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TOXICITY EVALUATION OF PAPER MILL EFFLUENTS

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The acute toxicity of final effluents from some paper mills located in the State of São Paulo, Brazil, was evaluated. The effluents were collected hourly, during 6 to 8 hours. Composite samples were prepared for 24h toxicity tests, according to ISO procedure (ISO,1982), modified: Daphnia similis and soft water were used. The results are shown in table 1.

RESULTS

TABLE 1 - Characteristics of the studied industries, toxicity and physico-chemical results.

INDUSTRY	Kind of manufactured paper	Treatment system	Flow/ out put (m^3/t)	CE 50, 24h % (a)	BOD (mg/l)	COD (mg/l)	Non filterable residues (mg/l)	pH	Conductivity (µS/cm)	Volatile non filterable residues (mg/l)	Settleable residues (ml/l)	Kjeldahl N (mg/l)	Total P (mg/l)
A	writing, printing, special	None	33.60	**36.0**	165	431	-	5.0	1,000	-	-	-	-
B		flotation, fiber recycling	65.54	**80.0**	35	59	538	7.2	560	-	-	-	-
C	wrapping	fiber recycling, settling tank	59.69	**13.5**	688	1,418	164	6.7	-	-	-	25.5	1.50
D	sanitary tissue	none	212.73	**0.9**	97	531	-	7.0	480	-	-	2.8	0.35
E		fiber recycling, settling tank	100.38	**N.T.** (b)	32	85	2	6.7	242	0	0	1.4	0.08
F		none	116.65	**N.T.**	190	362	490	6.7	276	-	-	-	-
G	card and cardboard	screen, flotation	109.83	**41.0**	26	98	29	8.8	2.640	-	-	2.8	3.80
H		fiber recycling	28.42	**N.T.** (c)	251	971	2,942	9.5	-	-	61.9	44.0	11.80
I		none	21.29	**N.T.**	450	2.030	150	7.3	-	-	115.0	12.2	0.95
J	special	none	78.37	**68.0**	517	1.250	403	9.4	1.000	-	-	-	-
K	writing, printing, special, wrapping, card, cardboard	flotation, fiber recycling, neutralization	47.12	**38.0**	-	-	-	7.4	-	-	-	-	-
L		settling tank, aeration, tertiary treatment	8.03	**N.T.**	16	54	4	5.7	745	0.5	<0.1	2.7	0.016
M	writing, wrapping	none	148.14	**19.5**	10	22.1	132	4.8	556	108.0	<0.1	9.0	0.25
N	printing, wrapping	fiber recycling, settling tank	209.86	**17.5**	93	300	194	4.5	-	122.0	9.0	4.8	0.14

a) CE 50,24h = Concentration which causes 50% immobility of the test organisms
b) N.T. = Not acutely toxic
c) N.T. = Not acutely toxic to *Daphnia magna*

DISCUSSION

The toxicity of paper mill effluents were, in most cases, much higher than the levels found in pulp and paper mills in the State of São Paulo. No correlation was found, through regression analysis, between effluent toxicity and its physico-chemical data. Information regarding manufactured paper, raw material, specific flow and treatment systems did not explain the detected toxicity. The toxicity found is probably due to chemical substances, additives and fungicides which have not been analysed and which are not usually investigated for control purposes. Effluent treatment systems, used for fiber recycling, proved inadequate for toxicity removal. The identification of the source of toxicity, the improvement of treatment systems and effluent toxicity evaluation are suggested viewing the protection of aquatic organisms.