Impact of Chlorofete Pesticide on Oxygen Consumption in three Freshwater fish .

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Abstract :

The effects of acute toxicity of pesticide on oxygen consumption of Three species of fish were used: *Gambusia affinis*, *Cyprinus carpio L* and *Ctenopharyngodon idella* were determined using Chlorofete pesticide an organophosphate pesticide (active ingredient is Tc 48% Chloropyrfos). Four concentration 0.1, 0.5, 1 and 5 ppm were used with the control sample in experiment oxygen consumption measured after 24 hours , the results of the oxygen consumption showed increase in the rate of oxygen consumption with increased the concentration in all fish and the Common carp was more resistant to oxygen deficiency , compared to grass carp which is the least tolerant and died after 24 hours .

Keywords: chlorofete pesticide ; oxygen consumption ; fish

Introduction

In recent years, the number of pesticides available and the quantity used has considerably increased. The term “pesticide” is used to include insecticides, acaricides, herbicides, fungicides and algicides, indeed any chemical which is used to control an unwanted organism. Pesticides are chemicals which have a specific toxic action to which the pest species is particularly sensitive (Svobodová *et al*.,1993). Initially, chlorinated pesticides have been used to control domestic and agricultural insects, especially DDT, and because they are slow-decomposing pesticides and their residues continue , they have been banned for years and used instead of organophosphate , byrthroids and carbamite pesticides. In the control of insects, but it has a high impact on the non-targeted neighborhoods, especially when used frequently and randomly and uncontrolled led to a lot of environmental problems and the negative impact on living organism, especially aquatic organism Including fish, affecting the vital

functions of fish, which directly affect the nervous system and the respiratory system.

The agricultural, industrial and domestic effluents degrade overall aquatic biota. Respiration is an important phenomenon of the life and rate of oxygen consumption reflect the internal metabolic activities of the animals. In aquatic animals, the respiration plays a major role in controlling the energy transformation in the animals. Therefore, the metabolic responses of organisms due to the changes in the surrounding environment are an indicator of the adjustment capacity of the organism (Kamble and Shinde, 2012) .

It is known that fish breathe dissolved oxygen in water through the gills, which contains the gill filaments that absorbs dissolved oxygen through them, but the presence of pesticides, especially organophosphate pesticide , affect the histological structure and physiological function of these gills such as hyperplasia and necrosis of gill filaments cells and fusion of secondary lamellae (Al Ali , 2001 ; Velmurugan *et al*.,2009 a ; Velmurugan *et al*., 2009; Bhuvaneshwari *et al*, 2015) thus affects the process of oxygen consumption.

(Sahai , 1990 ; Dharmalata and Joshi ,2002) assumed the rate of oxygen consumption controls the metabolic activities and changes in respiratory rates have been used as the indicator of the stress in pollutant exposed organisms.

Lokhande, (2017) reported the rate of oxygen consumption of *Rasbora daniconius* exposed to lethal concentration of dimethoate showed considerable alterations, Oxygen consumption clearly shows that the rate of respiration decreased as concentration of toxicant and time of exposure period increased. They suppose it may be due to toxic stress and due to disturbance of the gills . (Kamble and Shinde, 2012) indicate that the *freshwater lamellibranch mollusc*, *Lamellidens corrianus* revealed variation in rate of oxygen consumption as stress of Thiodan (Endosulfan 35 % EC), they stated that, penetration of pesticides in to the body of bivalves might have affected the gill architecture and could have alter the rate of oxygen consumption.

According to (Mathivanan , 2004) opinion when *Oreochromis mossambicus* exposed to sublethal concentrations of Quinolphenols and he found the rate of oxygen consumption was gradually decreases in all the exposure periods. He explain that toxicants in the environment mainly enter into fish by means of their respiratory system and may be possible that alteration in respiratory metabolism of exposed fishes is due to damage of respiratory organ by pesticide pollutions.

Chlorofete is an Anti-termite Insecticide which is A non-systemic organophosphate insecticide with contact, stomach and respiratory action , It is widely used organophosphate insecticide to control insects that affect crops . it inter into the environment from spraying on crops or from indeusteral and residential sewge.

The study of rate of oxygen consumption can be used as biochemical parameters to assess the effects of pesticide pollutant on the freshwater fishes. The present study was aimed to measure the effect of chlorofete on oxygen consumption in a three species of fresh water fish

Materials and Methods

Chlorofete pesticide is an organophosphate pesticide. The active ingredient is Tc 48% Chloropyrfos was used to determine its effect on the rate of oxygen consumption of pesticide-contaminated water. Three species of fish were used: *Gambusia affinis*, *Cyprinus carpio L* and *Ctenopharyngodon idella* obtained from the fish culture station at the Marine Science Center then transferred to the laboratory and placed in 40-liter aquarium with 10 fish per aquarium, fish acclimatized to laboratory conditions in dechlorinated tap water and The water was renewed every day , the same water was used in the experiment and PH , temperature ,salinity and hardness were calculated .

Fish were fed daily on a commercial diet during the acclimated and Feeding was stopped During the experiment, 1 liter of glass jar was used with three replicates per concentration and one fish per repeater. The concentrations of 0.1, 0.5, 1 and 5 ppm were used with the control sample covering the jars with aluminum foil to prevent air entering and light activity. The oxygen concentration was measured in the initial expermants and after 24 hours to found the difference between oxygen concentration , Oxygen was measured using by modified Winkler‟s method by (Welsh and Smith, 1960) Rate of oxygen consumption were calculated considering net weight of fish. The values for total oxygen consumption were expressed as ml of oxygen consumed and rate of oxygen consumption was expressed as as mL of oxygen consumed per gram of organism per hour (mL/g. hour) (Pitkin , 2000) .

Result and discussion

As aquatic organisms have their outer bodies and important organs such as gills almost entirely exposed to water, the effect of toxicants on the respiration is more pronounced. Pesticides enter into the fish mainly through gills and with the onset of symptoms of poisoning, (Maharajan *et al*., 2013).

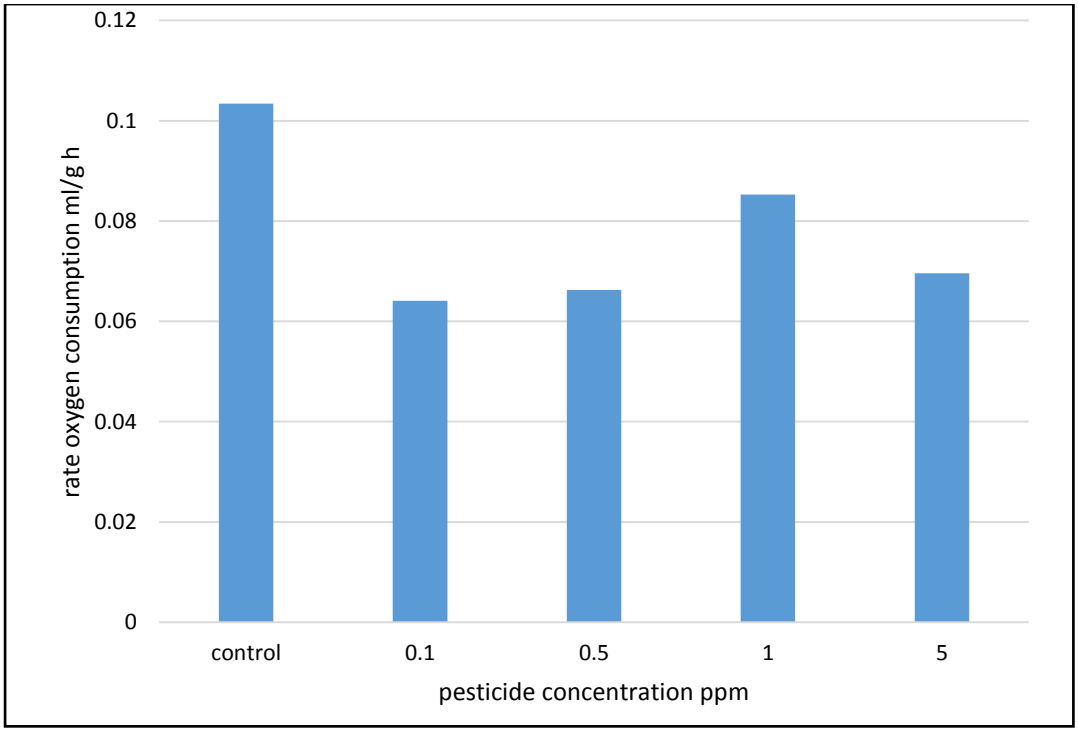
Oxygen consumption used as an index of the metabolic rate and general health of the fish. The early symptoms of pesticide poisoning in any

organism is alteration or failure of respiratory metabolism (Mushigeri and David, 2002 ; Fahmy , 2012 ; Ilavazhahan *et al*., 2017) . in this experiment the effects of pesticide on oxygen consumption of *Gambusia affinis*, *Cyprinus carpio L* and *Ctenopharyngodon idella* determined , the result showed increase oxygen consumption with increase pesticide concentration as in Fig (1,2 and 3).

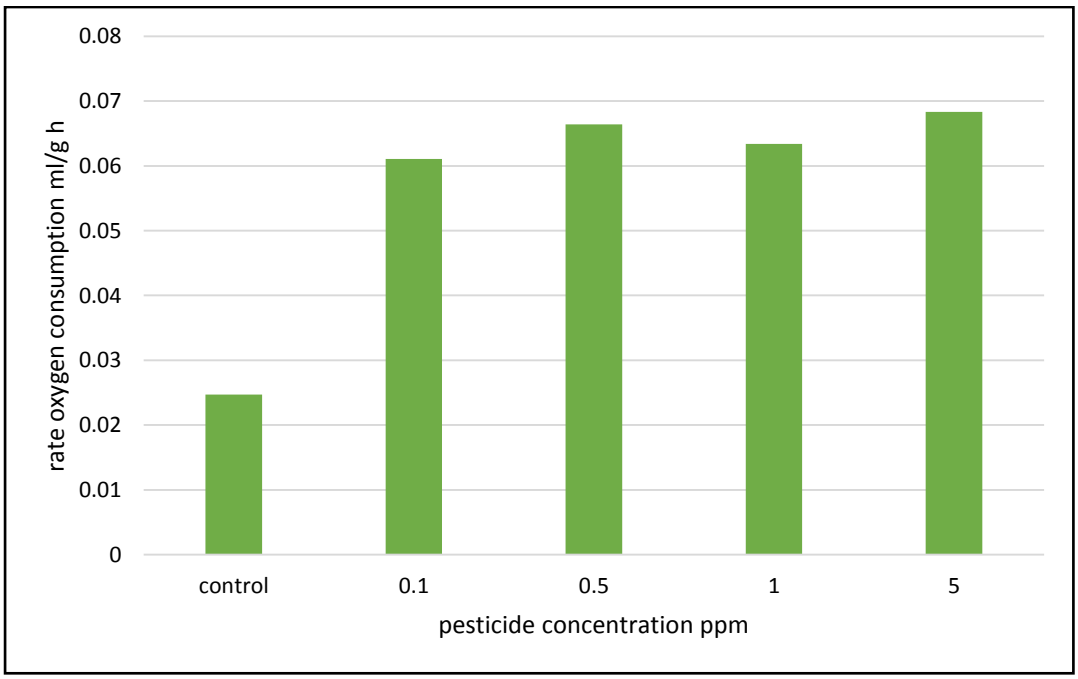
C. idella Were more affected then other fish which is die after 24 h but they less oxygen consumption than *G. affinis* and *C. carpio* Fig (4) , the rate of oxygen consumption increase with increase concentration , (5ppm) concentration showed more oxygen consumption and 1 ppm the less rate , while the control was the least rate of oxygen consumption of *C. idella* compared with other fish (Fig 2 and 3), table 1 .

This is may be to the chlorofete pesticide stress on respiratory system , the chlorofet pesticide induced by gill hesto pathological changes like cell necrosis and fusion of lamella (AlAli,2001) , While the *C. carpio* showed the control was the more rate of oxygen consumption and the concentration of pesticide show decrease in oxygen consumption (Fig 1), table 1 . May be due to the secretion of mucus as a means of defense of the effect of the pesticide, which reduces the consumption of oxygen and this what is found (David *et al*., 2002) when a sign that secretion of mucus over the gill limits the diffusion of oxygen, which may ultimately reduce the oxygen uptake by the animal.

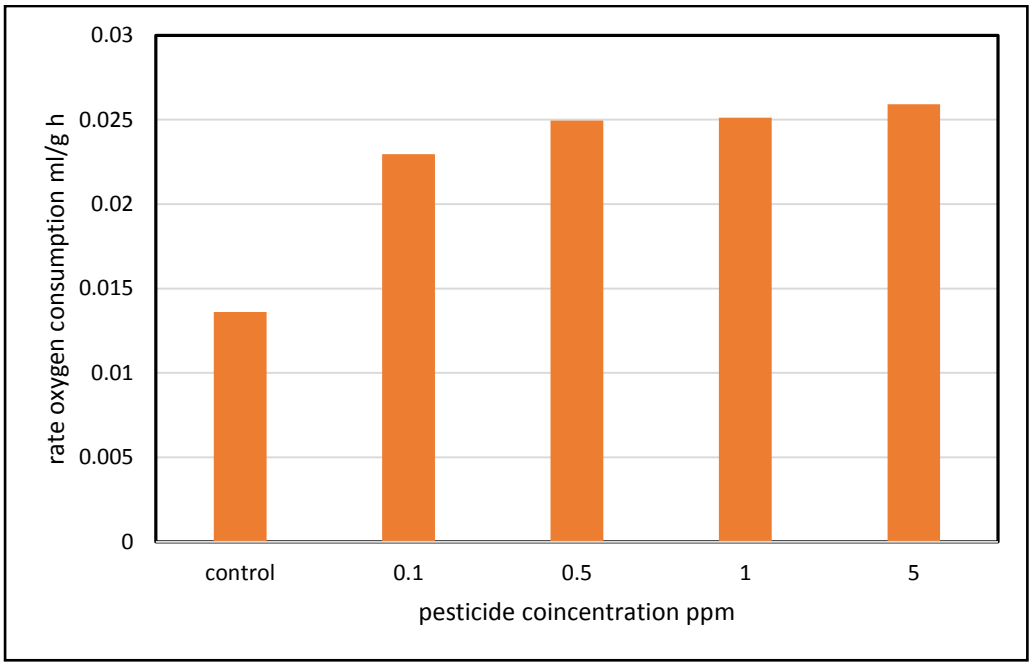
C. carpio showed increase in oxygen consumption when exposed to pesticide (high consumption (0.085 and 0.07 ml/g h) in (1 and 5ppm) respectively compared with the other fish in this experiment (0.068 and 0.026 ml/g h) in 5 ppm in *G. affinis* and *C. idella* respectively.



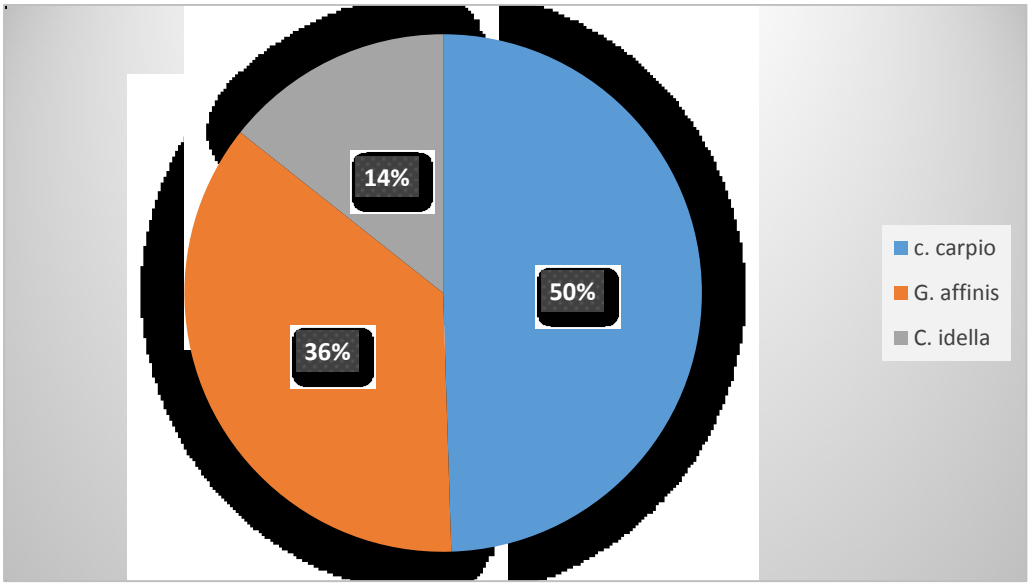
Fig(1) Rate of oxygen consumption ml/g h of *Cyprinus carpio L* exposed to chlorofete pesticide.



Fig(2) Rate of oxygen consumption ml/g h of *Gambusia affinis* exposed to chlorofete pesticide.



Fig(3) Rate of oxygen consumption ml/g h of *Ctenopharyngodon idella* exposed to chlorofete pesticide.



Fig(4) Percentage of the rate of oxygen consumption of the three fish exposed to chlorofete pesticide.

Table (1) Oxygen consumed ml O2 and rate oxygen consumption ml/g h in *C. carpio* , *G. affinis* and *C. idella* exposed to chlorofete pesticide.

	Cyprinus carpio		***Gambusia affinis***		***Ctenopharyngodon idella***	
Con.	**oxygen consumed ml O2**	**rate oxygen consumption n ml/g h**	**oxygen consumed ml O2**	**rate oxygen consumption n ml/g h**	**oxygen consumed ml O2**	**rate oxygen consumption n ml/g h**
control	**6.02**	**0.103**	**2.24**	**0.025**	**1.447**	**0.0136**
0.1	**3.73**	**0.064**	**4.81**	**0.061**	**3.313**	**0.023**
0.5	**3.64**	**0.066**	**3.97**	**0.066**	**3.593**	**0.025**
1	**5.09**	**0.085**	**4.34**	**0.063**	**3.127**	**0.025**
5	**5.32**	**0.07**	**4.11**	**0.068**	**3.127**	**0.026**

Many researchers have demonstrated the effect of pesticides on the respiratory system of fish and the rate of oxygen consumption through the influence of the nervous system controlling the breathing process or through the influence of the respiratory system directly through the effect on the gills (velmurugan, *et al*., 2009 b; Maharajan , *et al*., 2013; Chitra et val., 2012; Patidar *et al*., 2016 ; Deepasree and Rajendran , 2015).

A change in respiratory rate is one of the common physiological responses to toxicant including pesticide and easily detectable through changes in oxygen consumption rate, which used to evaluate the changes in metabolism under pesticide stress (Magar RS and Shaikh , 2012).

Decrease in oxygen up take efficiently was notes in rainbow trout exposed to fenvalerate and cypermetrin by (Bradbury, *et al*., 1986) .

Maheshwari *et al*., (2001) observed effect of triazophos to the fish *Clarius batrachus* and reported that organophosphate was more toxic among other insecticide. While Rao *et al*., 2003) showed reduced oxygen consumption value of fish *Oreochromis mossembicus* when exposed to organophosphorus pesticide chloropyrifos .

Sujatha , (2006) and Patil and David , (2008) reported that the disturbance in oxidative metabolism leads alteration in whole animal oxygen consumption in different species of fish exposed to pesticides. They explain alternative reason for the elevation of oxygen consumption would be due to the internal action of toxicants. Dube and Hosetti , (2010) reported that early warning systems monitor abnormal opercular movement as an indicator of respiratory stress also they Explain the disturbance in oxidative metabolism leads to alteration in completely animal oxygen consumption in different species of fish exposed to pesticides.

Also exposed *Cyprinus carpio* fish to the lethal concentration of quinalphos showed a significant decrease in the whole animal oxygen consumption due to the respiratory distress as a consequence of the impairment of oxidative metabolism (Chebbi and David , 2010).
Jothinarendiran , (2012)found during the study, the rate of oxygen consumption increased in the lower concentration and decreased in the higher concentration of dimethoate of *Channa punctatus* fish . The data of (Fahmy, 2012) shows that the rate of oxygen consumption was declined during all the exposure periods of malation on fish (*Oreochromis niloticus*). Magar and Shaikh ,(2012) study the effect of malathion on respiratory metabolism of *Channa punctatus*. The result showed significant decrease in oxygen consumption and rate of oxygen consumption.
Maharajan *et al*., (2013) showed that the treatment of *Catla catla* with profenofos lead to significant decrease in oxygen consumption as compared to control with the time of exposure. They found profenofos resulted in several alterations in the histo-architecture of the gills of. The alterations included curved secondary gill filaments, necrosis of gill filaments and conjestion of Secondary Lamellae. While Patidar *et al*., (2016) observe an initial increase in the oxygen consumption was observed in low sub lethal concentrations of Parathion on The teleost fish *Tilapia mossambicus* at the first day but a sharp decrease in oxygen consumption was observed in all sub lethal concentrations during time of exposure. and explain that Initially the fish were in more stress during first hour and later they shown signs of recovery . Ilavazhahan *et al*., (2017) found changes in the oxygen consumption was noticed with increasing exposure time of *Labeo rohita fish* to the toxicant

Conclusion

the present study is set about using chlorofete pesticide (an organophosphate pesticide with active ingredient is Tc 48% Chloropyrfos was used to determine its effect on the rate of oxygen consumption of pesticide-contaminated water. Three species of fish were used: *G. affinis*, *C. carpio L* and *C. idella* the result show the rate of oxygen consumption effected by presence of pesticide and the consumption increase with increase concentration in *G. affinis* and *C. idella* compared with *C. carpio* which may be to gill damage.

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تأثير مبيد الكلوروفيت على استهلاك الأكسجين في ثلاثة من أسماك المياه العذبة.

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الخلاصة :

درست تأثيرات السمية الحادة للمبيدات على استهلاك الأكسجين لثلاثة أنواع من الأسماك: *Gambusia affinis* ، *Cyprinus carpio L* و *Ctenopharyngodon idella* باستخدام مبيد الكلوروفيت وهو مبيد فسفوري عضوي (المادة الفعالة هي TC 48٪ كلوروبيرفوس). تم استخدام أربعة تركيز 0.1 و 0.5 و 1 و 5 جزء في المليون مع عينة السيطرة في تجربة معدل استهلاك الأكسجين والذي قيس بعد 24 ساعة، وأظهرت نتائج استهلاك الأكسجين زيادة في معدل استهلاك الأكسجين مع زيادة التركيز في جميع الأسماك وكان الكارب الشائع *C. carpio L* أكثر مقاومة لنقص الأكسجين، بالمقارنة مع الكارب العشبي *C. idella* الذي هو الأقل تحملا اذ ماتت الاسماك بعد 24 ساعة .