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## **Assessment of phytoplankton composition and physicochemical parameters of Omasi rice field, Anambra State, Nigeria**

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### **Abstract**

The microalgae and physicochemical parameters of floodwater of Omasi rice field in Anambra State, Nigeria were studied. Samples for the studies were collected at monthly intervals. The microalgae were studied using light microscopy and identified with taxonomic keys, text books and photograph materials from the internet. The physicochemical parameters and coliform content of the floodwater were analysed using the methods described by the American Public Health Association. Simple means of the parameters and percentages of the algal populations were calculated, while Pearson correlation ( $p \leq 0.05$ ) was used to check for significance of the relationships between the investigated parameters. A total of 12 algal taxa belonging to Chlorophyta (48.99%), Cyanophyta (32.89%), Euglenophyta (10.07%), and Bacillariophyceae (8.05%) were recorded in decreasing order of abundance. Water temperature ranged from 26-38 °C with mean of  $33.3 \pm 2.56$  °C; colour ranged from 15-175 Hazen units with mean of  $86.25 \pm 33.19$  Hazen units; depth of water ranged from 7-10.5 cm with mean of  $9.38 \pm 0.8$  cm. Ranges of nitrates and phosphates with their respective means were 0.5-1.8 mg/l ( $0.86 \pm 0.31$  mg/l) and 0.79-1.96 mg/l ( $1.18 \pm 0.28$  mg/l). Omasi rice field supported the growth of diverse algal groups and species; this may be as a result of available nutrients and good climate as can be deduced from the correlation analyses. Omasi rice field is typical of tropical freshwaters and some tropical rice fields that have been studied in terms of microalgal diversities and some physicochemistry.

**Keywords:** Diversities, Microalgae, Physicochemistry, Rice field, Omasi, Anambra State

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## INTRODUCTION

Algae are numerous in forms; reflecting genetic/molecular and morphological diversities. Their ecological distribution cuts across many habitats. Of algal diversities, the phytoplankton are the largest and the most common group in the freshwater. The benefits of this diversity are evident in their many uses; which range from providing important ecosystem functions to serving as raw material in industries, agriculture and scientific research. Some phytoplankton are important in human nutrition (Nangul and Bhatia, 2013) and animal feed additives as sources of single cell proteins (Ophilia and Ramanujam, 2017), polyunsaturated fatty acids (Oliver *et al.*, 2020), and important industrial pigments (Prasanna *et al.*, 2007). The most frequently used species in aquaculture are *Chlorella*, *Tetraselmis*, *Isochrysis*, *Pavlova*, *Phaeodactylum*, *Chaetoceros*, *Nannochloropsis*, *Skeletonema* and *Thalassiosira* (Priyadarshani *et al.*, 2012).

The flood water of rice fields constitutes a veritable ecosystem for algae to breed and thrive. And as an important aspect of algal study and biotechnology, taking inventory of the microalgae of some rice fields have been undertaken from which microalgae species have been isolated for further studies and uses. However, in most of these investigated rice fields, the bias has been on the diversity and ecology of the blue-green algae because of their agronomic importance (fixing atmospheric nitrogen for rice). Only few studies of these rice fields had captured complete spectrum of the microalgae diversity. In paddy fields of Lalgutwa area in India, Kumar and Sahu (2012) recorded 24 species of green microalgae belonging to Chlorococcales, Ulotrichales, Cladophorales, Oedogoniales and Zygnematales; Bala and Sinha (2017) recorded 22 species of algae belonging to Chlorophyta (3 species) and Cyanophyta (19 species) in Parsa district of Nepal, India. From different rice fields in Davangere Taluk, Karnataka, India Shivakumara and Pattar (2015) recorded 12 algal taxa belonging to Chlorophyta (10 species) and Heterokontophyta (2 species). Issa *et al.* (2000) recorded Chlorophyta, Cyanophyta, and Euglenophyta in Assint rice field in Egypt. In Nigeria, information on rice field microalgae is scanty. The available few include the algae of Adani rice field in Enugu State, Nigeria (Nweze and Ude, 2013). The current study is the first investigation and documentation on the

microalgae of Omasi rice field in Anambra State, Nigeria, in relation to the surrounding physicochemistry. Therefore, the objectives of this research included: (1) to provide a baseline data of phytoplankton diversity of Omasi rice field floodwater; (2) to assess some of the physicochemical parameters of this rice field floodwater and; (3) to study the possible relationships between the algae of this rice field floodwater and other investigated parameters.

## MATERIALS AND METHODS

### Study Area

Omasi belongs to Ayamelum Local Government Area of Anambra State of Nigeria (Fig. 1); one of 20 Local Government Areas of Anambra State. It is amongst the rice-producing area of Adani–Umubo–Aguleri (Uzozie, 1975). The area lies between latitudes 6°00 N and 7°00 N and longitudes 7°00 E and 8°00 E, along the flood plains of Anambra, Obina, Omambala, Ezu, and Do Rivers (Odo, G. PhD Thesis, University of Nigeria, Nsukka, 2004). The location is part of the undulating plain of the western reaches of the dip slope of Nsukka, described by Ofomata (1975) as part of the Anambra River plains lying 125 m above sea level. Rice cultivation is limited to the seasonally flooded lands bordering the above-mentioned rivers (Longtau, 2004). Two main seasons prevail in this area – dry season (November to March) and wet season (April to October) with a short break between late July and early August.

Due to its latitudinal location, the area receives abundant and constant insolation with mean annual temperature around 29°C during the rainy season and goes above this value in the dry season (Ezenwaji and Otti, 2013). The area has high relative humidity during the wet season and low values during the dry season months. Total annual rainfall ranges between 1500 – 2000 mm in the area (Ezenwaji and Otti, 2013). The soils are made up of sandstone, shale, mudstone, sand-shale and coal seams (Ofomata, 1975; Chukwu, 2007). The vegetation is a combination of montane forest (Umeghalu *et al.*, 2013) and derived Savanna (Chukwu, 2007; Umeghalu *et al.*, 2013). The major land uses in the area are agricultural. The farmers make use of farmyard, compost and green manures; and different combinations of NPK and urea fertilizers.

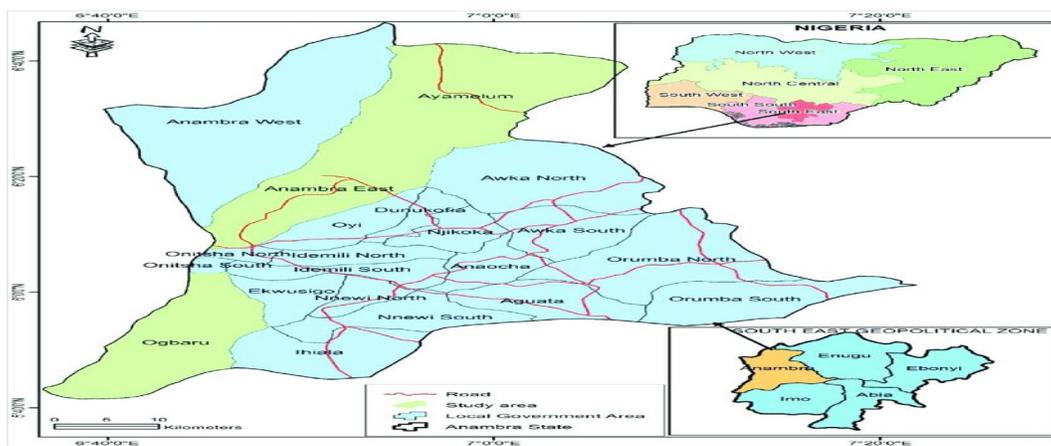


Figure 1. Map of Anambra State, Nigeria showing Ayamelum LGA, the study area

### Meteorological Data

The meteorological data for monthly mean rainfall and relative humidity for the period of investigation were collected from the Department of Crop Science, University of Nigeria, Nsukka.

### Sample Collection and Analyses

Sample collection started when enough flood water had collected in the field to allow for sampling; and stopped when the volume of such flood water had reduced significantly making sample collection impossible. This took four months (June to September, 2008). Samples for algal studies were collected with about 500 ml wide-mouth plastic containers and preserved immediately with Lugol's iodine solution in ratio of 1 part to 100 parts of the sample (Bellinger and Sigee, 2010). Samples for coliform study were collected with 2.5 L plastic gallons and taken to the laboratory for analysis. Taxonomic keys (Wehr and Sheath, 2003), text books (Prescott, 1962; Wetzel, 2001) and photographs from Google were used for algae identification after microscopic examinations using a light binocular microscope (Olympus model). The depth was measured in the field with a metre rule. Water temperature and pH were investigated *in situ* with a mercury-in-bulb thermometer of 0.1 °C calibrations and a battery-operated pH meter (Hanna model) respectively. Samples for physicochemical studies were collected with 3 L plastic containers. The colour, dissolved oxygen (DO), total alkalinity (TA), ammonia, silica, phosphate, sulphate, total suspended solids (TSS), total dissolved solids (TDS), total hardness (TH), calcium, magnesium, nitrate, chloride, chemical oxygen demand (COD), biochemical oxygen demand (BOD), potassium, iron, lead, zinc, and copper were

analyzed following the standards methods of APHA (1992). The coliform bacterial test was done using Maconkey broth media. Double strength and single strength Maconkey media were prepared and placed in fermentation tubes. Durham tubes were placed in inverted position in each tube. The media in the tubes and all materials used for the test were sterilized in an autoclave and allowed to cool. Volumes of 10 ml, 1 ml, and 0.1 ml portions of the sample were inoculated into the Maconkey broth media in the tubes and incubated for 48 hrs at 35 °C in a water bath. At the end of the incubation period, tubes showing gas formations in the Durham tubes indicate positive coliform results. From the positive results, the most probable number (MPN) of bacteria present in the sample was finally determined from a standard MPN table (APHA, 1985). Means and percentages of data collected were calculated. Data obtained were subjected to Pearson correlation at  $P \leq 0.01$  probability using SPSS Version 16.

### RESULTS

#### Physicochemical Parameters and Meteorological Data

The descriptive statistics for the physico-chemical parameters and coliform is presented in Table 2.

#### Phytoplankton Composition and Abundance

Four divisions of microalgae with their abundance as represented in Fig. 2 were observed. Bacillariophyceae were represented by *Navicula* and *Synedra*; Chlorophyta by *Closterium*, *Eudorina*, *Netrium*, *Spirogyra*, *Actinastrum*, *Ankistrodesmus*, *Mougeotia*, *Selenastrum*, and *Nephrocylum*; Cyanophyta by *Oscillatoria*,

*Microcystis*, *Spirulina*, *Synechocystis* and *Nodularia* and Euglenophyta by *Trachelomonas*, *Euglena*, and *Phacus*. *Oscillatoria* had the highest percentage followed by *Ankistrodesmus*. The taxonomic hierarchy of all the species encountered is presented on Table 1.

### Monthly variation in algal density and coliform content

The range for total algal density was 160 – 1960 individuals/ml obtained in July and September respectively; the mean value was  $720 \pm 421$  individuals/ml. Bacillariophyceae ranged 0 – 140 individuals/ml; the lowest and highest values were obtained in August and September respectively; the mean value was  $60 \pm 29$  individuals/ml. Chlorophyta population range was 80 – 1060 individuals/ml obtained in June and September respectively; the mean value was  $365 \pm 233$  individuals/ml. Cyanophyta population range was 40 – 580 individuals/ml obtained in July and September respectively; the mean value was  $245 \pm 126$  individuals/ml. Euglenophyta population range was 0 – 180 individuals/ml obtained in July and September respectively; the mean value was  $75 \pm 39$  individuals/ml. Coliform ranged from 28 – 120 MPN/100 ml; the lowest value occurred in June and July and the highest value in August and September; the mean value was  $74 \pm 26.56$  MPN/100 ml.

### Significant Pearson Correlation Results

At  $P = 0.05$  (\*) and  $P = 0.01$  (\*\*), some parameters showed significant correlations with one another and an algal group (Table 3). Significant negative correlations are between: total dissolved solids and depth (-0.989\*); nitrate and depth (-0.987\*); phosphate and water temperature (-0.966\*); ammonia and colour (-0.968\*); potassium and depth (-0.986\*); iron and calcium (-0.952\*). Significant positive correlations are between: total suspended solids and relative humidity (0.996\*\*); coliform bacteria and total hardness (0.962\*); biochemical oxygen demand and colour (0.986\*); chloride and colour (0.965\*); chloride and biochemical oxygen demand (0.984\*); nitrate and total dissolved solids (0.998\*\*); potassium and total dissolved solids (0.999\*\*); potassium and dissolved oxygen (0.958\*); potassium and nitrates (0.995\*\*); calcium and total hardness (0.974\*); iron and dissolved oxygen (0.966\*); lead and COD

(0.962\*); zinc and mean monthly rainfall (0.956\*); copper and chloride (0.978\*); and Bacillariophyceae and ammonia (0.980\*).

### DISCUSSION

The algal taxonomic compositions of this area were diverse. This could be as a result of some factors like nutrients (Mustapha, 2010), hydrology and physicochemical parameters (Roger, 1996; Kadiri 2000; Nweze and Chumboh, 2006). The highest value of Chlorophyta populations compared to other algal groups may be due to the high amount of nitrate, phosphate, sulphate, and magnesium (Hassan *et al.*, 2010). The lowest total algal populations which coincided with the highest volume/depth of water may be due to reduced nutrients from dilution (Nweze and Domrufus, 2006; Chattopadhyay and Banerjee, 2007; Okogwu and Ugwumbah, 2012), and/or as a result of increased zooplankton populations from increased habitat spaces for these primary consumers that feed on these algae (USEPA, 1995; Okogwu and Ugwumba, 2012). Increased water volume may also dilute algal cells. The significant negative Pearson correlation between water temperature and phosphate could be due to increased biological metabolism which increased the utilization of these compounds by micro- and macrophytes as noted by Egborge (1981); while the significant positive correlation between temperature and TDS is in agreement with the observations of Egborge (1981) on Lake Asejire that high temperature favours the rapid breakdown of organic matters in sediments which release their mineral components (TDS).

The trend of rainfall, which started in March, reached the first peak in May, decreased slightly until August, reached another peak in September and finally became scarce by December to February; a situation also observed by Nweze (2003) while working on Opi Lake. Rainfall showed significant positive correlations with zinc due to their supply through runoff (Nweze and Domrufus, 2006; Polkowska *et al.*, 2007). The significant positive correlations between nitrate with chloride and potassium could be due to the co-supply of the three from chemical fertilizers, example NPK, and/or occurrence of potassium as potassium trioxonitrate (V) (Toufeek and Korium, 2009).

Table 1. The taxonomic hierarchy of the microalgae species encountered during the period of the investigation

Genus	Division	Class	Family
<i>Closterium</i>	Chlorophyta	Conjugatophyceae	Closteriaceae
<i>Eudorina</i> ,	Chlorophyta	Chlorophyceae	Volvocaceae
<i>Netrium</i>	Chlorophyta	Conjugatophyceae	Mesotaeniaceae
<i>Spirogyra</i>	Chlorophyta	Conjugatophyceae	Zygnemataceae
<i>Actinastrum</i>	Chlorophyta	Trebouxiophyceae	Chlorellaceae
<i>Ankistrodesmus</i>	Chlorophyta	Chlorophyceae	Selenastraceae
<i>Mougeotia</i>	Chlorophyta	Conjugatophyceae	Zygnemataceae
<i>Selenastrum</i>	Chlorophyta	Chlorophyceae	Selenastraceae
<i>Nephrocytium</i>	Chlorophyta	Trebouxiophyceae	Oocystaceae
<i>Oscillatoria</i> ,	Cyanophyta	Cyanophyceae	Oscillatoriaceae
<i>Microcystis</i>	Cyanophyta	Cyanophyceae	Chroococcaceae
<i>Spirulina</i>	Cyanophyta	Cyanophyceae	Oscillatoriaceae
<i>Synechocystis</i>	Cyanophyta	Cyanophyceae	Merismopediaceae
<i>Nodularia</i>	Cyanophyta	Cyanophyceae	Microchaetaceae
<i>Trachelomonas</i>	Euglenophyta	Euglenophyceae	Euglenaceae
<i>Euglena</i>	Euglenophyta	Euglenophyceae	Euglenaceae
<i>Phacus</i>	Euglenophyta	Euglenophyceae	Euglenaceae
<i>Navicula</i>	Bacillariophyta	Bacillariophyceae	Naviculaceae
<i>Synedra</i>	Bacillariophyta	Flagilariophyceae	Fragilariaceae

Table 2. Descriptive statistics for the physicochemical parameters and coliform for Omasi rice field during the period of investigation

Parameters measured	Range statistics	Range: minimum-maximum	Sum: Statistics	Mean $\pm$ SE	Std Deviation Statistics	Variance statistics
Temperature ( $^{\circ}$ C)	12	26-38	133	33.25 $\pm$ 2.56	5.12	26.25
Relative humidity	2.62	76.9-79.6	313.31	78.35 $\pm$ 0.55	1.09	1.20
Mean monthly rainfall(mm)	139.59	186.43-326.02	961.75	240.44 $\pm$ 31.17	62.34	3887
Depth (cm)	3.5	7-10.5	37.5	9.38 $\pm$ 0.8	1.6	2.56
Colour (Hazen Unit)	1600	15-175	345	86.25 $\pm$ 33.19	66.38	4406
TDS (mg/l)	0.03	0.02-0.05	0.11	0.03 $\pm$ 0.01	0.015	0
TSS (mg/l)	0.018	0.002-0.02	0.047	0.01 $\pm$ 0.00	0.008	0
Total hardness (mg/l)	6	0-6	10	2.5 $\pm$ 1.5	3	9
Coliform MPN/100 ml	92	28-120	296	74 $\pm$ 26.56	53.11	2821
Dissolved oxygen (mg/l)	10.85	3.6-14.45	31.2	7.7 $\pm$ 2.33	4.65	21.64
COD (mg/l)	232	8-240	434	108.5 $\pm$ 48.28	96.56	9324
BOD (mg/l)	68	18-86	180	45 $\pm$ 14.74	29.47	868.67
pH	1.9	6-7.8	27.3	6.83 $\pm$ 0.51	1.01	1.03
Total Alkalinity (mg/l)	2.9	1.5-4.4	11.85	2.96 $\pm$ 0.76	1.52	2.32
Silica (mg/l)	0.3	0.3-0.6	1.9	0.48 $\pm$ 0.08	0.15	0.02
Chloride (mg/l)	48.98	1-49.98	70.98	17.75 $\pm$ 10.98	21.97	482.49
Nitrate (mg/l)	1.3	0.5-1.8	3.45	0.86 $\pm$ 0.31	0.626	0.39
Phosphate (mg/l)	1.18	0.787-1.967	4.72	1.18 $\pm$ 0.28	0.556	0.31
Sulphate (mg/l)	2.58	1.72-4.3	11.82	2.96 $\pm$ 0.53	1.07	1.14
Ammonia (mg/l)	36	8-44	104	26 $\pm$ 7.39	14.79	218.67
Potassium (mg/l)	2.73	0.8-3.53	6.13	1.53 $\pm$ 0.67	1.33	1.78
Calcium (mg/l)	3.2	1.6-4.8	12.8	3.2 $\pm$ 0.73	1.46	2.13
Magnesium (mg/l)	14.6	0-14.6	29.16	7.29 $\pm$ 3.14	6.28	39.43
Iron (mg/l)	0.82	0.04-0.86	1.59	0.4 $\pm$ 0.17	0.347	0.12
Lead	0.143	0-0.143	0.19	0.05 $\pm$ 0.03	0.06	0
Zinc (mg/l)	9.81	0-9.807	19.61	4.9 $\pm$ 2.11	4.22	17.81
Copper (mg/l)	0.35	0-0.35	0.35	0.09 $\pm$ 0.09	0.175	0.03

Table 3. Pearson correlations amongst investigated parameters in Omasi rice field during the period of investigation

	1	2	3	4	5	6	7	8	9	10	11	12
1	1											
2	-.892	1										
3	.175	.289	1									
4	-.564	.790	.551	1								
5	-.771	.402	-.759	-.014	1							
6	.618	-.858	-.578	-.989*	-.013	1						
7	-.862	.996**	.340	.770	.354	-.847	1					
8	-.401	.700	.650	.434	-.121	-.556	.760	1				
9	-.620	.820	.448	.451	.152	-.577	.865	.962*	1			
10	.415	-.767	-.802	-.918	.255	.947	-.782	-.707	-.651	1		
11	-.083	-.101	-.350	.287	.223	-.155	-.183	-.733	-.652	.083	1	
12	-.784	.441	-.711	-.049	.986*	.000	.405	.008	.274	.235	.061	1
13	.249	.156	.888	.649	-.763	-.608	.172	.279	.085	-.748	.108	-.792
14	-.790	.647	-.236	.681	.636	-.640	.577	-.089	.104	-.359	.665	.547
15	.531	-.168	.783	.399	-.883	-.333	-.152	.037	-.192	-.496	.162	-.927
16	-.881	.596	-.579	.117	.965*	-.174	.563	.144	.407	.055	.040	.984*
17	.663	-.877	-.524	-.987*	-.077	.998**	-.862	-.537	-.576	.926	-.180	-.061
18	-.966*	.753	-.401	.442	.888	-.471	.706	.157	.408	-.213	.258	.872
19	.461	-.563	-.289	-.907	-.069	.840	-.512	-.016	-.059	.684	-.663	.031
20	.748	-.376	.756	-.099	-.968*	.090	-.311	.271	.000	-.216	-.458	-.915
21	.601	-.854	-.604	-.986*	.014	.999**	-.846	-.577	-.591	.958*	-.127	.023
22	-.499	.810	.692	.627	-.096	-.730	.856	.974*	.949	-.840	-.560	.006
23	-.225	.480	.533	.121	-.148	-.258	.554	.947	.894	-.455	-.912	.006
24	.486	-.828	-.774	-.822	.176	.888	-.858	-.862	-.823	.966*	.308	.116
25	.096	-.170	-.120	.345	-.045	-.204	-.241	-.684	-.675	-.032	.962*	-.207
26	-.025	.458	.956*	.766	-.613	-.775	.488	.602	.447	-.920	-.126	-.596
28	.619	-.221	.814	-.035	-.913	.000	-.148	.453	.196	-.317	-.596	-.834

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
13	1															
14	-.010	1														
15	.947	-.202	1													
16	-.676	.624	-.862	1												
17	-.559	-.684	-.279	-.233	1											
18	-.395	.851	-.629	.933	-.527	1										
19	-.569	-.813	-.401	-.090	.848	-.441	1									
20	.644	-.771	.751	-.897	.155	-.893	.261	1								
21	-.624	-.612	-.350	-.153	.995**	-.447	.825	.059	1							
22	.396	.102	.122	.166	-.714	.258	-.243	.198	-.748	1						
23	.091	-.353	-.084	.097	-.237	-.002	.307	.352	-.284	.848	1					
24	-.604	-.265	-.328	-.062	.869	-.258	.508	-.201	.902	-.952*	-.658	1				
25	.348	.534	.422	-.214	-.212	.044	-.696	-.206	-.183	-.506	-.873	.221	1			
26	.929	.055	.775	-.441	-.732	-.183	-.554	.559	-.793	.707	.401	-.851	.078	1		
27	-.542	.629	-.778	.978*	-.386	.943	-.159	-.812	-.316	.365	.256	-.264	-.286	-.258	1	
28	.625	-.754	.679	-.794	.063	-.801	.274	.980*	-.034	.372	.528	-.342	-.356	.614	-.679	1

Key: \*= correlation significant at P = 0.05; \*\* = correlation significant at P = 0.01; 1 = water temperature; 2 = relative humidity; 3 = mean monthly rainfall; 4 = depth; 5 = colour; 6 = total dissolved solids; 7 = total suspended solids; 8 = total hardness; 9 = coliform bacteria; 10 = dissolved oxygen; 11 = chemical oxygen demand; 12 = biochemical oxygen demand; 13 = pH; 14 total alkalinity; 15 silica; 16 = chloride; 17 nitrate; 18 = phosphate; 19 = sulphate; 20 = ammonia; 21 = potassium; 22 = calcium; 23 = magnesium; 24 = iron; 25 = lead; 26 = zinc; 27 = copper; 28 = Bacillariophyceae

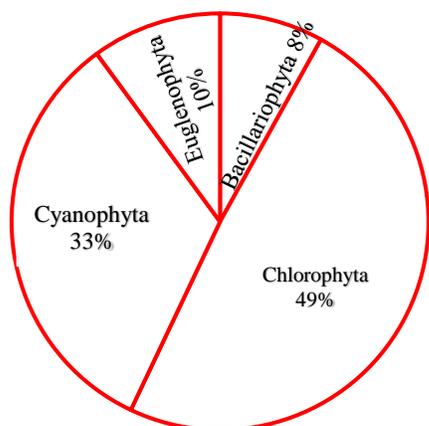


Fig. 2. A pie chart of the microalgae Divisions and their abundances in Omasi rice field

The colour of water in the rice fields was most of the time cloudy and sometimes clear. It was relatively very high during the peak of the wet season months due to inflow of debris and sand from agricultural farmlands (USEPA, 2002; Nweze and Chumboh, 2006), wading movement by farmers and live stocks (Harding and Winterburn, 1995), turbulence and re-suspension caused by rain (Nweze and Chumboh, 2006). The clarity or low value of the colour observed in the field could be due to the ability of the macrophytes roots to bind the soil particles and reduce their return to the water column (Roger, 1996). The observed significant positive correlations between colour of water and BOD and chloride suggests that these parameters may have induced colour or contributed to the turbidity of the water. The significant negative correlations between ammonia and pH and colour may be due to acidic pH that solubilized some metals resulting in impartation of colour as noted by Adeyemo *et al.* (2008).

There was spatial and temporal variation in the level of oxygen saturation. Dissolved oxygen was supersaturated in June. Temporal and spatial variation of oxygen is influenced by factors that regulate photosynthesis and respiration (Carlton and Wetzel, 1987); and according to Belanger *et al.* (1989) algae are the primary sources of oxygen in open water habitats. The observed significant positive correlation between TDS and DO suggested that TDS may have increased algal biomass and primary productivity which led to increased production of oxygen (Rader and Richardson, 1992). The significant positive correlation between total hardness with calcium showed that the hardness could be caused by calcium and sulphate ions (Wetzel, 2001); while the significant positive correlation between total hardness and potassium indicates that potassium

contributed to the total hardness. Nitrate showed significant positive correlation with phosphate may be as result of both elements coming from common source (agricultural farmland). The significant positive correlations between TDS with potassium and nitrate may be that potassium and nitrate constituted the TDS in the location (Adejuwon and Mbuk, 2011); which may be sourced from inorganic fertilizer used extensively by the farmers (Ololade and Ajayi, 2009). Nitrate and lead correlated positively with COD which suggested that the elements had anthropogenic source (Adebowale *et al.*, 2008).

## CONCLUSION

Omasi rice field is typical tropical rice field in terms of algal diversity. The algae encountered in this study are common tropical algae; which conformed to the trend of algal periodicity with respect to environmental factors controlling them. However, a complete study that would involve the study of soil algae of this rice field would be worthwhile.

## Conflicts of Interest

The authors have no conflict of interest to declare.

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