

Table of contents

Declaration	2
Acknowledgements	3
List of abbreviations	4
Table of contents	5
List of tables	7
List of figures	9
1 Introduction	10
1.1 Background	10
1.2 General applications of ion exchange resins	10
1.2.1 Applications in soil and environmental sides	12
1.3 Stages involved in the process of ion exchange.....	12
1.4 Water usage and associated problems	13
1.5 Composition of ion exchange resins.....	14
1.6 Hypotheses	20
1.7 Objectives.....	20
2 Materials and methods	21
2.1 Rohm and Haas ion exchange resins.....	21
2.2 Silica sand	22
2.3 Experiment 1. Determination of the substrate purity and effects of different washing methods	22
2.3.1 Determination of moisture content in resins	22
2.3.2 Amount of ion exchange resins and various treatments	22
2.3.3 Extraction of the ion exchange resins.....	23
2.4 Experiment 2. Determination of the efficiency of the resins in capturing various nutrients	23
2.4.1 Preparation of the cartridges	24
2.4.2 Experimental set-up	24
2.4.3 Collection of cartridge contents, sample preparation and extraction .	26
2.5 Experiment 3. Determination of ideal storage conditions for ion-loaded exchange resins	26
2.5.1 Extraction procedure	26
2.6 Data analysis.....	26
3 Results	28
3.1 Experiment 1	28
3.1.1 Amount of solutes extracted from ion exchange resins	29
3.2 Experiment 2	35
3.2.1 Analysis of the leachate and extracted solution.....	35
3.3 Experiment 3	40

3.3.1 Temperature and humidity during storage.....	40
3.3.2 Analysis of the leachate and extracted solution.....	40
3.3.3 Release of ions during extraction	43
4 Discussion.....	47
5 Conclusions	51
6 References	52
7 Appendices	57
7.1 Colour plates	57
7.2 SPSS outputs	67
7.2.1 Experiment 1	67
7.2.2 Experiment 2	69
7.2.3 Experiment 3	73