**Table S1:** Three factor factorial Analysis of Variance tests run on each of the 12 ANZECC elements. Factorial analysis of variance tests were run on elemental concentration under the factors of Biosorbent, pH (Fixed) and Time (Random). Type III sum of squares was used. All tests met the assumption of homogeneity of variance, normality of residuals and independence. Transformation of the data were required for some elements, the transformation applied is listed next to the title. Factors in bold indicate significance under alpha of 0.05.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Factor | Effect | DF | SS | MS | F | p |
| Aluminium | | | | | | |
| **Biosorbent** | **Fixed** | **3** | **2.9E+07** | **9.6E+06** | **159** | **<0.001** |
| **pH** | **Fixed** | **2** | **4.2E+05** | **2.1E+05** | **56.9** | **<0.001** |
| Time | Random | 5 | 5.8E+05 | 1.2E+05 | 2.12 | 0.132 |
| **Biosorbent\*pH** | **Fixed** | **6** | **3.7E+05** | **6.1E+04** | **6.75** | **<0.001** |
| **Biosorbent\*Time** | **Random** | **15** | **9.1E+05** | **6.1E+04** | **6.67** | **<0.001** |
| pH\*Time | Random | 10 | 3.7E+04 | 3.7E+03 | 0.41 | 0.933 |
| Biosorbent\*pH\*Time | Random | 30 | 2.7E+05 | 9.1E+03 | 0.27 | 1.000 |
| Error |  | 144 | 4.9E+06 | 3.4E+04 |  |  |
| Arsenic [Cuberoot] | | | | | | |
| **Biosorbent** | **Fixed** | **3** | **39.3** | **13.1** | **81.0** | **<0.001** |
| **pH** | **Fixed** | **2** | **0.09** | **0.04** | **17.9** | **<0.001** |
| Time | Random | 5 | 1.56 | 0.31 | 1.93 | 0.149 |
| **Biosorbent\*pH** | **Fixed** | **6** | **0.34** | **0.06** | **20.6** | **<0.001** |
| **Biosorbent\*Time** | **Random** | **15** | **2.43** | **0.16** | **58.7** | **<0.001** |
| pH\*Time | Random | 10 | 0.02 | 0.00 | 0.89 | 0.555 |
| Biosorbent\*pH\*Time | Random | 30 | 0.08 | 0.00 | 0.05 | 1.000 |
| Error |  | 144 | 7.73 | 0.05 |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Factor | Effect | | DF | | SS | | MS | | F | | p | |
| Boron | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **5.5E+06** | | **1.8E+06** | | **3.81** | | **0.033** |
| pH | | Fixed | | 2 | | 4.7E+05 | | 2.4E+05 | | 2.18 | | 0.164 |
| **Time** | | **Random** | | **5** | | **2.2E+07** | | **4.3E+06** | | **10.8** | | **0.001** |
| Biosorbent\*pH | | Fixed | | 6 | | 2.0E+06 | | 3.3E+05 | | 1.78 | | 0.138 |
| **Biosorbent\*Time** | | **Random** | | **15** | | **7.2E+06** | | **4.8E+05** | | **2.59** | | **0.013** |
| pH\*Time | | Random | | 10 | | 1.1E+06 | | 1.1E+05 | | 0.58 | | 0.815 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 5.6E+06 | | 1.9E+05 | | 0.08 | | 1.000 |
| Error | |  | | 144 | | 3.3E+08 | | 2.3E+06 | |  | |  |
| Cadmium | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **33.3** | | **11.1** | | **125** | | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **4.97** | | **2.49** | | **24.2** | | **<0.001** |
| Time | | Random | | 5 | | 0.65 | | 0.13 | | 0.94 | | 0.491 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **5.47** | | **0.91** | | **17.0** | | **<0.001** |
| Biosorbent\*Time | | Random | | 15 | | 1.33 | | 0.09 | | 1.66 | | 0.116 |
| pH\*Time | | Random | | 10 | | 1.03 | | 0.10 | | 1.92 | | 0.082 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 1.61 | | 0.05 | | 1.19 | | 0.243 |
| Error | |  | | 144 | | 6.47 | | 0.04 | |  | |  |
| Chromium [Squareroot] | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **4815** | | **1605** | | **418** | | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **3.20** | | **1.60** | | **7.03** | | **0.012** |
| **Time** | | **Random** | | **5** | | **104** | | **20.8** | | **5.37** | | **0.005** |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **6.06** | | **1.01** | | **5.24** | | **0.001** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **57.6** | | **3.84** | | **19.9** | | **<0.001** |
| pH\*Time | | Random | | 10 | | 2.28 | | 0.23 | | 1.18 | | 0.341 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 5.78 | | 0.19 | | 0.13 | | 1.000 |
| Error | |  | | 144 | | 221 | | 1.53 | |  | |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Factor | Effect | | DF | | SS | | MS | | F | | p | |
| Copper [Cuberoot] | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **570** | | **190** | | **816** | | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **0.08** | | **0.04** | | **4.66** | | **0.037** |
| Time | | Random | | 5 | | 2.39 | | 0.48 | | 2.06 | | 0.129 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **1.61** | | **0.27** | | **32.4** | | **<0.001** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **3.49** | | **0.23** | | **28.1** | | **<0.001** |
| pH\*Time | | Random | | 10 | | 0.08 | | 0.01 | | 0.97 | | 0.488 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 0.25 | | 0.01 | | 0.06 | | 1.000 |
| Error | |  | | 144 | | 21.6 | | 0.15 | |  | |  |
| Lead [Squareroot] | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **167** | | **55.7** | | **129** | | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **0.87** | | **0.44** | | **9.79** | | **0.004** |
| Time | | Random | | 5 | | 2.01 | | 0.40 | | 0.90 | | 0.504 |
| Biosorbent\*pH | | Fixed | | 6 | | 0.40 | | 0.07 | | 2.36 | | 0.055 |
| **Biosorbent\*Time** | | **Random** | | **15** | | **6.46** | | **0.43** | | **15.2** | | **<0.001** |
| pH\*Time | | Random | | 10 | | 0.45 | | 0.04 | | 1.58 | | 0.162 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 0.85 | | 0.03 | | 0.87 | | 0.663 |
| Error | |  | | 144 | | 4.68 | | 0.03 | |  | |  |
| Manganese [Log] | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **225** | | **75.0** | | **330** | | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **28.6** | | **14.3** | | **127** | | **<0.001** |
| Time | | Random | | 5 | | 3.50 | | 0.70 | | 2.49 | | 0.074 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **52.3** | | **8.72** | | **147** | | **<0.001** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **3.41** | | **0.23** | | **3.84** | | **<0.001** |
| pH\*Time | | Random | | 10 | | 1.13 | | 0.11 | | 1.90 | | 0.085 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 1.78 | | 0.06 | | 0.88 | | 0.653 |
| Error | |  | | 144 | | 9.73 | | 0.07 | |  | |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Factor | Effect | | DF | | SS | | MS | | F | | p | |
| Molybdenum [Cuberoot] | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **984** | | **328** | | **47.1** | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **14.0** | | **6.98** | | **113** | **<0.001** |
| Time | | Random | | 5 | | 52.3 | | 10.5 | | 1.52 | 0.244 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **45.1** | | **7.52** | | **54.0** | **<0.001** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **104** | | **6.96** | | **50.0** | **<0.001** |
| pH\*Time | | Random | | 10 | | 0.62 | | 0.06 | | 0.45 | 0.911 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 4.17 | | 0.14 | | 0.61 | 0.946 |
| Error | |  | | 144 | | 33.1 | | 0.23 | |  |  |
| Nickel [Log] | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **355** | | **118** | | **183** | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **2.04** | | **1.02** | | **10.5** | **0.003** |
| Time | | Random | | 5 | | 1.90 | | 0.38 | | 0.57 | 0.722 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **1.60** | | **0.27** | | **3.58** | **0.008** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **9.68** | | **0.65** | | **8.68** | **<0.001** |
| pH\*Time | | Random | | 10 | | 0.97 | | 0.10 | | 1.31 | 0.271 |
| Biosorbent\*pH\*Time | | Random | | 30 | | 2.23 | | 0.07 | | 0.90 | 0.621 |
| Error | |  | | 144 | | 11.9 | | 0.08 | |  |  |
| Selenium | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **86006** | | **28669** | | **49.4** | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **1556** | | **778** | | **13.7** | **0.001** |
| Time | | Random | | 5 | | 7719 | | 1544 | | 2.73 | 0.064 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **4729** | | **788** | | **10.9** | **<0.001** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **8709** | | **581** | | **8.05** | **<0.001** |
| pH\*Time | | Random | | 10 | | 567 | | 57 | | 0.79 | 0.642 |
| **Biosorbent\*pH\*Time** | | **Random** | | **30** | | **2164** | | **72** | | **1.91** | **0.006** |
| Error | |  | | 144 | | 5447 | | 38 | |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Factor | Effect | | DF | | SS | | MS | | F | | p | |
| Zinc [Cuberoot] | | | | | | | | | | | | |
| **Biosorbent** | | **Fixed** | | **3** | | **849** | | **283** | | **30.9** | | **<0.001** |
| **pH** | | **Fixed** | | **2** | | **157** | | **78.6** | | **96.8** | | **<0.001** |
| Time | | Random | | 5 | | 7.29 | | 1.46 | | 0.17 | | 0.970 |
| **Biosorbent\*pH** | | **Fixed** | | **6** | | **152** | | **25.4** | | **19.4** | | **<0.001** |
| **Biosorbent\*Time** | | **Random** | | **15** | | **137** | | **9.16** | | **7.00** | | **<0.001** |
| pH\*Time | | Random | | 10 | | 8.12 | | 0.81 | | 0.62 | | 0.784 |
| **Biosorbent\*pH\*Time** | | **Random** | | **30** | | **39.2** | | **1.31** | | **4.03** | | **<0.001** |
| Error | |  | | 144 | | 46.8 | | 0.33 | |  | |  |