

LIST OF TABLES

Table	Captions	Page no
1.1	Chitin content in shells of living species	12
2.1	Specifications of various dyes and chemicals	48
2.2	Degree of deacetylation of parent chitosan samples	58
2.3	Viscometric analysis of chitosan solution	60
2.4	Syntheses of low molecular weight chitosan derivatives	64
2.5	Viscometric analysis of CHT-D1 and CHT-D2 solutions	64
2.6	Viscometric analysis of CHT-D3 and CHT-D4 solutions	65
2.7	Viscometric analysis of CHT-D3 and CHT-D4 solutions	65
2.8	Intrinsic viscosity and viscosity average molecular weights of different grades of chitosan	66
2.9	Effect of storage time on viscosity of CHT solution	70
2.10	Reduced viscosity of CHT solution as a function of storage time	70
2.11	Effect of storage time on stability chitosan (CHT) solution	71
2.12	Effect of initial concentration on stability of chitosan (CHT) solution	73
2.13	Effect of storage time on viscosity of low molecular weight chitosan, CHT-D5 solution	73
2.14	Effect of storage time on stability chitosan (CHT-D5) solution	74
2.15	Effect of sodium acetate concentration on viscosity of chitosan solutions	75
2.16	Effect of sodium acetate on storage stability of chitosan solution	77
2.17	Effect of various treatments on fabric construction	78
2.18	Appearance of chitosan treated cotton fabric as a function of molecular weight and concentration (A&B)	81
2.19	Stiffness of chitosan treated fabric as a function of molecular weight and concentration (A&B)	84
2.20	Absorbency of chitosan treated cotton fabric as a function of molecular weight and concentration	86
2.21	C.I.Direct Red 81 uptake of chitosan pretreated cotton fabric as a function of molecular weight and concentration	89
2.22	C.I.Direct Blue 71 uptake of chitosan pretreated cotton fabric as a function of	90
		xiii

	molecular weight and concentration	
2.23	Effect of electrolyte (sodium sulphate) on dyeing of chitosan (CHT) treated cotton fabric	92
2.24	Effect of chitosan pretreatment on fastness properties of direct dye C.I.Direct Red 81	94
2.25	Effect of chitosan pretreatment on fastness properties of direct dye C. I. Direct Blue 71	94
2.26	Effect of chitosan treatment on colour depth and fastness of direct dyed cotton fabric	95
2.27	Effect of chitosan pretreatment on acid dyeing	97
2.28	Wrinkle recovery property of DMDHEU treated cotton fabric	100
2.29	Wrinkle recovery property of chitosan treated cotton fabric	100
2.30	Wrinkle recovery property of chitosan and DMDHEU treated cotton fabric	100
2.31	Effect chitosan treatment on resistance against microbial attack of cotton fabric (soil burial test)	102
2.32	Effect chitosan treatment on resistance against microbial attack of dyed cotton fabric (soil burial test)	103
2.33	Properties of chitosan treated cotton fabric by pad-dry-alkali process (A&B)	106
3.1	Specifications of various dyes and chemicals	123
3.2	Synthesis of CHTN	131
3.3	Effect of molecular weight on particle size	133
3.4	Preparation of nano chitosan dispersions of varying concentrations	136
3.5	Effect of preparation method and concentration of chitosan on particle size	136
3.6	Effect of TPP concentration on particle size of nano chitosan	139
3.7	Viscosity of nano chitosan dispersion as a function of particle size	141
3.8	Stability of nano chitosan solution as a function of particle size	143
3.9	Effect of particle size of nano chitosan on appearance and stiffness of cotton fabric	145
3.10	Effect of nano chitosan treatment on tensile properties of cotton fabric	147
3.11	Effect of particle size of nano chitosan on absorbency of treated cotton fabric	148
3.12	Effect of particle size of nano-chitosan on dye uptake of treated cotton fabric	149
3.13	Effect of particle size on fastness properties of direct dyes	151

3.14	Effect of particle size of chitosan on wrinkle recovery property of cotton fabric	152
3.15	Effect of nano chitosan treatment on resistance towards microbial attack	154
4.1	Specifications of various dyes and chemicals	169
4.2	Various ingredients used for the synthesis of TMCHT	175
4.3	Effect of methyl iodide concentration on DQ: Conductometric titrations readings	179
4.4	Conductometric method for determination of degree of quaternization (DQ) of TMCHT	182
4.5	Calculations of different C/N ratios of TMCHT	186
4.6	Comparative DQ values of TMCHT determined by various methods	187
4.7	Conductometric titration readings for TMCHT prepared in absence of sodium hydroxide	188
4.8	Effect of sodium hydroxide on DQ of TMCHT: Conductometric titrations readings	189
4.9	Effect of sodium hydroxide on DQ of TMCHT: Conductometric titrations readings	190
4.10	Effect of sodium hydroxide on DQ of TMCHT	191
4.11	Various ingredients used in the synthesis of <i>N</i> -sub CHT	193
4.12	Various <i>N</i> -substituted CHT derivatives	194
4.13	Elemental analysis (CHN) data of different <i>N</i> -sub CHT derivatives	211
4.14	Conductometric titrations readings for <i>N</i> -alkyl Q CHT derivatives	212
4.15	Conductometric titrations readings for <i>N</i> -alkyl Q CHT derivatives	213
4.16	Volume of 0.1M AgNO ₃ required for lowest conductance value for different <i>N</i> -Alkyl Q-CHT derivatives	215
4.17	Conductometric titrations for <i>N</i> -aryl Q CHT derivatives	227
4.18	Conductometric method for determination DQ of <i>N</i> -aryl Q CHT derivatives	227
4.19	DS and DQ of <i>N</i> -substituted CHT	229
4.20	Viscometer readings of <i>N</i> - sub CHT solutions in presence of sodium acetate	231
4.21	Reduced viscosity (η_{red}) of <i>N</i> -sub CHT solutions in presence of sodium acetate	232
4.22	Viscometer readings of <i>N</i> - sub CHT solutions in absence of sodium acetate	233
4.23	Reduced viscosity (η_{red}) of <i>N</i> - sub CHT solutions in absence of sodium acetate	234

4.24	Effect of quaternization on intrinsic viscosity of CHT derivatives	235
4.25	Application of <i>N</i> -sub CHT compounds on cotton fabric	238
4.26	Effect of <i>N</i> -sub CHT treatment on appearance of cotton fabric	239
4.27	Effect of <i>N</i> -sub Q CHT derivatives treatment on appearance of cotton fabric	240
4.28	Effect of <i>N</i> -sub CHT treatment on stiffness of cotton fabric	243
4.29	Effect of different CHT and <i>N</i> -sub CHT derivatives treatment on chlorine retention on cotton fabric	245
4.30	Effect of <i>N</i> -sub CHT treatment on absorbency of cotton fabric	247
4.31	Effect of <i>N</i> -sub CHT treatment on direct dyeing of cotton fabric	249
(A&B)		
4.32	Effect of <i>N</i> -sub CHT treatment on washing fastness of direct dyed cotton fabrics	255
4.33	Effect of <i>N</i> -Sub CHT treatment on colour depth of direct dyed cotton fabrics (Post dyeing treatment)	257
4.34	Effect of <i>N</i> -sub CHT treatment on washing fastness of direct dyed cotton fabric	259
4.35	Effect of <i>N</i> -Sub CHT treatment on dyeing with C.I. Acid Blue158	260
4.36	Wrinkle recovery property of <i>N</i> -sub CHT treated cotton fabric	262
4.37	Wrinkle recovery property of DMDHEU treated cotton fabric	262
4.38	Effect of different CHT and <i>N</i> -sub CHT treatment on soiling of cotton fabric	263
4.39	Effect of different CHT and <i>N</i> -sub CHT treatment on degree of soiling	265
4.40	Effect of different <i>N</i> -sub CHT treatment on yellowness index	266
4.41A	Effect of different <i>N</i> - Alkyl/Aryl CHT treatment on resistance against microbial attack of cotton fabric (soil burial test)	269
4.41B	Effect of different <i>N</i> - Alkyl/Aryl Q CHT treatment on resistance against microbial attack of cotton fabric (soil burial test)	270
4.42A	Effect of different <i>N</i> - Alkyl/Aryl CHT treatment on resistance against microbial attack of dyed cotton fabric (soil burial test)	272
4.42B	Effect of different <i>N</i> - Alkyl/Aryl QCHT treatment on resistance against microbial attack of dyed cotton fabric (soil burial test)	273
5.1	Characterization of river water and textile effluent	286
5.2	Specifications of various dyes and chemicals	290
5.3	Effect of calcium ions content in dye bath on colour value of direct dyed cotton fabric	298

5.4	Chitosan derivatives employed for chelation study	299
5.5	Effect of chelation time on residual Ca^{+2} ions in water	302
5.6	Effect of treatment time on extent of chelation of Ca^{+2} ions by different chelating agents	302
5.7	Residual Ca^{+2} ions content in treated water as a function of concentration of chelating agent for 1h treatment	305
5.8	Effect of concentration of chelating agents on the extent of removal of Ca^{+2} ions for 1h treatment	306
5.9	Residual Ca^{+2} ions content in treated water as a function of concentration of chelating agent for 24h treatment	307
5.10	Effect of concentration of chelating agents on the extent of removal of Ca^{+2} ions for 24h treatment	307
5.11	Residual Ca^{+2} ions content in CHT treated water at different pH	310
5.12	Effect of pH of CHT solution on extent of chelation of Ca^{+2} ions from water	311
5.13	Effect of particle size of CHT on chelation efficiency measured in terms of residual Ca^{+2} ions in water	313
5.14	Effect of particle size of CHT on extent of Ca^{+2} ions chelated	313
5.15	Effect Cu(II) ions in hydrogen peroxide bleach bath on bleaching of cotton fabric	315
5.16A	Effect of Cu(II) ions content in dye bath on colour value of direct dyed cotton fabric	316
5.16B	Effect of Cu(II) ions content in dye bath on colour value of reactive dyed cotton fabric	316
5.17	Residual Cu(II) ions content in treated water determined by various analytical methods	320
5.18	Chelation of Cu(II) ions by chelating agents determined by various analytical methods	321
5.19	Residual Cu (II) ions content in different chelating agent treated water as a function of chelation time	322
5.20	Effect of treatment time on extent of chelation of Cu (II) ions by different chelating agents	323
5.21	Residual Cu (II) ions content in CHT derivatives treated water as a function of pH	326
5.22	Effect of pH of chitosan derivatives solution on extent of chelation of Cu(II) ions	326

5.23	Residual Cu (II) ions present in treated water as a function of concentration of chelating agent for 1h treatment	328
5.24	Effect of concentration of chelating agents on chelation of Cu(II) ions for 1 h treatment	330
5.25	Residual Cu (II) ions present in treated water as a function of concentration of chelating agent for 24h treatment	330
5.26	Effect of concentration of chelating agents on chelation of Cu(II) ions for 24 h treatment	330
5.27	Residual Cu(II) content in chitosan treated of varying particle size	333
5.28	Effect of particle size of chitosan on extent chelation of Cu (II) ions	333
5.29	Residual C. I. Direct Red 81 content in effluent treated with different adsorbents at neutral pH	339
5.30	Sorption kinetics of C.I.Direct Red 81 at neutral pH	339
5.31	Residual C. I. Acid Blue 158 content in effluent treated with different adsorbents at neutral pH	341
5.32	Sorption kinetics of C.I.Acid Blue158 at neutral pH	341
5.33	Effect of NMP pretreatment on adsorption efficiency chitosan for direct and acid dyes at neutral pH	343
5.34	Effect of NMP pretreatment on sorption ability of CHT for direct and acid dyes at neutral pH	343
5.35	Residual C. I. Direct Red 81 content in effluent treated with different adsorbents at acidic pH	345
5.36	Sorption kinetics of C.I.Direct Red 81 at acidic pH	346
5.37	Residual C. I. Acid Blue158 content in effluent treated with different adsorbents at acidic pH	347
5.38	Sorption kinetics of C. I. Acid Blue158 at acidic pH	347