List of figures

Figure 1. 1 Presence of functional bacterial amyloid in various bacteria	
Figure 1. 2 Role of functional amyloid hydrophobin	
Figure 1. 3 Mechanism of flocculation	
Figure 1. 4 Optimization of two factors, A and B by one factor at a time (OFAT)	
Figure 1. 5 Optimization using Central composite design.	
Figure 1. 6 Central composite design involving 3 factors for optimization	
Figure 1. 7 Prediction of response using mathematical equation	
Figure 1. 8 Contour plots generated on the basis of predicted values	
Figure 1. 9 Photobioreactor for large scale cultivation of microalgae.	
Figure 1. 10 Stages in biofilm formation and breakdown	51
Figure 2. 1 Colony characteristics of amyloid producing bacteria on Congo red agar	82
Figure 2. 2 Fluorescence micrographs of the 15 selected isolates stained with thioflavin	
Figure 2. 3 Flocculation activity	
Figure 2. 4 Confirmation of amyloid in <i>B.cereus</i> CR4 by various techniques	
Figure 2. 5 Use of flagella staining method to observe amyloids on cell surface	
Figure 2. 6 Thioflavin T fluorescence of purified protein in UV transilluminator.	
Figure 2. 7 Purification, quantification and confirmation of amyloid in B. cereus CR4	
Figure 2. 8 Zeta potential analysis of kaolin particles	
Figure 2. 9 SDS Agarose gel electrophoresis for quantification of amyloids	
Figure 2. 10 BSA standard curve for quantification of amyloids	
Figure 2. 11 Time course of bioflocculant production by isolate Bacillus CR4	
Figure 2. 12 pH and temperature stability of bioflocculantobtained from B.cereus CR4	100
Figure 2. 13 LC-MS/MS analysis for the identification of purified amyloid protein CR4	102
Figure 3. 1 Effect of Temperature on bioflocculant CR4 production	122
Figure 3. 2 Effect of pH on bioflocculant production by <i>B. cereus</i> CR4	123
Figure 3. 3 CCD for optimization of lactose, yeast extract and tryptone for bioflocculant pr	oduction
by B. cereus CR4	129
Figure 3. 4 CCD for optimization of lactose, yeast extract and tryptone for bioflocculant pr	oduction
by B. cereus CR4	
Figure 3. 5 Effect of pH and amyloid additionon flocculation of kaolin.	
Figure 3. 6 Optimization of kaolin flocculation by amyloid bioflocculant CR4	
Figure 3. 7 CCD for optimization of kaolin floc size	
Figure 3. 8 Correlation between flocculation and floc size during optimization of flocculation	on of
kaolin by amyloid bioflocculant CR4 using central composite design.	
Figure 3. 9 Growth of Scenedesmus sp. in different media	
Figure 3. 10 CCD for optimization of $NaNO_3$ and $ZnSO_4$ for the growth of <i>Scenedesmus</i>	
Figure 3. 11 Effect of metal ions on flocculation of Scenedesmus by B.cereus CR4	

Figure 3. 12 Contour plots for optimization of pH and Fe+3 required for flocculation of	
Scenedesmus sp. by B. cereus CR4	9
Figure 3. 13 Contour plots for optimization of biomass, pH and Fe ⁺³ required for flocculation of	
Scenedesmus sp. by B. cereus CR4	0
Figure 3. 14 Contour plots for optimization of pH and Fe ⁺³ on floc size after flocculation of	
Scenedesmus sp. by B. cereus CR415	1
Figure 3. 15 Contour plots showing effect of pH, Fe ⁺³ and cell density on flocculation 15	2
Figure 3. 16 Correlation between % flocculation and floc size of Scenedesmus sp 15	3
Figure 3. 17 Flocculation of Scenedesmus using B. cereus CR4 under optimized conditions 15	3
Figure 3. 18 Interaction B.cereus CR4 cells with Scenedesmus cells	4
Figure 3. 19 Role of <i>B.cereus</i> CR4 in flocculation of <i>Scenedesmus</i> showing patching mechanism.	
	4
Figure 3. 20 Effect of Fe ⁺³ and pH on cell viability of <i>Scenedesmus</i> sp	7
Figure 3. 21 Effect of pH on cell viability and growth of Scenedesmus sp 15	9
Figure 3. 22 Effect of Fe ⁺³ on cell viability and growth of Scenedesmussp	0
Figure 3. 23 Growth of <i>B. cereus</i> CR4 in different media16	2
Figure 3. 24 Kaolin Flocculationactivity using B.cereus CR4 biomass grown in different media. 16	2
Figure 3. 25 Effect of cell density of B. cereus CR4, (grown in algal media) on 16	3
Figure 3. 26 Effect of glucose and inoculum size on growth of <i>B.cereus</i> CR4	6
Figure 3. 27 Effect of glucose and inoculum size on growth of Scenedesmus	7
Figure 3. 28 Cocultivation of Bacillus and Scenedesmus for aggregated growth16	8
Figure 3. 29 Bench scale studies for nutrient removal from synthetic wastewater16	9
Figure 3. 30 Removal of nitrate and phosphate from synthetic waste water using Scenedesmus sp. i	n
a batch reactor	1
Figure 3. 31 Continous reactor for the nutrient removal from wastewater	2
Figure 3. 32 Optimization of flocculant flow rate and reactor flow rate using central composite	
design17	5
Figure 4. 1 Effect of lactose, manganese and glycerol on biofilm formation	
Figure 4. 2 Effect of SDS stress on bioflocculation activity, amyloid production and biofilm	
formation of <i>B.cereus</i> CR4	1
Figure 4. 3 Effect of ethanol stress on bioflocculation activity amyloid production and biofilm	
formationby <i>B. cereus</i> CR4	2
Figure 4. 4 Effect of DMSO stress on bioflocculation activity, amyloid production and biofilm	
formation by <i>B.cereus</i> CR4	5
Figure 4. 5 Effect of NaCl stress on bioflocculation activity, amyloid production and biofilm	
formation by <i>B.cereus</i> CR4	6
Figure 4. 6 Representative photographs of biofilms formed by different Bacillus species	8
Figure 4. 7 MATH assay for quantification of % hydrophobicity of different <i>Bacillus</i> spp 20)1
Figure 4.8 Analysis of MATH assay results on the basis of presence and biofilm morphology 20	1
Figure 4. 9 Bright filed microscopy for analysing the effect of D-amino acids on biofilm formation	
by various Bacillus species	4

Figure 4. 10 Effect of D-amino acids on biofilm formation by various Bacillus species	205
Figure 5. 1 Cloning strategy of amyloid genes in <i>E.coli</i>	210
Figure 5. 2 Cloning strategy for the identification of amyloid gene in B. cereus CR4	215
Figure 5. 3 Screeing of transformants on Congo red agar	216
Figure 5. 4 Screening for amyloid positive clone on Congo red agar	216
Figure 5. 5 Confirmation of amyloid positive clone on Congo red agar and colony PCR	217
Figure 5. 6 Study of flocculation activity of the positive clone	217
Figure 5. 7 Steps in cloning of TasA gene from <i>B. cereus</i> CR4	219
Figure 5. 8 Congo red plate assay for the identification of clone with an insert of amyloid gen	e 219