Application of Newly Develop Bacterial Consortium for Decolorization of Structurally Different Textile Dyes

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Sri Lanka, niche of high quality supplier of apparel to the world, produce heavy load of textile wastewater every day. Such textile dye contained wastewater is to be treated prior discharge to the environment to maintain the pollution standards. The existing physical and chemical treatments methods are highly expensive. Therefore, the present study was focused on develop a novel bacterial consortium isolated and characterized previously as textile dye decolorizing bacteria which were isolated from textile wastewater effluent sites. Selected bacterial strains were starved overnight in 0.01 M sodium chloride, equalized the suspension at A590 = 0.35 and 5% (v/v) of suspension was introduced into sterile CI Direct Blue 201 (DB) textile dye at final concentration of 50 mg L^{-1}. Standard spectrophotometric method was followed to determine the decolorization percentage. Three individual bacteria; *Alcaligenes faecalis*, *Micrococcus luteus*, and *Staphylococcus warneri* acquired 60, 64 and 72 h respectively for complete decolorization of DB dye, were selected to prepare the bacterial consortium. Decolorization of the DB dye by the bacterial consortium was completed within 48 h. It was found that the complementary interactions among three strains for rapid decolorization of DB dye than their individual effect. Decolorization of DB dye by the consortium was further enhanced under static conditions with the presence of yeast extract and glucose in the medium. Repetitive addition of DB dye to the same initial biomass showed a complete decolorization up to four cycles and descending decolorization trend was observed afterward. Further, the bacterial consortium was able to complete decolorization of selected structurally different textile dyes (Vat green FFB, Cibracorn blue, Moxillon blue) confirming their application on treatment of wide range of textile dyes by providing a greener approach to Sri Lankan textile dyeing industry to fulfill 2030 Green Environment Concept.

Keywords: Decolorization; Textile dye; Bacteria Consortium, Bioremediation