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RESEARCH PAPER

Fertilizer Muriate of Potash Intoxication on Tissue Ascorbic Acid Levels of Fresh Water Teleost *Clarias batrachus*

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ABSTRACT

At lower concentrations and different time intervals, depletions in tissue ascorbic acid levels were observed while at higher concentrations, generally, elevations were seen.
Keywords: Clarias batrachus, Rainbow trout, Coho Salmon and Potash.

INTRODUCTION

Several species of fishes like Rainbow Trout and Coho Salmon, reared on ascorbate deficient diets, develop classic symptoms of fish scurvy (Halver, 1972; Halver, et al. 1969), lordosis, scoliosis, paralysis of trunk segments, bizarre distortion of support cartilage and hyperplasia of gills, followed by death, resulted in many fishes. The channel catfishes need vitamin C in their diet for development of bone matrix, blood vessels, wound repairs and other cartilaginous tissues in the body, to minimize susceptibility to pathogenic organisms and hypovitaminosis resulted in "broken back syndrome" in these fishes (Lovell, 1973; Wilson, 1973). In our laboratory, the effects of commonly used fertilizer muriate of potash, on *Clarias batrachus* was studied. The fishes were exposed to six different concentrations of fertilizer for 24 to 144 hours and results are given in this communication.

MATERIALS AND METHODS

Live and healthy fishes were collected from river Gomti at Lucknow. The fishes were brought to the laboratory' in plastic containers in natural water, these were then treated with 2% $KMnO_4$ to remove infections like ectoparasites etc. The fishes were allowed to rest for 72 hours to bring them to their normal mental and physiological conditions. Mortality, if any was routinely recorded for this study, Static Biossay Tests were followed. Six different concentrations of the fertilizer were selected. After the required interval of exposure, the fishes were taken out aquaria, blotted dry with the help of clean Turkish towel. The fishes were dissected liver, muscle, kidney tissues were taken, weighed and homogenized in 0.7 % normal saline solution, at 2 to 4 ^{0}C, in a glass homogenizer. The homogenates were used for the estimation of ascorbic acid levels and method of Roe (1961) was followed for the estimation.

Table 1. Water characteristic after dissolving fertilizer muriate of potash at different time intervals and concentration with the fish *Clarias batrachus*.

Fertilizer concentration (g/L)	Exposure Time (hr)	Room temp (^{0}C)	Aquaria temp (^{0}C)	pH	Hardness (total ppm)	Hardness (permanent ppm)	Alkalinity (methyl orange ppm)	Dissolved oxygen (ppm)
0.00*	00*	30.0*	23.5*	7.05*	182*	182*	264*	7.94*
	144*	29.6*	32.2*	7.20*	164*	164*	284*	7.19*
5.70	00	30.2	24.5	7.20	178	178	464	7.79
	144	32.2	25.3	7.25	162	162	404	7.19
6.25	00	30.2	94.2	7.25	159	159	449	7.64
	120	31.6	25.6	7.55	139	139	424	7.14
6.80	00	30.2	24.0	7.37	153	153	474	7.79
	96	29.6	24.6	7.41	131	131	464	7.05
7.20	00	30.2	23.9	7.40	151	151	494	7.59
	72	29.6	28.7	7.57	139	139	464	6.94
7.90	00	30.6	23.2	7.35	141	141	569	7.84
	48	30.4	24.1	7.53	135	135	579	7.19
8.80	00	30.6	23.1	7.45	131	131	531	7.59
	24	30.2	24.5	7.67	113	113	593	6.89

* Control Values

RESULTS AND DISCUSSION

Water characteristics, analyzed before and at the end of each set of experiment, using standard procedures (American Public Health Association), were well comparable (Table 1). However, the pH remained slightly changed after using the fertilizer.

The results obtained on ascorbic acid levels of the three tissues, liver, kidney and muscles of the fish *C. batrachus*, exposed for 24 to 144 hours to six different concentrations of the fertilizer are as follows:

Peak vitamin levels were observed in 24 hours, at 7.80 g/l in both liver and kidney and at 8.75 g/l concentration in muscles. Mild changes were observed at 48, 72, 96, 120 and 144 hours in all the three tissues. Toxicity of excessive potassium intake resulted in diminished growth rate, discoloration, haemorrhagic patches, drying and scaling of skin in mouse (Ogiwara and Hakoyarna, 1976). The toxic effect of the fertilizer Muriate of Potash resulted in significant hypervitaminosis to fishes *Clarias batrachus* and *Heteropneustes fossilis* (Joshi, 1978).

Potassium salts are derived mainly from potash mines, and they cause branch-tip death, chlorosis and necrosis of leaves. Different chemicals and toxicants like mineral products, rock phosphate, potassium chloride and other potassium salts are formed during manufacture of fertilizers and they cause toxicity to animal including human beings (Barnhart, 1969, Furukawa et al., 1977, Kariya et al., 1976, Neathery et al., 1979).

Ascorbic acid synthesis is stimulated by various drugs, from D-glucose and D-galactose through glucoronic acid pathway in liver of rat and other animals (Conney et al. 1975; Street and Chadwick, 1975). Hexachlorobutadiene decreased vitamin C by elimination in liver kidney and nervous tissues of rats (Poteryaeva, 1968), tetanus toxin, tetracycline and chloramphenicol, in blood, liver, kidney and adrenal tissues of guinea pigs and mice (Ghosh, 1939; Banerjee and Basu 1975). Similar depletions in vitamin C levels of the liver, kidney and muscles of the fishes were found in toxicity of fertilizer muriate of potash, at lower concentrations and different time intervals from 24 to 144 hours. Elevations are generally seen at higher concentrations of the fertilizer, found lethal in 24 to 48 hours only, our observations are in confirmity with others.

Haematological values can be used as a diagnostic tool to detect the impact of particular pollutant to fishes (Singh, 1982). As fertilizer Muriate of Potash caused remarkable changes in haematological values of fish *Clarias batrachus*, it can be used as an indicator for biomonitoring water pollution. Significant toxicity was observed due to agricultural fertilizers in fishes (Altnok and Capjub 2007, Erdogan et al., 2005, Hisar et al., 2004, Randall and Tsui, 2002, Yaro et al., 2005, Zachary et al., 2004, El-Shefai et al., 2004).

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