L-IV26

STUDY ON THE EFFECT OF COPPER WORKS EFFLUENT AS RAW AND AFTER ITS TREATMENT ON TILAPIA ZILLII GERV.

Hamed SALEH, Ahmed HAMZA°, Makawy AKEL° and Mohamed MORAD

Alexandria Institute of Oceanography and Fisheries, Alexandria (Egypt)
° High Institute of Public Health, University, Alexandria (Egypt)

Bioassay studies showed that the lethality of Copper Works effluent containing comparatively high concentrations of heavy metals e.g. Fe and Cu as well as moderate amount of organic matter (Table 1) is nil or negligible, while its sublethal effects e.g. feeding activity, growth retardation, and bioaccumulation of heavy metals are significant (Table 2). Treatment of such effluent with activated clay or activated carbon (0.5 mg/L) considerably decreased its content of heavy metals (Table 1) to the levels which could be tolerated by the fish with the result that bioaccumulation of heavy metals became negligble occuring mainly in the fish flesh putting in consideration that the high accumulation of heavy metals in the liver is attributed mainly to its role as reservoir and regulator of heavy metals in the fish (Table2). However, growth retardation for Tilapia zillii surviving in such treated effluent remains considerable (Table2), which may be attributed to the energy lost in ionic regulation of elements and ions present in such aquatic environment (Croghan, 1961).

Table 1: Characteristics of Copper Works effluent as raw and after its treatment with activated clay or activated carbon

Parameters	Raw effluent	After treatment with activated clay		After treatment with activated carbon	
		Effluent	% of improvement	Effluent	% of improvement
Turbidity	18	1.8	90%	2	88.8%
Total solids	461	383	16.9%	450	2.3%
Suspended "	25	12	52%	10	60%
B.O.D	60	32	46.6%	20	66.6%
C.O.D	135	70	48.1%	58	57%
Zn (µg/L)	110	50	54%	40	63.6%
Cu (µg/L)	150	18	88%	14	90%
Fe (µg/L)	512	97	81%	94	81.6%
Ni (µg/L)	80	40	50%	35	56.2%
Pb (µg/L)	20	N.D.	--	N.D.	--
Mn (µg/L)	30	N.D.	--	N.D.	--

N.D. = Not detected.

Table 2: Feeding activity, Condition of the fish flesh K_f, and bioaccumulation of Fe and Cu for Tilapia zillii living in the raw and treated effluent of Copper Works factory for 5 months.

Water quality	Feeding activity (Brown,1957)	K_f = gutted weight X100 / (Standard length)^3 (Brown, 1957)	Bioaccumulation of Fe and Cu in ppm.					
			Liver		Gills		Flesh	
			Fe	Cu	Fe	Cu	Fe	Cu
Raw effluent	5.4±4.1	1.96	69.9	83.2	56.8	17.6	15.5	2.5
After treatment with activated clay	11.8±2.9	2.13	38.9	35.1	33.7	6.6	12	0.6
After treatment with activated carbon	12.4±2.8	2.24	27.8	26.7	23.9	6.6	12.2	0.4
Tap water (ontrol)	12.6±2.8	2.40	22.1	21.6	23.8	5.2	11.6	0.6

Literature Cited:

Brown, M.E. (1957). Experimental studies on growth, from Physiology of fishes, Vol. I, Chap. IX.

Croghan, P.C. (1961). Competition and mechanism of osmotic adaptation, Sympos. Soc. Exper. Biol. 15:156-167.

L-IV27

DISTRIBUTION OF NUTRIENTS IN THE THERMAIKOS GULF, GREECE

V. SAMANIDOU[1], K. FYTIANOS[1] and G. VASILIKIOTIS[2]

(1) Environmental Pollution Control Laboratory, University of Thessaloniki, Thessaloniki (Greece)
(2) Laboratory of Analytical Chemistry, University of Thessaloniki, Thessaloniki (Greece)

The distribution of nutrients (phosphate, nitrate, nitrite and ammonium) in watersamples from eleven sampling stations in the Thermaikos gulf was studied during a period of one year (1985-1086).

Significant seasonal fluctuations were observed mainly for nitrate and nitrite, with maximum during winter and minimum in the summer.

Surface seawater from the Thermaikos gulf was sampled monthly during a period of one year (1985-1986) using polypropylene sampling bottles (1).

The samples were filtered through 0,45µm membrane filters. Determinations of phosphate, nitrate, nitrite and ammonia were done according to the Methods of Seawater Analysis (2) and all the used reagents were suprapur (Merck, A.G.).

RESULTS AND DISCUSSION

The mean values of concentrations of PO_4-P, NO_3-N, NO_2-N and NH_4-N in µg-at.l^{-1} for every sampling station which are presented in Table 1 illustrate the general levels found in the waters of Thermaikos gulf.

The nutrients values demonstrate the strong eutrophication conditions prevailing in Stations S_1 and S_5 which are due to their vicinity to the slaughterhauses's and municipal sewage outfalls.

From the obtained data in this study it becomes clear that during the winter high total inorganic nitrogen content was found through the studied area and a minimum in the summer. Station 1 where very low concentrations of DO were observed, dominated the lower oxidation states of nitrogen. The concentration of ammonia was extremely high(16.75 µm-at.l^{-1}) and the nitrite concentration was nearly five times greater than the average.

Significant increase of nitrate (7,40 µm-at.l^{-1}) was observed in the estuaries of Axios river. With heavy rainfalls the nutrients and especially the nitrate are washed out and discharged into Thermaikos gulf from the surrounding agricultural area after fertiliser application.

Plotting the monthly values of nitrate concentrations for St. 4 (estuaries of Axios river) against time, a curve with maxima at the end of Winter and during Spring and minima in the summer, is obtained. The peak concentrations were probable partially a result of heavy rainfalls washing out nitrate. The nitrate concentrations in Stations which are located in the gulf of Thessaloniki were about equivalent. No significant seasonal fluctuations were observed for phosphate concentrations, but a possible lowering of ammonium concentrations occured also in the summer.

The concentration of orthophosphate increased with the inset of spring and reduced to summer low.

Also no obvious seasonal fluctuations were observed in nitrite concentrations-i.e. no winter maximum or summer minimum. Increases in the nitrite content of S_1 and S_5 occur owing to the discharges of the sewages.

Table 1. Mean concentration of nutrients in the Thermaikos gulf (in µg-at.l^{-1}).

Stations	PO_4-P	NO_3^--N	NO_2^--N	NH_4^+-N	Ninorg/Pinorg
S_1	2.38	3.18	0.20	16.75	8.46
S_2	1.73	4.93	0.15	6.19	6.20
S_3	1.27	4.43	0.05	2.56	5.54
S_4	1.30	7.40	0.05	2.15	7.38
S_5	2.40	4.36	0.10	4.84	3.87
S_6	1.09	5.05	0.05	2.24	6.73
S_7	1.26	3.08	0.05	2.68	4.61
S_8	1.73	3.94	0.07	2.93	4.01
S_9	1.26	3.15	0.04	3.54	5.34
S_{10}	1.16	2.50	0.05	4.29	5.90
S_{11}	1.52	4.50	0.06	4.36	5.87

From the calculated nitrogen to phosphorus rations by atoms (N/P) of inorganic concentrations of these components (Table 1) it can be concluded that the lowest ratio by atoms was observed at station S_5 (Ninor/Pinor=3.87) because the excess of phosphorus in relation to nitrogen near the sewage outfall. The other stations being far from sewage outfall were poorer in nutrient levels.

The results showed an increase of the nitrogen to phosphorus ratio by atoms with distance from the sewage outfall due th phosphorus decrease with distance.

The surface distributions of nutrients indicate that the gulf of Thermaikos can be deveded into two principal regions. The bay of Thessaloniki characterised by high nutrient concentrations reflecting the anthropogenic influence, and the gulf of Thessaloniki where lower concentrations of nutrients were observed, close to those found in literature for slightly polluted areas (3).

REFERENCES

1. K. Fytianos and G. Vasilikiotis, Chemosphere, 12, 83-91, 1983.
2. K. Grasshoff. Methods of Seawater Analysis, Verlag Chemie, 1976.
3. S. Bernardi et al in VI^{es} Journees Etud. Pollutions, Cannes, CIESM (1982).

L