



HEMATOLOGICAL ASSESSMENT OF NILE TILAPIA TO THE SUB LETHAL CONCENTRATION OF AMMONIUM SULPHATE

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Abstract

The effect of ammonium sulphate on hematological parameters of Oreochromis Nilotica were analysed during this study. Fishes weighing about 10 g were exposed to 10% of the LC50 of ammonium sulphate. Nile Tilapia was exposed to 60, 120, 180, 240, 300 ppm of ammonium sulphate. After few weeks, Red blood cells (RBCs), White blood cells (WBCs), Haemoglobin like hematological parameters were decreased in stressed fish when compared to the control with significant differences ($p < 0.05$). Result of this study might be used to identify various diseases and stresses associated with the fishes.

Key words: Median lethal, dissolved oxygen, hematological parameters.

Objectives

- To study the effects of ammonium sulphate on water parameters on Nile Tilapia
- To study of lethal concentration of ammonium sulphate in Nile Tilapia fish.
- To study the effect of ammonium sulphate on the hematological parameters on Nile Tilapia.

Collection and maintenance of the fish Live fish of species *O. nilotica* were purchased from Fisheries Research and Information Center (Inland), Hebbal Outer Ring Road, Bengaluru. The collected fishes were all of even size and weight. Both the fish species were maintained in aqua- lab of CHRIST deemed to be university, Bangalore under laboratory conditions separately in 20L plastic tanks for a period of two weeks. To maintain the hygiene and water quality about half of the water was changed daily. By using a low-pressure aerator pumps the dissolved oxygen (DO) level of the water is maintained. Fishes were fed twice a day, with commercial pelleted feed with 28% protein in it. The health of the fishes was observed daily and diseased and dead fishes were removed from the water tank daily.

Visual examination of fish

during exposure Observations on the behavioural pattern of the fishes exposed to various concentrations of ammonium sulphate shows certain changes like quick and uncoordinated movement, increased opercular ventilation, respiratory distress, excessive mucus secretion within few hours of exposure and with the increase in exposure time there is change in the body pigmentation of these fishes and these effects are intensely shown by fishes at higher concentration.

Median lethal concentration (LC50) of ammonium sulphate Tilapia fish The medial lethal concentration of ammonium sulphate on tilapia fish were found to be 167.23 ppm and 130.9 ppm respectively using profit analysis in SPSS where logarithmic base is 10 with 95% significance (fig; 1&2). Tilapia fish at lower concentration (60 ppm) did not cause death of the fish after 96 hours of exposure. While at concentration 300 ppm cause death of fish in 24 hours of exposure.

It is observed that the mortality rate is increasing with increase in ammonium sulphate Cumulative mean mortality of exposed to different ammonium sulphate concentration during 96-hour exposure is given in Table 1. Analysis of water quality parameters The analysis of water quality parameters helps in supporting the primary data of hematological studies of Nile Tilapia . All the data were recorded 19



from the beginning to the end of the determination of median lethal concentration (LC50).

Estimation dissolved oxygen consumption by Tilapia The dissolved oxygen consumption of fish increases with increase in ammonium concentration and exposure time. The DO consumed by tilapia fish is 2, 3, 9, 12, 14, 22 mg/L during 96 hours of exposure. The DO level of water decreases with the addition of higher concentration of ammonium sulphate. When the fish are exposed to the ammonium salt they feel stress and start consuming more oxygen thus there occurs a decrease in dissolved oxygen content. The decrease in dissolved oxygen content is inversely proportional to the dissolved oxygen consumed by fish (Table 3). In natural environments water pollution caused by ammonium salts has significant effects in aquatic life.

Estimation free carbon dioxide production by Tilapia fish the free carbon dioxide level of samples with ammonium sulphate concentrations increases with the increase in the ammonium sulphate concentration due to high ammonium level. When fishes are exposed to various ammonium sulphate concentrations, the free carbon dioxide level increases as concentration increases. The free CO₂ produced by tilapia fishes at concentrations from 0- 300 were 3.8, 4.6, 7, 10, 11.8 mg/L respectively. . The above results show an increase in free CO₂ level with increase in ammonium sulphate concentration. (Table 4) . 20

Hydrogen ion concentration (pH) The pH level of each fish tank with different ammonium sulphate concentration in fish shows an increase with the as the concentration increases. pH values of water at various treatments increase with the high ammonium concentration. Before adding fishes into the ammonium salt the pH shows an increase as compared to the control set. This increase is due to that high amount of ammonia that are alkaline in nature (pH- 10). After 96 hours of introduction of fishes into these tanks also shows an increase in its pH level by the increase in ammonia content of water due the lack of cleaning during this experiment. (Table 5).

Temperature The temperature inside a water tank does not show significant changes with increase in concentration and time of exposure. The temperature found was 24.9- 25.2°C.

Haematological parameters The mean values of haematological parameters in this study are given below (Table 5) Erythrocyte count in normal fish is 2.22, 10⁶ mm⁻³ . The fishes exposed to the sub lethal concentration of ammonium sulphate showed mean value Red Blood Cell (RBC) ranged from 2.22 ± 0.08 to 1.65± 0.15 gL⁻¹. Increase in the concentration of ammonium sulphate cause the drastic decrease in the erythrocyte count. The result shows a significant decrease when compared to the control

Table1. Cumulative Mean Mortality of *O.nilotica* exposed to different concentrations of ammonium sulphate during the 96 hours exposure period

Time(Hrs)	0h	24h	48h	72h	96h
Concentration(ppm)					
0	0	0	0	0	0
60	0	0	0	0	0
120	0	0	1	1	1
180	0	0	1	1	3
240	0	1	1	2	3
300	1	1	2	2	4



Table 2, Effects of ammonium sulphate on dissolved oxygen consumption In *Nilotica* at various Concentrations

Sl.no	Concentration(ppm)	Dissolved oxygen Saltalone	Dissolved Oxygen Saltant fish	Dissolved Oxygen consumed by fish
		(mg/l)	(mg/l)	(mg/l)
1	0	8.0	6.0	2.0
2	60	11	4	3
3	120	14	6	9
4	180	19	7	12
5	240	25	10	14
6	300	30	8	22

Table3.Effects of ammonium sulphate on carbon dioxide consumption in *O.nilotica* at various concentrations

Sl.no	Concentration(ppm)	Free CO2 Saltalone (mg/l)	Free CO2 Saltand fish (mg/l)	Free CO2 Consumed By fish (mg/l)
1.	0	41.8	47	6
2.	60	24.2	28	3.8
3.	120	19.4	24	4.6
4.	180	15	22	7
5.	240	10	20	10
6.	300	7	15	6

Table4. pH ion concentration of *O.niloticus* at 6hours of exposure

Sl.no.	Concentration(ppm)	pH NH4SO4alone	pH NH4SO4 and Fish
0		5.5	8.9

Table5.Effect of ammonium sulphate on different parameters in blood of the fish,*O. nilotica*

Sl.no	Parameters	Control	24 h	48h	72 h
1	TotalRBC count 10^6 /cu.mm	2.22±0.08	2.01±0.41	1.89±0.24	1.65±0.15
2	TotalWBCcount 10^6 /cu.mm	14.11±0.04	16.52±0.10	17.31±0.16	18.61± 0.08
3	Haemoglobin(Hb)(gms/dl)	5.70±0.43	4.70±0.16	4.12±0.24	3.01±0.43

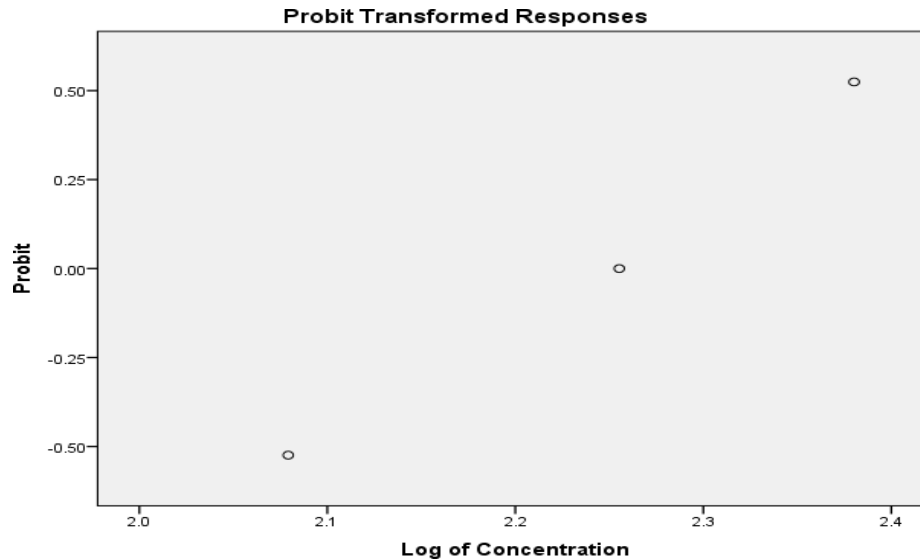


Figure 1: Lethal concentration of ammonium sulphate On in the LC50(96hrs) (probitVslogconc).

Summary and Conclusion

The present study reveals that the inorganic fertilizer ammonium sulphate has a significant toxic effect on freshwater fishes *O.niloticus* . So it is very important to give special concern during its discharge to the aquatic environment because it is biodegradable in nature. The Lc50 value of the detergent was estimated for 96hrs. The DO consumption, CO₂ production, pH increases by exposing to increasing concentrations. The present study also showed that the excess level of ammonium salt cause change in haematological parameters of these fishes which affect the health of fish leading to the death of fish. 31 After one-week red blood cell (RBC) count and Hb content decreased when compared to the control.

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