Some Algae Found in Twin Taung Lake, Budalin Township, Monywa District, Sagaing Region

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Abstract

The present study, algal flora of Twin Taung Lake, Budalin Township, Monywa District, Sagaing Region have been undertaken. Algal specimens were collected during August and September, 2017. Twenty-four species of algae were recorded from eleven sampling sites. Twelve species of Cyanophyceae, 2 species of Euglenophyceae, 1 species of Xanthophyceae and 9 species of Chlorophyceae were identified and stated. The species of *Anabaenopsis* were found in all sampling sites; *Synechocystis*, *Oscillatoria* and *Schizochlamys* were found in site 10; *Arthrospira*, *Rivularia*, *Trachychloron* and *Asterococcus* were found in site 8. Physico-chemical parameters of lake water-: temperature, pH, salinity, hardness, alkalinity, sodium carbonate, sodium bicarbonate, chloride, nitrate and phosphate were analyzed at Yae Kharr Factory, Sagaing Region. The temperature of water was between 31.2 and 31.8°C, the range of pH value was 9.31 to 9.42, the salinity was 2 ppm, the sodium carbonate was between 694 and 1494 ppm, the sodium bicarbonate was between 1057 and 1987 ppm, the total alkalinity was between 2470 and 2894 ppm, the total chloride was between 181 and 289 ppm, the total hardness was between 242 and 281 ppm, the phosphate was between 0.281 and 2.217 ppm and the nitrate was between 16.43 and 43.38 ppm.

Keywords: Algae, physico-chemical parameters, Twin Taung.

Introduction

Freshwater algae, also called phytoplankton, vary in shape and color, and are found in a large range of habitats (Anand *et al.* 2011). Algae are among the most diverse groups of simple autotrophic plant like organisms ranging from unicellular to multicellular. Members of the group show a wide distribution as most of the members found in aquatic environments showing variation to reside either on the surface of water as phytoplankton or on the bottom of the water as benthic or may be found attached to substratum as periphyton. However, some of the members live in terrestrial environment (Engdaw 2014). Algae are frequently found in polluted and unpolluted water and due to this behavior they are generally considered as indicators to determine the quality of water because water is essential for life (Rajurkar & Dalal 2014).

The physical, chemical and biological characteristics of lakes are extremely variable. Lakes vary physically in terms of light levels, temperature and water currents. Lakes vary chemically in terms of nutrients, major ions and contaminants. Lakes vary biologically in terms of structure and function as well as static versus dynamic variables, such as biomass, population numbers and growth rates (Horne & Goldman 1994). Several water quality parameters can be measured. Physical measurements include temperature and suspended solids. Chemical measurements include pH, phosphorous and nitrogen (Aull 2005).

Twin Taung Lake is about 9 km away from Budalin in Northwestern Sagaing Region. It is situated at North Latitudes 22° 22' 14" and East longitude 95° 1' 7". Twin Taung Lake is 975.36 m from east to west, 1097.28 m from north to south. River water had flown into the natural lake since 2008, but did not seriously hit production of *Spirulina* until 2012, but since early 2013, green *Spirulina* has turned yellow and production has fallen, signaling that the ecosystem m of the lake has been damaged by the

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inflowing river water. Expert is now redirecting the water body around the lake to maintain the water quality of the lake (Aye Min Soe 2014).

The aims of this study were to study phytoplanktons which grow in natural environment of Twin Taung Lake and to evaluate the physico-chemical parameters of water in Twin Taung Lake. The objective is to study the correlation of water quality and algae growing as contaminants.

Materials and Methods

Study Area

Twin Taung Lake is located at Monywa District in Sagaing Region. It is about 6 miles from east west of Budalin Township. Twin Taung Lake is 975.36 m from east to west, 1097.28 m from north to south and 51.21 m at the deepest place. It is situated North Latitudes 22° 22' 14" and East longitude 95° 01' 7". It has an elevation of 222 m as shown in Figure 1.

Sampling Sites

Eleven sampling sites such as north-east part of lake (Site 1), north part of lake (Site 2), north-west part of lake (Site 3), middle part of lake (Site 4), west part of lake (Site 5), south-west part of lake (Site 6), south part of lake (Site 7), south-east part of lake (Site 8), east part of lake (Site 9), Moemalal (Site 10) and Yaenatgyi (Site 11) were chosen as shown in Figure 1- 3. Among these, the fresh water from Chindwin River is escaping through the leaks at Moemalal and Yaenatgyi sites.

Collection of Water Samples and Analysis of Water Quality

Water samples were collected from the surface layer in September, 2017, by using water sampler. The water samples were analyzed for physico-chemical (i.e. temperature, pH, salinity, hardness, alkalinity, sodium carbonate, sodium bicarbonate, chloride, nitrate and phosphate) at Department of Quality Control, June Pharmaceutical and food Industry of Sagaing. Temperature was measured by thermometer and pH of water was measured by pH meter in the fields as shown in Figure 4 and 5.

Collection and Classification of the Algal Specimens

Algal specimens were collected twice a month from Twin Taung Lake during August and September 2017. The collected specimens were studied by using compound microscope and were measured by using micrometer. The images of all species were recorded by digital camera. Then, the algae were identified up to specific level based on their morphological characters. The identification and taxonomic descriptions were done by referring on Desikachary (1959), Prescott (1962), Philipose (1967), Komárek (2013), Dillard (1982-2000), and John *et al*. (2002) as shown in Table 1 and Figure 6.

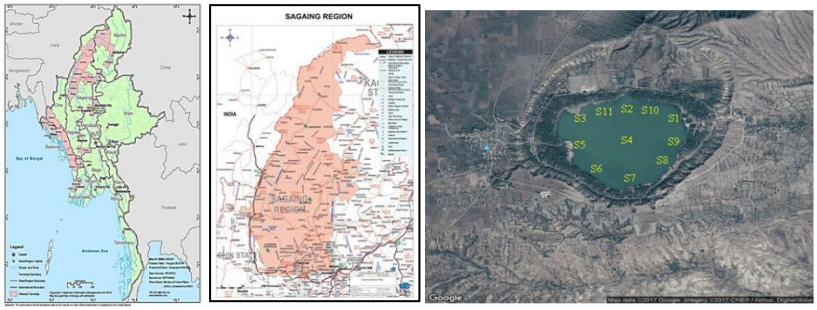

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Figure 1. Location Maps of Study Area

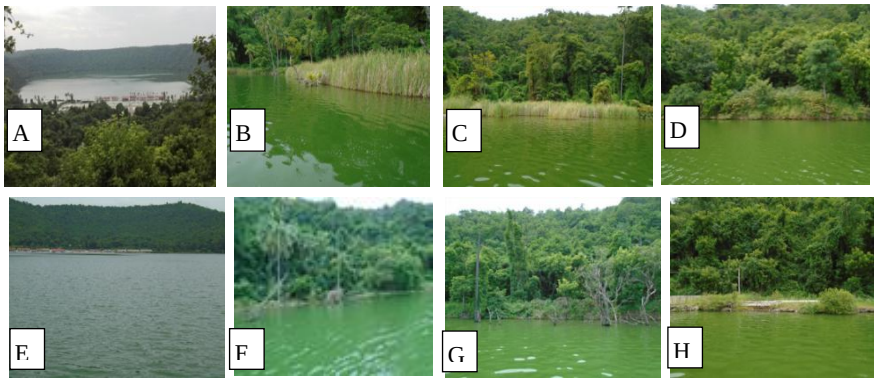

Figure 2. Sampling sites of Twin Taung Lake
A. Twin Taung Lake
B. North-east part of lake (Site 1)
C. North part of lake (Site 2)
D. North-west part of lake (Site 3)
E. Middle part of lake (Site 4)
F. West part of lake (Site 5)
G. South-west part of lake (Site 6)
H. South part of lake (Site 7)

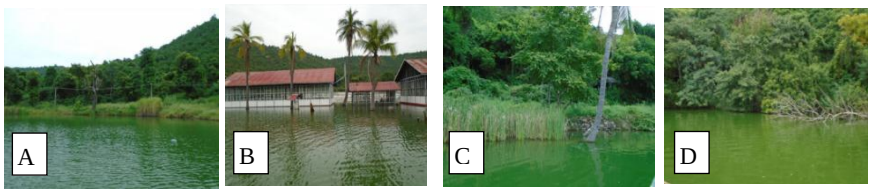

Figure 3. Sampling sites of Twin Taung Lake
A. South-east part of lake (Site 8)
B. East part of lake (Site 9)
C. Moemalal (Site 10)
D. Yaenatgyi (Site 11)

Results

Physico-chemical parameters of Twin Taung Lake

The values of physico-chemical parameters observed in 11 sampling sites were shown in Figure 4 and 5. The temperature of water was between 31.2 and 31.8°C, the range of pH value was 9.31 to 9.42, salinity was 2‰, the sodium carbonate was between 694 and 1494 ppm, the sodium bicarbonate was between 1057 and 1987 ppm, the total alkalinity was between 2470 and 2894 ppm, the total chloride was between 181 and 289 ppm, the total hardness was between 242 and 281 ppm, the phosphate was between 0.281 and 2.217 ppm and the nitrate was between 16.43 and 43.38 ppm.

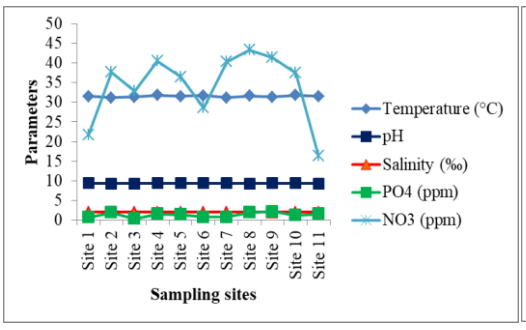

Figure 4. Physico-chemical parameters observed in 11 sampling sites of Twin Taung Lake

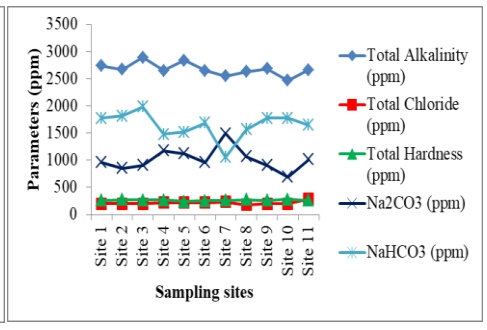

Figure 5. Physico-chemical parameters observed in 11 sampling sites of Twin Taung Lake

Taxonomic study of Algae

Totally 24 species belonging to 17 genera of 12 families were recorded: 12 species of Cyanophyceae, 2 species of Euglenophyceae, 1 species of Xanthophyceae and 9 species of Chlorophyceae were classified, described and recorded with photomicrographs as shown in Figure 6. The systematic classification of algae was shown in Table 1

Table 1. Classification of Algae Found in Study Area

Class	Order	Family	Genus		Species
Cyanophyceae	Chroococcale	Chroococcace	*Microcystis*	1.	*Microcystis aeruginosa* (Kutzing) Kutzing
				2.	*M. flos-aquae* (Wittr.) Kirchne
				3.	*M. protocystis* Crow
			Synechocystis	4.	*Synechocystis pevalekii* Ercegovic
	Oscillatoriales	Oscillatoriaceae	*Arthrospira*	5.	*Arthrospira platensis* (Nordst.) Gomont
			Oscillatoria	6.	*Oscillatoria refringens* Gardner
	Nostocales	Nostocaceae	*Anabaena*	7.	*Anabaena minispora* Watanabe
			Anabaenopsis	8.	*Anabaenopsis milleri* Voronichin
				9.	*A. arnoldii* Aptekar
				10.	*A. tanganyikae* (West) Wolose *et* Miller
			Cylindrospermum	11.	*Cylindrospermum desikacharyi* Komárek
		Rivulariaceae	*Rivularia*	12.	*Rivularia hansgirgi* Schmidle
Euglenophyceae	Euglenales	Euglenaceae	*Trachelomonas*	13.	*Trachelomonas robusta* Swirenko
				14.	*T. rotunda* Swirenko
Xanthophyceae	Heterococcales	Pleurochloridaceae	*Trachychloron*	15.	*Trachychloron depauperatum* Pascher
Chlorophyceae	Volvocales	Chlamydomonadaceae	*Chlamydomonas*	16.	*Chlamydomonas sectilis* Korschikov
	Tetrasporales	Palmellaceae	*Asterococcus*	17.	*Asterococcus limneticus* Smith
		Tetrasporaceae	*Schizochlamys*	18.	*Schizochlamys compacta* Prescott
	Chlorococcales	Chlorochytriaceae	*Kentrosphaera*	19.	*Kentrosphaera bristolae* Smith
		Oocystaceae	*Chlorella*	20.	*Chlorella ellipsoidea* Gerneck
			Oocystis	21.	*Oocystis borgei* Snow
				22.	*O. irregularis* (Petkof) Printz
				23.	*O. parva* West & West
	Zygnematales	Desmidiaceae	*Cosmarium*	24.	*Cosmarium subtumidum* Nordstedt

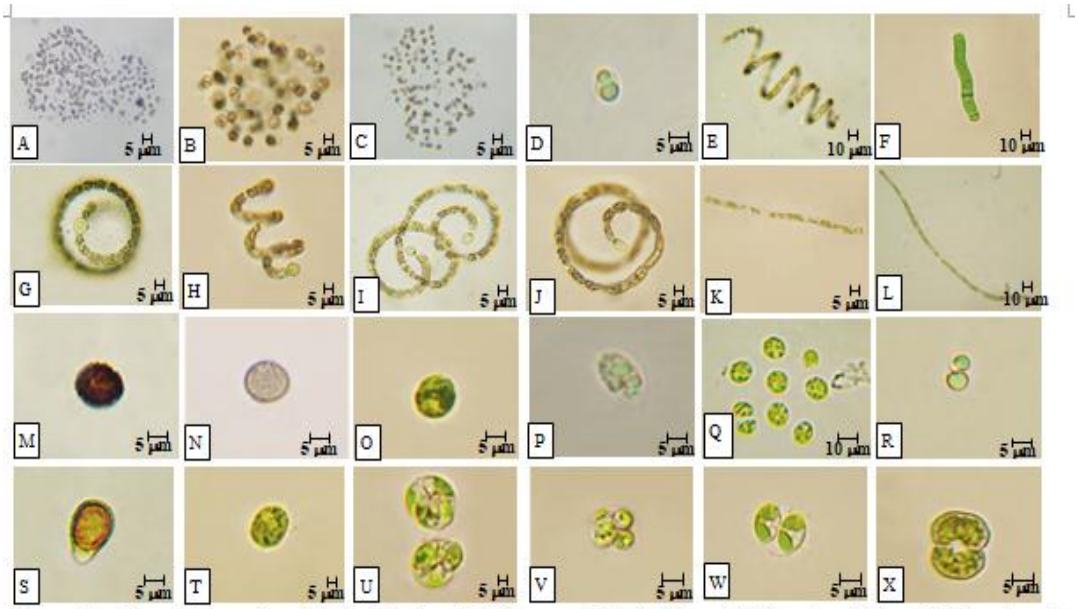

Figure 6. A. *Microcystis aeruginosa* (Kutzing) Kutzing, B. *M. flos-aquae* (Wittr.) Kirchner, C. *M. protocystis* Crow, D. *Synechocystis pevalekii* Ercegovic, E. *Arthrospira platensis* (Nordst.) Gomont, F. *Oscillatoria refringens* Gardner, G. *Anabaena minispora* Watanabe, H. *Anabaenopsis milleri* Voronichin, I. *A. arnoldi* Aptekar, J. *A. tanganyikae* (West) Wolose *et* Miller, K. *Cylindrospermum desikacharyi* Komárek, L. *Rivularia hansgirgi* Schmidle, M. *Trachelomonas robusta* Swirenko, N. *T. rotunda* Swirenko, O. *Trachychloron depauperatum* Pascher, P. *Chlamydomonas sectilis* Korschikov, Q. *Asterococcus limneticus* Smith, R. *Schizochlamys compacta* Prescott, S. *Kentrosphaera bristolae* Smith, T. *Chlorella ellipsoidea* Gerneck, U. *Oocystis borgei* Snow, V. *O. irregularis* (Petkt) Printz, W. *O. parva* West & West, X. *Cosmarium subtumidum* Nordstedt

Discussion and Conclusion

In the present study, a total of 24 algal taxa collected from Twin Taung Lake were stated and represented in Table 1. The result showed that four major groups namely Cyanophyceae, Euglenophyceae, Xanthophyceae and Chlorophyceae were observed in Twin Taung Lake. According to result, the species numbers of Cyanophyceae were the highest in this study area.

The heterocystous cyanobacteria such as *Anabaena*, *Anabaenopsis*, *Cylindrospermum* and *Rivularia* were observed in this lake. Among them, especially the species of *Anabaenopsis* were found in all sampling sites throughout the study period. In this study, the range of pH value was 9.31 - 9.42 and alkalinity was ranging from 2470 to 2894 ppm, nitrate was 16.43 - 43.38 ppm and phosphate was 0.281 - 2.217 ppm and thus, the water in this lake was alkaline water and rich in the value of nitrate and phosphate. These findings were agreed with Philipose (1967) who stated that members of Cyanophyceae grew well in water that was alkaline water and rich in nutrients such as nitrate and phosphate.

In the present study, only one genus of euglenoids *Trachelomonas* was found in the study area. According to results, nitrate was 16.43 - 43.38 ppm and phosphate was 0.281 - 2.217 ppm and thus, the water in this lake was rich in the value of nitrate and phosphate. These findings were agreed with Poniewozik & Juran (2018) who stated that *Trachelomonas* species was known to be particularly luxuriant in case of an abundant supply of phosphorus and nitrogen.

Nine species of Chlorophyceae were observed in this study. One species of *Kentrosphaera*, 1 species of *Chlorella* and 3 species of *Oocystis*, belong to Chlorococcales were found in this study. These species were growing on the water with the pH value of 9.31 - 9.42. The temperature of water was 29.1 - 31.8°C. This finding was agreed with Krishnan (2008) who stated that the Chlorophyceaen phytoplankton order of Chlorococcales was known to prefer inorganic nutrients providing alkaline pH and moderately high temperature.

In Twin Taung Lake, total hardness was 242 - 281 ppm, sodium carbonate was 694 - 1494 ppm and sodium bicarbonate was 1057 - 1987 ppm. Chorus & Cavalieri (2000) stated that water containing sodium carbonate at concentration below 60 ppm was generally considered as soft; 60-120 ppm, moderately hard; 120-180 ppm, hard; and more than 180 ppm, very hard. Therefore, it may be suggested that the water of Twin Taung Lake was containing sodium carbonate and its content was considered as very hard.

The variable pH values of water in study area were from 9.31 to 9.42 and salinity was 2‰ in October, 2017. The pH values were between 10.16 and 10.36 and the salinity was 4‰ up to 2012 and the growth of pure *Spirulina* occurred. After that the growth of *Spirulina* decreased, the other algae began to grow in this area. The pH value of most natural water is between 5 and 10. Sudden changes in pH value serve as warning signals for water quality and it may be adversely affected through the introduction of contaminants.

Finally, it was concluded that the occurrence of *Spirulina* nearly disappeared slowly due to the dominant groups of other algae in Twin Taung Lake since 2013. It may be suggested that it was due to the changes of physico-chemical parameters of water in this lake. Therefore, the continuous research of the monthly survey of algae occurrence and analysis of physico-chemical parameters should be made to get clear results.

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