**M.S.112. KRISHNAKUMAR, P.K.–Physiological Effects of Some Heavy Metals on Perna Viridis (Linnaeus)–1989–Dr.R. Damodaran.**

Concern over heavy metal pollution has received greater attention in the recent past. Most of the heavy metals are potentially harmful to most organisms at some level of exposure and absorption. The capacity of bivalve molluscs to accumulate potentially toxic heavy metals in their tissues, far in excess of environmental level is well known and has become the focus of an increasing number of studies. People concerned with environmental management increasingly recognise the need for monitoring physiological and biochemical effects to detect changes in the environmental quality. Mussels are now receiving considerable attention as subject of such pollution studies and have been proposed as suitable indicators for monitoring heavy metal pollution in the marine environment both locally and globaly as in "Mussel watch" programme.

The green mussel *Perna viridis* (Linnaeus) has wide spread distribution along both east and west coast of India. This species is ecologically and economically important, with outstanding potential for use as biological indicator of marine environmental quality. Therefore *P. Viridis* was selected as a test organism and was collected from a pollution free environment. Three toxic heavy metals namely

mercury, copper and zinc were selected for the study since they are widely recognised as most common pollutants in the marine environment.

The main objectives of the studies are:
(1) To collect base line information on some of the physiological indices of stresss in *P. viridis* which are necessary for biological effect monitoring; (2) To study the acute and sublethal toxic effect of metals on some of the physiological and biochemical indices of stress; (3) To understand bio-accumulation, distribution and depuration pattern of heavy metals in different body parts of *P. viridis* (4) To assess the suitability of the Indian mussel *P. viridis* as a biological indicator of heavy metal stress, in the marine environment.

The thesis consist of eight chapters, the first chapter is general introduction which covers preface, general literature review and the objectives of the study.

The second chapter deals with the physiology of *P. viridis* and the effect of body size on it. In order to have a base line information of physiology of *P. viridis* $O_2$ uptake, ammonia excretion, O:N ratio, filtration rate and body condition index were studied. Knowledge of a test organism's physiological responses to intrinsic factors is required for the planning, measurements and interpretation of any programme monitoring biological effects of pollution.

The third chapter discusses acute of Cu, Hg, and Zn so as to compare the toxic effects of these metals by determining 96 h LC50 and EC50 values. LC50 values were determined by static bioassay method and the effect of size group on toxicity was determined. EC50s were determined by studying the effect of metals on filtraion rate. Animals of smaller size group were found to be more sensitive to metal toxicity.

The fourth chapter is on bioaccumulation of Cu, Hg, and Zn discusses their bioconcentration factors and rates of accumulation in gill, mantle, viscera and muscle. The effect of salinity and size group on bioaccumulation was studied. The rate of accumulation of these metals were found to be high in smaller animals. Cu and Zn accumulation rates were found to be high in lower salinity.

The fifth chapter is depuration of Cu, Hg, and Zn different body parts after 5,10,15,20 and 25 days of exposure in clean sea water. Initially mussels were exposed 4 days in different concentrations of metals. Rate of depuration was studied in 35% o and 25% salinity ranges and biological half-lives of above metals were determined. Hg was found to be having very high biological half-life.

The sixth chapter deals with long term sublethal toxic effects of Cu on the general physiological indices of stress like respiraton, ammonia excretion, O:N ratio, filtration rate and body condition index. Animals exposed for 20 days in sublethal concentrations of Cu, were used for this study. The above mentioned physiological parameters were found to be useful in assessing sublethal copper stress.

The seventh chapter is on the sublethal toxic effect of Cu, Hg and Zn on respiration and filtration rate. The toxicity of Cu and Hg were compared by studying the effects on respiraton and filtration rate in *P. viridis* after 0,24,48,72 and 96 h exposure. The toxic effect of Hg was more severe on filtration rate than on respiration after 4 days exposure.

The eighth chapter deals with heavy metals stress and carotenoid concentraton in *P. viridis*. Carotenoid located in cytosomes or carotenoxysomes were reported to be taking part in anoxic energy production in molluscs. Mussels exposed to various acute and sublethal toxic levels of Hg, Cu and Zn were analysed to

find out the carotenoid concentration in their body. The carotenoid concentration in the body of mussels were found to be acting as a general index of stress.

A summary and list of references are given at the end.