

Contribution to the identification of solution for the remediation of salt-affected soils of the high valley of Cochabamba in Bolivia : use of Gypsum, Sulphur and Suaeda foliosa

Auteur : de Froidmont, Claire

Promoteur(s) : Colinet, Gilles

Faculté : Gembloux Agro-Bio Tech (GxABT)

Diplôme : Master en bioingénieur : sciences et technologies de l'environnement, à finalité spécialisée

Année académique : 2017-2018

URI/URL : <http://hdl.handle.net/2268.2/6031>

Avertissement à l'attention des usagers :

Tous les documents placés en accès ouvert sur le site le site MatheO sont protégés par le droit d'auteur. Conformément aux principes énoncés par la "Budapest Open Access Initiative"(BOAI, 2002), l'utilisateur du site peut lire, télécharger, copier, transmettre, imprimer, chercher ou faire un lien vers le texte intégral de ces documents, les disséquer pour les indexer, s'en servir de données pour un logiciel, ou s'en servir à toute autre fin légale (ou prévue par la réglementation relative au droit d'auteur). Toute utilisation du document à des fins commerciales est strictement interdite.

Par ailleurs, l'utilisateur s'engage à respecter les droits moraux de l'auteur, principalement le droit à l'intégrité de l'oeuvre et le droit de paternité et ce dans toute utilisation que l'utilisateur entreprend. Ainsi, à titre d'exemple, lorsqu'il reproduira un document par extrait ou dans son intégralité, l'utilisateur citera de manière complète les sources telles que mentionnées ci-dessus. Toute utilisation non explicitement autorisée ci-avant (telle que par exemple, la modification du document ou son résumé) nécessite l'autorisation préalable et expresse des auteurs ou de leurs ayants droit.

Appendices

Appendix A: Leachate and shoot analysis protocol

Different dilutions of the leachates, in 25 ml flasks, had to be done in order to be able to measure the samples' concentration in the scales available depending on the element analysed. Depending on the scale used different standard solutions had to be made to calibrate the device. The results of the different samples obtained were multiplied by their corresponding factor of dilution.

Phytoremediation

- Potassium

A scale of 15 to 500 ppm was used and standard solutions for the calibration curve were prepared using a stock solution of K at 1000 ppm. Factors of dilution were of 0 or 25 depending on the sample measured.

- Magnesium

A scale of 0.02 to 5 ppm was used. Standard solutions were prepared with a stock solution of Mg at 100 ppm and Strontium Chloride Hexahydrate ($\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$) at 10000 ppm. Factors of dilution were of 100 or 250 depending on the sample measured.

- Calcium

A scale of 0.01 to 3 ppm was used with a factor of dilution of 250. Standard solutions were prepared using stock solution of Ca at 100 ppm and Potassium chloride (KCl) at 10000 ppm.

- Sodium

A scale of 0.01 to 2 ppm was used for the measures of the sodium with a factor of dilution of 1250. A stock solution of Na at 1000 ppm and Potassium chloride at 10 000 ppm was used to prepare the standard solution.

Chemical amendments treatments

- Potassium

Two different scales were used for this element, the first for concentration between 1 and 6 ppm and the second one for concentration between 15 and 500 ppm. Standard solutions for the calibration curve were prepared using a stock solution of K at 100ppm for the 1-6 ppm scale and of K at 1000 ppm for the 15-500 ppm scale. Factors of dilution were of 0, 5 or 10 depending on the sample measured.

- Magnesium

A scale of 0.02 to 5 ppm was used. Standard solutions were prepared with a stock solution of Mg at 100 ppm and Strontium Chloride Hexahydrate ($\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$) at 10000 ppm. Factors of dilution were of 100 or 500 depending on the sample measured.

- Calcium

A scale of 0.01 to 3 ppm was used. Standard solutions were prepared using stock solution of Ca at 100 ppm and Potassium chloride (KCl) at 10000 ppm. Factors of dilution were of 250 or 500.

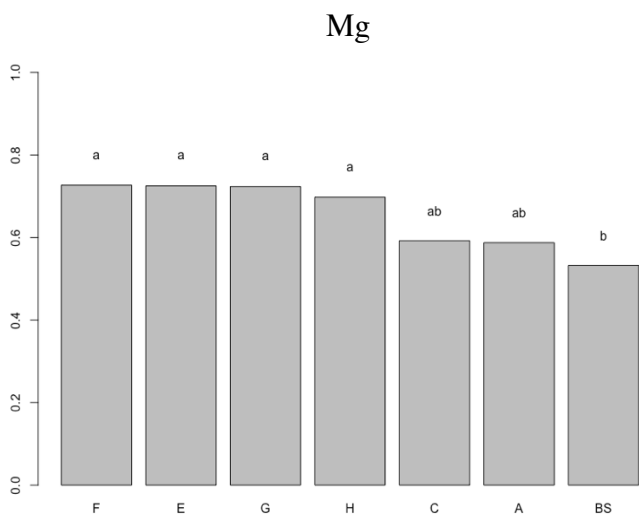
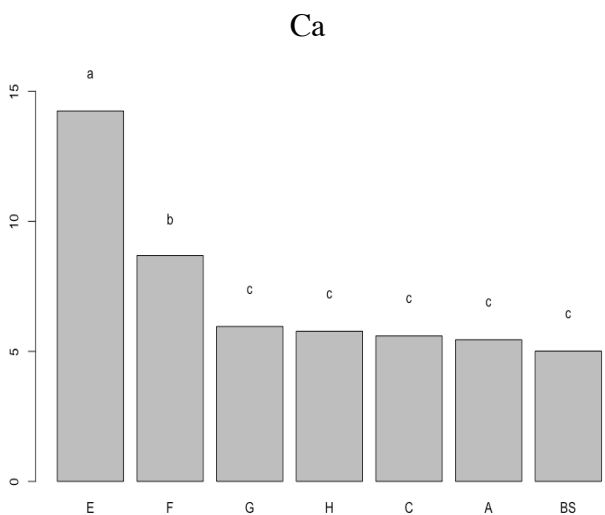
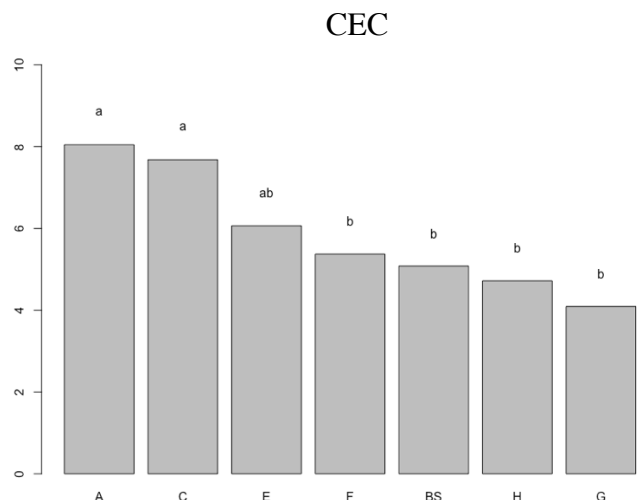
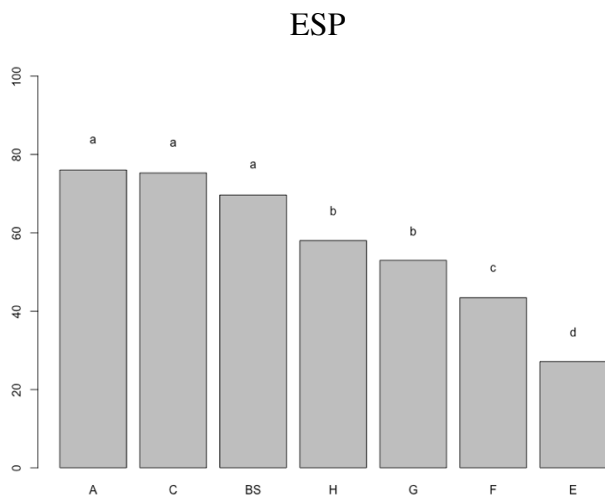
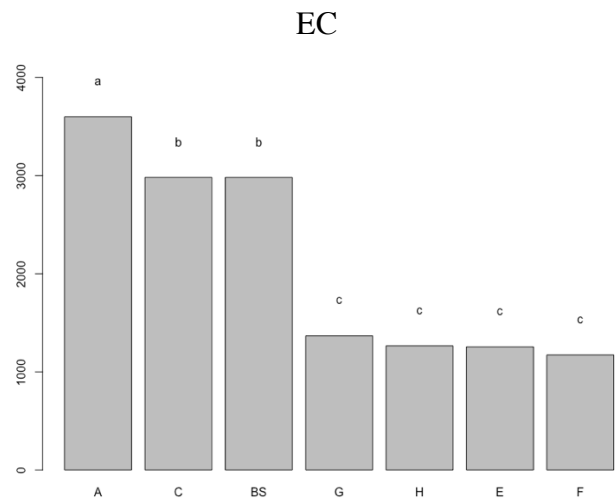
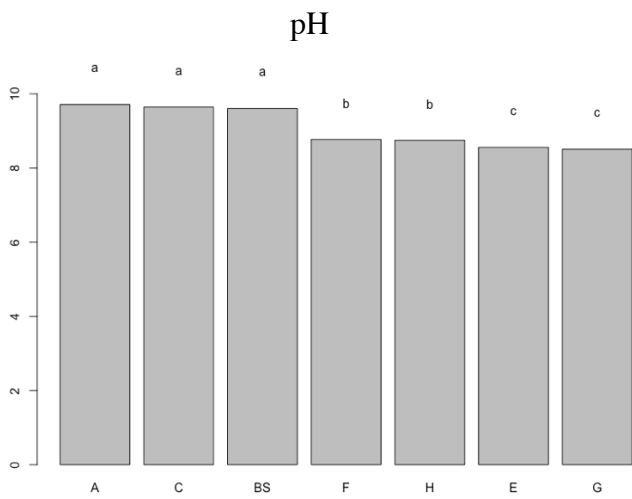
- Sodium

A scale of 2 to 400 ppm was used for the measures of the sodium. A stock solution of Na at 1000 ppm and Potassium chloride at 10 000 ppm was used to prepare the standard solution. Dilutions of either 1250 or 500 were done depending on the sample.

Appendix B: Concentration of sodium, calcium, magnesium and potassium in the collected leachates

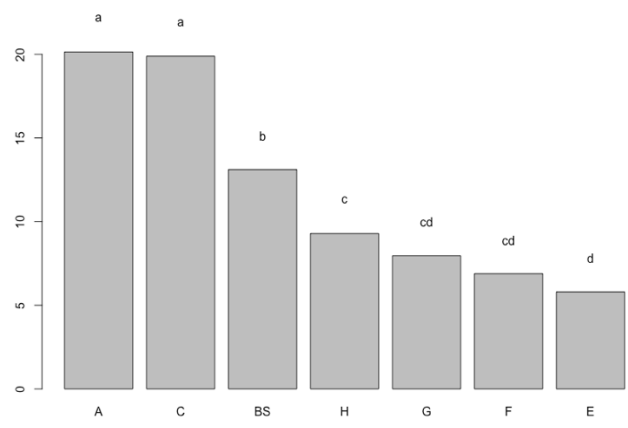
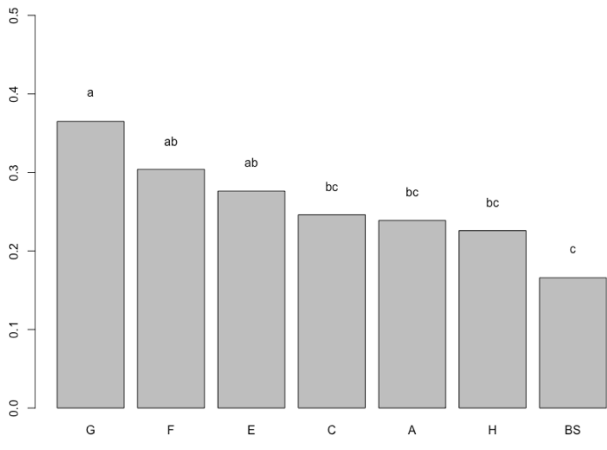
Treatment	Leachate 1	Leachate 2	Leachate 3	Leachate 4
Sodium [mg/L]				
100% - GR	26045.5±1189.2	9638.9±2869.5	8977.4±2762.8	5183.9±1527.9
50% - GR	29242.6±3478.7	9847.0±4668.3	9153.9±1264.3	5789.1±1363.7
100% - SR	37456.2±16247.8	16082.7±1152.6	14738.9±1422.7	9548.7±5272.2
50% - SR	34304.4±15117.8	13024.6±3823.3	11270.2±3114.3	5437.7±2686.2
Control	0.0	8436.5	14565.8±484.63	6529.0
Calcium [mg/L]				
100% - GR	546.1±144.4	732.4±421.4	344.5±78.4	378.2±126.4
50% - GR	1045.6±302.9	282.3±137.6	409.4±168.8	268.8±90.0
100% - SR	412.4±189.0	272.3±116.0	250.6±148.3	255.9±248.8
50% - SR	246.1±103.2	110.5±47.6	74.7±17.5	95.2±39.9
Control	0.0	356.5	115.0±24.4	63.8
Magnesium [mg/L]				
100% - GR	83.1±11.6	51.3±13.5	43.6±10.6	18.4±4.2
50% - GR	96.9±21.1	42.1±24.9	44.7±6.1	18.5±5.3
100% - SR	187.7±16.1	67.6±20.7	55.6±26.1	48.4±26.7
50% - SR	141.8±76.0	44.8±16.36	35.2±10.4	17.4±4.2
Control	0.0	75.7	29.5±4.9	14.5
Potassium [mg/L]				
100% - GR	62.9±4.5	26.7±6.5	24.9±3.8	15.6±2.5
50% - GR	65.4±2.9	24.6±11.5	25.8±3.7	16.5±3.6
100% - SR	75.1±12.4	40.1±5.6	35.1±1.6	26.9±8.7
50% - SR	70.4±22.3	33.3±7.7	30.3±4.7	22.3±6.2
Control	0.0	33.8±	34.8±1.2	17.0

Appendix C: Graphical results of Duncan's test in R studio

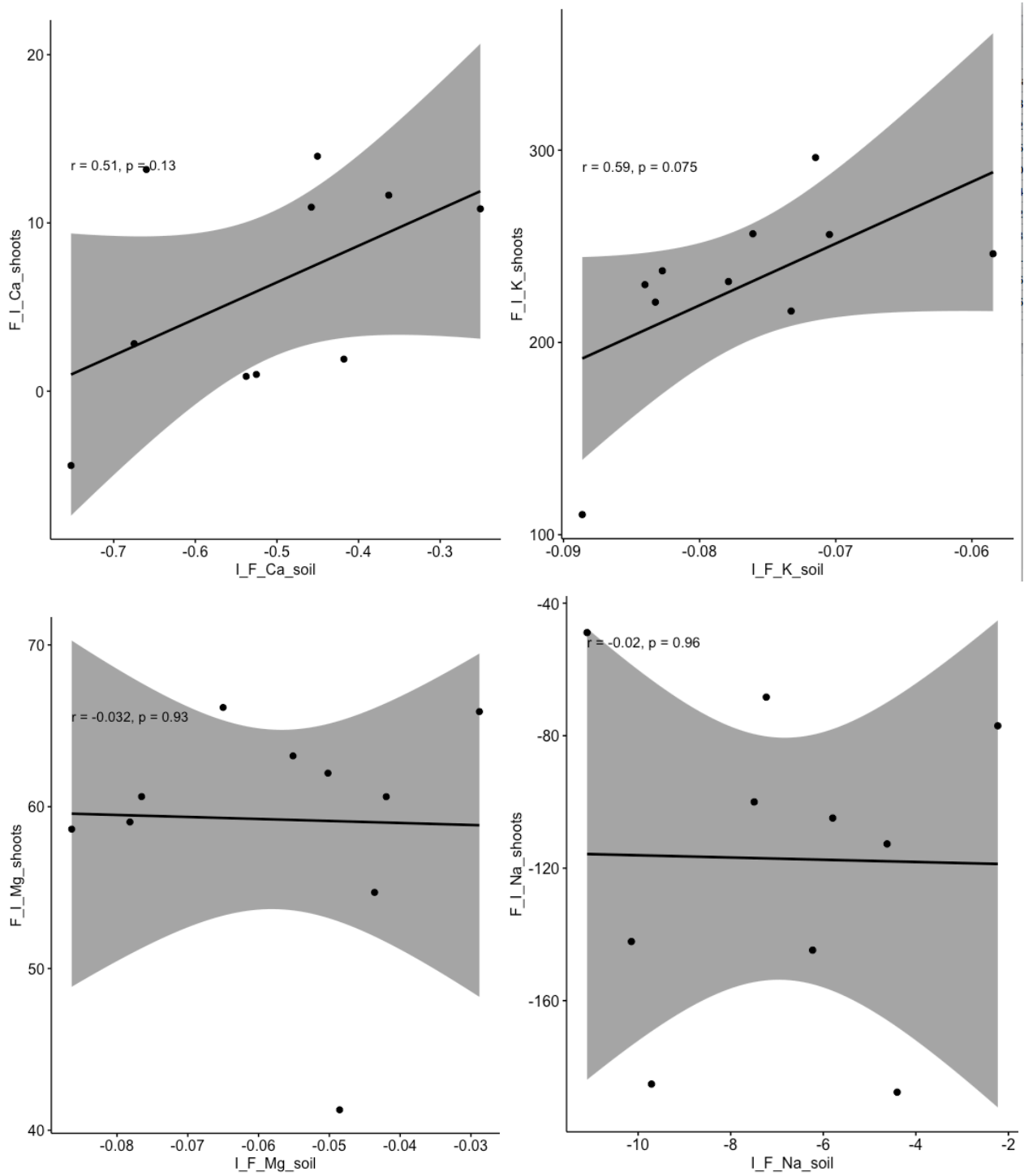


K

Na



Appendix D: Phytoremediation correlation (Table 13)



Appendix E: Chemical amendments correlation (Table 13)

