ABSTRACT

Textile industries consume large amount of water and dyes for different processes. The textile industrial effluents are causing a detrimental effect on soil and aquatic biodiversity. Conventional methods of treatment used are very expensive and least efficient. Environmental friendly, low cost and efficient methods are required. for this purpose present study was designed. Twenty one bacteria were isolated from textile affected soil, sludge and effluents of Hudiara drain in vicinity of Nishat Mills Limited 5Km Off - 22Km Ferozepur Road Lahore, Pakistan. All the isolates were screened at 50, 100, 150 and 200ppm of red, green, yellow and black textile dyes. The Isolates 1, 3, 5, 7, 9, and 20 were screened on the basis of ability to degrade the dyes efficiently more than 60%, within 24h at 50, 100, 150 and 200ppm of red, green, yellow and black dyes. Four consortia (BMP1/SDSC-01, BMP2/SDSC-02, BBP/SDSC-03 and BMP4/SDSC-04) were developed using combinations of these bacterial isolates. Among these, the consortium BMP1/SDSC-01 had maximum decolorization ability. It was 84% for green and red textile dyes while 85% for black and yellow. The pH, temperature and supplements were optimized to enhance the decolorization ability of the selected consortium. The results indicated that decolorizing ability of consortium for the red, green, black and yellow dyes was high as compare to individual strains. The consortium was able to decolorize 84%, 84%, 85%, 85% and 82% of 200ppm of red, green, black, yellow and mixed dyes within 24h while individual strain were required 72h. Optimum pH and temperature were observed 7.5 and 37 ^{0}C respectively. On supplementing urea the consortium decolorized 87%, 86%, 89%, 86% and 83% while on supplementing sodium chloride the consortium decolorized 93%, 94%, 93%, 94% and 89% of red, green, black, yellow and mixed dyes respectively, which was maximum while in the presence of ascorbic acid and ammonium chloride it showed intermediate results. Moreover, effect of untreated and treated dyes was investigated on germination of *Zea mays* L. (Maize) and *Sorghum vulgare* Pers. (Sorghum).

Bacterial consortia BMP1 (containing six isolates), BMP2 (three isolates) and BBP (three isolates) were capable of degrading red, green, black and yellow dyes and were resistant to heavy metals (Cu, Cd, Cr, Ni, Mn & Pb). They were equally beneficial for the reduction of other pollution parameters like colour, pH, EC, nitrogen, phosphorus, chloride, COD, BOD, TDS and TSS from textile effluents. The physicochemical

characterization of textile effluents was carried out before and after treatment by consortia to sort out most efficient consortium. The results indicated that the consortium BMP1 showed maximum reduction of EC (52.98%), pH (11.85%), nitrogen (79.02%), phosphorus (68.78%), chloride (46.42%), BOD (59.49%), COD (61.35%), TDS (44.93%) and TSS (52.58%). It was also useful in reduction of heavy metals such as Cu (92.3%), Cd (89.46%), Cr (83.52%), Ni (80.7%), Mn (88.3%) and Pb (93.5%). Treated textile effluents were applied to maize (*Zea mays* L. CV C1415) seeds and results indicated non toxicity in maize as compared to untreated effluent. The current study revealed that utilization of bacterial consortium for textile effluent treatment could be an effective method.

Finally, a bioreactor was designed to attain efficient, cost-effective and environmentally reliable bioremediation system for the biotreatment of textile effluents to produce water for irrigation purposes. The consortium BMP1/SDSC-01 was used in the bioreactor for the treatment of effluents. Bacterial obliteration from the biotreated textile effluents was done by using acetic acid, which proved efficient and result showed that bacterial growth was not possible in the presence of acetic acid. The treated and untreated textile effluents were applied on two common crops of Pakistan *Zea mays* L. CV C1415 (Maize) and *Sorghum vulgare* Pers. CV SSG5000 (Sorghum) to monitor efficacy of bioremediated textile effluents. During experiment plant height, number of leaves, photosynthesis rate, transpiration rate, and biomass were measured. The results clearly indicated that in untreated effluents maize plant height, biomass, photosynthesis and transpiration were 93.26, 45.38, 9.11 and 0.41, respectively. Under irrigation of treated effluents, plant height, biomass, photosynthesis and transpiration were 124, 44.07, 16.95 and 0.84 respectively. Similar trend was observed in sorghum, its plant height increased to 115.8 from 85 (untreated). Simultaneously, number of leaves, biomass, photosynthesis and transpiration were 8.62, 44.45, 13.29 and 0.51, respectively. The results are proving that bioreactor successfully reduced the toxicity level of textile effluents and can be used for irrigation purposes. This study will help to produce irrigation water from textile effluents at large scale in Pakistan by applying bioremediation.