BULL. BOT. SURV. INDIA
Vol. 47, Nos. 1-4 : pp. 115-120, 2005

MICROCYSTIS AERUGINOSA KÜTZING BLOOM IN PONDS OF MALDAH DISTRICT, WEST BENGAL

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ABSTRACT

Maldah District lies between 24° 41' and 25° 32' 30" N. latitude and 87° 48' and 80° 28' E longitude extended over 3,733.177 sq km constitute variety of water bodies with luxuriant growth of algal forms. Survey was carried out in two seasons in 9 ponds namely Bhadobartola, Damua, Jorkuppa, Kuppa, Meenatola, Rohini, Salami Darwaza, Samda and Shivrampalli infested with *Microcystis aeruginosa* Kütz. and its bloom. Quantitatively, *M. aeruginosa* Kütz. varied from pond to pond depending upon the concentration of pollutants and degree of anthropogenic activities. Taxonomically, the species is very important because of its characteristic features among the cyanophycean forms, global distribution and occurrence.

INTRODUCTION

Microcystis aeruginosa Kütz. is one of bloom forming species of Cyanophyceae (often called blue-green algae) floats usually on the surface of water and forms scum due to buoyancy produced by intra-cellular gas vacuolation (Kumar and Gopal, 1999, 2003; Paerl and Ustach, 1982; Walsby, 1972). They often persists for weeks to months in lower water column of eutrophic water bodies and deplete hypo-limnetic oxygen level needed for the survival of aquatic fauna (fishes and benthic invertebrates). Along with this, produces colour, foul odour, tastes and impair the aesthetic values of water quality by releasing certain metabolites (Paerl *& al.*, 1985). *Microcystis* cells are microscopic and grouped together in spherical to various shaped colonies up to 10 mm wide. As the algal blooms grow, it become thicker forming surface scum on the water bodies, rest near the bank as a thick layered bright bluish-greenish scum. Usually the water may show the appearance of blue-green paint floating or billowing near the bank of water bodies. The growth may periodically use up oxygen, causing fish to suffocate. The bluish-greenish colour of water changed on ageing and break down of cells results turning it as yellowish-greenish.

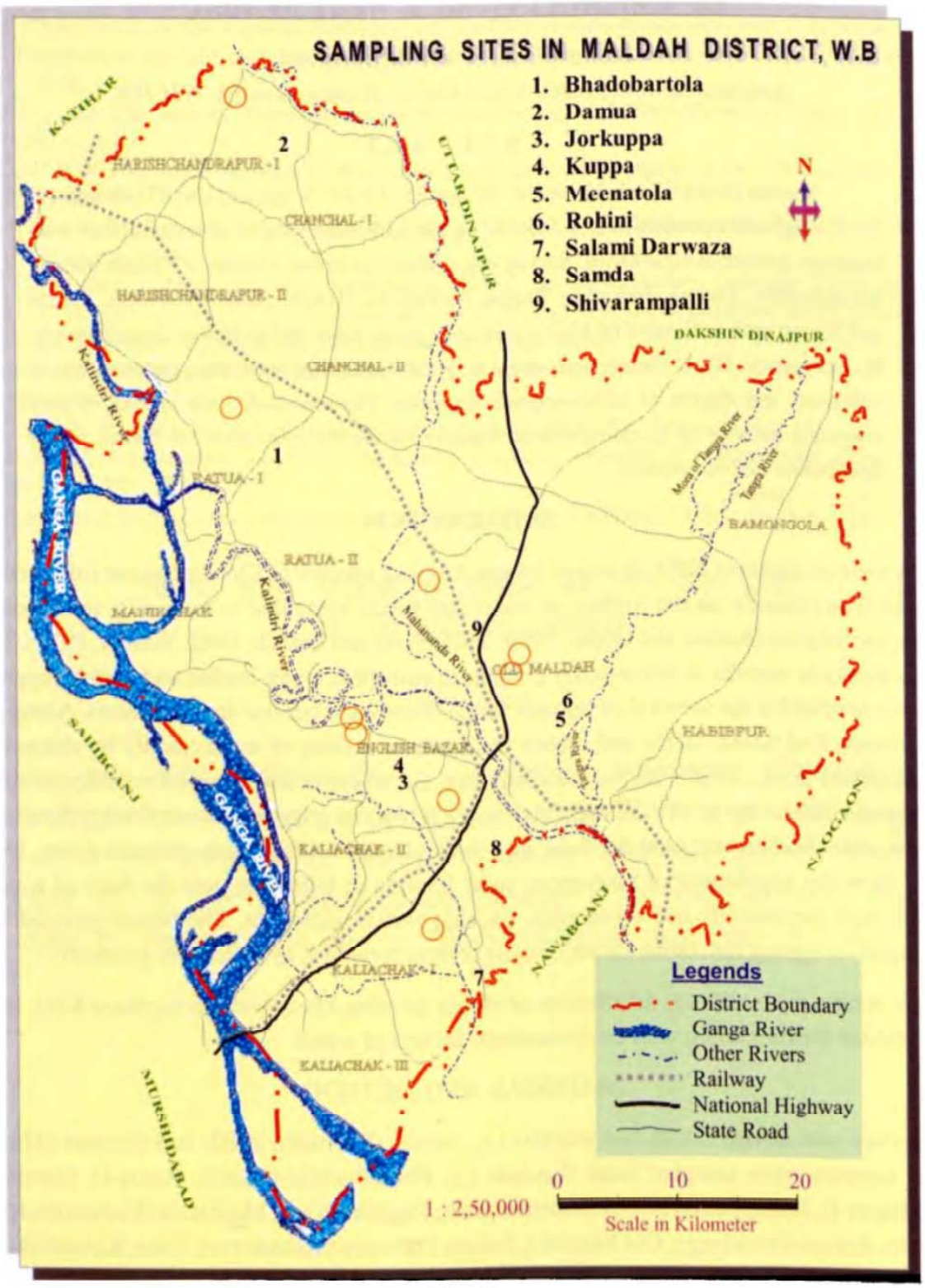
Present studies deals with the distribution of bloom forming *Microcystis aeruginosa* Kütz. in different ponds of Maldah District along with environmental factors of water.

MATERIAL AND METHOD

The survey was carried out in two seasons *i.e.*, winter (February, 2002) and summer (May to June, 2002) and samples were sampled from 9 ponds *i.e.* Bhadobartola (Bhado, Ratua-I), Damua (Konar, Harischandrapur-I), Jorkuppa and Kuppa (Karmanigram, English Bazar), Meenatola (Mohammadpur, Halna, Old Maldah), Rohini (Jatradanga, Old Maldah), Salami Darwaza (Maldah Fort, Gaur, Kaliachak-I), Samda

Date of receipt : 11.06.2004. Date of acceptance : 19.04.2005.

(Samdarpur, English Bazar) and Shivrampalli (Manglebari, Old Maldah) by towing the bolting silk net (No. 20) to a distance of 1 to 3 m except a few sample. The samples were preserved in Borosil glass tubes by addition of 3 to 4 drops of 4% Formalin solution on the spot of collection (Map I; Plate I, Photo No. 3).



Map 1

Atmospheric and water temperature was measured by graduated thermometer up to 110 °C and Hydrogen-ion-Concentration (pH) of water was recorded by high quality BDH pH paper strips. Colour and odour was assessed by personal observation and smelling the water. Above physico-chemical parameters were done as per APHA (1998). Density of the specimen was evaluated by drop method (Lackey, 1938) modified by Edmondson (1976) and specimens were identified as per standard monographs (Desikachary, 1959; Tiffany and Britton, 1952).

RESULT AND DISCUSSION

Physico-chemical characteristics of water and density of bloom forming species of 9 ponds have been presented in Table 1. The atmospheric and water temperature ranged from 24 °C to 29 °C and 21°C to 27 °C respectively in winter season and from 29 °C to 36 °C and 28 °C to 35 °C respectively in summer season. pH ranged from 6.5 to 8.0 in winter and 6.5 to 8.5 in summer season. Colour of the ponds were completely blue-green in Bhadobartola and in Meenatola possibly due to the overgrowth of blooms resulted from mixing of untreated water from domestic and agricultural origin and wash out of places of cattle's or flush of intermittent rain on dumped garbage. The favourable environmental conditions in presence of enriched water may eutrophicated the ponds may resulted into scum formation on water surface is in conformity with the observation of Walsby (1972). The odour of the ponds was recorded as fishy, rotten, grassy, septic and foul depending upon the bloom density and decaying of dead cells by the activities of fungi and bacteria and intermediate products formed during the decomposition or special substances synthesized within the cells of the micro-organisms (Palmer 1980; Pandey & *al.*,1983). The bloom specimen was identified as *Microcystis aeruginosa* Kütz.

Table 1. Physico-chemical characteristics and density of *Microcystis aeruginosa* Kütz. of different ponds of Maldah District.

Sl. No.	Name of Ponds	Temperature				pH		Colour		Odour		Density (O/L)	
		Atmospheric		Water									
		Win.	Sum.	Win.	Sum.	Win.	Sum.	Win.	Sum.	Win.	Sum.	Win.	Sum.
1.	Bhadobartola	29.0	36.0	27.0	35.0	8.0	8.5	BG	BG	SC	FO	1,210.08	3,612.51
2.	Damua	28.0	29.0	26.0	28.0	6.5	6.5	C	G	F	GR	33.63	135.35
3.	Jorkuppa	24.0	30.0	21.0	32.0	6.5	7.0	C	G	F	F	20.55	56.79
4.	Kuppa	27.0	32.0	24.5	30.0	6.5	7.0	M	G	OL	F	18.68	83.70
5.	Meenatola	28.0	34.0	25.0	33.0	7.5	7.8	BG	BG	FO	FO	35,854.34	95,686.27
6.	Rohini	28.0	35.0	26.0	34.0	7.0	7.5	M	G	F	F	31.76	84.70
7.	Salami Darwaja	28.0	34.0	24.0	33.0	7.0	7.5	G	BG	F	GR	51.54	187.4
8.	Samda	26.5	32.0	24.0	31.0	6.8	7.0	M	MG	OL	F	9.34	24.66
9.	Shivrampalli	27.0	34.0	24.0	33.0	7.0	7.5	G	BG	R	R	126.98	186.89

Win. = Winter, Sum. = Summer, BG = Bluish Greenish, C = Clear, G = Greenish, M = Muddy, MG = Muddy Greenish, SC = Septic, FO = Foul, F = Fishy, GR = Grassy, OL = Odourless, R = Rotten.

Microcystis aeruginosa Kütz. Tab. Phycologicae, 1 : 8, pl. 8, fig. 1, 1846; Crow, Tax. Genus *Microcystis*, New Phytol. 22: 61, fig. A, 1923a; Frény, Myxo. d' Afr. eqat. franc., 18, fig. 15, 1929; Geitler, Kryptongamenflora, 137, fig. 59d, 1932; Frény, Cyano. Cotes d' Eur., 10, pl. 1, fig. 6, 1933, Tiffany, L. H. and Britton, M. E., The Algae of Illinois, 336, pl. 91, fig. 1054, 1952; Desikachary, T. V., Cyanophyta, ICAR, 93, pl. 17, fig. 1,2,6 and pl. 18, fig. 10, 1959.

Clatthrocystis aeruginosa (Kütz.) Henfrey, J.Roy. micr. Soc.; 53, pl. 4, fig. 28-36, 1856; Fortini De Toni, Sylloge Algarum, 5 : 94, 1907.

Anacystis cyanea (Kütz.) Drouet & Daily Rev. Coccoid Myxophyceae, 36, 1956, pro parte; Incl : var. *major* (Witlr.) Smith, Prel., list of Algae of Wisc. Lakes, Trans. Wisc. Acad, Sci., 18 : 2, 1916 and other varieties and forms of *M. aeruginosa.*

Colonies when young round or slightly longer than broad, solid when old becoming clathrate, with distinct hyaline colonial mucilage; cells spherical generally with gas vacuoles. Cells are irregularly arranged to form simple elongate or linear ones to large reticulate colonies. Cells are 3.0 – 7.0 ì in diameter. These spherical cells are closely arranged within common diffluent mucilaginous matrix. Thus, sheath is hyaline and visible only when demonstrated by means of special techniques. Cell division is the only method of reproduction that occur in all directions (Plate I, Photo 4, 5 & 6).

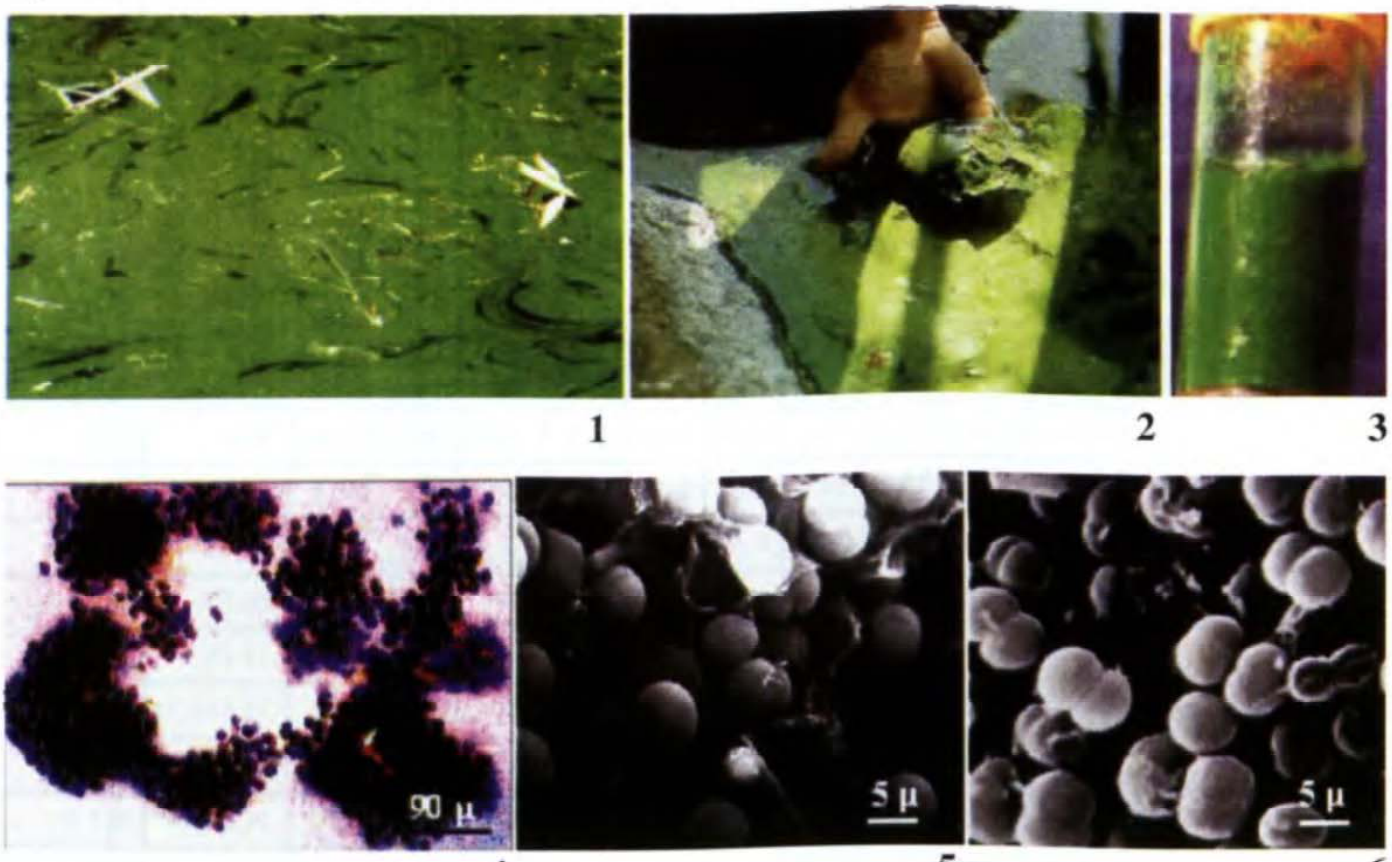


Plate I : 1. Bloom of *Microcystis aeruginosa* Kütz, 2. Scum of Bloom of *M. aeruginosa* Kütz., 3. Concentrated Sample of *M. aeruginosa* Kütz., 4. *M. aeruginosa* Kütz. under Light Microscope, 5. Mature Cells of *M. aeruginosa* Kütz under SEM, 6. Dividing Cells of *M. aeruginosa* Kütz. under SEM.

Distribution : Distributed in all ponds of Maldah District while bloom formation was found in ponds of Bhadobartola (Plate I, Photo 1) and Meenatola (Plate I, Photo 2 & 3).

During winter and summer seasons out of 9 studied ponds, *M. aeruginosa* Kütz. was recorded in 7 ponds along with other algal forms while in Meenatola and Bhadobartola ponds it was recorded almost axenic and density was recorded 95,686.27 O/L and 36,125.10 O/L respectively. Minimum *M. aeruginosa* Kütz. density was observed in Samda pond during both seasons followed by ponds of Kuppa and Jorkuppa. This species is potent in release of different types of hepatotoxins, which may cause acute to sever health problems in the animals and human beings.

It can be checked and reduced by treating the wastewater before disposal.and by reducing the use of fertilizer in agricultural fields. Application of lethal concentration of copper sulphate ($CuSO_4$) may help in elimination of the blooms or retard the growth. Biologically, introduction of *Lemna* (Angiosperm) / *Ochromonas danica* (Chrysophytic algae) / *Daphnia magma* (Zooplankton) in such ponds may control the over growth of *M. aeruginosa* Kütz. Besides, the following precautions if followed by the people may reduce the risk of illness or discomfort related to *Microcystis* are:

- Do not swim in water bodies where *Microcystis* bloom is evident.
- Do not drink water of such water bodies which is infested with *Microcystis* bloom.
- If contact has been made with *Microcystis* bloom infested water, simply wash off affected body part with fresh water. Skin irritations may occur in some cases after prolonged contact. If irritation persists, contact physician or local health centres.
- Keep pets and livestock away from the *Microcystis* bloom infested water to save themselves from toxic effect of microcystin.

ACKNOWLEDGEMENTS

Authors are thankful to the Director, Botanical Survey of India, Kolkata for constant inspiration and encouragements.

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पश्चिमी बंगाल के मालदाह जिले के तालाबों में खिले *माइक्रोसिस्टिस एरुजिनोसा* कुजिंग

प्रतिभा गुप्ता एवं शिव कुमार

सार संक्षेप

मालदाह जिला 24° 41′ एवं 25° 32′ 30′ उत्तरी अक्षांश एवं 87° 48′ तथा 80° 28″ पूर्वी देशान्तर में अवस्थित है। इसके 3733.177 वर्ग कि. मी. क्षेत्र में तालाबों में विभिन्न प्रकार के शैवाल भरे पड़े हैं। दो मौसम में 9 तालाबों के सर्वेक्षण किए गए – भदोबरतला, दमुआ, जोड़कुप्पा, कुप्पा, मीनातला, रोहिणी, सलामी दरवाजा, समदा एवं शिवराम पल्ली। इन तालाबों में *माइक्रोसिस्टस एरुजिनोसा* कुज बहुतायत में है। प्रदूषकों की मात्रा तथा एंथ्रोपोजेनिक गतिविधि के अनुसार एम. एरूजिनोसा में विविधता है। टैक्सोनॉमी की दृष्टि से साइनोफाइसिन फॉर्म्स, व्याप्ति और उपलब्धता के आधार पर यह जाति अत्यन्त महत्वपूर्ण है।