IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# EFFECT OF DICHLORVOS TECHNICAL GRADE AND 76% EC ON OXYGEN CONSUMPTION IN THE FISH *CATLA CATLA* (HAMILTON)

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**Abstract**

One of the major carp *Catla catla*, when exposed to both technical grade as well as 76% EC in sublethal and lethal concentrations in the laboratory *in vivo* had an impact on the oxygen consumption while of inspiration in respiration. The toxic action was of respiratory distress that resulted too an impairment of the metabolism of the cold blooded heterotrophic organism, the fish by which ultimately the growth can be retarded. The increase of size as growth is important for the fish culture that is cultured and the present studied one is the major component of the culture among the major carps and finally the venture of the aquaculture is at loss due to the pollution load of the pesticides.

**Keywords**: *Catla catla*, Dichlorvos Technical Grade, 76% EC Nuvan, oxygen.

## INTRODUCTION

The contamination of the aquatic bodies, due to the pollutants is inevitable. The pesticides are one kind among them and as toxicants cause deleterious effects when they find their way in the waters. The change of the physic-chemical parameters due to such result of defilement of the aquabodies. All the ambient inhabiting organisms especially the fishes got effected. Fish, the nektonic organism, cold blooded poikilothermic heterotropic respiring through gills any change of the dissolved oxygen alters the inspiration process of respiration. The intake of the gas required for its living, in the process of the consumption is reduced automatically, the metabolism is impaired and as a result the growth is retarded which is very important in culturing aspect when it is ventured. The present studied fish *Catla catla* is the cultured one, one of the major carps being surface feeder, any change that make the depletion of the dissolved oxygen the yield of the culture can be reduced.

Hence, the depletion of oxygen, which is measured as intake by the fish can serve as indices of the pesticide and can be considered as a biomarker of study. Sana Ullah *et al.* (2019) and also Kaviraja and Gupta (2014) recognized this type of study as indices of toxic action.

Styonova (2020) using this system of biomarker experiment in the fish *Cyprinus carpio*, the role of anhydrase enzyme for the transporation of oxygen and carbondioxide along with the shift of chloride was reported and any change of such catalytic action of the enzyme had a profound effect on the respiration.

Nnamdi *et al*. (2020) in the fish *Clarias gariepinus*, assessing the toxicity of 10 chemicals which include Dichlorvos the present studied one and reported that the organophosphate was toxic and the action of the resultant process was also due to the respiratory failure.

Akter *et al.* (2020) in the fish *Heteroneusteus fossils* due to the enzyme AChE inhibition, the respiration is effected and Sharmila and Kavitha (2019) too opined in the similar lines in the fish *Cyprinus carpio*.

According to Natalia (2019) report on the fish *Astayanax aeneus* mentioned that the enzyme AChE when inhibited due to the toxic action have reduced the respiratory rate.

Chandrasekhara Rao *et al.* (2017) for Dichlorvos, Somayyah *et al.* (2017), Sunanda *et al.* (2016) for organophosphates, reported the studies of respiratory nature for different fish. For other groups of pesticides including the organophosphates Ullah and Zorriezahara (2015); Murthy *et al.* (2013) and only for synthetic pyrethroids by Sana Ullah *et al.* (2019) too mentioned regarding such studies. But so far no report on *Catla catla* regarding respiratory effect of the pesticide in the literature that is available as of the present study.

Hence, the present study is attempted to know the effect on the oxygen consumption while in the inspiration of respiration that resulted due to the exposure of the technical grade as well as 76% EC of Dichlorvos, an organophosphate as toxicants in the fish *Catla catla.*

**MATERIALS AND METHODS**

Experiments on the oxygen consumption of the fish *Catla catla* were carried out in a respiratory apparatus developed by Job (1955). The fish were brought from local fish farms, Nandivelugu, Guntur (dt.), A.P., India and stored in the laboratory conditions in well aerated water for 10 days. They were acclimatized fish are used for the laboratory condition and such acclimatised fish experimentation. The water that was used in the toxicity experiments and for acclimatization was same. It has the following physical and chemical characteristics; Turbidity – 8 silica units, Electrical conductivity at 28°C-8.16 Micro ohms/cm, pH at 28°C-8.2.

**Alkalinity:** Phenolphthalein-Nil, Methyl orange as $CaCO_3$-*472, Total Hardness-*320, Calcium Hardness-*80, Magnesium Hardness-*40, Nitrite nitrogen (as N) - Nil, Sulphate (as $SO_4$) - Trace, Chloride (as Cl) -*40, Fluoride (as F-) -I.S., Iron (as Fe)-Nil, (*All these values are as micrograms/liter), Dissolved Oxygen - 8-10 ppm, Temperature - 28±2°C. During the experimentation period, the fish were regularly fed, but the feeding was stopped for about two days prior to the experimentation. The fish measuring 8 to 10 cm in length and 8 to 10g in weight were used in the experiment. All the precautions mentioned by APHA (1998, 2005 & 2012) are followed, for maintaining the fish. The fish were exposed to 96h $LC_{50}$ lethal 0.177 µg/L and also sub-lethal ($1/10^{th}$ of 96h $LC_{50}$) as 0.177 µg/L of technical grade and for 76% EC lethal 1.4 µg/l and 0.14 µg/l EC as sub-lethal ($1/10^{th}$ of 96h $LC_{50}$) respectively in the respiratory chamber.

The technical grade Dichlorvos was supplied by M/s. Hindustan Agrotech Industries, Ahamedabad, India and the 76% EC was purchased from the local market of Guntur, AP India.

The samples for the estimation were taken from the respiratory chamber, at every two hours intervals for a total period of 24 hours apart from the control (total 13 samples of each test determination and five of each to have averages).

**Description of the respiratory chamber**

The chamber used for the measurement of the whole animal oxygen consumption is a wide mouthed bottle which is called a respiratory chamber (RC). Its mouth was fitted with a four holed rubber stopper (S) and through one of the holes a thermometer (T) was placed to know the temperature of the medium in the respiratory chamber. From the remaining three holes three glass tubes were passed whose outer ends were fitted with the rubber tubes. These three tubes serve as delivery tubes and are designated as $T_1$, $T_2$ and $T_3$ respectively. They were fitted with pinch cocks $P_1$, $P_2$ and $P_3$. $T_1$ was connected with the reservoir ('R') and through this water could be drawn (inlet) into the respiratory chamber. $T_2$ was the atmospheric tube useful for testing the air tightness of the respiratory chamber which is taken into account as the fish is having the bi-model respiration hence extra care not to allow any air. Through the $T_3$ tube (outlet) samples from the respiratory chamber were taken for the estimation of the dissolved oxygen. The respiratory chamber was coated black to avoid any photo chemical reactions and to keep the animal activity at normal, during the entire period of the experiment.

**Setting up of the Apparatus**

Only one fish was introduced into each of the respiratory chamber that was with water drawn through $T_1$ from the reservoir. After checking the air tightness pinch cock $P_2$ was closed, to avoid any air to enter checked twice and the pinch cock $P_3$ was opened slightly so that a very gentle and even flow of water was maintained through the respiratory chamber. This was continued for 15 minutes to facilitate the animal in returning to a state of normal from the state of experiment, if any, difficulty due to the handling and also to allow the animal to adjust to darkness in the chamber
(acclimatization).

**Collection of the initial and final samples**

After allowing the animal to settle in the chamber, the initial sample was collected from the respiratory chamber through $T_3$. After collection of initial sample, the respiratory chamber was closed by closing $P_3$ first and then $P_1$ after two hours, until the next sample was collected from the respiratory chamber. Likewise, other samples also were collected at the end of each two hours for a period of 24 hrs. To calculate the amount of oxygen present in the water, the method followed is popularly known as the modified method of Winklers that was given by Golterman and Clymo
(1969).

Along with the experimental fish chamber, one respiratory chamber without the fish (control) was maintained. The control serves to estimate the initial amount of oxygen that was consumed by the fish. The experiments were conducted in sub-lethal as well as in lethal concentrations of both the technical grade and 20% EC of the chlorpyrifos that were used as the toxicants.

$$O_2 \text{ consumed by fish/ gram body weight/hour} = \frac{\alpha\text{-}\beta \times N \text{ of hypo} \times 8 \times 1000}{\text{Volume of the sample} \times \text{Correction factor} \times \text{Wt. of the fish} \times \text{time interval for each sample}}$$

$\alpha$ - hypo rundown before exposure
$\beta$ - hypo rundown after exposure

Student t-test was employed to calculate the significance of the differences between control and experimental means. P-values of 0.05 or less were considered statistically significant (Fisher, 1950).

## RESULTS

Comparative data on the whole animal oxygen consumption of control and experimental fish calculated per gram body weight in lethal and sub-lethal concentration of the technical grade and 76% EC for *Catla catla* and their percent variations are graphically represented as figures 1A & 1B and 2A & 2B. By taking time on X-axis and the amount of $O_2$ consumed per gram body weight on the Y-axis and both the line and bar modes are shown.

The results indicate that the toxicant contaminated water during the experimental period, continuously in the flow through, due to the immediate contact point only being the gills and also, the entry point had a stress on it. Not only that the fish not able to revert the sudden defilement act to cope up the situation it consumed more oxygen during the initial period and try to recover only at the later period.

The consumption of more quantity of the oxygen recovery and try to be stable in that toxic aspect of situation a positive sign of resistance and their effect is more precluded in 76% EC than to the technical grade is evident as per the figures.

## DISCUSSION

### Studies of Dichlorvos (The present studied toxicant)

Nnamdi *et al.* (2020) reported on the haematological effects in the fish *Clarias gariepinus* due to sublethal concentration of the toxicant exposure. They reported a decrement of RBC which had a profund bearing on the oxygen uptake and was the possible reason of decrease in consumption even in the present study.

Anukwu *et al.* (2020) while studying the Dichlorvos toxic action in the fish *Clarias gariepinus* using a modulator reported what fish showed toxic stress due to this anti-oxidant enzymes that enhanced in quantity. In the end, they concluded with an hypothetical concept that at high concentration the fish is subjected to oxidative stress which might be similar even in the present study.

Iniobong *et al.* (2020) reported in the fish *Clarias anquillaris* due to the exposure of the Dichlorvos exposure at the concentration of sublethal, RBC cells decreased as a result of the fish oxygen carrying capacity decreased hence the process of respiration was slowed down consequency less oxygen consumption.

Verma *et al.* (1984) in the fish *Heteroneusteus fossils* exposed to sublethal concentration and Rath and Misra (1979) in the fish *Tilapia mossambica* in sublethal concentrations had an impact of decrement in oxygen consumption and the above two reports were also mentioned in the view article.

Bhumika Benjara and Singh (2019) while reporting the toxicity of five pesticides including the present studied one, Dichlorvos to the fish *Mystus seengala* one of the reason for toxic effect was non other than respiratory distress which might be truce even in the present study.

Lakshmi *et al*. (2019), in the fish *Cyprinus carpio* too opined that the toxic effect on the physiological parameters as respiration was one, by which toxic stress only the fish succumb to death. The Aminotellic teleost fish had an profund effect due to lack of respiration properly.

Sameera Khan *et al*. (2018) while reporting on the behavioural changes of the Dichlorvos to the fish *Cyprinus carp* fingerlings reported that fish had a profound effect on respiration by which the fish showed distress and was in hypoxia condition for its survival.

Swarna Kumari *et al*. (2018) in the carps and also in grass carps due to the pesticide stress of Dichlorvos, particularly the effect on oxygen consumption both in 76% of lethal and sublethal both concentrations. The respiratory rate was severely effected, later the fish died due to toxic action of both the toxicants.

Nwamba Helen *et al*. (2018) in the fish *Clarias gariepinus* reported as the respiratory stress as one of the causes of toxic action that made the fish not to survive and succumb death when exposed to the different concentrations of the toxicity evaluation.

Ezike (2017), in the fish *Clarias gariepinus*, due to Dichlorvos toxic action the cat fish had respiratory stress which was due to reduction in RBC and haemoglobin concentration in the blood. The author concluded that the excessive application of the pesticide should be controlled in both urban and rural areas.

Chandrasekhara Rao *et al.* (2017) in their review article of Dichlorvos effects to the fresh water fish reported some of the earlier reports of its effect on respiratory aspects. According to Mallum *et al*. (2016) at the 24, 48, 72 and 96 hrs $LC_{50}$ value as per the concentration dependant, and duration after 720 minutes the beating of the caudal fin in its swimming activity decreased which means it was inactive. During the concentration of the toxicant level the fish drastically effected in its respiration.

The review article had also mention of Tilak and Swarnakumari (2009) due to the Dichlorvos effect as of decreased Oxygen consumption during 24 h experimented period both in lethal and sublethal concentration of Nuvan (76% EC). Damage of the gill epitheling in its pathological condition and oxidative stress were the valid reasons mentioned by the authors, which was similar even in the present study.

In the toxicological aspects the Dichlorvos of its awareness of public health was know to effect the respiratory, effect particularly in the form of irritation according to Mathur *et al.* (2000).

Suneel Kumar (2016), while studying the toxic impact of organophosphate Nuvan in the snakehead fish *Channa punctata*, the kidney organ was damaged apart from gills and liver which by combination of several processes the respiratory distress that resulted reduction of oxygen intake and also more ammonia secretion.

**Other organophosphates and others**

In the fish, *Gambusia affinis, Cyrpinus carpio, Ctenopharyngodon idella*, Balquees (2018) reported on the oxygen consumption at four different concentrations by taking $LC_{50}$ value of 24 hrs not 96 hrs (In the present study 96h as per APHA guidelines was taken). Gill damage histopathological aspect, mucus secretion/deposition on the filaments and the biochemical changes that underwent in the gill tissues particularly enzymes all combinedly resulted a failure of normal respiration due to toxic stress of action. The same is true for the present studied fish.

Lokhande (2017) in the fish *Rasbora daniconius* due to Dimethoate an organophosphate reported a depletion of quantum of oxygen consumption due to toxic stress, which is similar even in the present study. The behavioural attributes to observation during the toxicity studies too, particularly showness in the operculum movement resulted less oxygen intake.

Accumulation of bacteria apart from the toxic effect of the pesticide was reported in the fish *Labeo rohita* by Illavazhahan *et al*. (2010). The mucus accumulations made the adsorption of the bacteria to deposit and all that which made combinedly the impairment of the respiration activity.

Sathwick *et al*. (2017), due to exposure of 10% of the lethal concentration of 96h $LC_{50}$ value as sublethal experimented for 10, 20, 30 days of exposure resulted in the decrease of oxygen intake. The reasons they explained were:

- Microcytic anaemia
- A protective measure to cope the toxic stress lowered its intake

Inhibitory respiratory action, and all responsible for causing the effect. During the beginning of the experimentation, more quantity of oxygen was consumed and later decreased as in the present study. The commercial formulation 76% contain 24% ingredients of different nature also contributed for toxic action.

Ravindra and Patel (2016) by using organochlorine endosulphan in the fish Channa punctata too, reported similar lines. The pH of the water, temperature and concentration taken for experiment even though are

different of the present study, the same result was reproduced. The sampling of 2h duration for analysis of oxygen that is dissolved was also different. The architectural damage of the respiring organs of the fish which the authors mentioned as the main reason, which they offered as explanation and the same may be true even in the present study.

In the fish *Rasbora daniconius*, Karat *et al.* (2016) reported for an herbicide glyphosate, reported that because of the toxic stress (Taking $LC_{50}$ value of static bioassay) a different one of the present study, the fish consumed less oxygen. In the initial period, the fish consumed more oxygen to cope the stress of the toxicant and also require more energy to meet the situation of the toxicant.

In the fish *Cyprinus carpio*, due to the Cypermethrin toxic action, Neelima *et al*. (2016) reported, during the initial period to cope the prevailing stress for more energy consumed more oxygen and later due to toxic stress had less oxygen intake as in the present study. In sublethal concentration, the fish was able to recover whereas in lethal it succumbed to death.

Even Siddique *et al*. (2016) in the fish *Heteroneusteus fossils, Labeo rohita, Catla catla* and *Cirrhinus mrigala* by Anitha *et al.* (2010). Tilak and Satyavardhan (2002) in the fish *Channa punctata* too reported in the similar way. The gill damage, biochemical alterations of total proteins depletion and mucus accumulation all paved the way of less oxygen intake.

In the fish *Oreochromis niloticus* due to chlorpyrifos an organophosphate intoxication Padmanabhan (2015) reported a decrement of oxygen consumption due to the pesticide intoxification.

Kulkarni and Bhilave (2015) reported in the fish *Labeo rohita* due to diazonin an organophosphate toxic action the fish had less consumption. The mucus accumulation on the gills, opercular movement was show and inactive all contributed for the respiratory alterations of oxygen consumption.

According to Ramnarayan Singh (2014) due to dimethoate, an organophosphate (EC 30%) toxicity was resulted because of the electrolyte imbalance that existed in the internal enzymes component of membrane and cytosol disturbance resulted a lesser quantity of oxygen intake which might be contemplated even in the present study.

In the fish, *Danio rerio*, commonly called zebra fish, Priyanka and Ansari (2014) after testing with three toxicants, viz., endosulphan, chlorpyrifos and permethrin organochlorine, organophosphate and synthetic pyrethroid respectively, and concluded that the toxicity was in order of endosulphan, permethrin and chlorpyrifos. Toxicity were all due to respiratory distress and of gasping air due to stress that resulted toxic effect.

Sapana devi and Gupta (2014) in the fish *Anabas testudineus* by using the permethrin a synthetic pyrethroid as toxicant, Muttappa *et al*. (2014) in the fish *Cyprinus carpio* by using Quinolphos an organophosphate opined being heterotrophic the fish needs oxygen for metabolism important for growth. The present studied fish *Catla catla* is important for culturing practices and when toxic effect was making the impairment of growth really it had to be viewed seriously.

Madura Mukundam and Kulkarni (2014) even studied an esturine clam *Katelysiaopima* (Gmalin) due to the toxic action of cypermethrin had an impact on the oxygen consumption. Jispa *et al*. (2014) in the fish *Tilapia mossambica*, Manjula and Veeraiah (2014) in the fish *Cirrhinus mrigala* and Paritha Bhaun and Deepa (2014) in the fish *Oreochromis niloticus*, all, the studies only used cypermethrin as the toxicant and the reasons of such results, mentioned in the respective studies were as: (1) consequence of disturbance of anabolism and catabolism processes, (2) the architectural damage of the gill, and (3) toxic stress only. The same aspects are not an exception to the present study result.

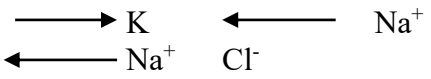
Maharajan *et al*. (2013) reported that the profenofos an organophosphate toxic action in the fish, *Catla catla* which had a profound bearing on the consumption of the oxygen only. By taking into consideration of only 24 h $LC_{50}$ value of the static tests the oxygen consumption effect was aimed and the result of decrement in the consumption was due to the architectural damage of the gill, increased mucus secretion and also higher 'ventilation volume' which all resulted a cumulative aspect of the oxygen in take efficiency and all the reasons

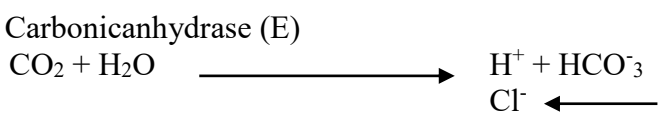
are even coincides of the result of this study. Even Rao *et al*. (2013) in the fish *Oreochromis niloticus* exposed to chlorpyrifos, the present tested toxicant reported in the similar lines of the present study.

Jothinarendran (2012) also reported in the fish *Channa punctata* by using dimethoate another organophosphate as toxicant. The fish were kept in the different concentrations ranging from 0.15 ppm to 0.6 ppm, upto 96 h duration. The initial period consumption rate and later of the exposure is the concentration dependant only, initially elevated and the stability reached at 72 hrs. The 'defection' of the normal gill surface area reduced to extent to such that which can result a decrease in the oxygen diffusion possible. The oxidative, acceleration towards the enhanced metabolism in the initial period that resulted an increase of the uptake of oxygen in the toxic stress. The results of this can also reiterate the results of the present study. Even in the fresh water bivalve mollusk, *Lamellidens corsianus* exposed to an organochlorine, thiodan, which was reported by Kumar *et al.* (2012) and they mentioned that the stress factor as a cause and as a consequence of it the metabolism enhanced to cope the energy demand that finally resulted the variations in the oxygen consumption.

Maria Christiana *et al*. (2010), for many species of fish using Talsar a permethrin synthetic pyrethroid formulation, Chebbi and David (2010) in the fish *Cyprinus carpio* using Quinolphos as the toxicant, Sameer and David 2014 in the same fish and with the same toxicant, Shareena *et al*. (2009) in the fish, *Tilapia mossambica* using Dimetheate as the toxicant, Marigounder *et al*. (2009) using cypermethrin in the fish *Labeo rohita*, Tilak and Swarna Kumari (2009) in the grass carp with an OP compound Nuvan. Vineeth Kumar and David (2008) in the fish Labeo rohita using Malathion, an organophosphate as the toxicant, Tilak and Koteswara Rao (2003) using chlorpyrifos in the three major carps, all, as the cause that reported in their respective studies emphasized only the stress factor resulted changes in the oxygen consumption and used this as a study of the biomarker for assessing the toxicant action. They all, also mentioned mainly the accumulation of the mucus on the gills and the architectural damage of the branchial filaments, the primary and secondary lamellae to be the valid reasons for such variations due to the stress and is same even for the present study also.

Evans (2005 & 1987) provided explained the mechanism of the gas exchange while during respiration. The toxic stress leads to the damage of the gill epithelium and as a consequence the epithelial transport of the ions is also affected. There are cells called chloride cells found in the lamellar epithelium. Their role in the ion transport, the afferent artery brings deoxygenated blood at its place where efferent one also at that same point, normal process takes place if anything happens the diffusion got impaired. There is a branchial epithelium that is sand-witched between serosa land mucosal blood. There are cat-ions $K^+$, Na with $Cl^-$ ions. When $Na^+$ goes out CI ions are more inside and externally $Na^+$ will be more. Positivity in the serosal blood, as-ion in the afferent artery. Later, $CO_2$ when diffused inside with water forms $H^+$ and $HCO_3^-$ after the dissociation of the weak carbonic acid. When $HCO_3^-$ goes out one $Cl^-$ ion gets inside. The osmo-regulatory, acid base and blood dynamic actions if it not affected by the environment pollutants. This can be explained as follows:




ATPase enzymes, Carbonic anhydrase (E) and $Na^+$, $K^+$ ions as in-flux and out-flux will be disturbed. The mechanism of actions is clearly explained in the article reported by Evans (2005 & 1987) and the above diagrammatic representation explains and if it is altered the $O_2$ diffusion is curtailed. Such similar mechanism is in operation even in the present work.

Sana Ullah *et al*. (2019) in their review article reported that the Deltamethrin increased the oxygen intake by reactive oxygen species production and lipid peroxidation in the vital organs and all other antioxidant enzymes had an impact in the fish *Hypothalmicthys moltrix*. They also mentioned that quoting the references of Parlale (2018), inferred that in the fish *Danio rerio* deltamethrin induced the oxidative stress leading to the inhibition

of the enzyme Acetyl cholinesterase (AChE) activity. Apart from the above, also as per the report of Abdul-Daim *et al.* (2015) increased the oxidative stress in the fish *Oreochromis niloticus* due to increase in malondialdehyde (LPO) in the liver, kidney and gills and decrease in the other enzymes such as catalase, superoxide dismutase glutathione peroxidase and glutathione. In the fish, *Sparus aurata* deltamethrin has an effect on metabolism that is disturbed and immune system due to oxidative stress as reported by Guardiola *et al*. (2014) that was also mentioned. Finally, they also added the work of Ensibi *et al*. (2013) in the fish *Cyprinus carpio* that the deltamethrin increased the level of malonodialdehyde level in the pancreas with concomitant increase in glutathione S. transferase, catalase and glutathione reductase. By visualizing all the above the present study of the result also can be inferred for changes in oxygen consumption due to the impact of deltamethrin.

Saumya Biswas *et al*. (2019) in the review article while referring the reports of Jispa *et al*. 2014, Logoswamy and Rewia (2009) and Marigoudar *et al*. (2009), the synthetic pyrethroids of group II has alterations in the oxygen consumption of the fish, *Tilapia mossambica, Tilapia mossambicus* and *Labeo rohita* respectively which were mentioned earlier too. The impact will be more in sublethal concentrations and was delayed and extended effect. Qiuhong *et al*. (2019) referring to deltamethrin toxicity, which was due to oxidative stress referring to all vertebrates of neurotoxic action.

Srinivasa Rao *et al.* (2018) reported in the fish *Ctenopharyngodon idella,* deltamethrin had a severe impact on the oxygen consumption due to the toxic stress and concluded that it was really the sublethal concentrations are lethals.

Balakrishna Naik *et al.* (2018) in the fish *Cyprinus carpio* reported that due to exposure to synthetic pyrethroid of type I permethrin due to architectural damage of the gill that resulted alterations in the oxygen uptake. Similarly, Balquees (2018) too opined of the similar lines of the above working with the permethrin as well as an organophosphate pesticide chlorofete, in the fresh water fishes *Gambusia affjinis, Cyprinus carpio* and *Ctenopharyngodon idella.*

Lenin Suvetha *et al.* (2015) while reporting on the deltamethrin toxicity to the fish *Labeo rohita,* the toxicity effect was due to hormonal and enzymological effects, particularly the cholinesterase that disturbed the oxygen metabolism. Guardiola *et al.* (2014) opined also in the fish *Sparius aurela* L., deltamethrin as a toxicant effected the fish due to oxidative stress.

## CONCLUSION

Oxygen is a parameter of life for its sustenance in living organisms and for the heterotrophs (animals-Fish) was a must for their metabolism. All such anabolism and catabolism reactive activities depend on the purification of the blood via the elimination of the metabolites, including gaseous carbon-dioxide. Gill is the entry point of the toxicant and is again at the same point, the exchange by diffusion of respiratory takes place. The reasons of the alteration of the consumption of the oxygen, at one end can be explained by the architectural damage of the respiring organ apart from the excretory organ, too, and at the other and the biochemical impediments of the blood, due to the failure of which only, not, to have the normal quantity of the oxygen to be carried to all cells/tissues/organs and that can be a good reason to be explained. All is well for the fish but it not, the health condition, disease prone, toxic stress even in sub-lethal concentrations have made them to suffer. It is a study of the biomarker in ecotoxicology and is the indices of the toxic action.

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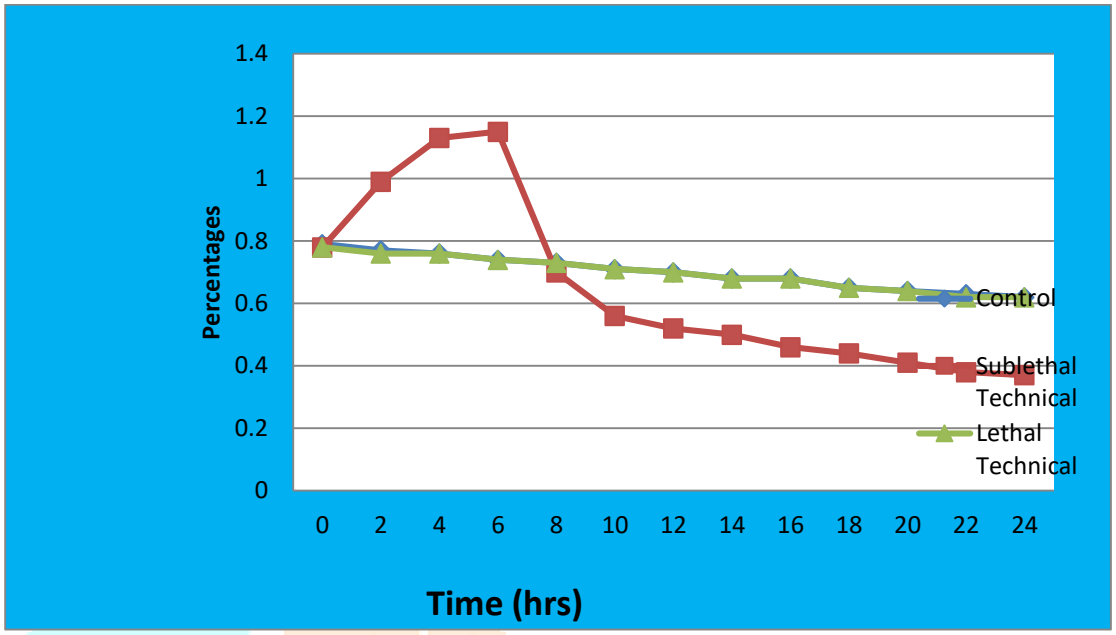
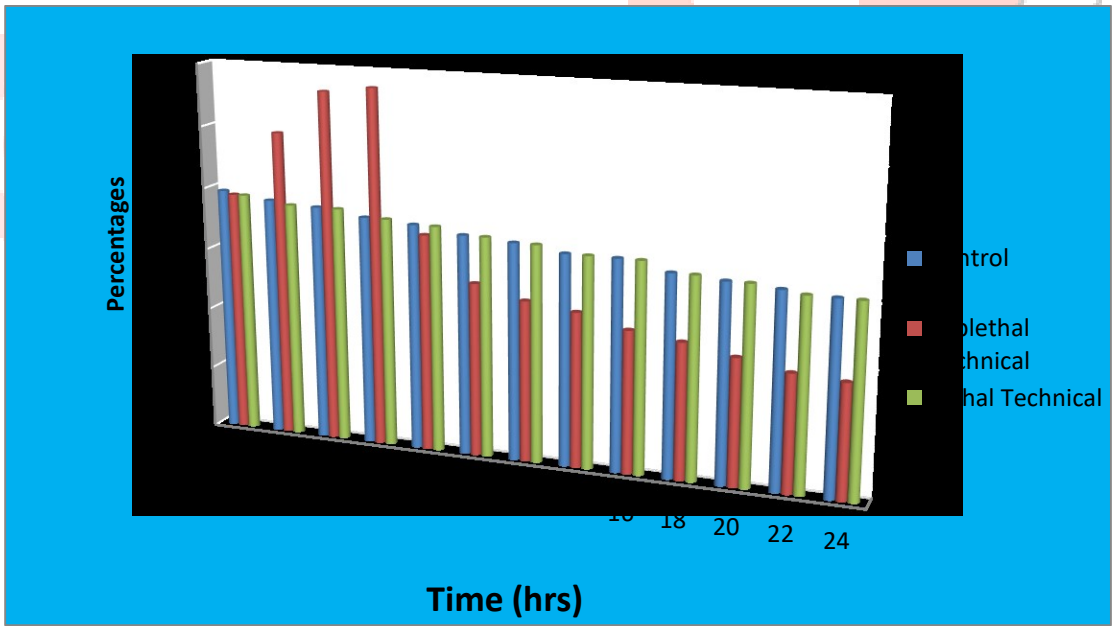
**Graph 1A**

**The Graphical representation (as line) for the amount of oxygen consumed in mg/gr body weight /hr of the fish *Catla catla* exposed to Sublethal and lethal concentrations of Dichlorvos technical grade**



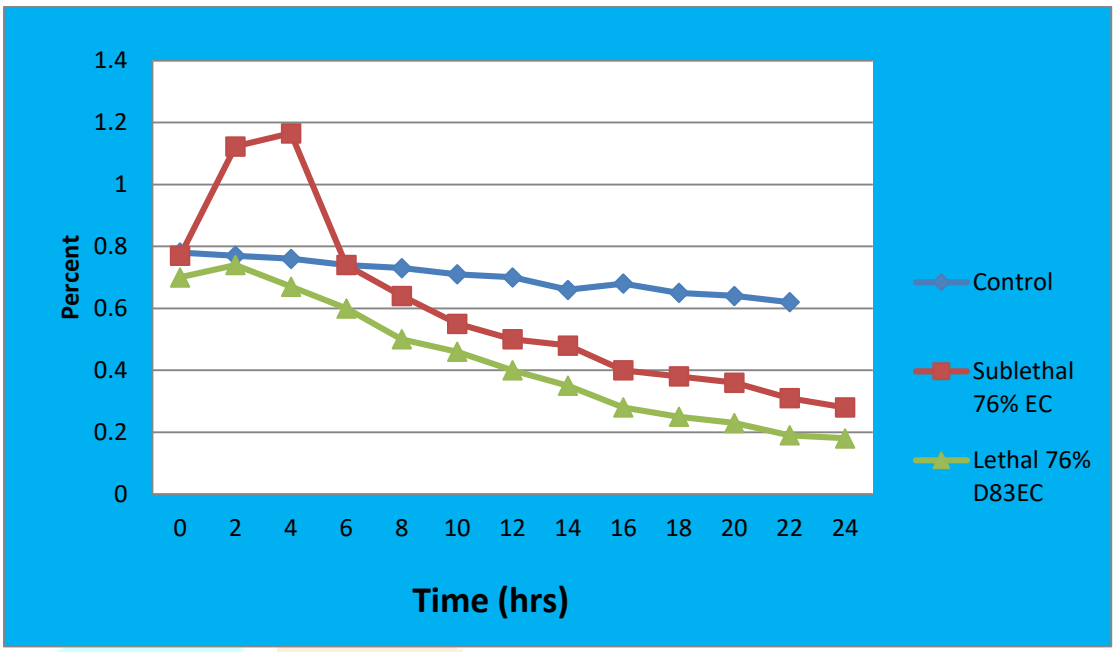

**Graph 1B**

**The Graphical representation (as bar) for the amount of oxygen consumed in mg/gr body weight /hr of the fish *Catla catla* exposed to Sublethal and lethal concentrations of Dichlorvos technical grade**



**Graph 2A**

**The Graphical representation (as bar) for the amount of oxygen consumed in mg/gr body weight /hr of the fish *Catla catla* exposed to Sublethal and lethal concentrations of Dichlorvos 76% EC**




**Graph 2B**

**The Graphical representation (as line) for the amount of oxygen consumed in mg/gr body weight /hr of the fish *Catla catla* exposed to Sublethal and lethal concentrations of Dichlorvos 76% EC**