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# Heart Beat Rate of Fresh Water Crab Barytelphusa Guerini Exposed in Organochloride Pesticide: Endosulfan

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***Abstract*: As the use of pesticides reached massive proportion, a darker side of these toxic chemicals revealed itself. Carried by natural forces such as wind, rain and the flow of rivers and ocean currents, residues of organochlorines being to appear everywhere on the globe, from tropical forests to Antarctic snows. Worse still, the slowly decomposing chemicals were talking their toll among many non–target fish and wildlife species. It becomes clear from the residue found in the bodies of dead or dying birds, that pesticides were directly responsible for their deaths. The direct kills were very stunning and at the gradual build-up of organochlorines in fish and wildlife tissues was another unforeseen consequence that posed an even greater long–term threat. Organochlorines residues persist in the environment for years after their application has ceased. Because of their stability, as well as other chemical properties, they accumulate at high concentration in the bodies of animals at the top of some ecological food chains. Present research paper pointing out the effect of Endosulfan on Hear beat of fresh water crab Barytelphusa guerini by analyzing statically data with graphically.**

***Keywords*: Heart Beat, Fresh water Crab, Barytelphusa guerini, Endosulfan.**

## 1. Introduction

The birth of pesticide era in the late 1940's was hailed as major breakthrough for mankind. The chemicals provide potent in the war against vectors of disease and pests of crops, forests and rangeland. These ling lasting poisons which belong to a group of chemicals called organochlorine compounds were successful weapons against mosquitoes, grasshoppers, weevils and other harmful insects. It was beloved that organochlorines would stop pests in their tracks, eradicating diseases and saving the products of forestry and agriculture for human consumption. This led to a progressive increase in the use of the compounds. Too much attention has been paid by workers towards the study of rate of heart beat on physiology of crab. The available literature on the rate heartbeat in crustaceans suggest that the heart ratio is influenced by a number of factor like temperature, light, blood composition, respiration, nutritional status; population density, carbon dioxide and oxygen content of medium, pH, body size etc. (Maynard, 1960; Lockwood, 1968; Prosser, 1973; Padmnabhan Naidu, 1966; Ambore, 1976; Florey and Kriebel, 1974; Toylor, Butler and Sherluk, 1973). Among all above cited factors, body size plays an important role and influences the rate of heart beat. Generally, heart rate varies with inversely proportional to the size of body. As per the rule, the rate of heart beat is faster in smaller animals and slower in larger animals of a species (Maynard, 1960; Lockwood, 1968; Prosser, 1973).

The animals required food & oxygen continuously for energy and to perform various metabolic activities. Thus digested food and oxygen should be transported to all the cells. This function is carried out with the help of body fluids. The arthropods possess the open type of circulatory system, which is presumably derived from the highly organized closed system of their annelids or pre-annelids ancestors. In most of the crustaceans the heart is dorsally placed inside the body. The blood fills up to the main body cavity. Which does not correspond to a primitive coelomic space but to sinuses of cavities burrowed within the body tissues. Thus tissues are in direct contact with blood. In these animals the system of cavities should be considered as a haemocoel and the blood which fulfils the characters of a circulatory fluid and those of inertial lymph should be caused haemolymph. The pigment haemocyanin is found in the blood of most crustaceans hence it has light blue colour.

## 2. Material and Method

*1) Experimental Animal*

The freshwater female field crab Barytelphusa guerini was used as the experimental non–target species model in the present investigation.

*2) Procurement and Maintenance of the Test Species*

Barytelphusa guerini is an edible freshwater crab normally inhibiting the paddy fields of Nanded District. It makes burrow in soft mud along the edges of the paddy field. It lives in burrows which are partially field with water. These animals can survive longer period on land but they do not inhabit brackish or saline water. They carnivores, feeding on worms, insects etc. and are also cannibals, feeding on younger crabs. Crab was collected from paddy field & in and around Nanded district. They were brought to the laboratory and maintained in large glass aquarium containing tap water. They were exposed to

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natural day–night cycles. The temp. Of water 20±⁻1°C in winter and 31±⁻1°C summer.

*3) Method of Heart Rate:*

- The crabs, Barytelphusa guerini, are a freshwater crab collected from the paddy fields of Nanded District.
- The rate of heart beat was noted after exposure interval of hours, 24h, 48, 72 and 96h. The method used as follows:
- The dissected animal body of exposed heart was kept in crab ringer solution to determine the rate of heart beat. The crab ringer contains all the essential components somewhat similar to that of crab haemolymph.
- Crab Ringer Composition:
  Sodium sulphate: 1.5261 gm
  Sodium phosphate: 0.0358 gm
  Sodium chloride: 16.1000 gm
  Potassium chloride: 0.4162 gm
  Magnesium chloride: 0.0804 gm
  Glucose: 0.6000 gm
  Distilled Water: 1000 ml
- Preparation of ringer solution was prepared by using annual grade reagent and the pH was to 7.7 with the help of pH 7.7 tribuffer. The glucose was added to the crab ringer solution just before the use (Posser, 1973). If the ringer is stored in refrigerator, could be used upto 15 days. It is the best quality composition in which the heart maintained a constant beat for 1 to 2 hours.
- The animals were collected from their natural habitat and acclimatized. Healthy female crabs weighing between 30–50 gm were selected for experimentation to avoid the effect of size and sex (Ambore N.E., 1976; Rajendra Prasad. K. et al., 1985).
- The heart beat was seen visually. Then the dissected animals were subjected to finger bowl filled with crab ringer and maintained 5 minute to allow the animal to recover from shock affect. The heart beat was noted and time taken 10 min. for each trials. The heart beat was determined in control exposure of chemical like Endosulfan.

## 3. Result and Observation

*1) Observation*

Effect of Endosulfan on Heart Rate Beats in Freshwater Female Crab Barytelphusa guerinin Effect of Endosulfan causes changes in Heart Beats. Heart Beats expressed in Beats/min. is the average of six observations ± S.D.

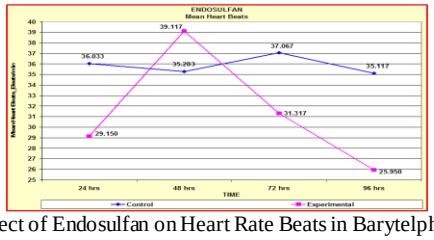


Fig. 1. Effect of Endosulfan on Heart Rate Beats in Barytelphusa guerini

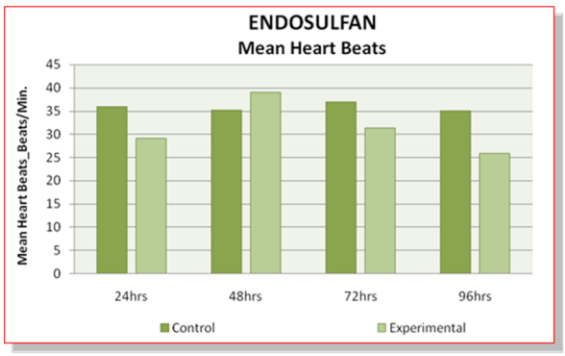


Fig. 2. Effect of Endosulfan on Heart Rate Beats in Barytelphusa guerini

Table 1
Effect of Endosulfan on Heart Rate Beats in female crab Barytelphusa guerini

| S. No. | Duration of Exposure | Control | Experimental |
|---|---|---|---|
| 1 | 24 | 36.03 ± 0.225 | 29.15 ± 0.468** |
| 2 | 48 | 35.28 ± 0.286 | 39.11 ± 0.325*** |
| 3 | 72 | 37.06 ± 0.197 | 31.31 ± 0.223*** |
| 4 | 96 | 35.11 ± 0.183 | 25.95 ± 0.152*** |

## 4. Result

- In present investigation when freshwater female crab, Barytelphusa guerini were exposed to t pesticide such as endosulfan. A significant change in heart rate was noticed. The results of experiments conducted are presented in Table and graphical representation for pesticide illustrated in Figure respectively.
- When crabs exposed to lethal concentration of endosulfan, a significant decrease in rate of heart beat was observed at 24 hours. From 24 hours it increases upto 48 hours then significant decrease was observed at 72 hours & it slow down at 96 hours.
- In endosulfan solution, the heart beat was accelerated at 48 hours & 72 hours simultaneously. Increase in heart rate due to increase in metabolic activity of heart at cellular level and nervous level because of shock of toxicant & stress on normal physiology of circulation. But later on it gradually recovers, after the end of exposure the heart rate tends to normal.

*1) Discussion*

The Crustacean possesses an open type of circulatory system and the haemolymph flows in the blood sinuses. A dorsally situated heart is present in most crustaceans. Though a true heart is lacking in cirripedes and many copepods and ostracodes (Lockwood, 1968). The brachyran heart is rhomboidal in shape and helps in circulating the haemolymph in the body with the help of its rhythmic beating (Lock Wood, 1968). Haemolymph contains haemocyanin, which is oxygen binding site in blood. It is known, that the frequencies of crustacean's heart rate differ under different environmental conditions. It varies not only dismal rhythm, but also lie to temperature, hydrogen ion concentration, toxicants, sex and size. Hence recording time of observations and other factors were also taken into

consideration and kept constant. Thus any environmental factor that alters the process of oxygen uptake can be expected to affect circulation. Of courses it is not exclude the possibility of some chemical acting directly on the heart and blood vessels. The rate of heart beat frequency has been studied in different crustanceans with conclusive report that alteration in heart rate occurs with change in environmental conditions, temperature, pH, salinity of water (Larimer, 1962; Larimer & Tindel, 1966; Florely & Kriebel, 1974; Hill and Koopowitz, 1975; Hume and Belied, 1976; McGraw and McMahon, 1986). The activity of heavy metals, pesticides and some other chemical pollutants is stress on the non-target organisms, which causes alteration in their normal physiology and also anatomy. Because of such metallic stress, it acts the normal cardiac physiology of all aquatic animals. The terminology in the physiology of stress has been confusing because some refer to so as the cause of responses such as thermal stress. Other workers call the responses themselves stress i.e. the animal is showing physiological stress and the causes become known as stressors. Any change to come over the stress needs energy, generally different sources of energy metabolism are aquatinted by the organism to encounter the stress. The metabolic cycle involved that are responsible for the production of energy, which undergo a drastic change such a change can determine whether the animal develops the necessary potential to counteract the stress.

## 5. Conclusion

- The pesticide pollutants play important role on the aquatic biota including fishes and crustaceans like crabs. The animals were exposed to sub lethal concentration of pesticide pollutants and effect of Endosulfan on heart beat was studied in Freshwater female crab Barytelphusa guerini. As compaired with control, the heart rate was initially decreased on exposure to Endosulfan.
- The crabs exposed to sublethal concentration of Endosulfan showed decrease at 24 hours, increase at 48 hours, decrease at 72 hours and decline at 96 hours.
- It concluded that heartbeat of crabs increases and decreases depending upon the specific type of toxicant and time.

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