

CONTENTS

1. Introduction.....	1
1.1 Research Background.....	1
1.2 Study Area.....	10
1.3 Objectives.....	15
2. Materials and Methods.....	16
2.1 Survey and selection of groundwater samples from North Gujarat and Saurashtra.....	16
2.1.1 Selection of the Districts from the study area and mapping of Fluoride in groundwater.....	16
2.1.1.1 Groundwater sample collection.....	16
2.1.1.2 Fluoride analysis.....	17
2.2 Bioremoval of Fluoride.....	19
2.2.1 Screening of Plant materials, checking Fluoride removal capacity and selection of suitable bioadsorbent.....	19
2.2.1.1 Preparation of Adsorbent.....	19
2.2.2 In-vitro Optimization Study.....	20
2.2.3 Physicochemical characterization of groundwater samples with special reference to Fluoride.....	23
2.2.4 In-vivo experiment for Bioremoval study for defluoridation capacity of the MBP and MSP.....	35
2.3 Estimation of biochemical parameters in the test plants.....	36
2.4 Bioaccumulation of Fluoride in crop plants.....	36
2.5 Scanning Electron Microscopy (SEM) and Energy Dispersive X- ray Spectroscopy (EDX).....	38
3. Results and Discussions.....	39
3.1 Survey and selection of groundwater samples from North Gujarat and Saurashtra.....	39
3.1.1 Mapping Fluoride concentration in Districts.....	39
3.1.1.1 North Gujarat.....	39
3.1.1.2 Saurashtra.....	51

3.2 Bioremoval of Fluoride.....	69
3.2.1 Screening of plant materials, checking Fluoride removal capacity and selection of suitable bioadsorbent.....	69
3.2.2 In-vitro Optimization Study.....	73
3.2.3 Physicochemical characterization of groundwater samples with special reference to Fluoride.....	84
3.2.4 In-vivo experiment for Bioremoval study for defluoridation capacity of the MBP and MSP.....	127
3.3 Estimation of biochemical parameters in the test plants.....	129
3.3.1 Pigment contents.....	129
3.3.2 Carbohydrate content.....	134
3.3.3 Protein content.....	137
3.3.4 Proline.....	140
3.4 Bioaccumulation of Fluoride in crop plants.....	143
3.5 SEM-EDX study in the grains of the test plants.....	149
3.5.1 SEM Analysis.....	149
3.5.2 EDX Analysis.....	159
4. Conclusions.....	165
5. Summary	169
References.....	175
List of Publications.....	188