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**INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN  
CHEMISTRY AND PHARMACEUTICAL SCIENCES**

(p-ISSN: 2348-5213; e-ISSN: 2348-5221)

[www.ijcreps.com](http://www.ijcreps.com)

(A Peer Reviewed, Referred, Indexed and Open Access Journal)

DOI: 10.22192/ijcreps

Coden: IJCROO(USA)

Volume 10, Issue 3 - 2023

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**Research Article**



DOI: <http://dx.doi.org/10.22192/ijcreps.2023.10.03.002>

**Study of biodiversity of Daha River of Siwan with  
particular reference to macrophytic algae, bryophytes,  
pteridophytes and angiospermic plants.**

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**Abstract**

Daha river that passes through Siwan in general and just to Western part of the town in particular, is a small perennial stream of about 96 KM in length. The marshy chaur, Sasamusa Chaur in Gopalganj, about 28.8 KM up stream in North of Siwan acts as a reservoir to supply water, due to which it becomes a perennial water body. It joins Ghaghra River 48 KM downstream to Siwan to Chapra town. During late winter and through the summer the water level and its expansion become much lower and narrow. During this it hardly appears like a river, rather appears like sewage. In the present work biological diversity was studied in different seasons. Here the common algal floras were collected during winter, spring, summer and late rainy seasons. During rainy season the water depth and dimension increase and water gets currents so most of the algal flora were washed away. However, during the survey macrophytic algal species such as *Chladophora*, *Pithophora*, *Chara*, *Nitella*, among bryophyte- *Riccia* and *Funaria*, some pteridophytic members such as *Equisetum*, *Marsillia*, *Azolla*, were found during October to December. In angiosperm, the epiphytes, helophytes, hyperhydrite, plankton, pleustophytes, Vittate etc. were found in different seasons of the year. During rainy seasons only floating macrophytes, such as *Eicchornia*, *Lemna*, *Ipomoea* spp were found on the surface from October to December, *Trapa*, *Eicchornia*, *Pistia*, *Nelumbo* were found on the surface; In between these plants *Lemna* was also observed on the surface. While near the bank, in few feet deep water *Ceratophyllum*, *Vallisneria*, *Hydrilla* were present. During this near the bank, *Colocasia*, wild species of *Poaceae*, members of *Cypreaseae* were also found. During winter here and there *Eicchornia* in its succulent form was found. During summer, the spread of water is found near the bed. The marshy areas were occupied by sedge grass and other moisture loving plants.

**Keywords:** Daha river, Biodiversity, Macrophytes, Sedge grass, *Cypreaseae*, *Poaceae*, Moisture loving.

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## 1. Introduction

Siwan district through which Daha River flows, extends from 25<sup>0</sup>22'N to 26<sup>0</sup>22' latitude and 84<sup>0</sup>E to 84.47'E longitude. During rainy season the water level crosses the coast of the river and spread in the nearby areas. But during summer the water is confined to its bed only.

Because, both sides of the river are situated agricultural lands so nutrients easily come to it during rainy season. Due to this the bed and the water contain nutrients that promote growth of different hydrophytic and moisture loving plants. For the study of above biodiversity, survey of the river was done.

Survey of literatures reveals that biodiversity of different water bodies including ponds, Wetlands, rivers, etc. have been studied by different workers. Some of them include, Thakur *et al*; (1995); Bandhopadhyay and Kumar (2001); Bandhopadhyay and Mukherjee (2005); Bhatt *et al*; (2007); Adhikari and Babu (2008); Kumar (2010); Mishra *et al*; (2012); Kumar and Prabhakaran (2013); Mishra and Narain (2014); Kumar and Chelak (2015); Patel and Patel (2016); Singh and Kumari (2017); Kuldeep and Acharya (2018); Sufia *et al*; (2019); Bassem (2020) and Faghihinia *et al*; (2021).

However, so far Daha River is concerned we have no report regarding biodiversity of Daha River of Siwan. Keeping these ideas in mind the present research work was planned to survey the biodiversity of the aforesaid river that is said to be life line of Siwan district.

## 2. Materials and Methods

For the study of macrophytes growing during rainy season, winter and summer, frequent survey was made. Most of macrophytes were identified based on previous knowledge. However, those which were not identified at spot were brought in the laboratory and with the help of standard text book and some teachers of Botany were identified in the laboratory. *Utricularia* was noted during November, but their identification was confirmed

only after the bladders could develop in December. They were found in shallow water at the bank of the river. Similarly, flowering macrophytes were collected when they were in flowering stage. Some submerged aquatic angiosperms were collected from the shallow water during December. Species of *Polygonum* and *Ranunculus* were collected during December to January. *Macrophytic* algae, few species of bryophytes were collected during December which were growing on the marshy bank of the river. Members of macrophytic algae, bryophytes and different species of monocot and dicot have been presented in table-1

## 3. Results and Discussion

For the study of macrophytic algae, bryophytes, pteridophytes, dicot and monocot species growing at the bank in the marshy places, free floating, submerged species, the bank of river was visited frequently. It was found that the river has rich biodiversity in different seasons of the year.

Among the macrophytic algae, *Pithophora*, *Cladophora*, *Chara* and *Nitella* were collected during late December to January. The Cowdung cake like structure floating in the water was *Pithophora* whereas algal plant growing on snail was *Cladophora*. Similarly, in submerged condition both *Chara* and *Nitella* were collected. The species of *Riccia* and *Funaria* were collected on the bank where the soil was moist. Species of Pteridophytes such as *Azolla* were collected during December, while *Pteris* during December to January. During this season *Marsilea* species was also collected.

During late rainy season, species of *Nelumbo*, *Trapa*, species of *Polygonum*, *Ranunculus*, *Sesbani* were found floating or partly submerged. Species of *Ipomoea* were floating on the surface of water during rainy season to winter season. Similarly, *Lemna* spp were found during rainy season as well as during winter season. When the bank of the river was dry but even had moisture, the species of *Achyranthes*, *Alternanthera*, *Amaranthus*, *Bacopa*, *Centella*, *Cassia* spp, species of *Eclipta*, *Euphorbia hirta*,

*Heliotropium*, *Cleome gynandra*, *Ceratophyllum* in submerged conditions, *Ageratum conijoitis*, *Boerhaavia* spp, *Lippia nodiflora*, *Malvestrum*, *Oxalis*, *Parthenium*, *Rumex dentatus*, *Phyllanthus* spp, etc. were found.

The common species of monocots were also found in different seasons of the year. Among them most abundant species were *Eichhornia* which was found in different morphological forms during rainy seasons and winter. Similarly, species of *Colocasia* were also abundant during late November to January. Commelina species were found during rainy seasons to second and third week of November. *Hydrilla* was found submerged during October to November. *Vallisneria* was also submerged in low deep water. Species of *Carex*, *Cyperus*, *Elocacia*, *Saccharum*, *Setaria*, *Potamogeton*, *Najas*, were

submerged but even the bank of river became dry they were growing in moist soil of the river bank.

Aquatic macrophytes have been grouped in different categories. Bandyopadhyay and Mukherjee (2005) adopted classification of macrophytes proposed by Cook (1996). There are 8 growth forms of aquatic macrophytes such as Epiphyte, Hyperphyte, Helophyte, Plankton, Pleustophyte, Rosulate, Tenagophyte and Vittae. All these forms are adapted in different aquatic conditions for their survival. Due to this they are submerged, partly submerged, floating, rooted floating, moist place can grow in aquatic and dry conditions. Due to this adaptation they are exotic but accommodate themselves in new habitat by replacing the preexisting flora of the area. Death and decay of these macrophytes enrich the nutritional conditions of the water bodies.

### Table-1

#### Members of macrophytic algae

1. *Pithophora polymorpha*
2. *Cladophora vagabunda*
3. *Chara vulgaris*
4. *Nitella gracilis*

#### Bryophyta

1. *Riccia crystal wort*
2. *Funaria hydrometrica*

#### Pteridophyta

1. *Equisitum fluviatils*
2. *Azolla pinnata*
3. *Marsilea quadrifolia*
4. *Pteris vittata*

#### Angiosperms – Dicot

1. *Achyranthes aspera*
2. *Agerdatum conizoides*
3. *Alternanthera sessilis*
4. *Alternanthera* spp
5. *Amaranthu spinosa*
6. *Bacopa monnieri*

#### Family

- Amaranthaceae  
Amaranthaceae  
Amaranthaceae  
Amaranthaceae  
Amaranthaceae  
Sacrofulariaceae

|                                     |                   |
|-------------------------------------|-------------------|
| 7. <i>B. procumbens</i>             | Sacrophulariaceae |
| 8. <i>Boerhaavia diffusa</i>        | Sacrophulariaceae |
| 9. <i>Centella asiatica</i>         | Apiaceae          |
| 10. <i>Cassia tora</i>              | Caesalpinnaceae   |
| 11. <i>Caesulia axillaris</i>       | Asteraceae        |
| 12. <i>Cleome gynandra</i>          | Capparidaceae     |
| 13. <i>Eclipta alba</i>             | Asteraceae        |
| 14. <i>Euphoriba hirta</i>          | Euphorbiaceae     |
| 15. <i>Ceratophyllum demersum</i>   | Ceratophyllaceae  |
| 16. <i>Heliotropium indicum</i>     | Boraginaceae      |
| 17. <i>Justicia simplex</i>         | Acanthaceae       |
| 18. <i>Ipomoea aquatica</i>         | Convulvulaceae    |
| 19. <i>Ipomoea cornea</i>           | Convulvulaceae    |
| 20. <i>Lippia nodiflora</i>         | Verbenaceae       |
| 21. <i>Lantana camera</i>           | Verbenaceae       |
| 22. <i>Malvestrum tricuspdatum</i>  | Malvaceae         |
| 23. <i>Nelumbo nucifera</i>         | Nelumbaceae       |
| 24. <i>Oxalis carniculata</i>       | Oxalidaceae       |
| 25. <i>Parthenium hysterophorus</i> | Asteraceae        |
| 26. <i>Polygonum glaberrum</i>      | Polygonaceae      |
| 27. <i>P. plebejam</i>              | Polygonaceae      |
| 28. <i>P. barbatum</i>              | Polygonaceae      |
| 29. <i>Rumex dentatus</i>           | Polygonaceae      |
| 30. <i>Phyllanthus niruri</i>       | Euphorbiaceae     |
| 31. <i>Phyllanthus spp.</i>         | Euphorbiaceae     |
| 32. <i>Ranunculus sleratus</i>      | Ranunculaceae     |
| 33. <i>Scoparia dulcis</i>          | Lamiaceae         |
| 34. <i>Trapa bispinosa</i> Roxb     | Trapaceae         |
| 35. <i>Tridax procumbent</i>        | Asteraceae        |
| 36. <i>Trianthema monogyna</i>      | Aizoaceae         |
| 37. <i>Utricularia spp.</i>         | Lentibulariaceae  |
| 38. <i>Sesbania spp.</i>            | Onagraceae        |

### Angiosperms – Monocot

|                                   | Family           |
|-----------------------------------|------------------|
| 1. <i>Aponogetan natans</i> Linn. | Aponogetanaceae  |
| 2. <i>Amorphophallus titanum</i>  | Araceae          |
| 3. <i>Colocacia esculenta</i>     | Araceae          |
| 4. <i>Colocacia gientia</i>       | Araceae          |
| 5. <i>Commelina benghalensis</i>  | Commelinaceae    |
| 6. <i>Commelins nudiflora</i>     | Commelinaceae    |
| 7. <i>Cirpus articulates</i>      | Hydrocharitaceae |
| 8. <i>Cirpus esculentus</i>       | Hydrocharitaceae |
| 9. <i>C. deformus</i>             | Hydrocharitaceae |
| 10. <i>C. longus</i>              | Hydrocharitaceae |
| 11. <i>Cyperus bulbosus</i>       | Cyperaceae       |
| 12. <i>Cyperus iria</i>           | Cyperaceae       |
| 13. <i>Cyperus corymbosus</i>     | Cyperaceae       |

|                                  |                  |
|----------------------------------|------------------|
| 14. <i>Cyperus rotandus</i>      | Cyperaceae       |
| 15. <i>Carex hirta</i>           | Cyperaceae       |
| 16. <i>Saccharum munja</i>       | Poaceae          |
| 17. <i>Saccharum spontaneum</i>  | Poaceae          |
| 18. <i>Saccharum glagantum</i>   | Poaceae          |
| 19. <i>Saccharum officinarum</i> | Poaceae          |
| 20. <i>Setaria verticillata</i>  | Poaceae          |
| 21. <i>Eicchornia crassipes</i>  | Pontederiaceae   |
| 22. <i>Potamogeton natans</i>    | Potamogetonaceae |
| 23. <i>Potamogeton luceus</i>    | Potamogetonaceae |
| 24. <i>Potamogeton crispus</i>   | Potamogetonaceae |
| 25. <i>Pistia stratiotes</i>     | Araceae          |
| 26. <i>Najas numor</i>           | Najadaceae       |
| 27. <i>Colocasia gigantean</i>   | Araceae          |


#### 4. Conclusion

Aquatic ecosystem promotes different forms of plants. Here only the macrophytes have been studied in the Daha river passing through Siwan district. Now a day such water bodies are being used for extraterrestrial cultivation such as *Trapa*. Similarly, members belonging to *Poaceae* such as *Saccharum* species are harvested and they are being used for making huts. *Sesbania* called Dhaicha is being used as green manure or its woody stalks are being used as fire wood by the local people.

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| DOI: <a href="https://doi.org/10.22192/ijcrcps.2023.10.03.002">10.22192/ijcrcps.2023.10.03.002</a> |  |

How to cite this article:

Manoj Kumar and Ravichandan Kumar. (2023). Study of biodiversity of Daha River of Siwan with particular reference to macrophytic algae, bryophytes, pteridophytes and angiospermic plants. *Int. J. Curr. Res. Chem. Pharm. Sci.* 10(3): 8-13.

DOI: <http://dx.doi.org/10.22192/ijcrcps.2023.10.03.002>