



Determination of the maximum permissible level of tannin in wastewater released to surface waters.

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Abstract

Tannins are found in many field herbs and legumes. They are astringent and bitter plant polyphenols that bind, precipitate or shrink proteins and certain other organic compounds. Tannin is released to the environment by the industries that are based on plant materials as their raw materials. The dissolution of Tannic Acid (TA) in water affects the physicochemical parameters of wastewater. This change can cause toxic effects on living organisms and change the ecosystem balance. As phytoplankton are the base of a food chain, *Chlorella vulgaris* was used for the estimation of the minimum tolerance level of TA in this study. *Chlorella vulgaris* is resistant to harsh conditions and invaders. Different concentration of TA of concentrations from 0 ppm to 100 ppm at an interval of 10 ppm and from 100 ppm to 1000 ppm at an interval of 100 ppm was prepared and the change of physicochemical parameters such as pH, Chemical Oxygen Demand (COD), Salinity, Conductivity, TDS, Temperature of water was measured. The limit was determined at the concentration of TA which breaches any of the water quality standard published by Central Environmental Authority (CEA) of Sri Lanka. The parameters such as pH and Chemical Oxygen Demand showed rapid variations even at smaller concentrations. At a TA concentration of 70 ppm, the pH goes below the permissible level of 6.0 and at a concentration of 200 ppm of TA the COD goes above the permissible level of 250 ppm. An acute toxicity assessment was carried out after providing suitable laboratory conditions for the growth of *Chlorella vulgaris*. During acute toxicity assessment, primary producers survived up to a concentration of 60 ppm. The cell count increases slightly in the first day for control setup, 50 ppm, 60 ppm, and 70 ppm. The rate of increase was more in 60 ppm than in 50 ppm compared to 0 ppm. Though, 70 ppm shows slight increase in day 1 afterwards the cell count was constant throughout 4 days. The cell count change in 80 ppm and 90 ppm concentration showed sudden increase in day 1 and afterwards the cell count was constant throughout 4 days. Therefore our study suggests that the maximum permissible level for Tannin in wastewater released to the environment should be less than 60 ppm.

Keywords

Tannic acid, Chlorella vulgaris, chemical oxygen demand, primary producers, acute toxicity