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Local screening for Algal diversity in relation to water quality of district Swabi: future prospects

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Abstract

Algal diversity determined the quality of water bodies for a particular area. District Swabi, the main drainage basin of River Indus is widely known for its fertile land, intact wetland and for its biological resources. The present study is an outcome of an effort to record species diversity and comparative analysis of unicellular & filamentous algae from the valley. Sum of 22 genera with 35 species of unicellular & filamentous algae re collected and identified from different localities of district Swabi. The most frequent genus in term of Genus was *Chaetophora* with 3 species (8.57 %). Other frequent genera were *Stegeoclonium* 3 species (8.57 %), *Apanochaete* 3 species (8.57%), *Ulothrix* 2 species (5.71%) and *Mugeotia* 2 species (5.71%). The genera *Ankistrodesmus* and *Oocystis* were represented by 4 species each (5.71%), *Spirogyra* and *Cladophora 2* species each (5.71%) and *Zygonium* single species (2.58%). The diversity among algal species in the present area showed that further extensive work is needed regarding algae and the characteristics of their habitats.

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Introduction

Swabi district was created on 1st July, 1988. Prior to that, it was a tehsil of Mardan district since its creation in 1937. It remained a tehsil under Peshawar district. It has two sub divisions namely, Swabi and Lahore. The district lies between 33-55 and 34-23 north latitudes and 72-13 and 72-49 east longitudes. It is bounded on the north by Buner district, on the east by Haripur district, on the south by Attock district of the Punjab province an on the west by Nowshera and Mardan districts. The total area of the district is 1543 square kilometer.

The famous river Indus rises from the north East Mountains of Gadoon area at Satkhaiter flowing with the eastern and southern boundary of the district and entering the Nowshera and Attock districts at Khund. The important Nullahs of the district are BadraiNullah, NarangiNullah and ShagaiNullah. Badarinullah:Flows form the north close to Swabi town and joins the Indusriver near Hund. Nar angiNullah: Entering the district at Narangi from the north East Mountains passes through NawaKilli, Turlandi villages and leaving the district at Ismaila village enters the Mardan district. ShagaiNullah: Enters at ChackNodeh of Swabi district flowing through Dagai, YarHussain villages and leaving the district at village Dobian.

The entire area is fertile and produces good crops. However, most of the cultivated area is barani, and under favorable weather conditions and sufficient rainfall gives very good of put of wheat, maize tobacco, sugarcane etc. There are a number of canals flowing in the district. Recently work on Pehur High Level Canal Project has been started, which would bring the area into prosperity and will certainly enhance the agriculture output. Rice is also grown in district Swabi.

Materials and methods

The present study includes the identification, classification and distribution of Green unicellular algae from different sites of Swabi. It includes the Study of the genera, and their respective species found in different localities of Swabi. It also includes the measurement of various physical and chemical properties of water in which the said algal flora. Six major area of district Swabi were selected for the present day. These areas are Maneri Payan, Maneri Bala, Saleem Khan, Shah Mansoor , PanjPir , and Baja. Sample of algae and water were collected from the research areas. The collections were made by hand picking and scraping the aquatic vegetations.

The collected sample of algae water was brought to laboratory in polythene bags. It were assorted and preserved in 4% formalin solution in specimen tubes. The PH of water, temperature of air and water were all recorded on the spot. Slides of collected samples were made and observed under microscope. Identification was made with the help of Prescott (1941), Tiffany and Briton (1952), Faridi (1977, 1978), Shah (1984, 1999, 2000, 2001) and Shameel (2003). Sketches were drawn with the help of camera lucida. Water sample from the research areas were analysed for their physical and chemical properties at PCSIR laboratory Peshawar. The specimens were preserved in herbarium, Department of Botany, The University of Agriculture, Peshawar.

Results and discussion

Thirty Five (35) species of Filamentous & Unicellular Algae were identified from the collected samples of District Swabi. The most common genus was *Chaetophora* with 3 species making (8.57%) of the total Filamentous & Unicellular Algae i.e identified. The other genera were *Stegeoclonium*, with 3 species (8.57%), *Apanochaete, with 3* species (8.57%), *Ulothrix* , 2 species (5.71%), *Mugeotia* , 2 species (5.71%), *Spirogyra,* 2 species (5.71%), *Chara, 2* species (5.71%), *Cladophora, 2* species (5.71%), *Zygonium,* 1 species (2.58%) the rarely occurring species were *Nitella, Goniochloris, Asterococcous, Quadringula, Tetrospora, Protoderma, Sphaeroplea, Batracospermum, Glaucocystis, Gomphosphaeria, Gongrosira, Basicladia, Ankistrodesmus,* and *Phacus* with 1 species each (2.85%). The pH of the

water at different sites ranged from 6.85-8.36. While the temperature of water ranged from 16°C-19°C and that of air ranged between 23°C– 34°C. the species diversity along with their physic-chemical analaysis are presented below.

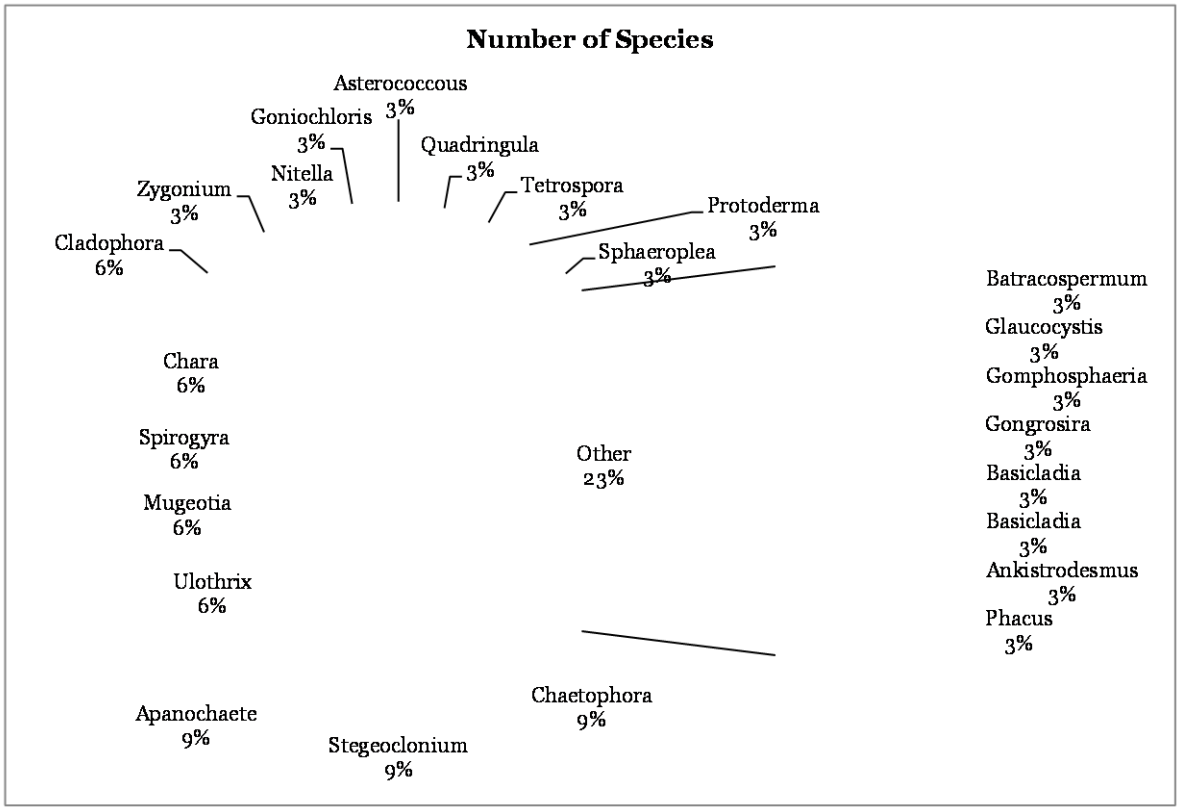

Fig. 1. Algal diversity in different regions of District swabi.

1. Maneri Payan

The genera recorded from various sites of Maneri Payan were:

Ulothrix Cylindricum, Ulothrix Suhconstricta, Chaetophora Attenuata , Chaetophora Elegans.

The pH of water in Maneri Payan is 7.77, conductivity is 700.00 µS/cm, TDS is 449.00 mg/L, TSS is 4.00 mg/L , Total hardness as $CaCO_3$ is 326.00mg/L, Calcium as $CaCO_3$ is 168.00 mg/L, Magnesium as $MgCO_3$ is 156.00 mg/L (greater than normal value 150 mg/L), M-alkalinity as $CaCO_3$ is 308.25 mg/L, P-alkalinity as $CaCO_3$ is nil, Chloride as Cl^{-1} is 26.50 mg/L, Sulphate as SO_4^{-2} is 180.75 mg/L, sodium as Na^{+1} is 45.25 mg/L, Potassium as K^{+1} Nitrate is nil.

2. Maneri Bala

The total recorded species of the various sites of Maneri Bala were:

Spirogyra weberi, Nitella tenuissima, Chara canescens, Asterococcus limneticus, Quadrigula closterioides, Tetraspora luhrica, Ulothrix cylindricum, Ulothrix suhconstricta, Chaetophora elegans, Sphaeroplea annulina, Batrachospermum moniliforme, Aphanothece nidulans, Stigeoclonium pachydermum

Where the pH of water is 7.10, conductivity is 690 µS/cm, TDS is 429 mg/L, TSS is 3 mg/L , Total hardness as $CaCO_3$ is 346 mg/L, Calcium as $CaCO_3$ is 172 mg/L, Magnesium as $MgCO_3$ is 164 mg/L (greater than normal value 150 mg/L), M-alkalinity as $CaCO_3$ is 332.50 mg/L, P-alkalinity as $CaCO_3$ is nil, Chloride as Cl^{-1} is 40.50 mg/L, Sulphate as SO_4^{-2} is 146.50 mg/L, sodium as Na^{+1} is 32.50 mg/L, Potassium as K^{+1} Nitrate is 4.30 mg/L,NO_2^{-1} is nil.

3. Saleem Khan

The total species recorded from Saleem Khan field were:

Zygogonium ericetorum, Chara canescens, Goniochloris sculpta, Tetraspora luhrica, Ulothrix cylindricum, Chaetophora attenuata, Stigeoclonium stagnatile, Sphaeroplea annulina, Mougeotia elegantula, Chaetophora incrassata

The water pH is 7.00, conductivity is 845 µS/cm, TDS is 549.50 mg/L, TSS is 9.00 mg/L (greater than the normal value 5.00 mg/L),Total hardness as $CaCO_3$ is 318.50 mg/L, Calcium as $CaCO_3$ is 184 mg/L, Magnesium as $MgCO_3$ is 124 mg/L,M-alkalinity as $CaCO_3$ is 320.50 mg/L, P-alkalinity as $CaCO_3$ is nil, Chloride as Cl^{-1} is 72.50 mg/L, Sulphate as SO_4^{-2} is 132.25 mg/L, sodium as Na^{+1} is 50.50 mg/L, Potassium as K^{+1} Nitrate is 14.40 mg/L,NO_2^{-1} is nil.

4. Shah Mansoor

The species identified from various sites of Shah Mansoor were:

Nitella tenuissima, Goniochloris sculpta, Quadrigula closterioides, Ulothrix suhconstricta, Chaetophora attenuata, Stigeoclonium stagnatile, Protoderma viride, Aphanothece nidulans, Gomphosphaeria lacustris, Basicladia chelonum, Phacus suecicus

Where the pH of water is 9.02, conductivity is 1116 µS/cm, TDS is 650.50 mg/L, TSS is 14 mg/L (greater than the normal value 5.00 mg/L),Total hardness as $CaCO_3$ is 342.60 mg/L, Calcium as $CaCO_3$ is 192 mg/L, Magnesium as $MgCO_3$ is 160 mg/L (greater than normal value 150 mg/L), M-alkalinity as $CaCO_3$ is 436.50 mg/L, P-alkalinity as $CaCO_3$ is nil, Chloride as Cl^{-1} is 190.25 mg/L, Sulphate as SO_4^{-2} is 18.50 mg/L, sodium as Na^{+1} is 70.50 mg/L, Potassium as K^{+1} Nitrate is 27.20 mg/L,NO_2^{-1} is nil.

5. Panjpir

The total species identified from various sites of Panjpir *were:*

Aphanothece nidulans, Gomphosphaeria lacustris, Basicladia chelonum, Ankistrodesmus falcatus, Phacus suecicus, Aphanochaete repens, Chaetophora incrassata, Chaetophora pisiformis, Protoderma viride.

Where the pH of water is 7.50, conductivity is 691 µS/cm, TDS is 460 mg/L, TSS is 7 mg/L (greater than the normal value 5.00 mg/L),Total hardness as $CaCO_3$ is 318.50 mg/L, Calcium as $CaCO_3$ is 173 mg/L, Magnesium as $MgCO_3$ is 135 mg/L , M-alkalinity as $CaCO_3$ is 323 mg/L, P-alkalinity as $CaCO_3$ is nil, Chloride as Cl^{-1} is 36.75 mg/L, Sulphate as SO_4^{-2} is 170.75 mg/L, sodium as Na^{+1} is 43.75 mg/L, Potassium as K^{+1} Nitrate is 4.60 mg/L,NO_2^{-1} is nil.

6. Baja

The total species identified from various sites of Baja *were :*

Aphanothece castagnei, Glaucocystis nostochinearum, Chaetophora pisiformis, Chaetophora incrassata, Gongrosira debaryana, Cladophora glomerata, Basicladia chelonum, Ankistrodesmus falcatus

Where the pH of water is 7.88, conductivity is 695 µS/cm, TDS is 440 mg/L, TSS is 5 mg/L (greater than the normal value 5.00 mg/L),Total hardness as $CaCO_3$ is 321 mg/L, Calcium as $CaCO_3$ is 164.50 mg/L, Magnesium as $MgCO_3$ is 145 mg/L , M-alkalinity as $CaCO_3$ is 329 mg/L, P-alkalinity as $CaCO_3$ is nil, Chloride as Cl^{-1} is 24.25 mg/L, Sulphate as SO_4^{-2} is 164.50 mg/L, sodium as Na^{+1} is 40.25 mg/L, Potassium as K^{+1} Nitrate is 3.40 mg/L,NO_2^{-1} is nil.

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