EXECUTIVE SUMMARY

"Studies on the efficiency of some plant products in protecting the stress induced lipid peroxidation in prawn". UGC reference no. MRP(S)-634/09- 10/KLMG009/UGCSWRO Dated 27.01.2010

by

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Fishes were experimentally exposed to $1/10^{th}$ concentration of 96 hrs LC_{50} value 96 hours. A control was also run in parallel. Changes occurring in the thiobarbituric acid value (TBA) of the biological membranes, the content of protein in liver tissue, Alkaline phosphatase and Acid phosphatase are worked out in control and mercury exposed animals. Group of 5 fishes from test were subjected to further experimentation. One group was fed with commercial fish feed for 4 days. The remaining groups of 5 fishes were fed with fish feed prepared by incorporating extract of Ocimum, Gooseberry, Garlic, Curry veppu and Turmeric. After 4 days the above parameters were again assayed. The results obtained were analysed statistically using Student's T test.

The increased thiobarbituric acid value in the liver of fish exposed to mercury indicates that more lipofuschin granules are produced as a result of lysosomal degradation and peroxidation of cellular membrane. A similar result was observed in the gills and digestive glands of *Mytilus galoprovincialis* exposed to copper, cadmium and zinc (Viarengo*et al*, 1990). In the tissue of Cu exposed mussels, a significant increase in the level of malonaldehyde, indicative of the peroxidative process and an increased accumulation of lipofuschin granules in lysosomes was observed. Mercury is non-essential heavy metal. The significant increase in TBA value for different tissues in fish exposed to mercury may be explained as due to a severe need to keep this non-essential toxic heavy metal away from the metabolic machinery. The lipofuschin granules formed by lipid peroxidation bind the toxic heavy metals and make it harmless and unavailable to the cell machinery. But these alterations unfavourably affect the physiology and membrane causing leakage or liability. In a cell several defence mechanisms implicated in the prevention of lipid peroxidation occur naturally. Mercury is able to reduce the activity of this protective machinery, thus enhancing lipid peroxidation. (Bus and Gibbson, 1979) resulting in augmented attack on the unsaturated fatty acids of the membrane.

When the fishes exposed to mercury was fed with commercial fish feed, and artificial fish feeds the TBA value significantly decreased. The decrease due to consumption of all the artificial fish feeds was significant at 1% level. This shows the antioxidant activity of garlic, ocimum, gooseberry, turmeric and curry leaf. The effect of mercury on the total protein content in the liver of *Oreochromis mossambicus* shows a decrease in the protein content from control to test. This indicates that protein undergo destruction in mercury exposed fishes. Over production of ROS damages cellular lipids, nucleic acids, proteins and leads to lipid peroxidation. (Martin *et. al*, 1996, Finkel and Halbrook 2000). The lipid peroxidation causes over production of lipofuschin granules and this leads to the destruction of lipoprotein membrane. Hence the total protein content is decreased.

The effect of feeding of different plant extracts on the total protein content in mercury exposed fishes shows a decrease in protein content. This may be caused by an enhanced utilization of protein for growth and hence the total protein content is decreased. The high level of enzyme activity obtained with diets containing plant extracts improved the digestion of protein, carbohydrate, fat and cellulose, which might in turn explain the better growth observed with the shrimps fed with plant extract incorporated diet. Similar effect has been reported for fish and shrimp in which digestion was shown to increase considerably in response to probiotics in the diet. (Sankar.G.*et al,* 2011). In fish fed with commercial fish feed, the total protein content is increased. This may be due to the presence of some component that present in food which retard ROS production and also protects the animal from lipid peroxidation. This in turn is responsible for the higher total protein content in this group.

In mercury exposed fishes amount of Alkaline phosphatase is decreased than the control group. Even though mercury is expected to damage the cellular membranes and leading to enhanced Alkaline phosphatase activity, our study shows a decrease in Alkaline phosphatase in animals exposed to mercury. This may be due to the direct inhibition of the enzyme by mercury. A more or less linear inhibition of the specific activity of both Acid and Alkaline phosphatase enzymes was reported by *Lakshmi et al, 1991*. The Alkaline phosphatase activity in fish fed with commercial fish feed as well as feed containing plant extracts invariably showed decrease in ALP activity. This may indicate a protective action of this feeds on the membrane structures. A study on the effect of garlic on antioxidant system in *Oreochromis niloticus* showed that addition of garlic in any form to fish diet can promote growth rate, decrease mortality rate and increase the antioxidant activity in fish. The result showed that Alkaline phosphatase and aspartate amino transferase activities in plasma decreases significantly (*M.A.A Metwally 2009*).

In mercury exposed fishes the amount of Acid phosphatase showed a very high increase, than the control ones. The increased activity of the Acid phosphatase indicates severe membrane damage in the presence of mercury, which acts as a labilizing agent *(Lakshmi et al, 1991*). The increased internal content of mercury resulted on prolonged exposure causes a greater tissue damage and hence elevated enzyme activity. Similar results has been reported by the *in vitro* studies on the effect of mercury on the enzyme by Rema 1995.Though lysosomes are the major sources of acid phosphatase, there exists some other sources such as mitochondria etc. , which contributes to the total acid phosphatase activity in the liver of stressed fish. The acid phosphatase activity in fish fed with commercial fish feed and the feed containing plant extracts also showed very high increase. The enhanced acid phosphatase activity in fish fed with commercial fish feed and plant extracts incorporated feed may be due to the improved digestive activities leading to better growth in animals. Enhanced utilisation of protein for growth and hence a reduction in protein level is seen in this study itself.