Short Communication

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Studies on Some Algae of Drinking Water Supplies of Karachi City (Residential Area)

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In aquatic system, algae are the major primary producer of organic matters, causing problems of pollution in water reservoirs. According to Ellis [1] and Skulberg [2] overgrowth and decomposition of algae produce bad taste and smell to the water and interfere with the filtration process causing clogging screens in the water supplies, Therefore, such waters are considered unfit for domestic supplies as reported by Bonney [3] and Lendal [4] while Prescott [5] and Matheson [6] investigated that waters of such lakes having supernatant growth of Aphanizomenon spp. Moreover, silica walls of diatoms form layer over sand filters, facilitating a thick mat of filamentous algae which block the filters of reservoirs investigated by Inst. of Water Engg., London [7]. In this regard, certain standards for drinking purpose have also been recommended for water before it could be accepted for human consumption [8-10].

Karachi, with a population af about 10 millions, faces the problems of unsafe drinking water, which cause stomach diseases. The population and industrial demand of Karachi city is being increased rapidly with the effect and ground water supplies are becoming insufficient [11]. Therefore, the demand of water has turned towards the lakes, rivers and reservoirs. The water surface favours the growth of planktonic algae, being capable of photosynthesis. Thus filter penetrating algae cause turbidity and decomposition of water and represent food for heterotrophic organism, developing in the mains and reservoirs in pipelines.

The drinking water for Karachi is supplied by the reservoirs of Karachi Water and Sewerage Board. In the pipelines, the over growth of algae may exert influence on the water quality by their metabolic activities. In this way a large number of algae interfere with the operation of treatment plants. As a result their decomposition produce bad taste, odour and change in colour of water and it also results into water clogging and blockage of filters.

Present work was undertaken for the survey and studies of algae which grow luxuriently in water supplies and reservoirs. Resistibility of algae against weather condition and clorination were also studied. In this connection 40 species of planktonic algae were identified from drinking water reservoirs of 82 localities of Karachi city (Residential area) during Nov. 1990 to Nov. 1991. Among the algae species, 15 belonging to green algae, 18 to blue green algae and 6 are diatoms. Water samples were also tested for chemical contents like sodium, potassium, calcium and manganese.

More than 300 samples of drinking water (both tap and well waters) were collected from 82 different localities of Karachi city (Residential areas) during Nov. 1990-91. Chemical analysis of water samples were made weekly.

Sources of water samples. Karachi Water and Sewerage Board is the authority for water supply in Karachi. There are three main water sources for Karachi Metropolitan, namely Indus, Hub Dam, Hallji and Dumloti wells. Water from Indus is treated from COD, Pipri and North East Karachi filter plant., water from Hub is supplied without filteration and water from Hallji is treated at Gharo filter plant. Water from Indus is conveyed through canals, siphons and pipelines to Pipri and NEK filter plants, water from Gharo and Dumloti wells is conveyed through conduct pipes and siphons to the city and then to each consumer's house.

The physical characteristics include temperature, colour, odour, and taste of water (Table 1). Chemical nature of water samples was determined by pH of water samples, while sodium and potassium were determined by Flame-photometer, (Model Cornive 400).

TABLE 1. ALGAE OF THE DRINKING WATER SUPPLIES OF KARACHI (RESIDENTIAL AREA) (DURING NOV. 1990-1991).

Localities	Algal group	No. of cell/L	Water temp. (°C)	Atmosp.temp. °C	Atmosp.humidity (%)	Colour of water	Taste of water	Ordour of water	pH	Na	K	Ca	Mg
1	C	2	25	11-25	30	Colorless	Tasteless	Odourless	7	28	3	38	10
2	Absent	-	19	10-24	25	Yellow	Soil like	Disagreeable	8	19	4	30	7
3	B	3	22	13-28	30	Colourless	Tasteless	Odourless	6	38	14	40	19
4	AB	3	22	13-28	32	"	"	"	6	20	7	33	19
5	Absent	-	20	15-24	30	"	"	"	6	30	18	29	3
6	AB	6	19	22-28	32	"	"	"	6	21	15	41	28
7	AB	5	18	22-00	32	"	"	"	7	25	20	35	35
8	A	3	22	16-27	19	"	"	"	7	20	10	60	19
9	A	3	22	16-27	19	"	"	"	7	20	10	60	19

(Contd.)

(Table 1 Contd.,)

10	Absent	-	22	17-28	20	"	"	"	7	26	16	25	40	
11	B	4	23	18-30	20	"	"	"	7	35	15	40	19	
12	B	4	23	22-32	20	"	"	"	7	23	20	39	20	
13	Absent	-	22	16-24	19	"	"	"	6	25	4	29	51	
14	ABC	8	22	16-24	19	Light yellow	"	"	7	21	6	40	22	
15	ABC	5	22	18-28	22	"	"	"	6	20	4	32	10	
16	BC	7	22	16-24	30	Colourless	"	"	6	24	5	26	27	
17	A	4	22	20-30	32	"	"	"	7	26	4	40	10	
18	A	2	22	15-25	17	"	"	"	7	30	4	35	12	
19	A	5	23	20-32	17	"	"	"	7	17	5	28	30	
20	AB	6	23	20-32	17	"	"	"	7	18	4	21	35	
21	AC	4	23	15-32	20	"	"	"	7	18	4	21	35	
22	AC	4	23	19-35	30"	"	"	7	18	3.5	42	35		
23	ABC	6	23	"	"	"	"	"	6	16	3	40	12	
24	ABC	6	23	"	"	"	"	"	6	25	4.5	51	19	
25	A	5	23	20-30	"	"	"	"	7	20	5	35	20	
26	A	5	24	15-25	34	"	"	"	7	30	3.5	15	10	
27	AB	2	24	"	"	"	"	"	7	26	45	32	12	
28	AB	2	25	19-30	35	"	"	"	7	32	6	35	17	
29	AC	2	25	"	37	"	"	"	7	32	5.5	32	19	
30	Absent	-	25	"	"	"	"	"	7	17	3	15	10	
31	A	6	25	20-30	35	"	"	"	7	26	4.5	40	12	
32	AB	5	25	20-32	30	"	"	"	7	25	5	35	9	
33	A	6	26	22-28	70	"	"	"	7	26	4.5	40	12	
34	AB	7	26	22-36	70	"	"	"	7	12	7.5	26	15	
35	AB	8	26	"	"	"	"	"	7	22	9	22	12	
36	Absent	-	26	"	"	"	"	"	7	20	8	17	12	
37	ABC	8	26	"	"	"	"	"	7	27	10	38	14	
38	AC	10	22	"	65	Polluted	Bad	Fishy smell	5	87	5.6	7	5	
39	A	8	22	22-36	65	Colourless	Tasteless	Odourless	7	50	6	6	4	
40	Absent	-	22	22-36	66	"	"	"	6	50	5	8	14	
41	AB	2	"	"	65	"	"	"	6	85	5	19	17	
42	ABC	6	"	30-37	72	"	"	"	8.25	50	5	6.5	3.9	
43	BC	3	"	"	70	"	"	"	6	45	6	6.7	3.8	
44	ABC	4	"	"	"	"	"	"	7	40	6	5.5	3.4	
45	Absent	-	24	25-35	"	"	"	"	7	40	5	16	7	
46	Absent	-	"	"	"	"	"	"	6	40	5	16	7	
47	Absent	-	25	26-35	"	"	"	"	6	35	5	18	7	
48	B	2	"	"	"	"	"	"	5	36	5	16	7	
49	Absent	-	"	"	"	"	"	"	5	36	5	16	7	
50	A	4	30	23-36	50	"	"	"	5	45	5	23	14	
51	AC	3	"	"	"	"	"	"	5	38	5	33	21	
52	A	10	"	"	"	"	"	"	5	40	10.5	30	21	
53	AC	6	22	22-37	"	"	"	"	7	40	5	8.5	3.9	
54	AC	5	"	"	"	"	"	"	7	36	2	6	3.4	
55	AC	4	20	23-32	40	"	"	"	6	40	5	9	3.4	
56	A	5	22	"	45	"	"	"	6	40	5	9	6	
57	A	5	"	23-33	50	"	"	"	7	40	5	9	6	
58	A	4	21	22-30	70	"	"	"	7	35	5	6	4.4	
59	A	5	"	24-31	75	"	"	"	6	38	5	6	4.4	
60	A	5	30	25-30	70	"	"	"	7	40	5	5.9	4.8	
61	A	4	"	22-30	"	"	"	"	6	40	5	6	4.5	
62	A	7	29	"	"	"	"	"	6	40	5	6	2.8	
63	A	3	30	21-35	65	"	"	"	6	36	5	5.5	2.8	
64	ABC	2	"	"	"	"	"	"	7	40	5	6	4	
65	Absent	-	"	"	"	"	"	"	6	25	5	4.7	3	
66	Absent	-	"	"	"	"	"	"	6	45	4	7	8	
67	AB	3	28	22-36	85	"	"	"	7	32	5	16	7	
68	A	3	"	"	"	"	"	"	7	32	5	16	7	
69	ABC	3	27	24-37	52	"	"	"	6	35	5	16	10	
70	AC	2	"	"	"	"	"	"	6	50	4	19	10	
71	A	3	25	24-36	60	"	"	"	7	50	4	19	10	
72	AB	5	"	"	"	"	"	"	6	95	2.5	19	10	
73	AB	5	"	24-38	34	"	"	"	7	100	22	19	8	
74	A	4	"	"	"	"	"	"	6	95	25	19	8	
75	AC	6	"	"	"	"	"	"	7	95	25	19	8	
76	AB	3	27	24-37	52	"	"	"	6	35	5	16	10	
77	Absent	4	"	"	"	"	"	"	6	80	20	23	7	
78	Absent	-	2	20-30	60	"	"	"	7	40	4	22	12	
79	AB	-	"	20-32	30	"	"	"	6	40	5	28	10	
80	A	3	"	20-30	"	"	"	"	6	41	6	19	7	
81	A	2	"	"	31	"	"	"	7	45	2223	10		
82	AB	2	18	15-32	30	"	"	"	6	40	22	15	7	

Calcium was determined by Javel Ash Atomic Absorption Sepectrophotometer, (Model AA, 782A). Manganese was determined by oxidation to permanganate, (a modification of the method of Williard). [1]]. Results show that the presence of algae in drinking water are not harmful for the human health, except causing indesirable smell, taste and colour.

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Key words: Algae, Drinking water, Karachi.

References

1. M. M. Ellis, A. E. West Fall and M. D. Ellis, Determination of Water Quality, Fish and Wild Life Service, US. Deptt. of the Interior Res. Report No. **9**, 122, (1948).
2. O. M. Skulberg, Algal Problems Related to the Eutrophication of European Water Supplies, and a Bio-assay Method to Assess Fertilizing Influence of Polluation on Inland Water (1964), pp. 202-298.
3. A. D. Bonney, *Phytoplankton* (Edward Arnold Pub. Ltd, 1975), pp. 115.
4. H. N. Lendal, Comprchensive Survey of Taste and Odour Problems, Water WKS Eng., 99 (1923), **1**, 38 (1946).
5. G. W. Prescott, *The Algae, A Review* (Great Britain, B. Thomas Ltd., France and London, 1969), pp. 437.
6. D. H. Matheson, The Effect of Algae on Water Supply, Asam. Gen. Rept. to 2nd Congress, Paris, France, (1952), pp.82.
7. *Approved Methods for the Physical and Chemical Examination of Water* (Institute of Water Engineering London, 1953), 2nd ed.
8. *Standard Methods for the Analysis of Water and Sewerage* (American Public Health Association, 1948), 19th ed.
9. C. M. Palmer, *Algae as Biological Indicator of Pollution.* (Deptt. Health Education and Welfare, Public and Health Service, Robert. A. Tafl. Sam. Eng. Center, Cincinnati, Ohio, 1957), pp. 6069.
10. C. D. Palmer, Algae in Water Supplies of United States, (US Deptt. of Health Education and Welfare Publ. Health Service, 1962), pp. 239-287.
11. S. A. Sattar, Drinking Water and Human Health: An Expatriate's Assessment of the Situation in Pakistan (1976).