INFLUENCE OF pH ON THE LETHAL TOXICITY OF PARA CRESOL, PARA NITROPHENOL AND RESORCINOL TO FRESHWATER FISH LEPIDOCEPHALICHTHYS GUNTEA

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Abstract: Phenolic compounds like para cresol, para nitrophenol and resorcinol has several sources including industrial wastes, coal , wood distillation, road tars, petroleum refining, chemical manufacture, domestic sewage discharges, natural sources such as plant material decay and leaching from coal and oil deposits enter natural water system and affect the fish and other aquatic organisms, Physico-chemical factors like pH affect the toxicity of different chemicals to the fish, So the static renewal bioassays were done to study the influence of pH on the lethal toxicity of para cresol, para-nitrophenol and resorcinol to the freshwater fish *Lepidocephalichthys guntea.* The studies shows that para cresol, para nitrophenol and resorcinol decreased their toxicity as the pH increased to the said fish .The 24,48,72 and 96 hours LC_{50} values for the fish exposed to para cresol were found to be 15.0,13.0,12.0 and ,9.0 mg/l at pH 6.0 and at pH 7.5 the 24,48,72 and 96 hours LC_{50} values were 18.0,15.0,13.0 and 11.0 mg/l and at pH 9.0, the LC_{50} values were 23.0,20.0,18.0 and 16.0 mg/l respectively, For the fish exposed to para nitrophenol at pH 6.0 the 24,48,72 and 96 hours LC_{50} values were 26.0,24.0,22.0 and 20.0 mg/l and at pH 7.5 the 24, 48, 72 and 96 hours were 31.0,29.0,27.0 and 25.0 mg/l respectively and at pH 9.0 were 32.0, 30.0, 29.0 and 26.0 mg/l respectively. The LC_{50} values at 24,48,72 and 96 hours at pH 6.0 were 78.0,76.0,74.0 and 73.0 mg/l and at pH 7.5 the LC_{50} values were 79.0, 77.0, 75.0 and 73.0 mg/l and at pH 9.0 the LC_{50} values were 84.0, 81.0, 79.0 and 77.0
mg/l for the fish exposed to resorcinol respectively.

Keywords: Toxicity, *Lepidocephalichthys guntea* ,Para cresol, Para nitrophenol Resorcinol, pH.

Introduction: Phenolic compounds such as para cresol, para nitrophenol and resorcinol have been released into natural waters from various industrial sources, phenols are used as antiseptics and disinfectants, and environmental factor like pH influences various metabolic and physiological process of fish (Metelev V.V. ,et al., 1983). Phenolic compounds are non specific metabolic inhibitors, affects nervous system and also acts as hemolyzing agents of erythrocytes (Krajnovic-Ozrectic.M and et al., 1988). para cresol is used in the manufacture of plasticizer photography, antiseptic, disinfectants and insecticides,. Para cresol toxicity to trout embryos, tench and roach were studied by Albersmeyer and Erichsen .1959. Para nitro phenol is used in synthesis of dyestuff and. Resorcinol is used in tanning industries, explosives, dyes and resins, Resorcinol toxicity to Sourotherodon mossambicus were studied by Renuka devi and Sastry, 1987.Studies on the influence of pH on the lethal toxicity of para cresol, para nitrophenol and resorcinol to the fresh water fish *Lepidocephalichthys guntea* were not done elsewhere so the bioassays were carried out.

Materials and Methods: The live freshwater fish *Lepidocephalichthys guntea* were acclimatized to laboratory condition for ten days in the glass aquarium and fed daily with commercial fish food and the size of the fish selected for the test were 5.16 ± 0.36cms long and weighed 1.46± 027 gms.. Test medium used was one day stored tap water. The test were conducted in triplicate keeping a control. Ten fish were exposed to each concentration of para cresol, para nitrophenol and resorcinol separately. Stock solutions were prepared by using analytical grade reagents with deionised water and acetone as solvent.

This required quantity of stock solution of individual type of toxicant was used to have the appropriate concentrations and the solutions were delivered to each glass aquarium to conduct the bioassay test separately. Prior to the commencement of the test feeding to the fish were stopped and were not fed during the test till the end of 96 hours . The medium used for the bioassays were dechlorinated tap water having temperature of 26.5-27.5°C, Dissolved oxygen 6.8-7.2 mg/liter and total hardness was 78-84 mg/liter as $CaCO_3$ (APHA et al., 1985) . The test solutions were renewed every 24 hours for a period of four days. The dose mortality rate obtained for the static bioassay test were plotted on log -probit graph . The LC_{50} and 95% confidence limits were calculated statistically (Litchfield .J.T. and F Wilcoxon .1949) The pH of medium was maintained at three different pH of 6.0, 7.5 and 9.0 respectively during the static renewal bioassay till 96 hours for para cresol, para nitrophenol and resorcinol separately.

Results and Discussions: Soon after the fish was introduced into various concentrations of Para cresol , Para nitrophenol and resorcinol showed erratic and rapid movement at higher concentrations and then they slowed down their movement , surfacing and gulping of atmospheric oxygen were also seen, blood clots near the gill regions was visible , excessive mucous across gill region for the fish exposed to para cresol and para nitrophenol and resorcinol was seen at lower pH, Pale coloration of the fish at the time of death was observed exposed to the higher concentrations to para nitrophenol, para cresol and resorcinol.

The 96 hour LC_{50} values for *P.promelas* was 19.0 mg/l of O-cresol (Matson et al., 1976). The 24,48,72 and 96 hours LC_{50} values for para nitrophenol to Rainbow trout at pH 6.5 and at temperature 7°c were 3.65, 3.60, 3.38 and 3.12 mg/l and at 12°c were 3.84, 3.79, 3.79 and 3.79 mg/l and at 17°c were 3.24, 3.24, 3.08 and 2.89 mg/l and for pH 7.5 at 7°c were 5.47, 5.17, 5.00 and 4.82 mg/l respectively and at 2°c were 7.0, 7.0, 7.0,and 6.93 mg/l and at 17°c were 7.07, 7.07, 7.07 and 7.07 mg/l respectively and for pH 8.5 the LC_{50} were at 7°c were 29.0, 17.15, 16.52 and 16.5 and 12°c were 72.9, 19.63, 18.21 and 18.21 (Marking et al., 1991). The studies shows that para cresol, para nitrophenol and resorcinol decreased their toxicity as the pH increased to the *Lepidocephalichthys guntea*. The studies shows that para cresol, para nitrophenol and resorcinol decreased their toxicity as the pH increased to the said fish .The 24,48,72 and 96 hours LC_{50} values for the fish exposed to para cresol were found to be 15.0,13.0,12.0 and ,9.0 mg/l at pH 6.0 and at pH 7.5 the 24,48,72 and 96 hours LC_{50} values were 18.0,15.0,13.0 and 11.0 mg/l and at pH 9.0, the LC_{50} values were 23.0,20.0,18.0 and 16.0 mg/l respectively (Table 1), For the fish exposed to para nitrophenol at pH 6.0 the 24,48,72 and 96 hours LC_{50} values were 26.0,24.0,22.0 and 20.0 mg/l and at pH 7.5 the 24, 48, 72 and 96 hours were 31.0,29.0,27.0 and 25.0 mg/l respectively and at pH 9.0 were 32.0, 30.0, 29.0 and 26.0 mg/l respectively (Table 2). The LC_{50} values at 24,48,72 and 96 hours at pH 6.0 were 78.0,76.0,74.0 and 73.0 mg/l and at pH 7.5 the LC_{50} values were 79.0, 77.0, 75.0 and 73.0 mg/l and at pH 9.0 the LC_{50} values were 84.0, 81.0, 79.0 and 77.0 mg/l (Table 3) for the fish exposed to resorcinol respectively.

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Table 1: LC_{50} Values and 95 Percent Confidence Limit for
The Fish *Lepidocephalichthys Guntea* Exposed to Para Cresol at Different pH

pH	24 hours	48 hours	72 hours	96 hours
6.0	15.0 (13.73-16.35)	13.0 (12.03-14.04)	12.0 (11.00-13.08)	9.0 (8.33-9.72)
7.5	18.0 (17.14-18.90)	15.0 (14.39-15.63)	13.0 (12.48-13.53)	11.0 (10.45-11.57)
9.0	23.0 (22.26-23.73)	20.0 (19.37-20.48)	18.0 (17.19-18.84)	16.0 (15.59-16.41)

Table 2: LC_{50} Values and 95 Percent Confidence Limit for
The Fish *Lepidocephalichthys Guntea* Exposed to Para Nitrophenol at Different pH.

pH	24 hours	48 hours	72 hours	96 hours
6.0	26..0 (24.29-27.82)	24.0 (22.22-25.92)	22.0 (20.75-23.32)	20.0 (18.86-21.20)
7.5	31.0 (29.80-32.24)	29.0 (27.61-30.45)	27.0 (25.96-28.08)	25.0 (24.27-25.75)
9.0	32.0 (30.41-33.66)	30.0 (28.11-32.01)	29.0 (28.23-29.79)	26.0 (25.34-26.67)

Table 3: LC_{50} Values and 95 Percent Confidence Limit for
The Fish *Lepidocephalichthys Guntea* Exposed to Resorcinol at Different pH.

pH	24 hours	48 hours	72 hours	96 hours
6.0	78.0 (77.30-78.70)	76.0 (75.17-76.83)	74.0 (73.33-74.66)	73.0 (72.42-73.58)
7.5	79.0 (78.45-79.55)	77.0 (76.46-77.53)	75.0 (74.47-75.52)	73.0 (72.63-73.36)
9.0	84.0 (83.33-84.67)	81.0 (80.43-81.64)	79.0 (78.45-79.55)	77.0 (76.46-77.53)

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