

# DNA AND RNA CONTENT IN SOME TISSUES OF FRESHWATER FISH *NOTOPTERUS NOTOPTERUS* EXPOSED TO COPPER SULPHATE

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## KEY WORDS

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## ABSTRACT

The nucleic acid (DNA and RNA) content in different tissues such as brain, liver, kidney and ovary of copper sulphate exposed freshwater fish, *Notopterus notopterus* has been studied. The changes in the nucleic acid content of the tissues have been observed. The DNA content in the ovary is higher in comparison to other tissues. The variation of DNA content in control and copper sulphate exposed fish is ovary > liver > brain > kidney. The RNA content also exhibited similar to that of DNA, having higher amount in the ovary and the variation is ovary > liver > brain > kidney. Although the degree of variation between the tissue remains same in both control and experimental groups, the nucleic acid content reduced under copper sulphate exposed freshwater fish, *Notopterus notopterus* indicating copper sulphate as a pollutant effect the nucleic acid content in the tissue.

## INTRODUCTION

Aquatic environments are loaded with several types of organic and inorganic pollutants. Huge amounts of agriculture pesticides, used for crop protection, eventually enter into the aquatic system. Similarly, heavy metals, which are released as industrial effluents form the major constituents of aquatic pollution. The presence of excess quantities of these toxic pollutants in water bodies has caused mass mortality of fishes in the past (Wangane et al., 1994)

Copper sulphate is a fungicide used to control bacterial and fungal diseases of fruit vegetable, nuts and field crops. Some of the diseases that are controlled by this fungicide include mildew, leaf spots, blights and apple scab. It is also used as an algacide, an herbicide in irrigation and municipal water treatment system. Copper sulphate is a naturally occurring inorganic salt and copper is an essential trace element in plant and animal nutrition. It is available in dusts wet table powders and fluid concentrates. Copper sulphate is also widely used as an algacide for controlling phytoplankton in fish ponds and lakes as well as a herbicide used in aquatic weed control since 1982 (Carbonell and Tarazona, 1993). As copper sulphate found to be a pollutant causing deleterious effect on aquatic organisms at different levels, in the present study effect of copper sulphate on nucleic acid content of some important tissues of the freshwater fish, *N. notopterus* has been undertaken.

## MATERIALS AND METHODS

Freshwater water fish, *Notopterus notopterus* has been

selected for the present study. This fish is available in large in large numbers in ponds, lakes, tanks and rivers in and around Gulbarga. The fish were brought to the laboratory and acclimatized one week before starting the experiments.

### Determination of LC<sub>50</sub>

50 fishes were used for the determination of LC<sub>50</sub>. The concentration that kills 50 per cent of the fish in 96 h duration (LC<sub>50</sub>/96h) was determine by Static Bioassay method (Doudoroff et al., 1951) by using the mortality values for 96h the LC<sub>50</sub> was determined by plotting the graph. The exposed fish were sacrificed after 96h (LC<sub>50</sub>) and the tissues such as brain, liver, kidney and ovary were dissected out and processed for determination of DNA/RNA content. In all the cases six observations were made and the results (DATA) were expressed as arithmetic mean with their Standard Deviation, Standard Error and Student't' were made as described by Suedecur (1946) and Fisher (1963).

The nucleic acid (DNA and RNA) content of the tissues was estimated by following the Diphenylamine method of Schneider (1940) using DNA as standard. The RNA content of the tissues was also estimated by Orcinol method using RNA as standard.

## RESULTS AND DISCUSSION

The nucleic acid content in different tissues such as brain, liver, kidney and ovary of both control and copper sulphate exposed fish *Notopterus notopterus* has been studied. The following results were observed in both control and copper

**Table 1: Showing DNA and RNA content (mg/g) in different tissues of the freshwater fish, *Notopterus notopterus* on exposure to Copper sulphate**

	Brain DNA	RNA	Liver DNA	RNA	Kidney DNA	RNA	Gonads DNA	RNA
Control	133.75 ± 0.81	49.33 ± 0.25	145 ± 0.80	51.5 ± 0.31	87.91 ± 0.40	49 ± 0.13	170 ± 0.79	58 ± 0.81
CuSO <sub>4</sub> exposed	135.20 ± 0.79	46.76 ± 0.49	137.5 ± 0.86	46.76 ± 0.42	85.41 ± 0.76	45.95 ± 0.29	142.5 ± 0.86	55.51 ± 0.31

sulphate exposed fish, ovary contain large amount of DNA in comparison to other tissues (Table 1). The degree of DNA content in control and copper sulphate exposed fish, ovary > liver > brain > kidney.

The RNA content also exhibited similar to that of DNA having higher amount in the ovary. The degree of RNA content in control and copper sulphate exposed fish (Table 1) ovary > liver > brain > kidney. DNA/RNA ratio in different tissues: - Control:-brain has 2:1, liver 2:1, ovary 2:1 and only in kidney it is 1:1. Copper sulphate (CuSO<sub>4</sub>):- brain has 2:1, liver 2:1, ovary 2:1 and only in kidney it is 1:1. Total RNA content comprised of m, r and t RNA are variable. Miglavs and Jobling (1989) The RNA/DNA ratio indicates the protein synthetic potential of a cell and it is an index of fish growth. Wilder and Stanley (1989) reported the fall of RNA/DNA ratio of salmonid fishes by the treatment of carbaryl. Significant loss of metachromasia has been observed in mercury treated fishes after 9 and 30 days of exposure and moderate loss was found after 22 days.

The effects of sub-lethal concentrations (3% and 15 % v/v) of untreated nickel chrome electroplating effluent on the reproduction of female *Channa punctatus* were studied during preparatory, prespawning and spawning phases of reproductive cycle. Both GSI and HSI of the exposed fish were lower as compared to control fish in all the phases. An irregular pattern of deposition of macromolecules (DNA, RNA and Proteins) in liver as well as in ovaries indicated that exposed fish were not cycling properly due to stress. Alterations in the contents of macromolecules were greater in treatment T<sub>2</sub> (15 % v/v) than T<sub>1</sub> (3 % v/v) during all the phases (Kaur and Kaur, 2005).

The present study clearly indicates that a short term exposure

to copper sulphate, the DNA and RNA content of tissues get reduced in the freshwater fish *Notopterus notopterus* indicating copper sulphate as pollutant effect the nucleic acid content in the tissues.

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