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## EFFECT OF AMMONIUM SULPHATE ON NUCLEIC ACID CONTENT OF FISH (CHANNA STRIATA) LIVER

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### Abstract:

The present study highlights the detrimental impact of ammonium sulphate exposure on the liver tissue of *Channa striata*. Ammonium sulphate, a common nitrogen-based fertilizer extensively used in agriculture, often enters aquatic environments through agricultural runoff posing a significant ecological threat to aquatic life. From the results obtained it was observed that the amount of DNA in experimental fish showed decrement when compared to control whereas RNA content increased when compared to control.

### INTRODUCTION

Ammonium sulphate( $(\text{NH}_4)_2\text{SO}_4$ ) is a common chemical compound with applications that range from agriculture, industry to laboratory science. Ammonium sulphate is an ideal salt for the separation process of enzymes due to it has high solubility and low toxicity towards enzymes and is cost efficient for the preservation. Ammonium sulphate comprises nitrogenous fertilizers, when utilized the water pollution results and it is viewed as more important than other materials. (Aygarth and Jarvis.,2002). Ammonia is one frequent toxic factor in aquaculture and is primarily developed from food residues, pesticide and animal waste. (Randal and tsui.,2002). Ammonium sulphate is a substance which is utilized in good manner by plants and bad manner when it is combined with water and impact on fishes. (Palanivelu et al.,2005). Ammonium sulphate utilized in the agricultural sector as such as fungicides, insecticides and herbicides. (Sato, et al.,1999). Ammonium sulphate is a source or blend of nitrogen and Sulphur for plant; enzymes and it used for formation of chlorophyl. (Racotta and hernandez-herrera.,2000). Ammonium applied in large quantities can cause harm to the gill and tissue and other body organs of the fish, which results in the scarcity of the fish. (Narayana et al.,2017). Agricultural chemicals while beneficial to crop can have harmful side effects on non target organism like fish when they enter ecosystems Protecting species like *Channa striata* is crucial not only for preserving biodiversity but also for ensuring the sustainability of fresh water resources that support human communities Ammonium sulphate as an augmented crop yield but it has unforeseen adverse effects on the fish. (Cheng and Chen.,2002). Fishes are used as ecological and water quality, biological indicators, ammonium excess runoff nutrients excess into mixed with water and get converted as ammonia, it is very toxic to aquatic life even in low concentration. (Wicks et al., 2002). Ammonium with water is mostly present in ionized and nonionized form. (Lu et al.,2016).

Ammonia is a major component of fertilizers and it has to be continuously excreted or transformed into less toxic substances to avoid accumulation to toxic concentration in the body. (Randall and tusi.,2002). Limited species-specific data, although several studies exist on fish in general, there's still a need for more targeted studies on *Channa striata* for precise understanding Materials and Methods:

### Collection of fish:

The air breathing snakehead fish, *Channa striata*. Were collected from Begum bazar, Hyderabad, Telangana. And wash with 0.4%  $\text{KMnO}_4$  solution to prevent infection and healthy fishes are taken for the procedure. Separate



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them in two groups one is experimental and the other is control. The feed with standard feed diet 2% ground nut cake and rice Braun at the rate of 2% body weight. The length of the fish is in between 10-15cm procedure. They were separated into two groups.

**Morphology:**

It is also referred to as “snake head fish” it has cycloid scales all over its body, is elongated and head is depressed and has cycloid scales. The arterial part is cylindrical. It grows to about 45cm long, mouth is completely toothed and a large gap exists dorsal fin possesses a high number of soft rays the anal fin possesses a moderate number of rays and caudal fin is rounded; it has the ability to bury themselves in mud during the period of drought condition.

The ammonium sulphate ((NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>) has severe influences on metabolic activities of fish *Channa striata* in the present investigation fish were exposed to sub lethal concentration 16ppm of ammonium sulphate for 3 days and simultaneously controls were maintained.

Group-1 experimental fishes were taken and exposed to 16ppm ammonium sulphate for three days.  
 Control without ammonium sulphate.

The following parameters were analysed following standard protocols referred from: Plummer.(1987)

Estimation of DNA DPA (diphenylamine) method RNA.by orcinol method.

**Calculations:**

$$OD \text{ value} = \frac{OD}{OD \text{ of standard}} \times \frac{\text{amount of standard}}{\text{amount of tissue taken in grams}} \times 1000$$

**Mean:**

$$= \frac{\text{sum of the values of items}}{\text{number of items}}$$

(or)

$$\bar{x} = (x1 + x2 + x3 + \dots + xn) / n$$

**Standard deviation:**

$$SD = \sqrt{[\sum (xi - \bar{x})^2 / (n - 1)]}$$

**Results:**

When fish was exposed to ammonium sulphate showed noticeable behavioural changes, such as irregular swimming patterns, restlessness, and increased opercular movements.

From the results obtained it was observed that the amount of DNA in experimental fish showed decrement when compared to control where as RNA conten increased when compared to control. And the same has been showed in (Table 1,2.)



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Table 1: observation table showing OD value and the amount of DNA

OD VALUES			AMOUNT OF DNA(μmoles/mg wt of tissue)	
So.no	CONTROL	EXPERIMENTAL	CONTROL	EXPERIMENTAL
1	0.21	0.14	39.9	26.6
2	0.07	0.33	13.3	62.7
3	0.22	0.11	41.8	20.9
4	0.42	0.29	79.8	55.1
5	0.56	0.09	106.4	17.1
6	1.01	0.38	191.9	72.2

Table 2: observation table OD value and amount of RNA

OD VALUES			AMOUNT OF RNA μmoles/mg wt of tissue)	
	CONTROL	EXPERIMENTAL	CONTROL	EXPERIMENTAL
1	0.07	0.81	13.3	153.9
2	0.22	0.72	41.8	136.8
3	0.26	0.55	49.4	104.5
4	0.90	0.87	171	165.3
5	1.02	1.02	193.8	193.8
6	1.16	0.60	220.4	114

Table 3: The mean value and the standard deviation of DNA and RNA of fish liver exposed to ammonium sulphate

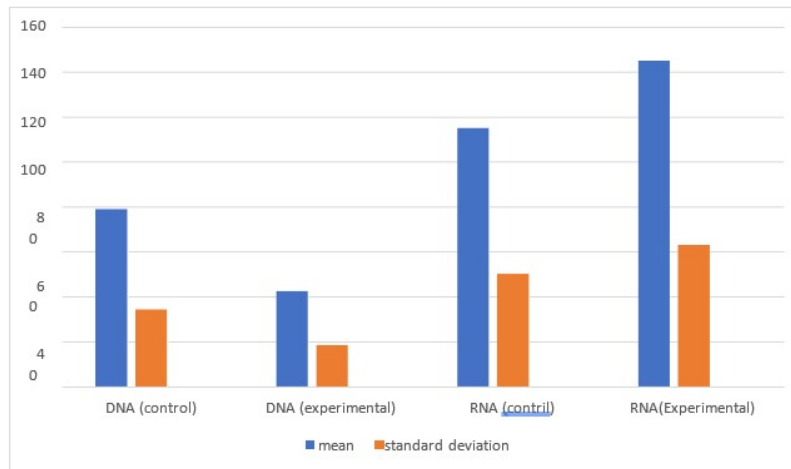
sample	mean	Standard deviation
DNA (control)	78.85	±34.1492
DNA (experimental)	42.43	±18.3760
RNA (control)	114.95	±49.7838
RNA (experimental)	144.716	±62.6751



All the values are mean of 6 observations and  $\pm$  indicates standard deviations of 6 observations

Graph 1:

**Graphical representation of effect of ammonium sulphate effect on mean and standard deviation DNA & RNA of fish (Channa striata)**



## DISCUSSION

The present study aimed to investigate the impact of ammonium sulphate on the nucleic acid of *Channa striata*. By focusing on the quantification of DNA & RNA using the diphenylamine method and orcinol method respectively, the present investigation provides insights into how exposure to this widely used agricultural chemical can cause molecular and physiological disturbances in aquatic organisms. Ammonium sulphate is mostly used in agricultural practices because it has high solubility. The study observed a clear reduction in the levels of DNA & increased RNA in *Channa striata* exposed to ammonium sulphate. When compared to the control group.

Similarly, the orcinol method showed a marked increase in RNA content in the exposed fish. RNA is essential for protein synthesis enzyme production and cellular function increase in RNA levels indicate potential disruption of cellular processes, leading to physiological stress and increased metabolic efficiency. Cytotoxic effects of ammonium sulphate on DNA & RNA affect the overall health and survival of the fish. Sub-lethal effects, even at sub-lethal concentrations, ammonium sulphate can alter nucleic acid levels, impacting cellular metabolism and growth (Joseph & Raj, 2011),

The results confirmed genotoxicity in liver and gill tissue, which reflects potential long-term damage to fish population. Similar finding highlighted the toxic impact of long-term exposure to ammonium sulphate on fish health. (Vasanthi m et al 1990), Concentration-dependent toxicity, the extent of DNA and RNA damage depends on the concentration and duration of exposure to ammonium sulphate. (Saha et al., 2002)

Impact on DNA structure exposure to ammonium compounds can result in single-strand breaks and fragmentation in DNA, leading to reduced DNA content in liver cells. (Pandey et al., 2017)

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