Conclusion
CONCLUSION

Increasing industrialization and urbanization results in the discharge of waste to the environment, which in turn creates more pollution. The discharge of toxic effluents from various industries adversely affects the water resources, soil fertility, aquatic organisms and ecosystem integrity. The textile industry is one of the greatest generators of liquid effluent pollutants, due to the high quantities of water used in the dyeing processes. Azo dyes account for majority of all textile dye stuffs produced because of the ease and cost effectiveness of their synthesis, their stability and the variety of colors available compared to natural dyes. Improper textile dye disposal in aqueous ecosystems leads to the reduction in sunlight penetration which in turn decreases photosynthetic activity, dissolved oxygen concentration, water quality and depicts acute toxic effects on aquatic flora and fauna, causing severe environmental problems worldwide. Therefore, the treatment of industrial effluents containing aromatic compounds becomes necessary prior to their final discharge into the natural resources of water bodies.

Economical and eco-friendly approaches are needed to degrade dye-contaminated wastewater from various industries. *Escherichia coli*, *Chromohalobacter Salexigens* and *Alkalibacillus sp.* isolated from textile effluents completely biotransformed Evan’s Blue, Malachite Green and Metanil Orange respectively. The dye degradation was found to be dependent on various optimization parameters such as temperature, pH, dye concentration, agitation speed and additional nutritional sources. The results obtained in this study for the mechanisms involved in dye removal can be considered as a fundamental step for the representation of the experimental behavior and for development of process design. HPLC and FT-IR analysis substantiated the complete degradation of Evan’s Blue, Malachite Green and Metanil Orange by the isolates, involving the complete breakdown of functional bonds to form non-toxic intermediates. GC-MS chromatogram of the degraded samples revealed complete absence of carcinogenic amines, which are prohibited in accordance with the Consumer Goods Ordinance, Textiles Committee, Ministry of Textiles, Govt. of India. Phytotoxicity studies with
Sorghum vulgare and Phaseolus mungo revealed the complete detoxification of the textile azo dyes. Thus, with the results obtained from the GC-MS analysis and phytotoxicity assay, the bacterial strains were proved to be highly capable of detoxifying the potent harmful and carcinogenic azo dyes and their breakdown products.

In addition, degradation and detoxification ability of the Escherichia coli, Chromohalobacter Salexigens and Alkalibacillus sp. could be advantageous to integrate degradation process prior to conventional processes. Further, pilot or large scale simulations are required to investigate the ability to establish a continuous process for effluent treatment using our microbial culture. Thus this work may provide a reasonable basis for development of an effective biotechnological process for the environmentally safe remediation of dye pollutants present in textile effluents.

Based on the behavioural, morphological and histopathological assay of gill showed its possible waste minimization through compellation effect treatment and through advanced dyeing techniques such as lowering of liquors ratio during dyeing, optimizing dyeing processes and recipes, process of innovation and by substituting offending dyestuffs with more ecofriendly substitutes etc for pollution control. This can be effectively applied by source reduction instead of “end of pipe” solution.

In the present study a comparative study was made to know the impact of untreated textile dye effluent with treated textile dye effluent with bacterial strains. Textile effluent was found to be more toxic when compared to the treated textile effluent with control. With respect to toxicity behavioural and morphological histopathological changes of fish in untreated textile effluent was found to be more toxic highly damages followed by treated textile effluent with bacterial strains because gills are direct contact with environment.

From the present study it is understood textile industry effluent shows the degree of damage caused by the pollutants on the different target organs of the fishes. Thus it could be suggested that precautionary measures should be taken
against the discharge or the treatment of this effluent before releasing it in the fresh water bodies. Control of this type of pollution can be best achieved by reduction or prevention and dilution at the source. Legal administrative and technical measures are also necessary to reduce or eliminate the undesirable effects of industrial effluents in receiving waters. Based on the behavioural, morphological and histopathological assay of gill showed its possible waste minimization through compellation effect treatment and through advanced dyeing techniques such as lowering of liquors ratio during dyeing, optimizing dyeing processes and recipes, process of innovation and by substituting offending dyestuffs with more ecofriendly substitutes etc for pollution control. This can be effectively applied by source reduction instead of “end of pipe” solution. This can be practiced by standards imposed by the authorities.