ABSTRACT

Studies on the phytotoxic effect of a synthetic detergent, ‘Surf excel blue’, an anionic, linear alkylbenzene sulphonate (LAS) containing detergent, on five macrophytic plants [Alternanthera philoxeroides (Mart.) Grisb., Eleocharis dulcis (Burm. f.) Trimen ex Hensch., Fimbristylis miliacea (Linn.) Vahl. var. miliacea, Monochoria vaginalis (Burm.f.) Persl. and Nymphoides indica (L) O. Ktze.], prevalent in lower Kuttanad wetland were carried out. The experimental plants were exposed to different concentrations of the detergent (0.1 g l⁻¹, 0.25 g l⁻¹, 0.5 g l⁻¹ and 1.0 g l⁻¹) for a period of one month. Periodic analysis was carried out to study the stress effect of the detergent. Variations in growth were studied in terms of relative growth rate and specific leaf area. Detergent influenced biochemical changes in control and treated species were evaluated by estimation of total chlorophyll, soluble sugar, total protein, electrolyte leakage, lipid peroxidation, total amino acid, proline, ascorbic acid and total phenol. The stress impact of the detergent at different concentrations on the plants was noted and variations in plant characteristics were identified as biomarkers. Chlorophyll stability index (CSI) and the extent of membrane injury (MI) were also assessed. Histological variations were observed for the detergent induced changes in the leaves. Analysis of water samples was carried out for pH, electrical conductivity, TDS, turbidity, dissolved oxygen (DO), biochemical oxygen demand, chemical oxygen demand, phosphate and LAS to examine whether the presence of the detergent affected the water quality. Seasonal analysis for LAS in water samples collected from specific sites in the selected area were done to determine the levels of detergent contamination in the natural system from where the experimental macrophytes were collected. Data were statistically analyzed for ANOVA and correlation. It was observed that the detergent inflicted differential changes in plant and water quality characteristics which were found to be dose and duration dependent. At lower concentrations of the detergent, the system recouped to normal and the plants adapted. The changes in growth, biochemical parameters and histological characteristics were differential. Among the parameters studied, lipid peroxidation, membrane injury and total phenol content were noted as better biomarkers of detergent stress. The quality of water exposed to the experiment...
was seen affected. Presence of wetland macrophytes were found useful in restoring the water quality and in effectively reducing LAS, the anionic component of the detergent in the experimental system. This was found species related and *E. dulcis* was noted as the most efficient phytoremediator. Greater impact on the plants at higher concentrations revealed the phytotoxic nature of the contaminant that led to their eventual death and decay, further deteriorating the aquatic system. These observations can be indicative of the possible effects on their counterparts in the natural system which was found to contain significant amount of LAS detergent contamination.

**Key words:** synthetic detergent, freshwater macrophytes, stress, biomarkers, lipid peroxidation, chlorophyll stability index, membrane injury, LAS, phytoremediator, phytotoxic.