LIST OF FIGURES

Figure 1: Flow of electrons via uptake hydrogenase system 7
Figure 2: Schematic representation of the various sources of reducing equivalents and hydrogen during nitrogen fixation 11
Figure 3: Location of the site of isolation at Gujarat, India 34
Figure 4: Cultures isolated from Hamisar pond, Bhuj, India 39
Figure 5: Cultures isolated from Hamisar pond, Bhuj, India 40
Figure 6: Cultures isolated from Hamisar pond, Bhuj, India 41
Figure 7: Cultures isolated from Bet-Dwarka and Okha ports, India 47
Figure 8: Cultures isolated from Bet-Dwarka and Okha ports, India 48
Figure 9: Cultures isolated from Bet-Dwarka and Okha ports, India 49
Figure 10: Cultures isolated from Bet-Dwarka and Okha ports, India 50
Figure 11: Transmission Electron Micrograph of Anabaena variabilis 57
Figure 12: Transmission Electron Micrograph of Anabaena variabilis 57
Figure 13: Transmission Electron Micrograph of fortnight old Nostoc muscorum 58
Figure 14: Transmission Electron Micrograph of fortnight old Nostoc muscorum 58
Figure 15: Transmission Electron Micrograph of one month old Nostoc muscorum 59
Figure 16: Transmission Electron Micrograph of one month old Nostoc muscorum 59
Figure 17: Scanning Electron Micrograph of Anabaena variabilis 60
Figure 18: Scanning Electron Micrograph of Nostoc muscorum 60
Figure 19: Absorption spectra of Anabaena variabilis 61
Figure 20: Absorption spectra of Nostoc muscorum 61
Figure 21: Nitrogenase activity of Anabaena variabilis 65
Figure 22: Absorption spectra of pigments leached by Anabaena variabilis 68
Figure 23: Nitrogenase activity of Nostoc muscorum 70
Figure 24: Laboratory scale glass reactor used to remove the colour from artificial textile effluent using the exopolysaccharide produced by Cyanothece sp. 85
Figure 25: Effect of different NaCl concentration on growth of Cyanothece sp. 87
Figure 26: Effect of different NaCl concentration on exopolysaccharide production by *Cyanothece* sp. 87
Figure 27: Effect of nitrogen source on growth of *Cyanothece* sp. 88
Figure 28: Effect of nitrogen source on exopolysaccharide production by *Cyanothece* sp. 88
Figure 29: Effect of pH on growth of *Cyanothece* sp. 89
Figure 30: Effect of different pH on exopolysaccharide production by *Cyanothece* sp. 89
Figure 31: The IR spectra of the exopolysaccharide obtained from one month grown *Cyanothece* sp. 90
Figure 32: The IR spectra of the exopolysaccharide obtained from a fortnight grown *Cyanothece* sp. 91
Figure 33: H¹-NMR spectrum of the exopolysaccharide production obtained from *Cyanothece* sp. 92
Figure 34: Putative structure of the exopolysaccharide with the numbering system used in the interpretation of the results 92
Figure 35: Percentage efficiency of exopolysaccharide produced by *Cyanothece* sp. to remove colour from suspensions at various initial dye concentrations 95
Figure 36: Effect of different organic molecules on % efficiency of exopolysaccharide produced by *Cyanothece* sp. to remove colour from suspensions 96
Figure 37: Effect of different metal ions on % efficiency of exopolysaccharide produced by *Cyanothece* sp. to remove colour from suspensions 96
Figure 38: Laboratory scale glass reactor designed for integrated hydrogen production and to remove the colour from artificial textile effluent using *Phormidium valderianum* 107
Figure 39: Percentage decolorization by *Phormidium valderianum* at various initial dye concentrations 110
Figure 40: Percentage decolorization by *Phormidium valderianum* at various pH 110
Figure 41: Percentage decolorization of Acid red by *Phormidium valderianum* in presence of various concentrations of phenol 112
Figure 42: Percentage decolorization of Acid red by *Phormidium valderianum* in presence of NaCl and MgCl<sub>2</sub> 112

Figure 43: Hydrogen production by cells grown in presence of dye during growth phase, nitrogenase synthesis phase and both phases 116

Figure 44: Hydrogen production by *Phormidium valderianum* in laboratory scale reactor under batch production 118

Figure 45: Dye removal by *Phormidium valderianum* in laboratory scale reactor 118

Figure 46: Autoradiograph of proteins from *Phormidium valderianum* after incubation with <sup>14</sup>C at various time intervals 120