

STUDIES ON THE DISTRIBUTION OF CHLOROPHYCEAN ALGAE OF RIVER YAMUNA AT AGRA, UP, INDIA

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Abstract

Studies on the algal diversity of river Yamuna at Agra revealed the presence of 15 algal Genera and 20 species of chlorophyceae has been identified from selected sites by their appearances such as shape and colour of the thallus. The phenology of freshwater algae mostly belonging to chlorophycean members is totally dependent on the physico-chemical characteristics of the water bodies. Maximum algal population was noticed in early summer, followed by winter, while the lowest in august. The amount of water discharge velocity and transparency influence the occurrence and abundance of algal diversity. During summer and winter time, certain species of chlorophyceae group were recorded as dominant species e.g. *Chlorella vulgaris*, *Pediastrum sp.*, *Spirogyra sp.*, *Scendesmus sp.*, *Chara sp.*, *Volvox sp.*, *Cladophora sp.*, *Closterium cynthia*, *Zygnema sp.*, *Pendorina sp.* and *Chlamydomonas sp.* etc.

Key words: Chlorophyceae, Algae, River Yamuna etc.

Introduction

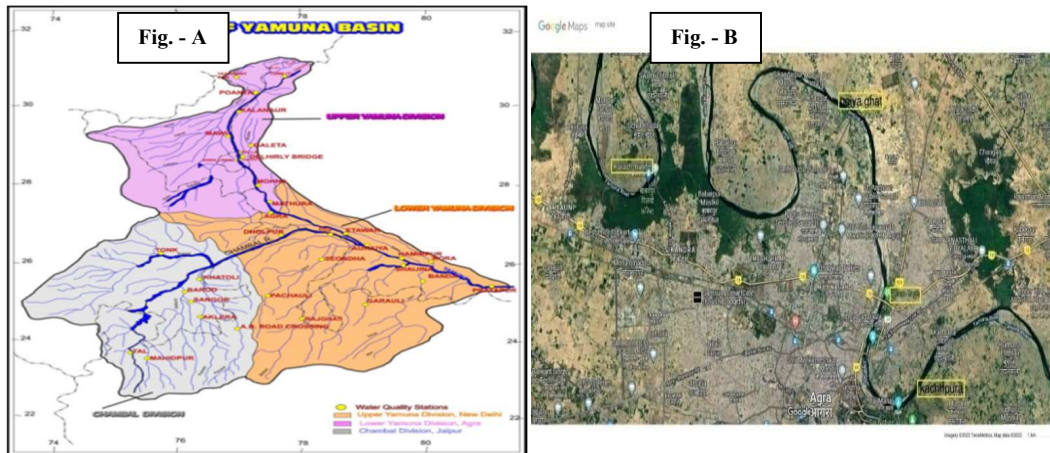
Algae constitute a large and diverse group of simple, typically autotrophic organisms, ranging from unicellular to multicellular forms. Algae are photosynthetic organisms that occur in most habitats, ranging from marine and freshwater to desert sands and from hot boiling springs to snow. River Yamuna (Fig.A) originates from Yamunotri glacier situated at lower Himalayas in Utrakhnad State and flows through Delhi and Agra, which is an important wetland ecosystem. This study is a pioneer in the seasonal phycological investigation of the river.

Chlorophycean members are important as primary producers of organic matter at the base of the food chain in most of the aquatic ecosystems and also provide oxygen for other aquatic life Sarkar (2011). Phytoplanktons are the primary producers of water bodies; these are the main source of food directly or indirectly for various animal groups Rao (1975). Physicochemical parameters and quantity of nutrients in water play significant role in the distributional patterns and species composition of phytoplanktons mostly green algae in the aquatic habitats. The penetration of light, temperature, salinity, pH, hardness, phosphates, nitrates and water current velocity are the important factors for growth and density of phytoplanktonic species Mahar *et al.* ,(2000). Govinda and Shiva (2017) studied the seasonal distribution of Algal flora, where they studied 34 genera belonging to chlorophyceae. The characteristics of Yamuna river basin and reviewed the state of knowledge of the river. There has been relatively little change in the state of the river or our understanding of its ecosystem characteristics except that the levels of pollution and the encroachments on to the floodplain have increased Gopal and Chauhan (2007). Nutrients are the main limiting factor for algal growth. In freshwater habitats, like River Yamuna, phosphorus is usually the principal and essential nutrient for all life forms. Nitrogen can also trigger algal blooms, but it is a more common factor in

salty water. Generally there are two sources of nutrients in the water, natural and manmade. Natural sources include nutrients that leach from soil and atmospheric deposition Rai and Gaur (2001), whereas man made sources account for much larger amounts and these include fertilizer, livestock manure, human sewage, industrial run-off etc. Amongst autotrophic plants and possibly within the whole of the plant kingdom, algae are unexcelled for variation in structure, range of habitat and diversity of role. The Phycological researches and diversity of algae have been reviewed time to time. An attempt is made in the present communication to focus attention on the studies relating to the freshwater green algae and their phenology in the river Yamuna at Agra.

MATERIAL AND METHODS

To assess algal diversity existent in the water body. Samples of freshwater algae were collected periodically over the year from different locations of the river Yamuna at Agra, viz. Kailash Temple, Poiya ghat, Rambagh and Kachhpura (Fig. A & B). The samples were brought to the laboratory, washed under running tap water and preserved in 4% formaldehyde solution. Mounts of these samples, observe under microscope and identification of algae following the keys given by Desikachary (1959) Prescott (1951) Tiffany and Britton (1952), Randhawa (1959), Prasad and Mishra (1992) and Kant and Gupta (1998).



RESULT AND DISCUSSION

The distribution of the algal flora depicted in Table-1 consisted of 16 genera and 20 species studied from four different sites of Yamuna River at Agra. Higher populations of *Spirogyra* and *Chlamydomonas* were recorded in summer seasons in river Yamuna, but their populations were significantly reduced during monsoon months i.e. from June to September due to the occurrence of flood with suspended soil and sand particles. The population of *Pediastrum* was recorded as high in winter time i.e. in the month of January slowly declined till March. Higher population of *Scendesmus sp.* was observed in the month of May, during which the water level declined gradually.

Table1: Distribution of algal species of selected sites of Yamuna River at Agra.

Algal Species	Site 1			Site 2			Site 3			Site 4		
	W	S	M	W	S	M	W	S	M	W	S	M
<i>Actinastrum hantzschii</i>	-	-	-	-	-	-	-	+	-	-	+	-
<i>Chlamydomonas pseudopertyi</i>	+	-	-	-	-	+	+	-	-	+	+	-

<i>Closteriummoniliferum</i>	-	-	-	-	-	-	+	-	-	-	-	-
<i>C. cynthia</i>	-	-	-	-	-	-	-	+	-	-	-	-
<i>Eudorina sp.</i>	-	+	-	+	-	-	+	-	-	+	-	-
<i>Pediastrumsimplex</i>	-	-	-	+	+	-	+	-	-	-	-	+
<i>Scenedesmus quadricauda</i>	-	+	+	-	+	-	-	+	-	-	-	+
<i>S.acuminatus</i>	+	+	-	-	-	-	-	-	+	-	+	-
<i>S.obliquus</i>	-	+	-	-	+	-	-	+	-	-	+	-
<i>Spirogyraellipsospora</i>	-	-	-	-	+	-	-	-	-	-	+	-
<i>S.flavescens</i>	-	+	-	-	-	-	-	+	-	-	+	-
<i>S.varians</i>	-	+	-	-	+	-	-	+	-	-	+	-
<i>Staurastrum sp.</i>	+	-	-	-	-	-	-	-	-	-	+	-
<i>Trachelomonas sp.</i>	+	-	-	-	-	-	-	-	+	-	-	+
<i>Volvox sp.</i>	-	+	-	-	-	-	-	+	-	-	+	-
<i>Zygnemasp.</i>	-	+	-	-	+	-	-	-	-	-	-	-
<i>Pendorina sp.</i>	-	+	-	-	+	-	+	+	-	-	+	-
<i>Chlorella vulgaris</i>	+	+	+	+	+	+	-	-	-	+	+	+
<i>Cladophora sp.</i>	-	-	-	-	+	-	-	+	+	-	-	-
<i>Chara sp.</i>	+	+	-	-	-	-	-	-	+	-	+	-

As a consequence of the entry of freshwater and rainwater into the river Yamuna after summer months, the population of Scenedesmus was comparatively reduced from July to November. The seasonal fluctuation in *Chlamydomonas sp.* showed distinct change; while population was observed in winter, it was much less during summer months. Peak of this genus occurred during the month of January. The occurrence of freshwater species of *Eudorina sp.* was also reported in the month of March. In general, moderate temperature, low current velocity and high transparency of water appear to be better conditions for algal growth.

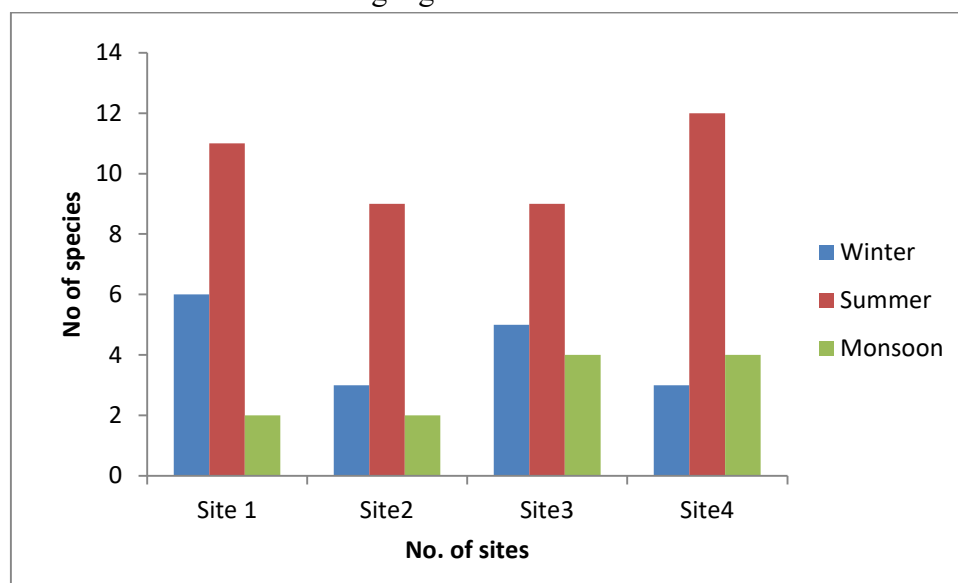


Fig.1. The distribution of Algal's species at various sits of Yamuna river.

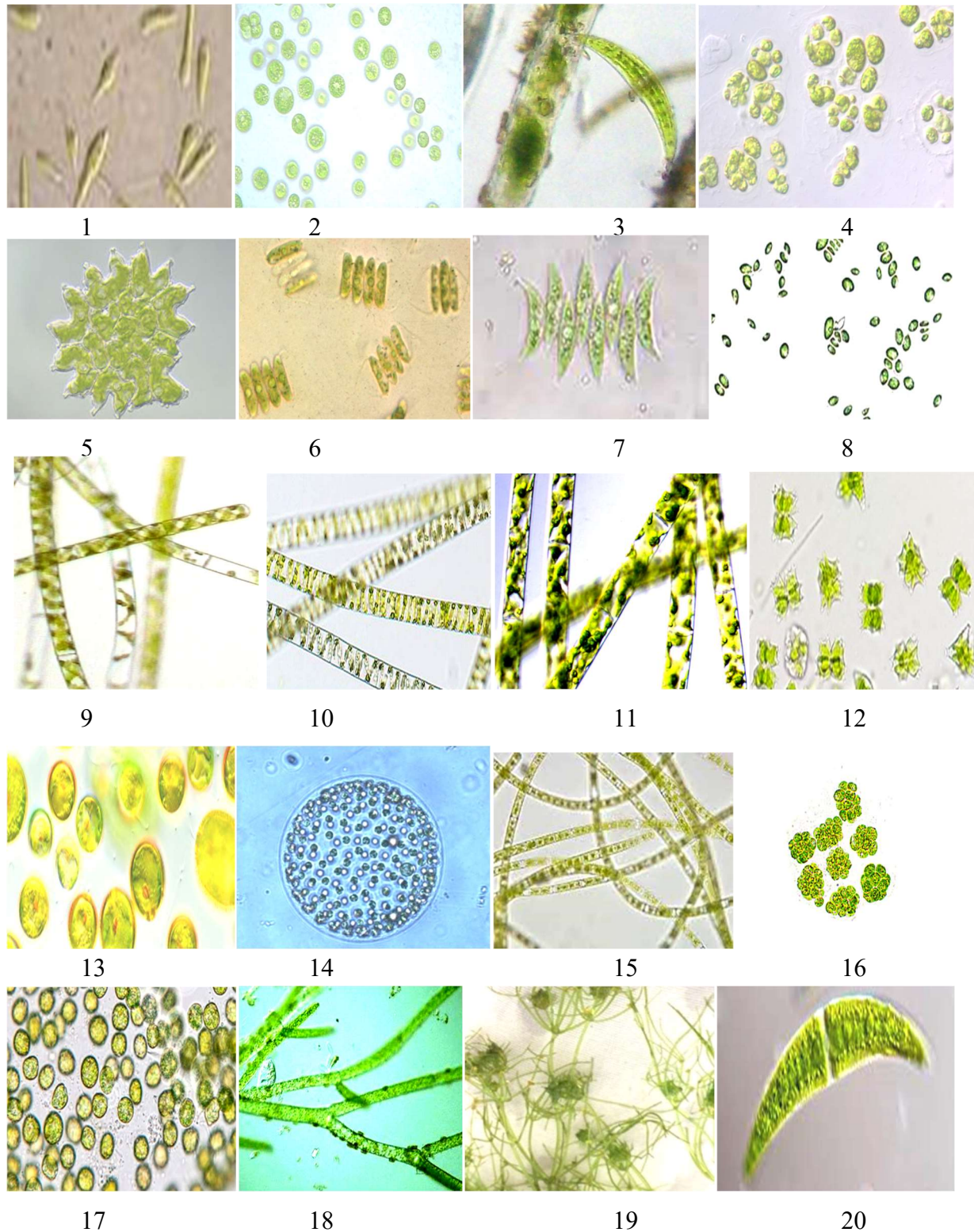


Plate 1. *Actinastrum hantzschii* 2 *Chlamydomonas pseudopertyi* 3 *Closterium moniliferum* 4 *Eudorina* sp.5 *Pediastrum simplex* 6 *Scenedesmus quadricauda* 7 *Scenedesmus acuminatus* 8 *Scenedesmus obliquus* 9 *Spirogyra ellipsospora* 10 *Spirogyra flavescens* 11 *Spirogyra varians* 12 *Trachelomonas* sp.13 *Staurostrum* sp.14 *Volvox* sp.15 *Zygnema* sp. 16 *Pendorina* sp. 17 *Chlorella*

vulgaris 18 *Cladophora* sp. 19 *Chara* sp. 20 *Closterium cynthia*

Chlorella vulgaris and *Pendorina* sp occurred during winter and summer season where as lowest population of *Closterium cythia* was noticed in summer time. *Zygnema* sp., *Volvox* sp., *Starastrum* sp. and *Chara* sp. was recorded as higher in summer season.

The dissolve oxygen (DO) was low and it was varied from 8.5 -1.8 mg/l whereas at addition of combined waste discharge from domestic and industrial sources indicates higher organic pollution. Due to availability of diluting water added by Mathura refineries, improving the self purification capacity. The quality of water in river Yamuna exhibited buffering as a result of which some fluctuations were noticed. Free carbon dioxide (CO₂) and dissolve oxygen (DO) ranged from 0.5 – 3.5 mg/l in water of river Yamuna reflected the growth of many algae in the ecosystem.

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