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Studies on the Occurrence of Phytoplankton near the Confluence of Gardi Nallah and Godavari River at Kopargaon Dist. Ahmednagar

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Abstract:- Phytoplankton collection was carried out from the Godavari river at Kopargaon for one year. Four sampling sites were selected near the confluence of the Godavari river and Gardi nallah. Two sites were located at upstream of Gardi Nallah and two are downstream of nallah. The monthly collection of phytoplankton from selected sampling sites was carried out during the period June 2017 to March 2018. Present studies revealed that a total 38 species from 29 genera belonging to 4 class namely as Chlorophyceae , Cyanophyceae, Bacillariophyceae and Euglenophyceae were encountered during the investigation period. Chlorophyceae was found to be the dominant group. Many planktonic and epiphytic algae were encountered during investigation period at four sampling stations The commonly occurred genera were *Ankistrodesmus, Scenedesmus, Coelastrum ,Chlorella, Tetrastrum, Crucigenia, Selanastrum.* Bacillariophyceae was second largest group encountered during study period. This group comprised 16 species belonging to 10 genera. The commonly recorded genera of this class are *,Fragilara, Nitzschia, Navicula, Mastogloia and Synedra* . Cyanophyceae was represented by 4 genera and 4 species . The recorded genera were *Microcystis, Merismppedia Oscillatoria* and *Chroococcus* .Euglenophyceae was represented by 2 genera i.e. *Euglena* and *Phacus* and 2 species. The downstream sampling stations shows luxurious growth and population of phytoplankton as it receives Sugarcane Factory effluents and domestic wastes from that region .

Keywords:- *Phytoplankton, Confluence, Gardi Nallah, Godavar River, Kopargaon.*

I. INTRODUCTION

Algae are autotrophic group of aquatic ecosystem. Algae are ubiquitous and abound various types of water bodies. Water pollution is an important problem as the population and industrialization expands and it must be taken seriously if aquatic life resources are to be saved and their productivity is to be maintained. The maintenance of healthy aquatic ecosystem is dependent on the abiotic properties of water and biological diversity of the ecosystem They are primary producers of aquatic ecosystem and acts as food for most of aquatic animals. They are ubiquitous and abound various types of water bodies. They also imparts unpleasant odour to the water and degrades the water quality also. The maintenance of healthy aquatic ecosystem is dependent on the abiotic properties of water and biological diversity of the ecosystem. Aquatic plants inhabit three distinct environment i.e. inland water, estuarine water and marine water. Inland waters again subdivided into two distinct habitats as i.e. lentic environment or stagnant water and lotic environment or running water. Kopargaon is situated at Northern region of Ahmednagar. Four sampling sites were selected near confluence of the Godavari river and Gardi nallah for phytoplankton collection.

II. MATERIALS AND METHODS

Kopargaon is situated at Northern region of Ahmednagar at the bank of Godavari river in Ahmednagar district. Godavari river originates at Brahmagiri hills in Sahyadri ranges of Western Ghats at Trymbakeshwar just 30 kms.upstream of Nashik city. It flows east words passing through Nashik city, Niphad Taluka and near Wadgaon village it enters in Kopargaon taluka. Four sampling sites were selected near the confluence of the Godavari river and Gardi nallah. Two sites were located upstream of Gardi Nallah and two are located at downstream of nallah**.** The monthly collection of phytoplankton from selected sampling sites was carried out during the period June 2017 to March 2018. Algal samples were collected by using plankton net of bolting cloth 250 meshes / linear inch and preserved in 4% formaldehyde and Lugols solution. Microphotographs of phytoplankton were taken simultaneously by using research microscope (“Leica DM 1000 LED Microscope) and computer software. Qualitative analysis of phytoplankton was carried out by using the relevant literature like Kamat, 1963a, b; Prescott, 1962; Sarode and Kamat,1984; Desikachary, 1969; and Philipose, 1967.

III. RESULTS AND DISCUSSION

Many planktonic and epiphytic algae were encountered during investigation period at four sampling stations of Godavri river. The algal classes recorded during present studies are Chlorophyceae, Euglenophyceae, Cyanophyceae

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and Bacillariophyceae comprising 14 families, with 29 genera and 38 species (Table.1 and Table.2).

➢ *Chlorophyceae:-*

During investigation period, Chlorophyceae was found to be the largest dominating group and comprises13 genera and 16 species. The commonly occurred genera were *Ankistrodesmus, Scenedesmus, Coelastrum, Chlorella ,Tetrastrum, Crucigenia and Selanastrum.*

It was observed that Chlorophycean taxa flourished during late winter and summer seasons. Throughout the investigation period at all stations Chlorococcales were found dominant as compare to other members. *Scenedesmus* comprised 3 species. Besides this, *Cosmarium* are also found abundantly. *Ankistrodesmus, Spirogyra, Crucigenia, Selanastrum Kirchenerialla are* found in more number during summer season. Thus, it was observed that Chlorophycean taxa flourished during late winter and summer seasons. Sanap *et al.*(2006), and Tiwari *et al.* (2001) also found the same results from river Godavari at Nashik and river Ganga at Kanpur respectively. According to Verma and Mohanthy (1995), low level of DO, high BOD and nutrients during summer favours the growth of phytoplankton. Pandey *et al.* (1995) encountered maximum density of Chlorophycean flora during the month of April and May and least in September. Our findings co-relates with these results. In the present studies, the temperature and pH showed direct co-relation with phytoplankton population. Pandey *et al.* (1995) and George (1976) also reported the same results from rivers Kosi and Kali respectively.

Chlorophyceae was dominant at all stations during the investigation period and their number was more during summer. Our results were referable with that of Sharma and Lyngdoh (2003).

Discharge of anthropogenic wastes in river stream drastically affects the water quality and the algal flora inhabiting it. Chlorophycean flora flourishes well both in polluted and unpolluted habitats (Tiwari *et al.,* 2001). Periodicity and population (abundance) of Chlorococcales depended upon the mode of nutrition (Munawar, 1970, Seenayya, 1971).

➢ *Cyanophyceae: -*

This class was represented by 4 genera and 4 species. The recorded genera were *Merismopedia*, *Microcystis*, *Oscillatoria* and *Chroococcus.* During summe,r more number was recorded and might be due to availability of more free CO_2, sunlight, phosphate and nitrate concentration. Lowest number of algal taxa of BGA was recorded during monsoon months particularly in months of July, August and September and might be attributed to high speed of water flow.

Raised values in temperature, low water flow and more nutrition with bright sunlight increased the algal population during summer (Sanap and Pingale, 2011). According to Pawar *et al.* (2006), high organic matter, high temperature and low DO favours the growth of blue green algae. Lakshminarayana, (1965) was of opinion that abundant growth of blue green algae attributed due to high pH, dissolved organic matter, more nitrates and phosphates. According to Venkateswarlu, (1969), Cyanophyceae occurred whenever the oxidisable organic matter was high and DO was low together with low pH. Parvateesam and Mishra (1993) also observed Cyanophycean peak during summer and low during winter while Deshmukh and Pingle (2006) also of the same opinion,

➢ *Bacillariophyceae: -*

Bacillariophyceae was second largest dominant group encountered during study period. This group comprised 16 species belonging to 10 genera. The commonly recorded genera of this class are, *Fragilara, Nitzschia, Navicula, Gomphonema, Mastogloia and Synedra.*

During investigation period it was observed that diatoms were found abundantly during winter season and their number gradually declines during summer. Our results matches with that of Sanap *et al* (2007).

Due to discharge of municipal sewage of Kopargaon city as well as industrial effluents of Sanjivani Sugar factory in river water, pollution tolerant taxa were flourished. Due to low DO during summer and winter season, the dominating diatom forms like *Fragilaria*, and *Synedra* were recorded. Our investigation co-incides with the results of Sankaran (2005). During investigation period it was also observed that diatoms were found abundantly during late winter and summer seasons. Similar results were obtained by Lakshminarayana (1965) from the rivr Ganga. Our results matches with Venkateswarlu (1983), who was of opinion that decrease in level of DO, high oxidisable matter, raised values of chlorides, phosphates and nitrates favours the growth of diatoms like *Nitzschia sp., Achnanthes sp.. NaviculasSp.* and *Gomphonema sp.*

➢ *Euglenophyceae:*

This class was represented by 2 genera i.e. *Phacus*, *Euglena*, and 2 species. During late winter and summer seasons their number was remarkable, while during monsoon Euglenoids were sparsely recorded. *Phacus* and *Euglena* are most pollution tolerant genera according to Palmer's index found during the investigation period.

During late winter and summer seasons the Euglenoids were remarkable, while during monsoon Euglenoids were sparsely recorded. Our results coincide with that of Rishi and Kachroo (1984) who also reported the same results. During summer season water becomes stagnant at these sites that

favours the growth and population of Euglenoids. At these sites pollution tolerant genera are recorded indicating the organic pollution. According to Seenayya (1971), the higher temperature above 25^0C is favorable for the growth of Euglenoids. Our results also showed the more number of Euglenoids in summer season when temperature was raised.

Sr. No.	Classes	Families	Genera	Species
1	Chlorophyceae	06	13.	16
2	Cyanophyceae	02	4	4
3	Bacillariophyceae	05	10	16
4	Euglenophyceae	01	02	02
Total		**14**	**29**	**38**

Table.1:- Different classes of phytoplankton with families and no. of Genera and species encountered during investigation period:

Sr. No	Class	Family	Name of Algal form
1	Chlorophyceae	Scenedesmaceae	*Scenedesmus incrassatulus*var. *Mononae* G. M. Smith
2			*Scenedesmus arcuatus* Lemmerman
3			*Scenedesmu s bijugatus*(Turp.*) Kuetzing var.gravenitzii (Bernard) Comb.*
4			*Crucigenia quadrata* Morren
5		Coelastraceae	*Coelastrum spharicum* Naegeli
6		Chlorellaceae	*Chlorella vulgaris* Beyerinck
7		Oocystaceae	*Oocystis irregularis* (Petkof) Printz
8			*Ankistrodesmus convolutes* Corda
9			*Selenastrum minutum* (Naegeli) Collins
10			*Kirchneriella contorta* (Schmidle)Bohlin
11			*Kirchneriella lunaris* (Kirch.)Moebius
12			*Tetraedron pusillum* (Wallich)W.et. G.S. west
13			*Tetrastrum heteracanthum* (Nordst.) Chod
14		Zygnemataceae	*Spirogyra crassa* Kutetzing
15		Desmidaceae	*Cosmarium pseudobroomei* Wolle.
16			*Closterium diana* var. *arcunatum.* Ehr
17	Cynophyceae	Chroococaceae	*Chroococus limneticus* Lemm.
18			*Merismopedia punctata* Meyen
19			*Microcystis aeruginosa* Kuetz.
20		Oscillatoriaceae	*Oscillatoria chalybea* (Martens.) Gom
21	Bacilllariophyta	Naviculaceae	*Navicula pygmaea* Kuetz
22			*Navicula rhynchocephala Kuetz.* var. *elongata* Mayer
23			*Navicula cupsidata* Kuetz.
24			Mastogloia blatica *Grun.*
25		Nitzschiaceae	*Nitzschia tryblionella* Hantzsch v. *levidensis*(W. Smith) Grun.
26			*Nitzschia filliformis* (W.Smith)
27		Surirellaceae	*Gyrosigma kuetzingii* (Grun.)Cleve
28		Achnanthaceae	*Achanthes microcephala*(Kuetz.) Grun
29		Fragilariaceae	*Rhopalodia gibberula*(Ehr) OMuell
30			*Gomophonema lanceolatum* Ehr . *v .insiginis (* Greg.) Cleve
31			*Stauroneis phoenicenteron*Ehr. v. *crumenifera* (mayer)
32			*Fragilaria leptostauron*(Ehr.) Hustedtv.*woerthensis* Mayer
33			*Fragilaria ungeriana* Grun.
34			*Fragilaria pinnata* Her.f*surotunda* Mayer
35			*Fragilaria intermedia* Grun.
36			*Synedra ulna* (Nitz.)Ehr.
37	Euglenophyceae	Euglenaceae	*Euglena gracilis* Klebs
38			*Phacus caudate* var. *Ovalis* .Drezepolski

Table.2:- Details of Phytoplankton recorded during investigation period at all sampling stations:

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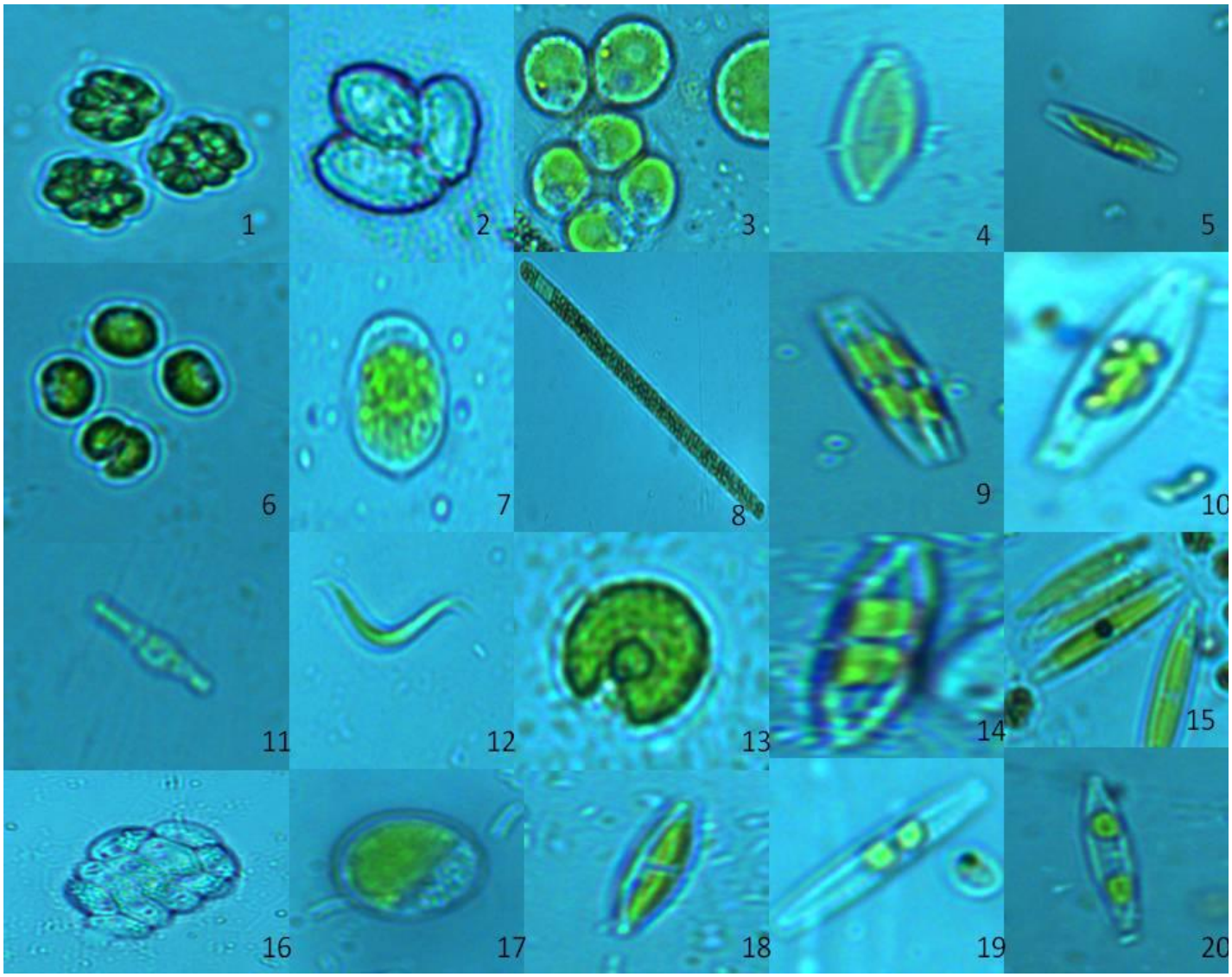

Plate 1 [1]*Chrococus limneticus, [2] Oocystis irregularis, [3]Tetrastrum hetracanthum, [4] Fragillaria ungeriana, [5] Fragillaria leptostroma , ,[6]Coelastrum sphaericum, [7]Chlorella vulgaris , [8] Oscilatoria chalybea, [9] Fragillaria pinnata, ,[10] Nitzschia , [11] Navicula constans , [12] Ankistrodesmus convoluta, [13] Kirchneriella lunaris, [14] Fragilllaria intermeda , [15] Achenthes microcephala , [16]Coelastrum sphaericum ,[17] chlorella , [18] Stauroneis phoenicentens , [19] Navicula cupsidata [20]Gomophonema lanceolates ,*

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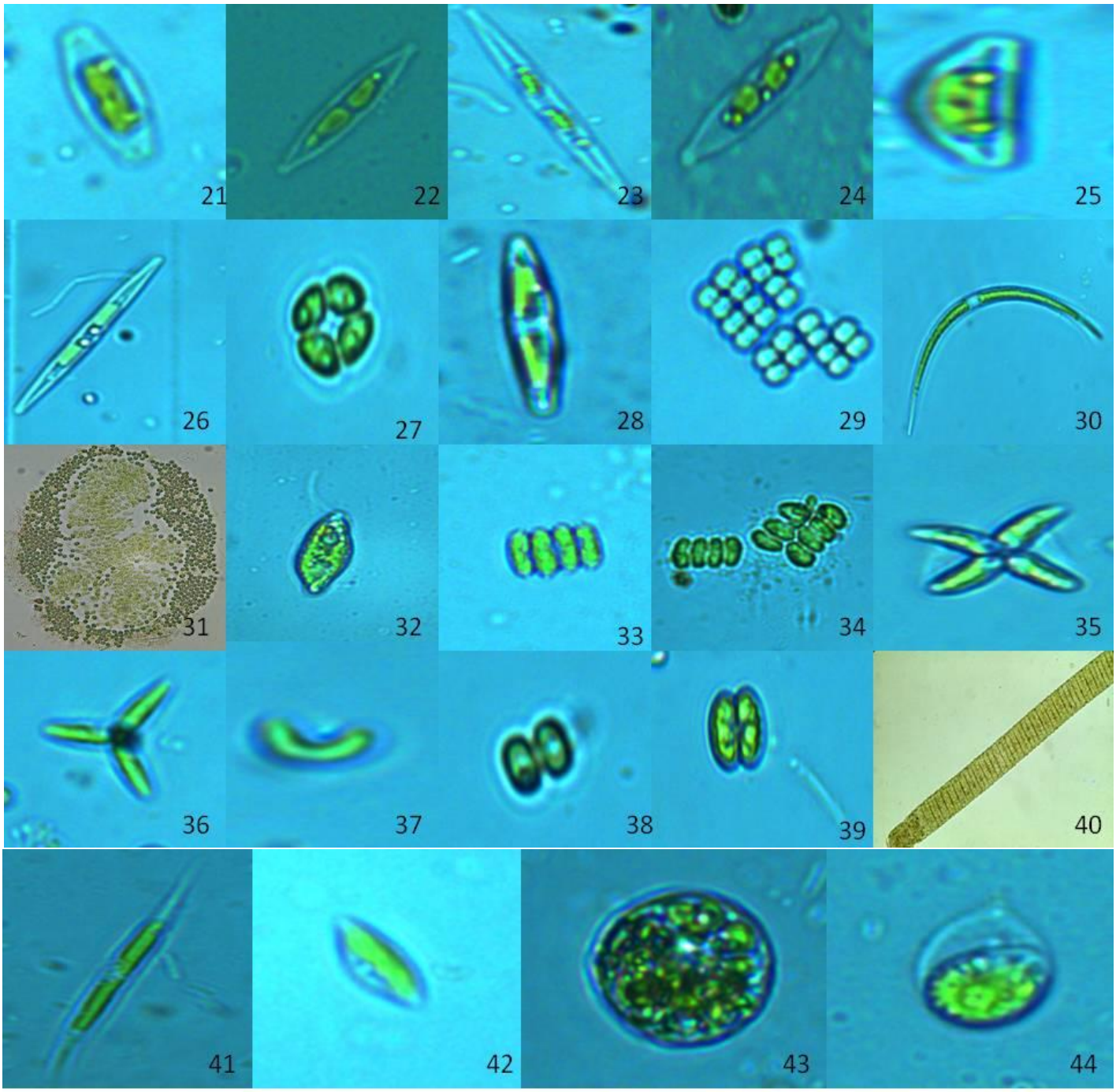

Plate 2

[21] Nitzschia tryblionella,[22] Navicula rhynechocephala , [23] Navicula pygmaea , [24] Navicula rynchocephala , [25] Amphor venta ,[26] Synedra ulna, [27] Crucigenia quadrata, [28] Mastagloica sarmae , [29]Merismopedia punctata, [30] Closterium dina, [31] Microcystis aeruginosa , [32] Euglena gracilis, [33]Scenedesmus bijugatus , [34] Scenedemus arcutus, [35]Quadrigula quaternata , [36]Kirchenerilla contorta, [37]Selenastrum minutum , [38]Cosmarium psuedobroomen, [39] Scenedesmus incrassatulu, [40] Oscillatoria , [41] Gyrosigma kutzingi, [42]Rhopalodia gibberula,[43] Chlorella vulgais, [44] Phacus caudata

IV. CONCLUSION

It was observed that when the river and nallah flows, at that time the phytoplankton recorded were very less in number. In general, planktonic algae recorded were less in number in Godavari river when water flow was high during monsoon, while its number increases during winter and peak point was observed during summer. It might be due to many nutrients got available for their growth in addition to bright sunlight and much quantity of carbon dioxide. It was also observed that temperature and sunlight also affects the growth and abundance of phytoplankton in the river water.

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