The Investigation of the Limitations of Toxic Dye Biosorption by Pyracantha coccinea

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For over a decade, it has been known that the toxic dyes released from textile factories into wastewaters have severe damaging effects on the marine eco-system as they disrupt photosynthetic processes, trigger tumor growth in aquatic species and form an unpleasant odor. In this study, a few textile dyes, some of which have been announced to have carcinogenic and mutagenic side effects, were studied to determine the limitations of dye removal by scarlet firethorn (Pyracantha coccinea). Given that a suitable aquatic environment is provided, some organic substances show the tendency to bind to contaminants such as heavy metals or dyes. This binding, which results in full or partial removal of the contaminant, is scientifically known as biosorption. This study relies on biosorption processes for the removal of toxic dyes, aiming to investigate the parameters that have an effect on the biosorption rate. The factors investigated include the surface charge of the dye used, initial dye concentration, pH, temperature, biosorbent dosage, agitation speed, and salinity. The effect of washing the fruits before experimentation on Crystal Violet dye biosorption was also studied to ensure that the cost of the biosorption method was minimized if it were to be implemented in a textile factory. The optimum condition was determined and it was found that Pyracantha coccinea is a promising biosorbent for cationic dye removal with a yield of over 70 %. As the data showed no significant biosorption of anionic dyes, the biosorption process was concluded to be electrostatic. For further determination of the nature of dye biosorption by Pyracantha coccinea, isotherms and kinetic models were drawn. A prototype for the implementation of this project in a real textile factory was drawn.

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