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Studies on Algae Associated With Coca-Cola and Seven-7up Effluents in Kaduna, Nigeria

S. K Zaky [1]
1. Department of Biological Sciences. Kaduna State University Nigeria.

Abstract: *The composition of Algae Associated with Coca- Cola plc and 7- up Bottling companies' industrial effluent from Kakuri Kaduna was investigated for 12 months (April 2009-May 2010). A total of 55 algal classes were identified, Bacilliophyta (9.3%), Chlorophyta (55.7%), Cyanophyta (35%). Chlorophyceae were more noticeable and wide spread planktonic algae in the study area, Chlamydomonas sp and Euglena gracilis increased the phytoplankton densities in April at station A,B,C respectively.. Blooms of Chlamydomonas sp and Euglena sp were prevalent. Chloropphyceae dominated communities .Microcystic aeruginosa, Anabaena sp ,Aphanizomenon flos-aquae are undesirable water quality conditions typical of polluted water in carbohydrate / sucrose. Higher valves of nitrate and phosphate were observed during the rainy season while dissolved oxygen (DO) and transparency were higher during dry season. The study constitutes a vital contribution toward enumeration of fresh water phytoplankton associated with industrial effluence which is presently limited.*
***Key words**: Associated Bacilliophyta, Chlorophyta, Effluents, Cyanophyta, physico-chemica properties.*

I. Introduction

Studies of algae associated with industrial effluence are scanty in Nigeria. Most of the works on algae are on temperate forms. Planktonic algae are microscopic plant which float in water and moved passively by wind or water current. Algae are well known for their role as the most important photosynthesizing organisms on earth and the primary producers of aquatic ecosystem (Lee, 1982). Algae have also been used as indicators of water quality. Kumari et al., (2008),(Davies et al., 2009),(Venkateswarlu 1981). With a thorough understanding of the alga community is thus important for establishing local bio-monitoring programmes (Ziller and Economous-Amilli,1998). Example of such monitoring indexes include Trophic Diatom index (Kelly,1998),(Kelly and Whitton, 1995).

II. Materials And Methods

The Study Area

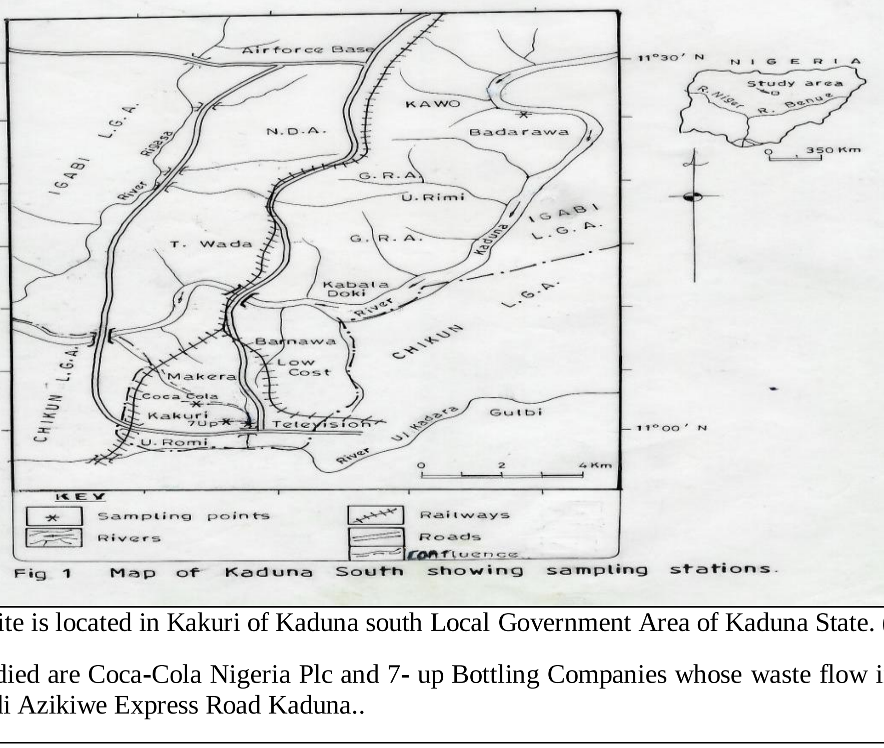

Fig 1 Map of Kaduna South showing sampling stations.

The study site is located in Kakuri of Kaduna south Local Government Area of Kaduna State. (Fig.1)

The effluents studied are Coca-Cola Nigeria Plc and 7- up Bottling Companies whose waste flow into a stream across the Nnamdi Azikiwe Express Road Kaduna..

Collection and Identification of Algae

Water sample was obtained with a plankton net of mesh size 55µm towed at low speed for 10minutes, Sampling points were three namely A (Coca-Cola waste), B (7- up Bottling waste) and C (Confluence of point A and C waste). The algae were recovered following the method suggested by Valencar and Desai (2004). Samples were preserved in 4% umbuffered formalin prior to observation. Identification of species was carried out using the Wild MII binocular microscope. Relevant keys as described by as (Patrick and Reimer 1966),(Prescott, 1961) were consulted.

Physico-Chemical Properties

Duplicate samples for the estimation of physico-chemical parameters were obtained biweekly for one year (April 2009 - May 2010). Field measurements were made between 09.00 and 10.00 hour, while surface water temperature, Log of concentration (pH) and Electrical conductivity (Ec) was determined in situ using portable HANNA pH/EC/Temperature meter model 210. Transparency was measured using standard secchi disc. Dissolved oxygen (DO) and Biochemical Oxygen Demand (BOD) were determined using Azide modification of Winkler method. The determination of nitrate, and phosphate were made with respective spectrophotometric model 210VGP. The procedures outlined in APHA (1985) were followed.

III. Results And Discusion

A total of 55 taxa of algae were identified from the three Stations studied. taxa identified, comprises of 19 taxa from Bacillariophyta, 27 from taxa Chlorophyta, 9 taxa from Cyanophyta. It was obvious that the algal flora from the five communities was dominated by the Chlorophyta and Bacillariophyta, while the Cyanophyta were relatively few and had the highest algal specie. (Massoud et al.,1983) noted that sewage and agricultural wastes favor the abundance of Chlamydomonas and Euglena gracilis as increased organic load, Ossillatoria and Ulothrix zonata are regarded as tolerant of only moderate organic pollution, Sladecek (1973). Venkateswarlu, (1981) noted that the present Cyanophyta and Euglenophyta throughout and in abundance is evidence of highly organically polluted water. The composition of algae in the Stations agrees with studies on Plant Biodiversity and Bioindicators in aquatic environment (Shubert, 1984 and Kelly, et al., 1993). It is interesting to note that some of the specie has been implicated as biological in indicator of pollution as reported by (Nwankwo et al., 1988).

All the species of alga identified were characteristic of fresh water environment.

A total of 8 physico- chemical properties (Table 1) were study. High transparency was recorded during the dry season; this could be due to less silt particles and less flood waters consequently less turbidity.

Low transparencies were recorded during the wet season in all the three stations which could be attributed to refuse, silt particles brought into the stream by flood waters, these could also be due to chemicals used by the compound during production and human activities with attendant increase in turbidity. Similar observation was made by (Kemdirim, Kelly and Ali, 1993), (Nwankwo, 1996) and (Ezra 1995).

The pH values recorded in the three Stations were within the expected range for inland waters (pH6.5 – 8.5). Similar observation was reported by Sarker et al (1980), Al- Sa adi, (1982), and Kelly and Ali (1993).
The acid condition of the Station could be attributed to influx of flood water.
The dry season indicated rise in pH which agrees with the observation made by (Kelly and Ali 1993).

Table 1. Mean monthly variation of general physic-chemical properties of the station A, B and C

-	Transparency (m)	pH	Temperature (°C)	Conductivity (µS/cm)	Nitrate (g/l)	Phosphate (mg/l)	BOD (mg/l)	DO (mg/l)
January	270	7.4	29	240	0.6	0-5	52.9	2.5
February	217	7.6	28.1	233	0.4	1.2	53.2	3.1
March	207	7.7	31	241	0.6	1.2	53.8	3.7
April	212	8.2	31	247	0.6	1.2	53.8	3.7
May	75.6	7.8	28.7	221	2	1.5	19.2	3.8
June	76.6	7.4	29.5	251	2	1.6	47.1	3.8
July	74.2	7.2	28.7	276	2	1.5	46.8	3.5
August	38.3	6.5	27.3	239	0.5	1.1	42.2	2.8
September	34.7	7.5	27.7	596	5.5	0.3	54.8	2.2
October	120	7.6	29.3	248	0.5	0.5	51.4	2.1
November	214	7.8	28.6	391	0.6	0.3	45.6	5.4
December	215	7.2	26.8	213	0.6	0.9	45.8	2.1

High surface water temperature values recorded between March, May, October and November coincided with the period of increased solar radiation, low humidity and reduces cloud cover.

Low surface water temperature values recorded between December and February, this could be attributed to low volume of effluence discharge and the harmattan period when large amount of dust covers tends to reduce solar radiation and high humidity hence resulted in low temperature values. Similar observation was reported by (Egborge, 1984). Interned-ate temperature was experienced between June and September which coincided with the period of high cloud cover, low solar radiation, low evaporation, low transparency, low conductivity and low dissolved oxygen. The three temperature changes reported in this studies agrees with the observation of (Kemdirim, 1990), (Ezra and Abdul-Hameed 1997).

This suggests that, temperature along is unlikely to be the limiting factor for algal growth. This observation agrees with those made by (Ezra, 2006), (Ezra, 2000) and (Nwankwo, 1985), that temperature is not an important factor in affecting algal growth.

High conductivity values were recorded in dry season which might be attributed to high concentration of dissolute solids as a result of high evaporation rates of water due to high water temperature and increased levels of solar radiation. Low values were recorded in wet season which could be related to dilution effect by rainfall. Similar observation was made by (Ezra, 2006) and (Kelly and Ali 1993).

The variations in nutrients namely Nitrate, Phosphate contents of the three Stations showed closed relationship with the season and rainfall pattern. Since these nutrients levels were higher in the wet than dry season could be attributed to run-off from other sources. (Nwadiaro and Oji, 1986), observed the low nitrate levels during the dry season months could be due to the absence of flood water. (Ezra, 2010) observed higher nitrate-nitrogen and phosphate-phosphorus concentration during the wet season than the dry season.

The biological oxygen demand in the three Stations generally recorded higher values in dry season than in the wet season. This could be related to low photosynthetic activities of the algae during this time due to reduced solar energy, in dry season there is an increase in solar energy with its attendant increase in photosynthetic activities. High Dissolved Oxygen (DO) values were recorded in dry, while low values were recorded in wet season. The higher dissolved oxygen values recorded in dry season could be attributed to higher algal cell density during this period. (Ezra,2000), (Massoud et al., 1983) and (Prowse and Talling 1958) observation showed that increase in dissolved oxygen content of water could be attributed to the development of phytoplankton. This suggests a strong association of algae with the effluent

References

[1]. APHA/AMWANPC (1985) Standard method for the examination of water and Waste water,16th Edition, APHA, New York, 1193pp.
[2]. APHA (1990). In: Adakole (2000).Effects of Domestic, Agricultural Effluent on the quality and Biota of Bindare stream, Unpublished Ph.D thesis. Ahmadu Bello University, Zaria, Nigeria.
[3]. ALI AD, EZRA A.G and ABDUL S.D (2007) Changes in the physicochemical attributes of an urban stream in Jos, Nigeria. Journal of aquatic science 22[1]45-5.
[4]. ASTM (2001) Biological method for the Assessment of water quality. America society for testing and materials.special Technical publication No.528 Philadelphia DI771, 888 and 859.
[5]. Ezra A. G. and Abdulhameed, A. (1997). Studies on algae from four ponds in Zaria. proceedings of the international conference on Biotechnology for development in Africa, Enugu, Nigeria.
[6]. Ezra, A. G. (1995).The Ecological studies of Algae in Gubi Dam, Bauchi State Nigeria, Xiii + 187pp Ph.D.Thesis Abubakar Tafawa Balewa University Bauchi, Bauchi State.
[7]. Ezra, A. G. (1999). The ecology of algae in Gubi reservoir, Bauchi, Nigeria. PhD Thesis, Abubakar Tafawa Balewa University, Bauchi, Nigeria.
[8]. Ezra, A.G. (2006). Periphyton of some Aquatic Algae in a near Abubakar Tafawa Balewa University, Bauchi, Bauchi State. Nigeria Journal of Experimental Aquatic Biology 7 (2) 117-122.
[9]. Kelly, M.G. and Ali A.D. (1993). The effect of organic pollution on algal communities in a tropical steam, Tropical fresh water Biology 353-370.
[10]. Kelly, M.G. and Whitton, B.A. (1995). The trophic Diatom index: a new index for monitoring eutrophication in rivers. Journal of Applied Phycology 7:433-444.
[11]. Kadiri, M. O. (1999) A comprehensive preliminary checklist of algae of the Ikpoba reservoir, Edo State, Nigeria. Global Journal of pure and Applied Science 5:485-491.
[12]. Massoud, A. H. Saah and Samir E. Antoina (1983). Effect of pollution on phytoplankton in Asher canal, a highly polluted canal of the shaft al-Aral Estuary at Basrah, Iraq. Department of Biology, University of Basrah, Basrah, Iraq. Hydrobiologia 99,189-19.
[13]. Nwadiaro,C.S. and Umeham, S.N. (1985). The chemical hydrology Oguta lake Imo State, Southern Nigeria. Archive Hydrobiologia.105,251-269.
[14]. Nwankwo, D. I. and Akinsoji, A. (1988). Periphyton algae of Eutrophic Creek and their Possible use as indicator. Nigeria Journal of Botany, Vol.1, Pp 4.
[15]. Patrick, R and Reimer C. W. (1966). The diatoms of the United States 2 vols. Moonegr. Academy of Natural Science. Philaphia 13.
[16]. Prescott, G.W. (1961) Algae of the western great Lake area, W.M.C. Brown company publishers. 977pp.
[17]. Palmer, C.M. (1980). Algae and water pollution castle House publications. 235pp.
[18]. Prowse, G.A. and Talling, J.F.C. (1958). The seasonal growth and successionof plankton algae in the white Nile. Limmnological oceanography.
[19]. Reind, G.K. and Wood, D.R. (1976). Ecology of Inland waters and estuarine. D. van. Nostrand Coy. N.Y. 402pp.
[20]. Verlencar, X.N. and Desai S. (2004) phytoplankton Identification manual.National Institute of Oceanography. Dona panla, Goa
[21]. Venkateswarlu, V. (1981) Algae as indicators of river water quality and pollution. In. WHO workshop on Biological indicators and indices of environmental pollution CPCB, New Delhi, pp93-100.