Gyrosigma acuminatum (kutz) Rabh
Hantzschia amphqioxys (Ehr) Grun
Navicula canalis Husted
Nitzschia dissipata (Kutz) Grun
Palmella mucosa Kuetzing
Pinnularia intermedia Cleve
Zygnema carinatum Taft

DIVISION: Chlorohyta
CLASS: Chlorophyceae
ORDER: Chlorococcales
Aphanothece stagnina Braun
Ankisrodesmus gracilis Webs
Anabaena wisconsincuse Prescott
Chlorogonium maximum
Closterium venus Kutzing
Coelastrum microporum Nageli
Crucigenia crucifera(Wolle) Coll
Haematococcus lacustris (Girod) Rostafl
Mougeotia abnormis Kisselew
Pediastrum botyanum (Turp) Menengh
Sphacrocystis schroeteri chodat
Tetraedron candatum Hansgirg
Tetradosmus wisconsinensa
Ulothrix zonata sp
Westella boryoides Wildemann

ORDER: Euglenales
Euglena. gracilis Klebs
E. sanguinea Ehrenberg

ORDER: Ulotrichales
Microspora elakatothrix Hindak biplex

ORDER: Volvocales
Chlamydomonas auguiesa Dill
C. acus nygardii
Pandorina morum (Muell) Bory
Pleodorina californica Shaw
Tetrastrum triangulare Komarek
Volvox globator Linnaeus

ORDER: Zygematales
Anthrodesmus longii Corda
Closterium acerosum (Schr) Her

DIVISION: Cyanophyta

CLASS: Cyanophyceae

ORDER: Chrococales
Aphanothaete flos aquae Komark
Coelospharium knetzingianum Nageli
Chroococcus linmeticus Lemmernan
Microcystis aeruginosa Kutzing
M. lncerta lemmermann

ORDER: Hormogondu
Glococystis sp
Oscillatoria princes Vancher
Oscillatoria agardii Gonitt
Oscillatoria. proboscides f. crassa

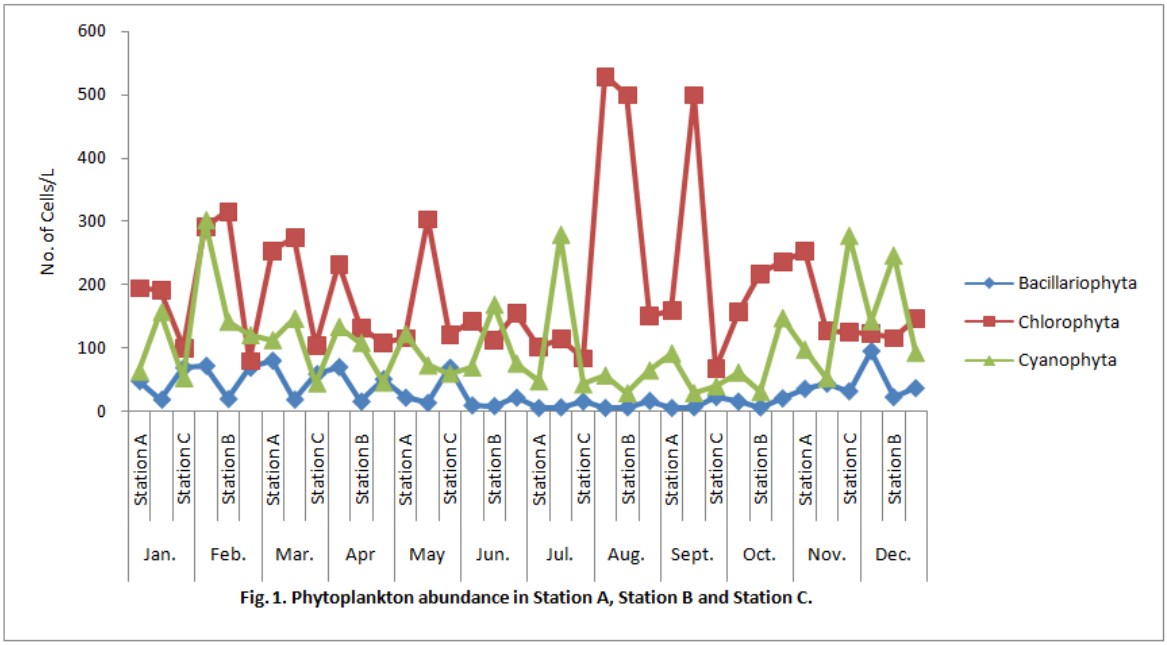

Figure 1. Graph showing phytoplankton abundance and distribution in the various Stations

V. Discussion

A total of fifty-five phytoplankton species were recorded in this finding. They phytoplankton of Kakuri industrial effluent were dominated by chlorophyceae throughout the study period, However similar findings with diatom as dominance have been reported by Adesalu and Nwankwo, (2008), Davies et al ;(2008), Emmanuel and Onyema, (2007), Mustapha (2010), Nwankwo, (1998), Kadiri, (2002b),Olomukoro and Oronsaye, (2009),Onyema (2010) and Uttah et al, (2008).

The dominance of algal flora from the three communities were dominated the green algae, Massoud et al. had a similar report that domestic sewage and agricultural waste favor the abundance of chlamydomonas and Euglena gracilis. Oscillatoria and Ulothrix Zonate were observed in this finding, are

regarded as tolerant to moderate organic pollution. The abundance of green algae in the three Stations of studies in dry and wet season notably Ulothrix, Sphacrocystis and bloom of chamydomonas and Euglena reported by Venkateswarlu et al (2000), were clear evidence of chemical effluent from food or pharmaceutical industry mix with sewage water.

The large phytoplankton observed chlorophyceae and was dominated by chorococcales forms. Diatoms were dominated by the pinnate forms. The order of dominance of the phytoplankton group was chlorophyceae (55.7%) > Bacillariophyceae (35%) > Cyanophyceae (9.3%).

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