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Phytoplankton Studies of the Rabigh Dam Stream, Makkah Province, Saudi Arabia

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A PRELIMINARY Checklist on phytoplankton dynamics of the Rabigh Dam Stream was investigated during the wet (January and February) and arid (July and August) seasons of 2018. Composite sample were collected along the Rabigh Dam Stream. These outcomes provide useful information on the checklists and ecology of plankton's species which could be potentially used as bio-indicators for assessing and monitoring the Rabigh Dam Stream. Five main algal groups were recorded namely: Cyanophyceae, Chlorophyceae, Euglenophyceae, Bacillariophyceae and Pyrrophyceae. This study identified 65 phytoplankton species consisted of Blue-green algae (9 species), Green algae (46 species), Euglenoids (1 species), Diatoms (6 species), and Dinoflagellates (3 species). The following order of dominance was; Cyanophyceae> Chlorophyceae> Euglenophyceae> Bacillariophyceae> Dinophyceae. In spite the number of blue-green algal species was low, they represented 63.62% of the total phytoplankton followed by Chlorophyceae (19.08%), Euglenophyceae (11.21%), Bacillariophyceae (5.72%), respectively. On the other hand, the Dinophyceae represented the rarely group (0.37%) of the total phytoplankton. There were main changes in phytoplankton composition due to the projects drinking water reservoir construction. It could be related to the severe human activities and difference in sampling strategies. It was concluded that all the dams had well balanced phytoplankton communities. The changes in phytoplankton composition and numbers were significantly varying among the period of study.

Keywords: Rabigh Dam, Phytoplankton, Wadi Rabigh, Physico-chemical parameters.

Introduction

Around 70% of the earth surface is secured by water, of which less than 3% is Fresh water and the remaining is saline. Because of variables like quick increment in population, urbanization, industrialization and gigantic utilization of water in industry and farming, a monstrous weight on the amount and nature of the accessible freshwater has been created (Kundzewicz et al., 2007).

Human-made dams are important in our modern life. A dam is constructed to control water through the situation of a blockage of earth, rock as well as concrete over a stream or waterway. Dams are generally built to store water in a reservoir, which is then served for an assortment of utilization, for example, water supply, flood control, irrigation, navigation, sedimentation control and hydropower. The vast majority of the dams are single-purpose dams, yet there are currently a developing number of multipurpose dams. Utilizing the latest distribution of the World Register of Dams, water system is by a long shot the most well-known reason for dams. Among the single reason dams, 48% are for water system,

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17% for hydropower (creation of power), 13% for water supply, 10% for flow control, 5% for diversion and 1% for route and fish cultivation (http://www.icold-cigb.net/GB/dams/role_of_dams.asp).

In arid land as Saudi Arabia construction of a dam may sound like a superfluous undertaking. The Arabian Peninsula in particular, is characterized by a desert climate that originated the sandy desert. The area surrounded the Rabigh dam characterized by rocky and sandy places get quickly cold soon after the sunset, allowing the humidity present in the air to condensate and permit the little wildlife possibly present to survive in the harsh climate. These rocky areas have also a very limited capacity to absorb the rain which therefore flows towards the 'valley bottom' creating the so called 'wadi', an Arabic term to indicate a riverbed or intermittent stream.

In Saudi Arabia there were eight dams, Baysh Dam, Hali Dam, Jizan Dam, Rabigh Dam, King Fahad Dam, Murwani Dam, Najran Valley Dam and SitaeAlhven Dam. Makkah Province has three dams, Hali Dam, Murwani Dam and Rabigh Dam.

The Rabigh Dam is a significant dam on Wadi Rabigh about 35km east of Rabigh in Makkah Province of western Saudi Arabia. The dam has many functions to include overflow rain control, urban water supply and groundwater recharge. Water from the dam's reservoir is treated before being supplied to Rabigh. The dam was constructed between 2003 and 2008. It is owned and operated by the Ministry of Water and Electricity. The Rabigh Dam has a multi-reason development that store the water which couple of years back was streaming to the sea in the alleged Rabigh Wadi, give surety: i) Flood control; ii) Metropolitan water supply and iii) Groundwater energize, helping the general framework to have huge advantages.

The rains of the investigated area during winter, happened two or three times making canals in the Wadi (Stream) in the 'Wadi' and spilled out of the mountains to the valley base undistributed. The soil in reality does not absorb much water that hence could achieve its goal without significant misfortune. Because water is so important to enable the characteristic life to survive. Dams were constructed to satisfy human needs.

Water is considered to be the fundamental element on the earth, where plants, animals or people cannot live without it especially in arid region like Saudi Arabia. Plankton represent the base of the aquatic food chain and are the primary producers of the organic substances upon which many other consumers depend. The aim of this investigation was to determine the preliminary patterns in the phytoplankton species composition and the abundance in the Rabigh Dam stream and some of its physico-chemical parameters, which affect planktonic growth, tolerance, dominance, abundance or absence.

Materials and Methods

Location and structure of the Rabigh Dam stream

The Rabigh Dam, lying between 22° 49' 17.3'' latitude and 39° 22' 34.2'' longitude (Fig. 1). The total length of the dam is 285m, with a maximum width 10m. The maximum depth of the dam was 80m. The maximum stream from the sources to the dam wall is about 5.87km, with an average stream width of 0.27km. The main sources of the Rabigh Dam waters are from Wadi Mor and Wadi Hyia, both of them meets at Wadi Tmya. All of these Wadis are named Wadi Rabigh.

Composite sample were collected from different sites along the Rabigh Dam stream during wet and arid season for both physic-chemical and biological parameters. We can't take a regular site along the stream due to the geological structure of the area surrounded the stream were very difficult.

The sampling taken from different places of Rabigh Dam stream in both seasons, are they mixed together and then analyzed physico-chemically and used for identification of different phytoplanktons.

Field physico-chemical analysis of the water sample

The water temperature and pH were determined *in situ* by using portable meter called WTW7200 pH meter Inolab with microprocessor. The dissolved Oxygen was measured by using Oxygen meter (Portable Jenway Model 9500) with microprocessor. Conductivity, Ammonia, Nitrate and reactive Phosphorus were measured *in situ* by using Portable Hydrolab model YSI 6 Series Multiparameter Water Quality Sondes (6600 V2-4 Sonde).

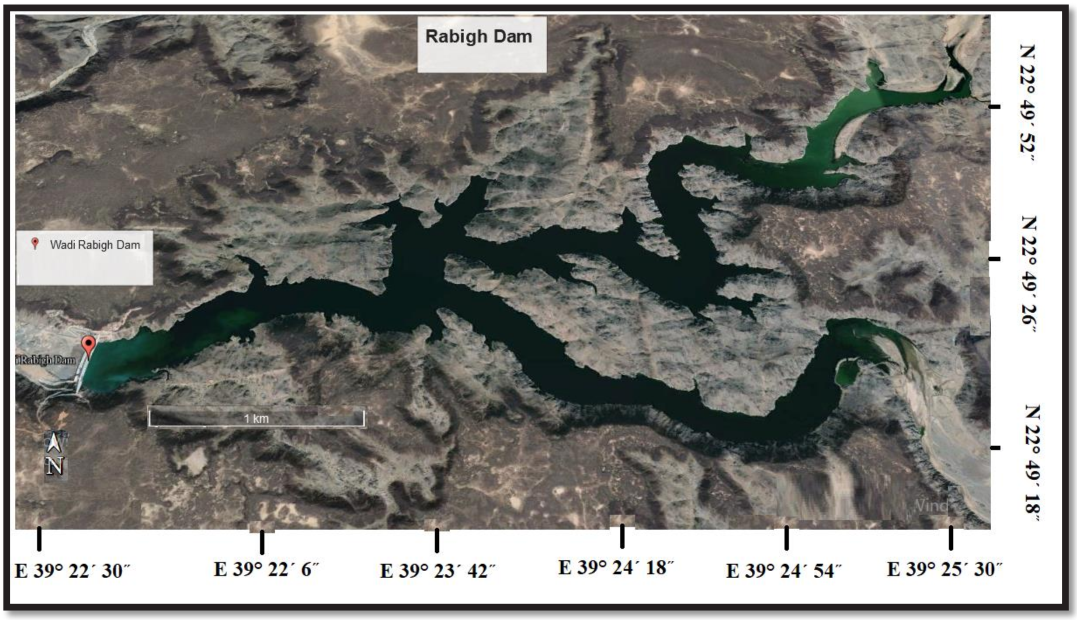

Fig. 1. Map showed the Rabigh Dam stream.

Sample collection

The water sample containing phytoplankton were immediately fixed in a 5% formalin solution and transported to the laboratory of phycology in the Faculty of Science and Arts, Rabigh Branch, King Abdulaziz University, Saudi Arabia, for analysis and identification. Estimation of the standing crop (quantitative analysis) and species composition (qualitative analysis) of the phytoplankton communities were carried out using the sedimentation technique. One liter of the sample was collected from the subsurface layer of composite sample and preserved in 4% neutral formalin. The samples were transferred to graduated cylinders of 500ml capacity. A few drops of Lugol's solution were added until the samples changed to faint tea color. The samples were decanted and siphoned slowly with a small plastic tube ending with a fine nylon cloth of 20μm mesh diameter, until the samples was concentrated to about 100ml. Estimation of the standing crop (quantitative analysis) and species composition (qualitative analysis) of the phytoplankton communities were carried out using the sedimentation technique (Ultermöhl, 1958; EPA, 1979; APHA, 1992).

Phytoplankton counts, identification and standing crop calculation

Phytoplankton cells were counted using a Palmer and Malony slide (0.1ml volume). The species composition and the number of phytoplankton cells were determined at high magnification of research microscope (40X and 100X). The standing crop was calculated. According to the dominancy of the phytoplanktonic species will tabulated as D: Dominant, A: Abundant, C: Common, R: Rare and S: Absent. The main references used for identification of algal taxa were, Kofoid & Swezy (1921), Lebour & Marie (1930), Mills (1933-1935), Hendey (1964), Starmach (1966), Le Cren (1978), Perscott (1978), Sliegh (1989), Mizuno (1990), Garcia-Baptista (1993), Silva & Pienaar (2000) and Botes (2003).

Statistical analysis

Statistical analysis was run utilizing MVSP 3.1 program for the determination of diversity index, evenness or equitability and the number of species (Kovach, 2000). We calculated the species richness, algal density, relative abundances of dominant species to describe the phytoplankton communities.

Results and Discussion

The Rabigh Dam is an unimportant dam on Wadi Rabigh around 35km east of Rabigh in Makkah Province of western Saudi Arabia. The dam has much capacity to incorporate flood rain control; urban water supply and groundwater revive. Water from the dam's repository was dealt with before being provided to Rabigh and the economic city beside Rabigh. The Rabigh Dam has a multi-reason improvement that store up the water that couple of years back was gushing to the Red Sea in the claimed Rabigh Wadi. It give surety to: I) Flood control; ii) Metropolitan water supply and iii) Groundwater stimulate, helping the general structure to have immense preferences.

Physico-chemical parameters

The ranges of physico-chemical parameters in the Rabigh Dam stream are represented in Table 1. Temperature plays an important role in activity of aquatic organisms. Water temperature varied significantly between wet and arid seasons ($P<0.05$) from 21.5-28.5°C. This result indicates a wide range in temperature. During the period of investigation, water temperature showed a wide fluctuation especially in arid season. The lower temperatures in wet season as results of the rains which lead to turbulence and water movement, which makes the water lose heat. This result agrees with the data obtained by Abubakar & Yakasai (2012) at Salanta River Kano, Nigeria.

Transparency and water depth varied significantly between the wet and arid seasons. The highest depth (38m) was recorded beside the wall of the dam while the average depth at the whole stream fluctuated between 3.80 and 4.30m during wet and arid season. On the other hand, the transparency not too much and ranged between 0.95 and 0.80 m. Water transparency did not demonstrate any noteworthy regular or spatial variety without a doubt this should not out of the ordinary, since Secchi disc was generally controlled by suspended solids, and transparency had a tendency to be low when suspended solids were high and vice versa (Abubakar & Yakasai, 2012).

Hydrogen ion concentration (pH) ranged between 7.50 and 7.80 throughout the investigation period. The alkaline pH is an indicative of poor productivity. Our results consistent with the results of Nhiwatiwa & Marshall (2007) who recorded pH ranged between 6.2 and 9.3 in two Zimbabwean dams with aquatic macrophytes growing in them. Electrical Conductivity had an average value of (653.5µS/cm) in the wet season and the mean value of680.4µS/cm) in the arid season. Dissolved oxygen (DO) is one of the most significant factors that refer water clarity. Dissolve oxygen content ranged between 6.4mg/L during wet season and 4.3mg/L during arid season. The Nitrate ranged between 159 - 170µg/L during the wet and arid season, respectively. On the other hand, Ammonia fluctuated between 210µg/L during wet season and 200µg/L during arid season. In Rabigh Dam stream reactive phosphate (PO_4-P) was significantly higher during arid season 360µg/L than the wet season with 324µg/L.

Phytoplankton community structure

Five major algal groups were represented in the sampled areas of the Rabigh Dam stream (Table 2). These were the Cyanophyceae, Chlorophyceae, Euglenophyceae, Bacillariophyceae and Pyrrophyceae. A total of 65 taxa belonging to 48 genera were identified. Of these taxa, 9 belonging to blue-green algae, 46 green algae, 1 euglenoides, 6 diatoms and 3 dinoflagellates. In spite the number of blue-green algal species was low; they represented 63.62% of the total phytoplankton followed by Chlorophyceae (19.08%), Euglenophyceae (11.21%) and Bacillariophceae (5.72%) respectively. On the other hand, the Pyrrophyta represented the rarely group of the formed 0.37% of the total phytoplankton (Fig. 2).

TABLE 1. Ranges of some available physico-chemical parameters of the Rabigh Dam stream.

Parameters	Unit	Wet Season ± SE			Arid season±SE		
Air temp.	°C	22	±	0.02	42	±	0.03
Water temp.	°C	21.5	±	0.03	28.5	±	0.03
Conductivity	µS/cm	653.5	±	15.20	680.4	±	16.70
Depth	m	3.8	±	0.80	4.3	±	0.90
Secchi Disc	m	0.95	±	0.10	0.80	±	0.10
pH		7.5	±	0.20	7.8	±	0.25
Dissolved oxygen	mg/L	6.4	±	0.80	4.6	±	0.50
Nitrate	µg/L	150	±	3.40	170	±	5.30
Ammonia	µg/L	210	±	5.70	200	±	6.80
Reactive phosphate	µg/L	324	±	7.90	360	±	12.60

TABLE 2. Phytoplankton community structure in Rabigh Dam stream.

	Wet season			Arid season		
	Relative abundance	**% Abundance of each group**	**% Abundance of the total Phytoplankton**	**Relative abundance**	**% Abundance of each group**	**% Abundance of the total Phytoplankton**
Chlorophyceae						
Carteria sp.	R	1.25	0.27	R	0.74	0.12
Chlamydomonas sp.	C	15.06	3.21	R	0.77	0.13
Chlamydomonas globosa	C	15.15	3.23	R	1.11	0.18
Eudorina elegans	R	1.87	0.40	R	0.65	0.11
Eduorina unicocca	R	0.69	0.15	R	0.56	0.09
Gonium Sociale	R	0.62	0.13	S	0.00	0.00
Pandorina morum	R	1.44	0.31	R	0.56	0.09
Volvox sp.	R	2.78	0.59	R	3.71	0.61
Golenkinia radiate	R	0.28	0.06	R	0.37	0.06
Golenkinia parvula	R	0.69	0.15	R	0.93	0.15
Characium limneticum	R	1.11	0.24	R	1.51	0.25
Schroederia sp.	R	0.32	0.07	R	0.33	0.06
Pediastrum duplex	R	3.08	0.66	R	11.96	1.97
Pediastrum simplex	R	3.08	0.66	R	2.06	0.34
Pediastrum tetras	R	0.67	0.14	R	0.50	0.08
Coelastrum microporum	R	1.16	0.25	R	1.24	0.20
Ankistrodesmus falcatus	R	7.44	1.59	R	0.66	0.11
Chlorella vulgaris	R	1.16	0.25	R	9.41	1.55
Dictyosphaerium pulchellum	R	0.63	0.13	S	0.00	0.00
Kirchnerielle obese	R	1.16	0.25	R	1.24	0.20
Lagerheimia ciliate	R	0.63	0.13	S	0.00	0.00
Monoraphidiyum arcuatum	S	0.00	0.00	R	0.66	0.11
Monoraphidiyum sp.	S	0.00	0.00	R	0.66	0.11
Nephrocytium sp.	S	0.00	0.00	R	0.66	0.11
Oocystis borgei	R	7.98	1.70	R	9.99	1.65
Oocystis parava	R	0.63	0.13	R	0.66	0.11
Oocystis lacustris	S	0.00	0.00	R	0.58	0.10
Sphaerocystis sp.	S	0.00	0.00	R	0.66	0.11
Tetraedron minimum	R	0.63	0.13	R	9.41	1.55
Tetraedron sp.	R	0.63	0.13	R	9.41	1.55
Actinastrum hantzschii	R	0.63	0.13	R	0.66	0.11
Crucigenia sp.	R	7.44	1.59	R	0.66	0.11
Micratinium pusillum	R	0.63	0.13	R	0.66	0.11
Desmodesmus acuminatus	R	8.07	1.72	R	12.27	2.02

TABLE 2. Cont.

	Wet season			Arid season		
	Relative abundance	% Abundance of each group	% Abundance of the total Phytoplankton	Relative abundance	% Abundance of each group	% Abundance of the total Phytoplankton
Desmodesmus arcuatus	R	8.74	1.86	R	0.66	0.11
Desmodesmus armatus	R	0.63	0.13	R	0.66	0.11
Desmodesmus denticulatus	R	1.16	0.25	S	0.00	0.00
Desmodesmus ellipticus	S	0.00	0.00	R	0.66	0.11
Desmodesmus intermedius	S	0.00	0.00	R	0.66	0.11
Desmodesmus maximus	S	0.00	0.00	R	0.66	0.11
Desmodesmus opoliensis	R	0.63	0.13	R	9.47	1.56
Desmodesmus spinosus	S	0.00	0.00	R	0.66	0.11
Tetrastrum elegans	R	0.63	0.13	S	0.00	0.00
Closterium gracile	R	0.63	0.13	R	0.66	0.11
Cosmarium sp.	R	0.63	0.13	S	0.00	0.00
Staurastrum paradoxum	S	0.00	0.00	R	0.58	0.10
Euglenophyceae						
Euglena sp.	D	100.00	9.07	D	100.00	13.46
Dinophyceae						
Gleodinium sp.	R	33.33	0.13	R	33.33	0.11
Peridinium sp.	R	33.33	0.13	R	33.33	0.11
Ceratium hirundinella	R	33.33	0.13	R	33.33	0.11
Cyanophyceae						
Aphanocapsa sp.	R	0.38	0.25	R	0.15	0.10
Chroococcus sp.	C	6.17	4.02	C	6.54	4.07
Merismopedia tenuissima	D	15.10	9.84	A	11.13	6.93
Microcystis aeruginosa	D	24.93	16.25	D	26.54	16.52
Oscillatoria sp.	A	11.23	7.32	A	11.89	7.40
Oscillatoria limnetica	A	10.36	6.75	A	11.01	6.85
Anabaena spiroides	C	5.72	3.73	C	6.05	3.76
Nostoc sp.	C	5.72	3.73	C	6.05	3.76
Spirulina platensis	D	20.39	13.30	D	20.65	12.85
Bacillariophyceae						
Navicula sp.	R	6.17	0.25	R	1.46	0.11
Bacillaria sp.	R	2.83	0.11	R	2.73	0.20
Nitzschia sp.	R	6.17	0.25	R	1.46	0.11
Chaetoceros sp.	S	0.00	0.00	R	1.46	0.11
Melosira sp.	R	2.83	0.11	C	46.45	3.48

TABLE 2. Cont.

	Wet season			Arid season		
	Relative abundance	**% Abundance of each group**	**% Abundance of the total Phytoplankton**	**Relative abundance**	**% Abundance of each group**	**% Abundance of the total Phytoplankton**
Cyclotella meneghiniana	C	82.01	3.30	C	46.45	3.48
Diversity index		2.902			2.846	
Equitability or evenness		0.727			0.698	
Number of species		54			59	

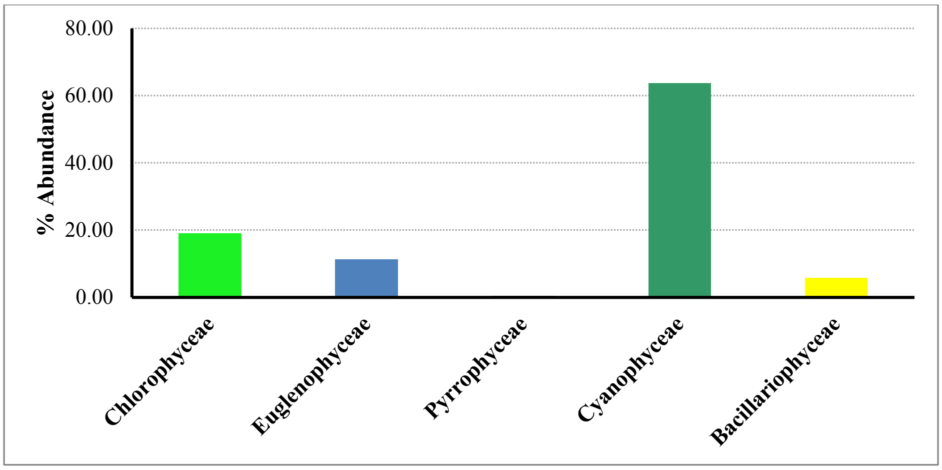

Fig. 2. Percentage abundance of the different phytoplanktonic group.

Phytoplankton community structure

Phytoplankton community structure in Rabigh Dam stream was represented in Table 2. Five major algal groups were represented in the sampled areas of the Rabigh Dam stream. These were the Cyanophyceae, Chlorophyceae, Euglenophyceae, Bacillariophyceae and Pyrrophyceae. A total of 65 taxa belonging to 48 genera were identified. Of these taxa, 9 belonging to blue-green algae, 46 green algae, 1 euglenoides, 6 diatoms and 3 dinoflagellates. In spite of the low number of blue-green algal species; they represented 63.62% of the total phytoplankton followed by Chlorophyceae (19.08%), Euglenophyceae (11.21%) and Bacillariophceae (5.72%), respectively. On the other hand, the Pyrrophyta represented the rarely group (0.37%) of the total phytoplankton (Fig. 2).

In Rabigh Dam stream, phytoplankton diversity was higher in the arid (59 species) than the wet season (54 species) and blue-green algae were the more important group among the phytoplankton categories recorded. Our data agreed with the results obtained by Bisimwa et al. (2016) in the case of remove one and that is higher species in arid season than wet season. There is a difference between our data and Bisimwa et al. (2016) in case that, our data revealed that the blue-green algae occupied the dominant phytoplanktonic group while at Bisimwa et al. (2016) recorded that diatom was the most abundant group.

The abundance percentage of total phytoplankton composition represented 51% during wet season and 49% during arid season. The diversity index was respectively 2.902 and 2.846 in wet and arid season, respectively. Evenness or equitability values were 0.727 recorded in wet season and 0.698 in arid season.

The plenitude of phytoplankton samples by a few number of taxa was reflected by low equitability or evenness recorded. Diversity index is affected by the quantity of species. High value of diversity index was recorded during wet season with low number of taxa.

Cyanophyceae

The results revealed close similarity between the wet and arid season in the abundance of their taxa. Cyanophyceae were mainly represented by 8 genera and 9 species. The most leading species were, *Microcystis aeruginosa*, *Spirulina platensis*, *Merismopedia tenuissima* and *Oscillatoria* sp. These species represented about 70.93% of the total Cyanophyceae group and about 45.20% of the total phytoplankton composition, during the period of investigation. On the other hand, *Aphanocapsa* sp. recorded as rarely algal species of the blue-green algae.

Microcystis aeruginosa was the most dominant species among the blue-green algae during this study. The maximum occurrence of this species was recorded during arid season and this may be attributed to the effect of temperature and stagnant water during arid months as well as the great tolerance of Cyanobacteria to wide range of environmental factors. This phenomenon was agreed with the data obtained by Touliabah (1996) and Ishak et al. (1979) at the River Nile stream.

The Obtained data agreed with the data recorded by El-Otify (1985), Zaghloul (1985) and Abd El-Monem (1996) in Aswan High Dam - Egypt. They reported that blue green algae were the dominant group especially during summer season. The same phenomenon was recorded by Touliabah (1996), at the River Nile at Helwan sector in front of Iron and Steel Factories. They attributed this observation to the effect of pollutants discharged directly from these Iron plants as well as the increased temperature. Also, the present results coincide with the data obtained by Sharmeen & Md. Abu Sayed (2008). They recorded a bloom of Cyanophyceae occurred due to various environmental factors in two urban fish ponds in the Rajshahi city, Bangladesh.

Chlorophyceae

Depending on the population density of the green algae and their percentage to total phytoplankton crop (19.08%) were less dominant compared with the blue-green algae. During wet season the standing crop of the green algae was very high than dry season by 1.3 folds. This is may be due to the rainwater was loaded by nutrients as a result of erosion the mountain. Most of Chlorophyceae species were rarely recorded except *Chlamydomonas* sp. This species formed 30.2% and 1.89% of the total green algae during wet and arid season, respectively.

The obtained results were in contradiction with the data obtained by Rostamian et al. (2015). They recorded the maximum density of phytoplankton was from Chlorophyceae followed by Bacillariophyceae and Cyanophyceae. They concluded this resultwas from to change in habitat across the tropic spectrum.They concluded that their results were due to change in habitat across the tropic spectrum.

Euglenophyceae

This group occupied the third dominance position along the total phytoplankton standing crop. They represented only by one taxa named *Euglena* sp. The highest density of this group being 13.46% from the total phytoplankton standing crop was recorded during arid season. On the other side, the least abundance of this group being 9.07% of the total phytoplankton standing crop was observed during wet season. Our data disagreed with those obtained by Touliabah (1996) which reported the euglenoidgroup was scarcely and sporadic presence in the Nile River stream during winter months.

Bacillariophyceae

Member of this group were less represented in the Rabigh Dam stream in both wet and arid season. The occurrence of diatoms was more in the arid season than in the wet season. Four diatom species were recorded with the pennate forms and two species of the centric forms. *Melosira* sp. and *Cyclotella meneghiniana* formed the most leading species of the Bacillariophyceae. The present data was agreed with those obtained by Bisimwa et al. (2016). They reported that, diatoms were the leading group in dry season than in wet season. They recorded 18 pennate diatom, while the centric diatom was less in diverse than pennate forms. In the present date, six diatom species were recorded one of them from centric diatom. The most leading species of the diatom form in the present study was *Cyclotella meneghiniana*. The reduced Bacillariophyceae diversity in wet season may be attributed to the low water transparency which reduced as a result from the high mountain surrounded the stream as well as the suspended matter (Bisimwa et al., 2016). Bahati et al. (2015) reported the same phenomenon about eibenthic algae of Kahuzi-Buega National Park's streams.

Dinophyceae

Pyrrophyta were scarcely in comparison with other phytoplankton classes. They formed about 0.37% of the total standing crop. This group was represented only by three taxa.These species were *Gleodinium* sp., *Peridinium* sp. and *Ceratium hirundinella*. The presence of *Ceratium* and *Peridinium* were recorded also by Saad & Abbas (1985) and Touliabah (1996) at the River Nile stream.

The contribution of this algal group was little and non significant. In this investigation, there was no significance difference between wet and arid season concerning the abundance percentage of dinoflagellates species. The present data contradict with those obtained by Pfiester (1990), Ibrahim (1978), Shaaban-Dessouki & Baka (1985) and Touliabah (1996). They stated that, the maximum occurrence of Dinophyceae was during summer due to temperature which was the limiting factor.

Biostatistical analysis

In Rabigh Dam stream, phytoplankton diversity was less in wet season (54 species) than the dry season (59 species). The present data was contradicted with those recorded in Bisimwa et al. (2016). The diversity index was higher (2.902) in wet season than those recorded in arid season (2.846). The same pattern was recorded with the evenness. The reduction of diversity index in the dry season may be attributed to the intensive growth of *Microcystis aeruginosa* leading to decrease the transparency (Bahati et al., 2015).

Conclusion

The outcomes from this study showed the requirement for additionally observing keeping in mind to pick up a superior comprehension of Rabigh Dam stream riverine phytoplankton and profit by the ecological indicator limit of the phytoplankton standing crop.Further studies focusing on other factors such as presence of heavy metals in the dams due to erosion of the mountain during the rainy time and of lengthy periods are recommended.

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دراسات على الهائمات الطحلبية في مجرى سد رابغ، مكة المكرمة، المملكة العربية السعودية

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تم إجراء دراسة ديناميكية مبدئية على الهائمات النباتية في مجرى سد رابغ خلال الفصول الرطبة من السنة (يناير وفبراير) وكذلك في الفصول الجافة (يولية وأغسطس) من العام 2018 م. جمعت عينات تشمل طول مجرى السد. حيث بمثل هذه الدراسة التي توفر معلومات وكذلك أنواع الهائمات الطحلبية والتي يمكن إستخدامها فيما بعد كمؤشرات حيوية على بيئة منطقة سد رابغ.

تم تسجيل خمس مجموعات طحلبية رئيسية في منطقة الدراسة وهي: مجموعه الطحالب الخضراء المزرقة، مجموعه الطحالب الخضراء، مجموعه الطحالب اليوجلينية، مجموعه الطحالب الدياتومية ومجموعه الطحالب البيرية.

تم تعريف 65 نوعاً من الهائمات الطحلبية خلال هذه الدراسة، 9 أنواع من مجموعه الطحالب الخضراء المزرقة، 46 نوعاً من مجموعه الطحالب الخضراء، ونوع واحد فقط من مجموعه الطحالب اليوجلينية، 6 أنواع من مجموعه الطحالب الدياتومية و3 أنواع من مجموعه الطحالب البيرية. وقد كان ترتيب السيادة للهائمات الطحلبية كانت على النحو التالي: الطحالب الخضراء المزرقة > الطحالب الخضراء > الطحالب اليوجلينية > الطحالب الدياتومية > الطحالب البيرية. وعلى الرغم من انخفاض عدد أنواع الطحالب الخضراء المزرقة، فقد مثلت 63.62% من إجمالي الهائمات النباتية تليها الطحالب الخضراء (19.08%)، بينما الطحالب اليوجلينية شكلت 11.21%، والطحالب الدياتومية فقد كانت نسبتها 5.72% من إجمالي الهائمات النباتية. وعلى الجانب الآخر فقد كانت مجموعه الطحالب البيرية نادرة في تواجدها حيث شكلت 0.37 من إجمالي الهائمات النباتية. ونتيجة لبناء سد رابغ وذلك بهدف بناء خزان لمياه الشرب فقد يؤدي ذلك إلى تغيرات رئيسية في مكونات الهائمات النباتية. وقد يرتبط ذلك بالأنشطة البشرية المتعددة. والخلاصة في أن جميع السدود لديها مجتمعات متوازنة من الهائمات النباتية. وأي تغيرات تحدث في تكوين الهائمات النباتية وأعدادها تكون متباينة بشكل كبير بين فترة الدراسة.