RESEARCH PAPER:

Morphotaxonomical studies on diversified algal community from Swarnrekha river at Namkum, Ranchi, Jharkhand

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SUMMARY

The present paper deals with morphotaxonomical investigation of algal flora growing in Swarnrekha River at Namkum, Ranchi. Important genera recorded from river flowing through this area were *Spirulina, Chlorella, Scenedesmus, Oscillatoria, Lyngbea, Pithophora, Oedogonium* etc. In the current scenario the algae are beneficial in various ways. So, it is necessary to conserve algal genetic resources and to do more systematic work on its potential and application for benefit of human beings as well as for other organisms which is possible only after understanding the ecology and habitats of various algal forms.

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Key words : Swarnrekha river, Anthropogenic eutrophication, Algal population

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The river Swarnrekha, is an important river of Ranchi, Jharkhand which is originated from Pisca, Nagri, Ranchi. It flows from SW to NE near Namkum area and is in the process of anthropogenic eutrophication. This river receives effluents from sewage, industrial emission, fertilized farm lands, cremation spots etc. are gradually broken down by microorganisms which cause lowering of BOD. Human activities fertilize water bodies with nitrogen phosphorus and calcium leading to change in water quality resulting increase in the algal population.

As there is no report of any kind of algal investigation in the Swarnrekha river running throw Namkum area at Ranchi, Jharkhand, a survey was made for the collection and identification of various algal specimens during the period of October 2008 to May 2009. Present paper deals with the total 21 algal taxa belong to three different classes *viz.,* Cynophyceae (7), Chlorophyceae (12) and Basccilaiophyceae (2). *Spirulina platensis, S. major and Microcystis stagnalis,* were collected from the bank of river with pH ranging between 8.5-10.5 near cremation spots where the burnt ashes of the rituals are thrown in the river. Flourishing growth of *Chlorella* and *Scenedesmus* species were found in the moist soil with pH 6-7.5. Rest Cynophycean members were found at pH of 8-9 and Clorophycean membes were at pH 7-8.

MATERIALS AND METHODS

Materials were collected with the help of their suitable tools and brought to the Algal Biotechnology Laboratory, Ranchi University Ranchi. Collected samples were thoroughly washed and temporary slides were prepared after staining with suitable stains and observed under standard microscope. These were preserved at 4% formalin. Camera lucid drawings were made. Identification was done with the help of available literature, journals and standard monographs.

RESULTS AND DISCUSSION

Systemetic enumeration and description of the algal materials found in the river-

CLASS: - CYANOPHYCEAE

– *Microcystis stagnalis* Lemm.

Colonies very long, cells very closely

Table 1: Algal specimens found in different range of pH

pH	Algae
6-7.5	*Chlorella vulgaris, Scenedesmus quadricauda, S. quadricauda* var. *quadrispina,* S. bijuga, *S. bijugatus* var. *bicellulae*
7-8	*Pediastrum boryanum, Hydrodictyon reticulatum, Cladophora glomerata, Pithophora varia, Oedogonium laetervirens, Spirogyra sp., Zygnema stellinum, Syrogonium stictium, Cosmerium awadhense, Closterium tumidum*
8-9	*Merismopedia marssonii, Oscilatoria subbrevis, Lyngbea hieronymusii, Rivularia baccariana, Nostocopsis lobatus, Navicula cuspidate* var.*ambigua*, *Cymbella ventricosa*
8.5-10.5	*Microcystis stagnalis, Spirulina platensis, S. major*

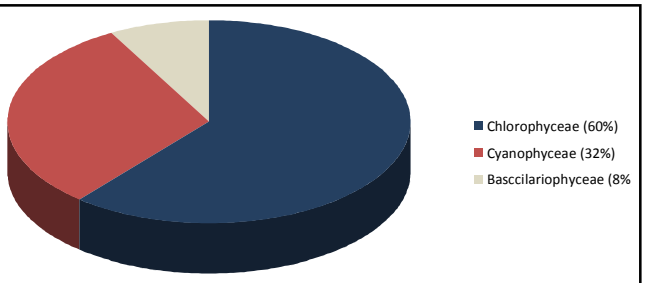

Fig. 1: Percentage composition of thre different classes of algal species

arranged spherical or irregular, 1.2–2.5µm in diameter, pale blue green, free floating (Fig. 1). At the bank of river, April – May 2009.

– *Merismopedia marssonii* Lemm.

Cells spherical, 1.5-2.5µm broad, colony rectangular, with 6 cells, deep blue in colour (Fig. 2). At the bank of river, April – May 2009.

– Oscilatoria subbrevis

Trichomes single, straight, cells 4.5-6.2µm broad, 1.8-3.2µm long, not granulated at the cross walls, end cell rounded (Fig. 5). At the bank of river where water is used for bathing and washing, March – April 2009.

– *Spirulina platensis* (Nordst.) Gomont var. *tenuis* (Rao, C. B.) comb nov.

Trichome 6-8.5µm broad, regularly spiral, spirals 26-36.5µm broad and distance between two spirals ranging from 28 to 41µm (Fig. 3). At the banks of river near cremation spot, April 2009.

– *S. major* Kuctz. ex Gomont

Trichome 1.6-1.9µm broad, regularly spirally coiled, spirals 2.6-3.5µm broad, distance between two spirals ranges from 3.5 to 5.5µm (Fig. 4). At the banks of river near cremation spot, April 2009.

– *Lyngbea hieronymusii* Lemm.

Filaments single, slightly bent, 11-15µm broad, sheath firm, colourless, cells10-14µm broad, 2µm long, not constricted at the cross walls, granulated, end cell broadly rounded (Fig. 6). At the bank of river where water is used for bathing and washing, Jan.-Feb. 2009.

– Rivularia baccariana

Thallus hemispherical, olive green, sheath thin, yellowish brown, trichome 3.7-6.5µm broad, produced into a hair like structure, heterocyst basal 8.5µm long (Fig. 7). Attached with moist rock, Nov. 2008.

– *Nostocopsis lobatus* Wood em. Geitter

Thallus spherical to sub-spherical, more or less irregularly lobed, trichome end tapering or slightly pointed, cells in older region 6-12µm broad and 8-20µm long, heterocyst mostly lateral (sessile) or terminal (pedicellate) on 1-3 celled lateral branch and 12-20µm broad (Fig. 8). Attached with moist rock, Nov.-2008.

CLASS: - CHLOROPHYCEAE

– *Chlorella vulgaris* Beijeriinck

Cells spherical, 9.9-16.5µm in diameter with a thin smooth membrane and cup shaped chloroplast (Fig. 11). On damp soil at the bank of river, Oct.2008

– *Pediastrum boryanum* (Turp.) Menegh

Cells 6.2-8µm in diameter, no. of cells -8, arranged in a single layer (Fig. 12). Attached with a twig at the bank of river, Jan.–Feb.-2009.

– Hydrodictyon reticulatum

Cells arranged in pentagonal or hexagonal arrangement in the net, cells 154-560µm long and 56-96µm broad (Fig. 13). Free floated at the bank of river, Feb.-March -2009.

– *Scenedesmus quadricauda* (Turp.) Breb.

Colonies 4 celled, cells 2.6-3.9µm long arranged in a linear series, poles of a linear spine (Fig. 14) On damp soil at bank of the river, Oct.-2008.

– *S. quadricauda* (Turp.) Breb. var. *quadrispina* G. M. Smith

Colonies 2 celled, cells ovoid 4-4.9µm broad and 9-10.5µm long, spines 4.2-5.3µm long (Fig. 15). On damp soil at the bank of river, Oct.2008.

– *S. bijuga* (Turp.) Lagerheim

Colonies 4 celled in a single flat series, oblong in shape, cells 5µm broad, 14-15µm long (Fig. 16). At the bank of river, Dec.2008.

– *S. bijugatus* var. *bicellulae* (Chodat) Philipose

Colonies 2 celled, ovoid cells 3.2µm broad and 8µm

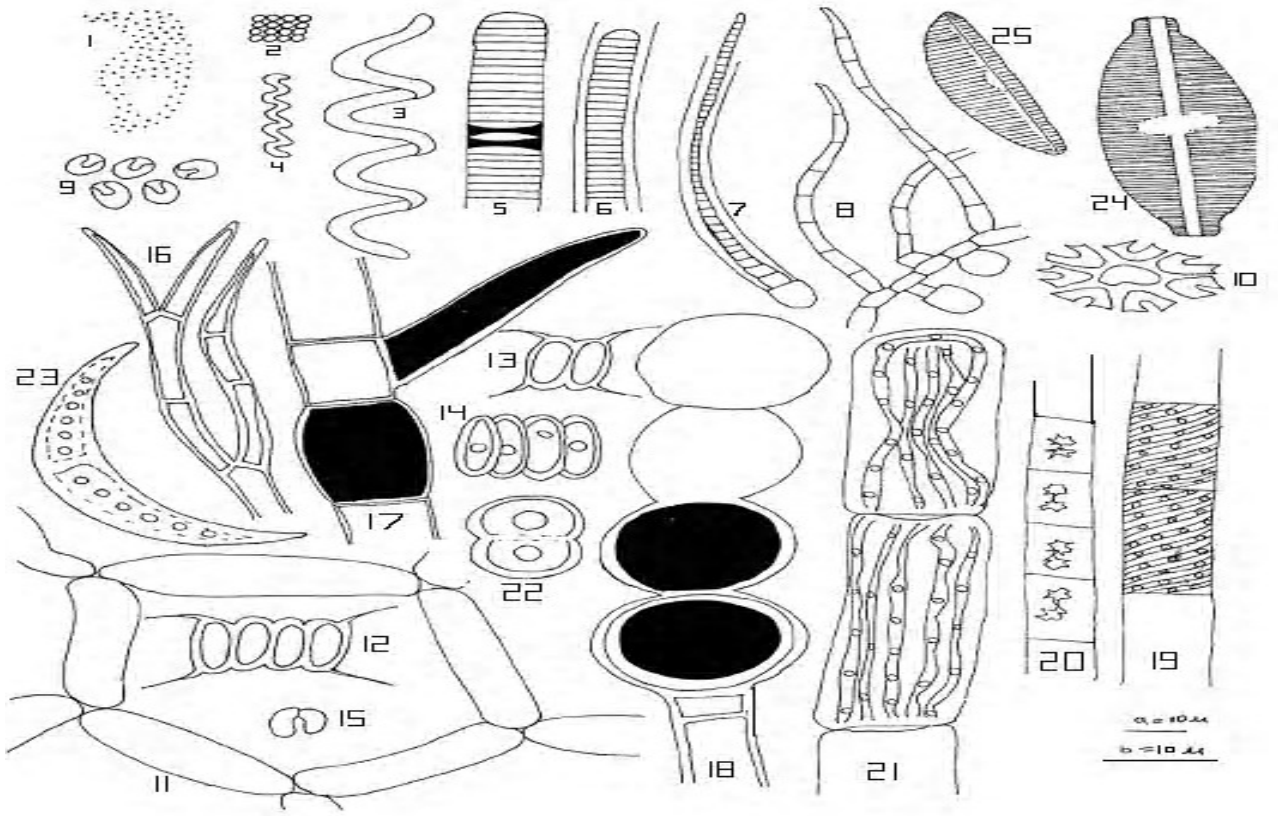

Fig. 1.-*Microcystis stagnalis,* Fig. *2.-Merismopedia marssonii,* Fig. *3.-S. platensis,* Fig. *4.-S. major,* Fig. *5.- Oscilatoria subbrevis,* Fig. *6.-Lyngbea hieronymusii,* Fig. *7.-Rivularia baccariana,* Fig. *8.-Nostocopsis lobatus,* Fig. *9.-Navicula cuspidate,* Fig. *10.-Cymbella ventricosa,* Fig. *11. Chlorella vulgaris,* Fig. *12.-Pediastrum boryanum,* Fig. *13.- Hydrodictyon reticulatum,* Fig. *14.-Scenedesmus quadricauda,* Fig. *15.- S. quadricauda* var. *quadrispina,* Fig. *16.-* S. bijuga, Fig. 17.- *S. bijugatus* var. *bicellulae,* Fig. *18.-Cladophora glomerata,* Fig. *19.- Pithophora varia,* Fig. *20.- Oedogonium laetervirens,* Fig. *21.- Spirogyra* sp., Fig. *22.- Zygnema stellinum,* Fig. *23.- Syrogonium stictium*, Fig. 24.- *Cosmerium awadhense,* Fig. *25.- Closterium tumidum.*
SCALE:- B- Figs-1-2, 4-10, 12-15, 18, 22-25, SCALE:-A-Figs-3, 11, 16-17, 19-21.

Plate 1: Camera lucid drawings of algal samples

long. (Fig. 17). On moist soil at the bank on river, Nov. 2008.

– *Cladophora glomerata* (L.) Kuetz. var. *GLOMERATA* Van Den Koek

Plant yellowish green, lower part of thallus dichotomusly branched, apical cells tapering, cells in main branch 48.6-64.8µm broad, 448-567µm long and the cells of branchlet 30-38µm broad, 194.4-220µm long (Fig. 18). Attached with rock, Nov.-Dec.-2008.

– Pithophora varia

Filaments long, less branched, cells cylindrical, cells of main filament 30-62µm broad and 200-400µm long, cells of lateral branch 43-55µm broad and 200-300µm long, akinete both intercalary and terminal, ovoid, 80-150µm broad and 50-200µm long (Fig. 19). Attached with rock, Nov.-Dec.-2008.

– *Oedogonium laetervirens* Wittr

Vegetative cells cylindrical, 10.5-18.5µm broad and 16-20µm long, oogonium single or up to four, 32-36µm long and 36-40µm broad (Fig.2). Free floated at the bank of river, Oct.-Nov.-2008.

– *Spirogyra* sp.

Cells 80-105µm broad and 190-221µm long, chloroplast spiral (Fig. 21). Free floated at the bank of river, Oct.-Nov.-2008.

– *Zygnema stellinum* Vaucher

Vegetative cells 28-32.5µm broad and 40-92µm long, chloroplast star shaped (Fig. 22). Free floated at the bank of river, Oct.-Nov.-2008.

– Syrogonium stictium

Cells 62.8-120.6 broad, 120.6-314 long. number of chloroplast stands -5 (Fig. 23). Free floated at the bank of river, Nov.-Dec.-2008.

– *Cosmerium awadhense* Prasad and Mehrotra

Cells slightly longer than broad, deep constriction, semicells sub-semicircular, cell all smooth, each semicell

with lobed massive chloroplast contening single pyrenoid in each lobe, cells 8.4-7.5 30-35µm broad and 30-35µm long at isthmus (Fig. 24). At the bank of river, Nov.2008.

– *Closterium tumidum* Johnson

Cells bow shaped isthmus centrally located, grass green in colour, cells 14µm broad and 90µm long (Fig. 25). At the bank of river, Nov.-2008.

CLASS: - BASCCILARIOPHYCEAE

– *Navicula cuspidate* Kuetz.var.*ambigua* (Ehr.) Clave

Valves long, broadly lanceolate with narrowly constricted much produced, flately rostrate capitate ends, length-76µm, breadth-20µm striae 20-22 in 10µm (Fig. 9). Free floated at the bank of river, Jan.- April 2009.

– *Cymbella ventricosa* Kuetz.

Valves asymmetrical, lunate with dorsal margin convex and ventral margin almost straight, axial area narrow and central broad, 48-32µm long and 11-12µm broad, striae -11-13 in 10µm, (Fig. 10). Free floated at the bank of river, Jan.- April 2009.

During observation, it was found that the waste water provides a suitable medium for photosynthetic microalgae. This results in high quality reusable effluent water and valuable algal biomass that can be used for other purposes such as food, feed etc. Use of *Spirulina* in waste water recycling process and production of useful biomass has been well studied in Hawrah by Pal (2005). The use of Cynobacteria can help in maximizing the aquaculture production and restore environmental quality in areas adversely affected by industrial and municipal activities and commercial use of algae is likely in the near future. Thus, a greater emphasis will be placed on the use of these naturally occurring algae, as we are on the threshold of a utilization that will have an influence on all our lives.

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