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## **A fraction of fresh water algae of Kalpani stream and adjoining area of district Mardan, Pakistan**

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### **Abstract**

Present study deals with morpho-taxonomic description of 73 fresh water algae belonging to 34 genera, 25 families, 17 orders and 09 classes in Kalpani stream and adjoining area of district Mardan. Among these, 48 species (65.75%) belong to 17 genera, 12 families, 08 orders and 05 class of Phylum Chlorophyta and 09 species (12.33%) belong to 09 genera, 04 families, 02 orders and 01 class of Phylum Cyanophyta. In addition to it, 08 species (10.96%) belong to 05 genera, 05 families, 04 orders and 01 class of Phylum Bacillariophyta and 05 species (6.85%) belong to 03 genera, 02 families, 02 orders and 01 class of Phylum Ochrophyta. Furthermore, 03 species (4.11%) belong to 03 genera, 02 families, 01 orders and 01 class of Phylum Cyanobacteria. Fresh water algae are producer of aquatic ecosystem as they are source of food. Further studies are required to make extensive collection and identification of fresh water algae and other algae from various parts of district Mardan.

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## Introduction

The algae have been an interesting group for investigation because of their very primitive nature and a world-wide distribution, which is due to their capability to exist under most varied environmental conditions. Ertan & Morkoyunlu, (1998) recorded 73 taxa belonging to the Bacillariophyta, Chlorophyta, Cyanophyta and Euglenophyta divisions from Aksu Stream (Isparta, Turkey). Reshmi, (2004) conducted a detailed study on Chlorophycean biodiversity in Wet lands on Satna (M.P.) India. Please write about the general features of fresh water algae with reference.

In Pakistan a few taxonomical studies have been conducted of fresh water algae. In Karachi (Farzana & Nizamuddin, 1979 and Shameel & Butt, 1984), other areas of Sindh Province (Leghari & Arbani, 1984 and Leghari, *et al.*, 2000) and Punjab Province (Ghose, 1919 & 1924., Randhawa, 1936., Ali & Sandhu, 1972., Masud-ul-Hasan, 1978, 1980) reported some fresh water algae. But little attention has been paid on the study of fresh water algae of the Khyber Pakhtunkhwa Province (Faridi, 1971, Sarim & Zaman, 2005 and Sarim, 2005). It appeared that vast areas of the Pakistan were however not studied. Therefore, this study was undertaken to make a survey of fresh water algae from Mardan.

## Study area

The district lies from 34°12'0"N 72°2'24"E. The elevation of the valley is 1000 to 2056m above sea level. It is bounded on the north by Burner district and Malakand protected area, on the east by Swabi and Burner districts, on the South by Nowshera district and on the west by Charsadda district and Malakand protected area. The total area of the district is 1632 kilometers. Mardan district may broadly be divided into two parts, North-Eastern hilly area and south western plain. Kalpani, an important stream of the district rises in the Baizai and flowing southwards join Kabul river. Other important streams which join Kalpani are Baghiari Khawar on the west and Muqam

Khawar, coming from Sudham valley and Naranji Khawar from the Narangi hills on the left. (Fig. 1).

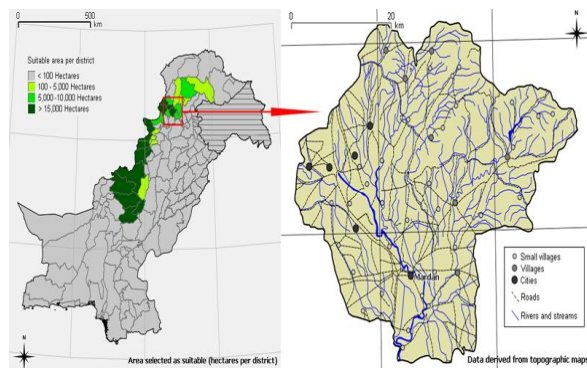


Fig. 1. Map of district mardan.

## Materials and methods

### Collection of samples

The study was conducted by frequently surveying in winter, spring and summer during 2010. More than 50 algal/phytoplankton samples of Fresh water algae (Fig. 2) were collected with the help of phytoplankton net mesh size 5–10  $\mu$  meter from Kalpani stream and adjoining area of districts Mardan. Different methods of collection were used for different algae i.e. filamentous algae were collected with help of forceps, desmid flora was collected with the help of pipette, macro-algae and aquatic plants were picked up with hands from the collection sites (Fig. 3 & 4), epilithic flora was collected with the help of tooth brush and knife from rock surfaces near water bodies.

All the collected samples of phytoplankton as well as other plankton were preserved in 2 to 3% formalin. Algal samples were preserved in 4% formalin to which a little of glycerin was added. The analysis was carried-out at Department of Botany, University of Peshawar, Khyber Pukhtoonkhwa, Pakistan.

### Identification

One drop from each sample were taken with the help of small pipette put on the slide and covered with

cover slip, under the microscope and the diagrams were drawn with the help of camera lucida technique (Fig. 5). The identification of phytoplankton up to the level of species was made with the help of literature cited (Smith, 1950; Prescott, 1961; Siddiqi & Faridi, 1964; Tiffany & Britton, 1971; Akiyama & Yamagishi, 1981).



Fig. 2. Specimen of Algae.



Fig. 3. Collection of Algae.



Fig. 4. Collection of Algae.



Fig. 5. Microscope with Camera Lucida.

## Results

In present study 73 fresh water algae species belonging to 34 genera, 25 families, 17 orders and 09 classes were identified of Kalpani stream and adjoining area of Mardan. Among these 08 species (10.96%) belong to 05 genera of Phylum Bacillariophyta (Table I). 48 species (65.75%) belong to 17 genera of Phylum Chlorophyta (Table II). 03 species (4.11%) belong to 03 genera of Phylum Cyanobacteria (Table III). 09 species (12.33%) belong to 09 genera of Phylum Cyanophyta (Table IV). 05 species (6.85%) belong to 03 genera of Phylum Ochrophyta (Table V).

Table 1. Occurrence of Bacillariophyta in Kalpani stream and adjoining area of Mardan.

Phy	Class	Order	Family	Genus	Species
Bacillariophyta	Bacillariophyceae	Cymbelales	Cymbellaceae	<i>Cymbella</i>	<i>Cymbella aspera</i> (Ehr.) Cleve
					<i>C. affinis</i> Kuetzing
					<i>C. ventricosa</i> Kuetzing
		Rhoicospheniales	Rhoicospheniaceae	<i>Rhoicosphenia</i>	<i>Rhoicosphenia curvata</i> Grunow
					<i>Stauroneis anceps</i> Ehrenberg
		Naviculales	Stauroneidaceae	<i>Stauroneis</i>	<i>Epithemia zebra</i> Kuetzing
Rhopalodiales	Rhopalodiaceae	<i>Epithemia</i>	<i>E. mulleri</i> Fricke		
Surirellales	Surirellaceae	<i>Cymatopleura</i>	<i>Cymatopleura solea</i> Smith		

**Table 2.** Occurrence of Chlorophyta in Kalpani stream and adjoining area of Mardan.

Phy	Class	Order	Family	Genus	Species		
Chlorophyta	Chlorophyceae	Charales	Characeae	<i>Chara</i>	<i>Chara schweinitzii</i> Braun		
		Chlorococcales	Oocystaceae	<i>Oocystis</i>	<i>Hydrodictyon reticulatum</i> Legerheim		
					<i>Kirchneriella</i>	<i>Kirchneriella lunaris</i> (Kirch.) Moebius.	
					<i>Oocystis borgei</i> Snow		
					<i>O. crassa</i> Wittrock in Whittrock & Nordstedt		
					<i>O. elliptica</i> W. West.		
					<i>O. eremosphaeria</i> Smith		
					<i>O. gigas</i> Archer		
					<i>O. lacustris</i> Chodat		
					<i>O. parva</i> West & West		
					<i>O. pusilla</i> Hansgirg		
		<i>O. pyriformis</i> Prescott					
		Scenedesmales	<i>Crucigenia</i>	<i>Crucigenia tetrapedia</i> West			
	<i>Scenedesmus armatus</i> Smith						
	Chlorophyceae	Oedogoniales	Oedogoniaceae	<i>Oedogonium</i>	<i>Oedogonium grande</i> Kuetzing		
					<i>O. plusiosporum</i> Wittrock		
	Chlorophyceae	Ulotricales	Ulotrichaceae	<i>Ulothrix</i>	<i>Ulothrix subconstricta</i> West		
					<i>U. zonata</i> Kuetzing		
	Euglenophyceae	Euglenales	Euglenaceae	<i>Euglena</i>	<i>Euglena oblonga</i> Schmitz		
					<i>Phacus pleuronectes</i> Dujardin		
	Euglenophyceae	Chlorellales	Chlorellaceae	<i>Ankistrodesmus</i>	<i>Ankistrodesmus convolutes</i> Corda		
					<i>A. falcatus</i> (Corda) Ralfs		
	Zygnematophyceae	Cladophorales	Cladophoraceae	<i>Cladophora</i>	<i>Cladophora fracta</i> Kuetzing		
					<i>C. glomerata</i> Kuetzing		
					<i>C. insignis</i> Kuetzing		
		Zygnematales	Zygnematales	Desmidiaceae	<i>Closterium</i>	<i>Closterium moniliforme</i> Ehrenberg	
						<i>Cosmarium granatum</i> Brebisson	
						<i>C. protractum</i> Debary	
						<i>C. moniliforme</i> Ralfs	
						<i>Hyalotheca dissilines</i> Brebisson	
						<i>Spirogyra</i>	<i>Spirogyra condensata</i> Kuetzing
							<i>S. crassa</i> Kuetzing
							<i>S. ellipsospora</i> Transeau
<i>S. fluviatilis</i> Hilse							
<i>S. kaffirita</i> Transeau							
<i>S. nitida</i> Link							
<i>S. oblate</i> Jao							
<i>S. porticalis</i> Cleve							
<i>S. rectangularis</i> Tanseau							
<i>S. rhizobrachialis</i> Jao							
<i>S. scrobiculata</i> Curda							
<i>S. setiformis</i> Kuetzing							
<i>Spirogyra submaxima</i> Transeau							
<i>S. tetraple</i> Transeau							
<i>S. wabashensis</i> Tiffany							
<i>Zygnema</i>	<i>Zygnema cylindricum</i> Transeau						
	<i>Z. pectinatum</i> Agardh						

**Table 3.** Occurrence of cyanobacteria in kalpani stream and adjoining area of mardan.

Phy	Class	Order	Family	Genus	Species
Cyanobacteria	Hormogoneae	Nostocales	Rivulariaceae	<i>Calothrix</i>	<i>Calothrix parietina</i> Thuret
				<i>Dichothis</i>	<i>Dichothis gypsophila</i> Kuetzing
		Nostocaceae	<i>Anabaena</i>	<i>Anabaena variabilis</i> Kuetzing	

**Table 4.** Occurrence of cyanophyta in kalpani stream and adjoining area of mardan.

Phy	Class	Order	Family	Genus	Species	
Cyanophyta	Cyanophyceae	Chroococcales	Merismopediaceae	<i>Merismopedia</i>	<i>Merismopedia convolute</i> Brebisson	
			Hyellaceae	<i>Pleuroc</i>	<i>Pleurocapsa varia</i> Drouet & Daity	
		Oscillatoriales	Oscillatoriaceae	<i>Oscillatoria</i>	<i>Oscillatoria curviceps</i> Agardh	
				<i>O. tenuis</i> Agardh		
				<i>O. limosa</i> Agardh		
				<i>Lyngbya</i>	<i>Lyngbya birgei</i> G.M. Smith	
				<i>Plectonema</i>	<i>Plectonema tomasinianum</i> Bornet	
				Phormidiales	<i>Phormidium</i>	<i>Phormidium inundatum</i> Kuetzing

**Table 5.** Occurrence of ochrophyta in kalpani stream and adjoining area of mardan.

Phy	Class	Order	Family	Genus	Species
Ochromytha	Coscinodiscophyceae	Fragilariiales	Fragilariaceae	<i>Diatoma</i>	<i>Diatoma anceps</i> Kirchner
				<i>D. vulgare</i> Bory	
				<i>Synedra</i>	<i>Synedra ulna</i> Ehrenberg
		Thalassiosirales	Stephanodiscaceae	<i>S. tenera</i> Smith	
				<i>Cyclotella</i>	<i>Cyclotella kuetzingiana</i> Thwaites

**Discussion**

Algae are of tremendous importance to life on earth. As primary producers in almost all the ecosystems, they play a vital role in food chains. Algae are regularly contributing fresh oxygen to the atmosphere, where as animals are contaminating it by adding carbon dioxide. They directly or indirectly serve as food for fish and other aquatic animals important to man. Their luxuriant growth tells upon the taste and odor of water and sometimes they make it unfit for drinking. Physico-chemical factors play an

important role in the distribution of algal species and distribution of fish and fauna among them. Temperature is the most important physical factor which controls phytoplankton population. So, water temperature is important in terms of its effect on aquatic life. As the temperature increases the dissolved-oxygen content decreases in water, due to increase metabolism and respiration activity (Welch, 1952). High temperatures have a direct effect on growth of algal species and communities and aquatic life.

During the present study of fresh water algae, the total of 73 species were found to be Unicellular forms, colonial forms, un-branched filamentous forms, branched filamentous forms, pseudo filamentous forms, mesh like thallus, heterotrichous forms and irregular forms. Such type of study was also carried out on Bara River Peshawar, by Sarim, 2005. Seasonal variation of fresh water algae was noticed during the study. Most of the fresh water algae were found growing in summers and springs. The least numbers being found in winters. This was primarily a taxonomical study. These findings will be of great use to scientific workers in future who want to explore more and more about fresh water algae of district Mardan.

## Conclusion

Algae in fresh waters have numerous environmental functions and are based upon the recycling of nutrients. Urbanization has led to the pollution of surface water bodies resulting in decline/extinction of some species. On the other hand, some species have increased enormously making water unfit for drinking and recreation. This study only comprises the taxonomic position of algae. It is proposed that a combined i.e. taxonomical and limnological study should be done to understand the biodiversity of alga in Kalpani stream of District Mardan.

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