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# Pesticidal Influence on the Respiratory Metabolism of Fresh Water Male Crab, Barytelphusa guerini

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**Abstract:** The present observation was undertaken to study the influence of pesticide (Acephate and Sumidon, on the respiratory metabolism of fresh water male crab, *Barytelphusa guerini*. The animals were collected from paddy fields of Nanded district. They were brought to the laboratory and acclimated for 8- 10 days. The selected animals were subjected to sub-lethal concentration on pesticide Sumidon (1.2 ppm) and Acephate (3.5 ppm). The effect of Sumidon and Acephate on, the oxygen consumption of fresh water male crab was studied. The animals were subjected to sub-lethal concentration of Sumidon and Acephate at 0, 24, 48, 7, 96 and 120 hours after regular intervals. The results were Plotted and discussed in details.

**Key Words:** *Barytelphusa guerini*, Acephate, Sumidon, Oxygen Consumption.

## I. INTRODUCTION

The studies of impact of pesticides, organic and inorganic matter on aquatic animals are the important aspects of chemical contamination of environment. Many chemical pesticides such as organochlorine, carbamate, organophosphate, fungicides, herbicides etc. are useful in agriculture and equally important against pest that causes diseases of animals and human beings. The Sumidon and Acephate are biologically active; they are extensively used in plant protection, operations on account of their less persistence in the environment their excessive use produces more hazards to the aquatic animals. The problem associated with presence Sumidon and Acephate stability; they are extremely persistent and widely distributed in the environment. These pesticides pose a critical stress on the aquatic biota, like crabs.

As concern to the crustaceans, crabs are economically important as they are used as a food source of man and it fulfills the human need to some extent in our country. But since last decade, their natural environment is being disturbed due to the pollution. The increasing population density, faster urbanization and industrial growth have increased the complexity of pollution and causes deterioration of environment. The study of the impact of pesticides on aquatic animals is an important aspect of chemical contamination of the aquatic environment. Now a day's many pesticides have been extensively used and are utilized in agricultural operation. These pesticides have various physiological effects such as enzyme Inhibition, inhibitory effects on growth, food intake, metabolism and general development of animal (Tungare and Sawant, 2000).

Respiration is an endless oxidative process in a living animal resulting in consumption of $O_2$ and production of $CO_2$. Therefore the calculation of rate of oxygen consumed especially with reference to energy utilization by crabs focuses the physiological mechanism in animals. The objectives of the present study are to evaluate with the treatment of two pesticides i.e. Sumidon and Acephate on the rate of oxygen consumption on freshwater crabs i.e. *Barytelphusa guerini*.

## II. LITERATURE SURVEY

The respiratory activities in animals were studied by Baby and Menon, 1986 on exposure to pollutant on the fresh water bivalve, *Perna indica*. The compensatory mechanism i.e respiration under influence of toxic stress was studied by Mali et. al, 2009 on fresh water crab, *Barytelphusa guerini*. Similar results were obtained by the Vutukur, 2005 on exposure to aquatic animals. The effects of pollutants on the respiratory activity were studied by Prashanth et al., 2003. Ambore,

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(1976) studied the respiratory metabolism under influence of toxic stress on aquatic animal i.e. fresh water crab, *Barytelphusa guerini* with special reference to sex and size. The effect of pesticides on various physiological activities such as enzyme inhibition, inhibitory effects on growth, food intake, metabolism and general development of animal were studied by Tungare and Sawant, 2000.

## III. MATERIALS AND METHODS

The animals used for experimentation were the fresh water crab, *Barytelphusa guerini*. The species is available abundantly in the paddy fields of Nanded district, Maharashtra. The crabs were maintained in the glass aquarium jars, fed with goat meat and acclimatized to the laboratory conditions. The freshwater male crabs, *Barytelphysa guerini* were subjected to one sub-lethal concentration of 1.2 ppm of Sumidon and sub-lethal concentration of 3.5 ppm of Acephate up to 120 hours period of exposure. Only healthy crabs were selected for the present study (Ambore, 1976).

**Estimation and measurement of rate of oxygen consumption:**

The respiratory metabolism was studied by modified "Winkler's Method" (Welsh and Smith, 1959). The set up designed by Saroja (1959) was used to estimate the rate of oxygen consumption. The animals were subjected to organophosphate pesticides such as Sumidon and Acephate and the rate of oxygen consumption was estimated at 0, 24, 48, 72, 96 and 120 hr. A black coloured glass bottle with Inlet and outlet was used as the respiratory chamber and after taking necessary precautions a medium sized crab was introduced in to the air tight respiratory chamber. The initial and final sample of water for estimation of DO was drawn after specific time intervals. The obtained results were expressed as ml/hr/lit/gm wet weight of crab.

The changes were observed in respiratory metabolism of freshwater crabs, Barytelphusa guerini exposed to Sumidon and Acephate were compared and discussed in results and discussion.

## IV. RESULTS AND DISCUSSION

The present investigation reveals the effect of two organophosphate pesticides on respiratory metabolism in fresh water male crab, *Barytelphusa guerini.* The two pesticides viz. Sumidon and Acephate were used to study the effect on the rate of oxygen consumption in animals. The obtained results are plotted in the observation table and graphical manner.

The fresh water male crabs, exposed to pesticide i.e. Sumidon showed the changes in the rate of oxygen consumption. The rate of oxygen consumption in fresh water crab, *Barytelphusa guerini* up to the 120 hours period of exposure was found to be increased. The values obtained for 24, 48, 72, 96 and 120 period of exposure were found to be 0.060, 0.055, 0.059, 0.068 and 0.070 ml/gm/lit/gm wet weight of the body. Initially the rate of oxygen consumption was found to be increased till 48 hours to 72 hours later on there was slight increase in the rate of oxygen consumption and it increased up to 120 hours.

The treatment of Acephate leads to increase in the consumption rate of oxygen by fresh water male crab, *Barytelphusa guerini*. The rate of oxygen consumption was found to be inclined initially up to 72 hours and then decline in the rate of oxygen consumption was recorded from 96 hours up to 120 hours. The values obtained for 24, 48, 72, 96 and 120 period of exposure were found to be 0.025, 0.030, 0.040, 0.035 and 0.020 ml/gm/lit/gm wet weight of the body.

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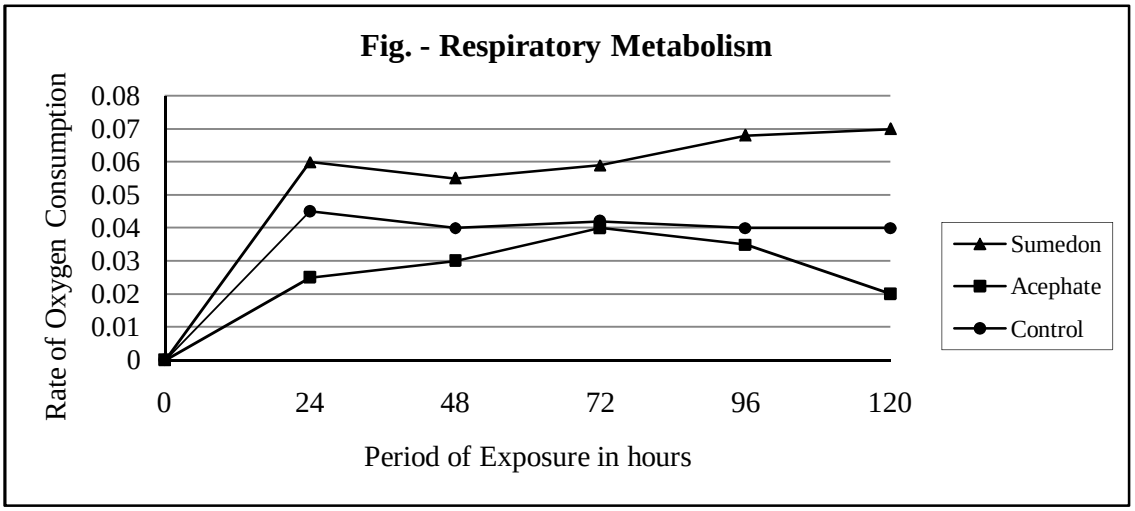
**Table - Rate of oxygen consumption by crab, *Barytelphusa guerini* exposed to Sumidon and Acephate.**

| Sr. No. | Period of Exposure (hours) | Rate of oxygen consumption (ml/lit/hr/gm wet weight of crab) | | |
|---|---|---|---|---|
| | | Sumidon | Acephate | Control |
| 1 | 0 | -- | -- | -- |
| 2 | 24 | 0.060 | 0.025 | 0.045 |
| 3 | 48 | 0.055 | 0.030 | 0.040 |
| 4 | 72 | 0.059 | 0.040 | 0.042 |
| 5 | 96 | 0.068 | 0.035 | 0.040 |
| 6 | 120 | 0.070 | 0.020 | 0.040 |

The obtained data were compared and showed in the form of graph. The graph plotted in the present study for toxicity of commonly used organophosphate pesticides i.e. Sumidon and Acephate on the fresh water crab, *Barytelphusa guerini* which is important in the aquatic ecosystem. The graph showed the respiratory metabolism in crab (Rate of oxygen consumption versus exposure period in hours) to evaluate the toxic impact of pesticides on the eco-bio-system.

**Graph- Effect of pesticides on the respiratory metabolism in freshwater male crab, *Barytelphusa guerini***




Respiration is an important physiological activity in all living organisms. The oxygen is necessary to provide energy to carry out metabolic activities. The change in rate of oxygen consumption is a good index of the metabolic capacity of an organism to face environmental stresses. The present investigation reveals pesticides exert effects on rate of oxygen consumption. The changes found in the normal respiratory metabolism is due to it's intimate contact with polluted water which decrease the oxygen diffusing capacity of the gills. The pollutants act as a respiratory depressant in brown mussel, *Perna indica*. The mortality rate of animals in toxic media is attributed to the asphyxiation which ultimately leads to the failure of respiratory metabolism, which may be caused centrally in the brain through respiratory surface (Baby and Menon, 1986).

The changes in rate of oxygen consumption of fresh water male crab, on exposure to pollutant showed decrease in oxygen consumption on exposure to Acephate and it is evident and in agreement with earlier obtained results of the

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workers in different aquatic animals which exhibit enhancement or decrease in oxygen consumption of exposed animals and showed variable result in the same animal. The decline in the rate of oxygen consumption under pesticidal stress may be due to penetration of the toxicant at sub-cellular levels and damage of gill tissue, thereby failure of an alternative compensatory mechanism to achieve energy generation for combating toxic stress (Mali et. al, 2009).

Thus, from above results it was clear that various pollutants affect the life of aquatic animals directly or indirectly. Freshwater animals are highly vulnerable to pollution (Vutukur, 2005). The decreased rate of oxygen consumption when exposed to Acephate is due to depletion of dissolved oxygen content of water and increase in BOD. The decrement may be due to the respiratory distress as a consequence of the impairment of oxidative metabolism (Prashanth et al., 2003).

## REFERENCES

1. **Ambore, N. E. (1976):** Studies on some aspects of physiology in fresh water crab, Barytelphusa guerini with special reference to sex and size. Ph. D. Thesis submitted to Marathwada University, Aurangabad.
2. **Baby K. V. and N. R. Menon (1986):** Oxygen uptake in brown mussel P. Indica under sublethal stress of mercury, cadmium and Zinc.Indian. J. Mar. Sci 15 (2) 127 –130
3. **Mali, R. P., Jagtap, A. R., Kothole, S. D. and Shaikh Afsar (2009):** Effect of zinc sulphaton oxygen consumption and heart beat in the freshwater female crab Barytelphusa guetini. J. Aqua. Biol,, Vol. 24 (1) :139 - 144.
4. **Prashant, M S, M David and Riveendra C Kuri (2003):** Effect of cypermethrin on toxixity and oxygen consumption in the freshwater fish, Cirrhinus mrigala. J. Ecotoxicology. Envron.Monit., 13 (4) : 271-277.
5. **Saroja, K. (1959):** Studies on oxygen consumption in tropical poikilotherms Oxygen consumption in relation to body size and temp. in the earthworm, Megascolex mautithi when kept in water. Proc. India Acad. Sci. (B) : 49, 183-193.
6. **Tungare, S. M. and A. D. Sawant (2000):** Physiological effects of heavy metals on prawns. International conference on Probing in biological system in Mumbai Feb. 2000 pp. 139.
7. **Vutukur, S. S. (2005):** Acute effects of Hexavalent Chromium on Survival, Oxygen Consumption, Hematological Parameters and Some biochemical profiles of the Indian Major Carp, Labeo rohita. Int. J. Environ.,. Res. Public Health. Vol. 2 (3), 456-462
8. **Welsh J. H. and R. I. Smith (1959**): The laboratory exercise in invertebrate physiology Minneapolis, Burgess, Publication Company.