Review of: Root reinforcement and slope bioengineering stabilization by Spanish Broom (Spartium junceum L.)

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This manuscript presents a complete overview on the biotechnical characteristics of the root system of Spanish Broom in the context of slope stability and erosion. In particularly, the authors focus on the vertical distribution of Root Area Ratio for the quantification of root reinforcement.
The authors rely on new data of laboratory tensile tests for the mechanical characterisation of mechanical root parameters and use them for the calculation of root reinforcement. The authors use the Wu approach (1979) for the calculation of the root reinforcement and implement it in an 2D-infinite slope method for the calculation of the Safety factor of the slope. Moreover, the authors discuss the influence of different type of plant propagation and plantation on the stabilisation effects of the plants. Comparing vertical root distribution data of transplanted and spontaneous plants the authors conclude that spontaneous plants are more efficient in stabilisation then transplanted plants. Finally, the authors tested the rooting ability of stem cuttings in order to evaluate the applicability of this technique for the recover of unstable slopes.
Although, the analysis would constitute an interesting contribution to the topic, it is questionable if it would be the case to take in consideration more advanced approaches for the calculation and discussion of root reinforcement (Pollen et al., 2005) and slope stability (Schmidt et al., 2001).

The following are more detailed comment for the revision:

- Please number the equations reported and use the number as reference in the text.

- P.3994,line 24,"….less suitable for soil bio-engineering or for triggering natural plant succession.": Where is it discussed in the text? Didn't you show that, even if less than natural plants, transplanted plants (like used in Bio-engineering) increase considerably slope stability? Is it not to early to take conclusion on the influence on natural plant succession? Please, rethink this sentence or explain better.
- P. 3995, line 16, "Authors studied…hills.": please reformulate the sentence or use a table.

- P. 3996, line 3, "As far as fine roots are....land surface.": This sentence is not clear to me. What you mean?
- P. 3996, line 5: To me, is not clear the meaning of this sentence. Resistance to what? Which is the connection whit the previous sentence? Please explain better.
- P. 3996, line 6: sentence is not complete "...cross section unit area".
- P. 3996, line 13, "..., with regard to the spatial distribution of roots": tensile strength or distribution of roots? Do you mean different root diameter classes? Please explain better.
- P.3996, line 20, "....influence the results of tensile tests..". Insert "results".
- P. 3996, line 27, "...,except for species and soil conditions.": Which is the meaning of this statement? Please explain better.
- P. 3997, line 2, "...recover badlands ().": give literature references.
- P. 3997, line 10 "...can develop quite satisfactory...": this sentence is to qualitative and it is not clear to what is refereed. To which kind of root system? Please explain better.
- P. 3997, lines 20-29: It looks like you anticipate a summary of methods in the Introduction. This is good in the abstract, but I think should be removed here.
- P. 3998, line 9: more information would be helpful: age of the transplanted plants at the moment of transplantation, provenience of the transplanted plants, geometry of the plantation, and so on.
- P. 3998, lines 13-14: This sentence should come before, in line 9.
- P. 3998, line 21: modify the sentence in "... of rain events a (Table 1).", and I would give the link of the data at the beginning of the sentence.
- P. 3999, line 7: specify the type of test: drained-undrained, saturated-unsaturated.
- P. 3999, line 25, "The direct calculation..": calculation or measurements? Wasn't it in the field? This sentence confuse, please explain better.
- P. 4000, line 10: Ds, the largest soil diameter explored by the roots, how is it estimated or measured? How is the inter-distance between neighbour plants taken in account? How is it than considered for the estimation of root reinforcement at the stand scale? Are the root systems overlapping?
- P.4001, line 10: a index is missing: (Mu-M$_o$)/Mo.
- P. 4001, lines 21-24: This statement in not true. Is it know (Waldron and Dakessian, 1977; Pollen et al., 2005) that so-calculated cohesion values can not be use to rank species or individual plant because it depend on the root diameter distribution. Different distributions leads to different maximal root reinforcement, thus the variability is not due only to the RAR and the maximal tensile strength.

- P. 4002, line 5: equation is not correct. Add brackets,

$$F_s = \frac{(c'+c'_v)}{(\gamma_{sat} \cdot z \cdot \cos\beta + Wv) \cdot \sin\beta} + \ldots$$

- P. 4002, line 10: Z=vertical depth of the failure plane.
- P. 4004, line 14: Soil analysis, and not analisys.
- P. 4006, lines 26-27: how are the hydrological thresholds calculated? Saturate or unsaturated flow? Which equation did you use?
- P. 4006, line 20: you calculated, somehow, the vertical distribution of the RAR for each single plant. How did you upscale the root reinforcement to the entire stand? How did you consider the distance between the plants?
- P. 4007, lines 11-15: as mentioned before, this method need to be better explained and some arguments of the discussion need to be revisited.
- P. 4009, line 5: It is not possible to evaluate the statement just on the base of fig 1. A better description of the slope failure is needed: dimentions, geometry, type of failure.
- P. 4009, lines 5-7: This conclusion can not be evaluated. It is not explained how you calculate the estimated occurrence of the return time. Please, explain better the method and how you get to the conclusions.
- P. 4009, line 2: Expand the discussion, considering that the methods you used are not the state of the art. Wu method versus Fiber bundle model, infinite slope method versus finite element method or discrete element methods.
- P. 4010, line 26, "The root tensile strength is significant." What does it mean? Refereed to what?

- Figure 4: I suggest to replace it with the results of a chi squared test.
- Figure 5: What do the bars mean? Quantile, confidence interval?
- Figure 9: Add literature data as comparison (Operstein, Tosi, DeBeats).

The manuscript presented could be published in HESS with a minor revision, following the indicated modifications and expanding the discussion section 4.3.