

UGC MAJOR RESEARCH PROJECT
(F.No.38-216/2009 (SR) dated 26th August 2011)

**‘Effect of artificial fertilizers on Kuttanad wetland ecosystem,
the rice bowl of Kerala’**

Executive summary

Kuttanad is a low lying area in the southern end of the Vembanad Lake. Indiscriminate use of agrochemicals is regularly practiced in Kuttanad area to boost agricultural production. It includes a broad range of pesticides, synthetic fertilizers and other chemical growth agents. These chemicals have high pollution potential which results in significant environmental and health risks. Aquatic organisms accumulate these pollutants in their body directly from contaminated water and indirectly via food chain. All species are tolerant to a certain amount of pollution, and beyond its tolerable limits, the characteristic biochemical and physiological responses starting from the cellular and sub-cellular levels of organization to the ultimate survival or death of the individual are elicited. The present investigation is envisaged to understand the extent of fertilizer pollution and its impact on selected species of aquatic organisms.

The physico-chemical and biological properties of Kuttanad wetland ecosystem was studied by collecting samples from 10 stations in the study area every month during May 2012 to August 2013. The studies revealed the results, viz., not much variation in temperature; slightly acidic pH; seasonal variations in salinity, dissolved oxygen, transparency and total dissolved solids; variation in nitrate with the application of fertilizers in the paddy field; low level of phosphate; much varied level of sulphate; high prevalence of total coliforms and faecal coliforms; variation in plankton population and low fish diversity. The survey conducted revealed the overuse of agrochemicals in Kuttanad.

An attempt has been made to find out the toxic effects of some fertilizers, such as urea and Ammonium Phosphate Sulphate on selected parameters like histology, haematology and biochemical composition of the organisms, the black clam, *Villorita cyprinoides* and the fish, *Tilapia mosambica* and *Etroplus maculatus*. The acute toxicity bioassays using the fertilizers on the test species selected were conducted. On exposing the clam to the fertilizer, urea, and the fish to the fertilizer, Ammonium Phosphate Sulphate the organisms exhibited adverse response.

The chronic toxicity bioassays revealed that *V. cyprinoides* were affected by urea pollution and caused severe destruction of various organs. *T. mossambica* and *E. maculatus* exhibited tissue alterations on exposure to Ammonium Phosphate Sulphate. Compared to *T. mossambica*, *E. maculatus* showed severe damages even in low concentration of the fertilizer.

The effect of different concentrations of the fertilizer, Ammonium Phosphate Sulphate on some haematological parameters of *T. mossambica* was estimated by determining the TEC, Hb, Ht, ESR, MCV, MCH, and MCHC. Almost all the parameters in the study exhibited significant variation. The effect of different concentrations of Ammonium Phosphate Sulphate on protein and glycogen contents of *E. maculatus* was also revealed its toxic effect.

Thus it can be concluded that monitoring and understanding the acute toxicity and chronic toxicity bioassays on different fish exposed to the fertilizers, would be helpful in understanding its deleterious effects. The fertilizer and pesticide pollution affect the fishery resources adversely both by contaminating the flesh thereby making it inedible to human beings and by reducing the population density.