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# Pesticides induces alterations in protein content of fresh water male crab, *Barytelphusa guerini* (h. Milne - edwards), from Godavari basin, Nanded, Maharashtra

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## ABSTRACT

With rapid industrialization and increase in human population, the pollution of water bodies has become a universal phenomenon in present day. Out of various sources of water pollution; the enormous use of pesticides pollutes the river and major water sources. The aquatic biota present in these sources faces the problem of aquatic pollution. The present research work focuses the attention on the effect of pesticides i.e. Sumidon and Acephate on freshwater male crab, *Barytelphusa guerini* from Godavari River, Nanded have been studied. The crab in polluted water exhibited significant decline in the total protein content in hepatopancreas compared to control values. The obtained results were expressed in terms of tables and graphs. The significance of these changes is discussed in the content of homeostatic phenomenon.

**Key Words:** Total Protein, Sumidon, Acephate, *Barytelphusa guerini*

## INTRODUCTION

All organisms maintain their internal milieu more or less constant by making use of a variety of regulatory mechanisms. The unbalanced ecosystem problem reveals the environmental threats in developing world. The environmental contamination by pesticides has been documented in both biotic and abiotic components. The increase in level of pollutants in the environment causes the assimilatory capacity of these regulatory mechanisms. This leads to biochemical changes and finally results in death of organisms. The causes of pollution are many of which the random use of different pesticides often causes lot of damage on non-target organism. The pesticide causes various problems affecting to the ecosystem. It causes effects on growth of aquatic organism and physiological changes in body of aquatic animals (Holbrook, 1980).

The organophosphate pesticides constitute a large proportion of the total synthetic chemicals employed for the control of pests in the field of agriculture, veterinary practices and public health. The enormous use of pesticides causes pollution of the environment which has become an increasing problem over last century with the development of industry, agriculture and increase in population. The use of organophosphrous compounds is because of

their rapid biodegrability and non persistent nature (Bhatnagar et.al., 1992; Thakur, 2013).

The aquatic organisms that run through agricultural areas have high probability of being contaminated by runoff and ground water leaching by a variety of chemicals. The use of pesticides which on entering the aquatic environment bring multiple changes in organism by changing their nutritional value, growth of organisms, behavioral pattern etc. (Tripathi et. al, 2002).

Protein being an importance constituent of animal tissues, has a main role in cell metabolism. The use of pesticides causes the effect on the protein contents in animals. Therefore to elucidate this biological problem the effect of organophosprous pesticides i.e. Sumidon and Acephate on the total Protein Content in tissues of fresh water crustacean, Barytelphusa guerini were investigated. The present work was undertaken to point out the inter-relationship of total protein content due to stress of pesticides in *Barytelphusa guerini*. The parameter was studied in details and showed highly sensitive response to pesticide stress. Therefore the assessment of protein can be considered as a diagnostic tool to determine physical phases of organism.

## RESULTS

The freshwater male crab, *Barytelphusa guerini* used for experimentation. The species is available abundantly in the paddy fields of Nanded, 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* (weighing between 35 to 50 gms) were subjected to one sub-lethal concentrations of 1.2 ppm of Sumidon and 3.5 ppm of Acephate. The animals were exposed for 0, 24, 48, 72 and 96 hrs period of exposure. Only healthy crabs were selected for the present study (Ambore, 1976).

The protein contents were estimated in the hepatopancreas of fresh water crab, *Barytelphusa guerini*. The estimation of protein content was done by the method of Lowry et.al, (1956) using crystalline bovine serum albumin (BSA) as the standard. The values were calculated from standard graph of protein. The same procedure was repeated for six readings under each observation. The values for total protein content in crab, *Barytelphusa guerini*. The obtained results were compared with the animals maintained in the control set. The obtained values are plotted in graph and discussed in detail.

The total protein content is expressed as mg/gm wet wt. of tissue.

The freshwater crab, *Barytelphusa guerini* exposed to sub-lethal concentration of Sumidon and Acephate as a toxicant showed remarkable changes in protein contents in hepatopancreas. The values obtained for protein content under Sumidon stress at 24 hrs, 48 hrs, 72 hrs and 96 hrs period of exposure were found to be 22.96, 20.72, 19.87 and 12.14 mg/gm wet wt. of tissue

**Table-1. Effect of Pesticides i.e Sumidon and Acephate on Total Protein Content of Fresh Water Male Crab, *Barytelphusa guerini* for 24, 48, 72 & 96 hours period of exposure**.

| Sr. No | Exposure Period | Total Protein Content (mg/gm wet wt of tissue) (Control Set) | Total Protein Content (mg/gm wet wt of tissue) (Sumidon) | Total Protein Content (mg/gm wet wt of tissue) (Acephate) |
|---|---|---|---|---|
| 1 | 24 hrs | 23.72 ± 0.35 | 22.96 ± 0.74 | 21.96 ± 0.24 |
| | 48 hrs | 23.32 ± 0.36 | 20.72 ± 0.16 | 18.22 ± 0.36 |
| | 72 hrs | 23.20 ± 0.24 | 19.87 ± 0.45 | 16.74 ± 0.24 |
| | 96 hrs | 24.14 ± 0.54 | 12.14 ± 0.15 | 10.14 ± 0.18 |

*(Each Value is Mean of Five Observations ± S. D.)*

**Graph-1: Effect of Pesticides i.e Sumidon and Acephate on Total Protein Content in Hepatopancreas of Fresh Water Male Crab, *Barytelphusa guerini* for 24, 48, 72 & 96 hours period of exposure**

Respectively (Table-1). The protein contents in hepatopancreas of fresh water crab, *Barytelphusa guerini* was found to be suddenly decreased up to 96 hrs period of exposure as compared to control set. The values obtained for total protein content in hepatopancreas of freshwater crab, Barytelphusa guerini in control set were found to be 23.72, 23.32, 23.20 and 24.14 mg/gm wet wt. of tissue for 24, 48, 72 & 96 hours period of exposure respectively.

The amount of total protein contents in fresh water crab, Barytelphusa guerini exposed to under Acephate stress were found to be 21.96, 18.22, 16.74 and 10.14 mg/gm wet wt. of tissue for 24, 48, 72 & 96 hours period of exposure respectively (Graph-1). The obtained values were compared with control set values and the decreasing trend was observed up to 96 period of exposure.

## DISCUSSION

Proteins are "building blocks of life" found everywhere in an organism. They are of vital importance to the survival of living things, are produced without any defects organization in the cell. They constitute a large part of the structure of cells and are present in all tissues. They are composed from chain of amino acids and are vital components of every cell in the living organism. Proteins play an important role in physiological functions like structural components of cell membranes enzymes, proteins in blood (plasma proteins and hemoglobin), hormones, nucleoproteins and antibodies (Albert Lehninger *et al.*).

The pollution of aquatic environment generally causes changes in the physiological and structural aspects of the inhabitant organisms, particularly in crustaceans (Avinashe et.al., 2013). Stress condition causes biochemical changes, to overcome this changed situation, extra energy is needed. The energy required is supplied in the form of stored depots in protein, glycogen and fat. The biochemical composition changes according to stress condition in environment of aquatic animals. The crustaceans resist against such unwanted condition by their own way and try to minimize the effect of this altered situation by removing the toxicant. The concentration of protein in blood gives proper idea of the stress (Sawant et. al., 2012).

Protein being an importance constituent of animal tissues, has a main role in cell metabolism. All enzymes and hormones are made up of protein and involved in the metabolic activities. The present research work shows the changes in protein content of crab, Barytelphusa guerini. The total protein contents in hepatopancreas were found to be decreased under influence of pesticide stress i.e. Sumidon and Acephate as compared to control set.

The animals in stress condition require extra energy to carry out metabolic activities. The loss of energy in the animal body fulfilled from the stored depots in the form of protein, glycogen and fat in various tissues. The biochemical composition in treated animals changes according to environmental factors, starvation, toxicants etc. The crustaceans resist against stress condition by their own way and try to minimize the effect of this altered situation by removing the toxicant. The amount of protein content gives proper idea of the stress. To overcome form this problem the present investigation tries to fulfill the gap on the study on effect of pesticidal stress on protein content of fresh water crab, Barytelphusa guerini. Therefore the assessment of protein can be considered as a diagnostic tool to determine physical phases of organism.

The declining trend of total protein contents in various tissues of crab was observed by Kumar *et al.* (2012) under sodium arsenide stress in catfish *Clarius batractus.* To overcome the present stress situation for elevation of repair level, the proteolysis in tissues takes place which results in decreased of protein contents (Kabeer et al., 1977). The similar results were obtained by More, (2012) and Sawant et.al, 2012 observed similar results in fresh water crab, *Barytelphusa guerini* in hepatopancreas exposed to cadmium sulphate and copper sulphate respectively.

The impairment in protein synthesis decreases total protein content of tissue. This mechanism is for the enhancement of proteolysis to meet the high energy demand under pesticidal stress. The fall in protein level during pollutant exposure may be due to increased in protein catabolism and decreased anabolism of protein (Kabeer, 1978). Shariff (1987) studied the effect of detergent on protein content. The decrease in protein content may be due to increased activity of proteolytic enzymes.

The present investigation reveals that pesticides i.e. Acephate and Sumidon at sub-lethal concentrations induce energy demand in the whole body tissue and the crab try to withstand the toxic stress imposed at the cellular level by operating some sort of regulatory pathway.

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