

Interactive comment on “Coffee husk mulch on soil erosion and runoff: experiences under rainfall simulation experiment” by H. Moreno-Ramón et al.

Anonymous Referee #4

Received and published: 1 June 2014

The paper describes a study evaluating coffee-husk mulch as an erosion and runoff mitigation technique. The experiment compared runoff and erosion rates across three levels of mulching (none, surface application, and integrated in the soil), four soils, and two crusting classes (without and with rain crust).

Coffee husks appear to be an effective mulch for reducing runoff and erosion at the plot scales, and using the residue as a mulch could be a useful application. I am not aware of coffee husk residue being tested as a mulch in other work, and the study also addresses the impacts of the presence of soil crust on runoff and erosion. Despite the novelty of the material being tested, the contributions to our understanding of the effect of mulches or soil crusting on hydrologic and erosion responses are not clear. This should be better explained in the discussion of the results. The scientific significance

C515

of this work is fair as presented and may be elevated to good if the authors can improve the discussion of the results.

The presentation of the work is poor and requires substantial revision. There are many grammatical errors, and these often make the results difficult to interpret. The authors should have the manuscript edited to improve the presentation in English, especially with regard to sentence structure and reducing redundancy.

The methods, results, and discussion are unnecessarily brief, and this makes the study hard to interpret and the scientific quality of the paper poor. The results could not be replicated given the current description. Some of the major issues in the study are:

There is no mention of the antecedent soil moisture condition, except that half the plots had rain applied to form a crust. Were the non-crusting plots wet without crusting? Or were the crusting plots dried to the same soil moisture after the crusts were formed? If neither case, the crusting may be confounded with the soil moisture condition, which would also affect runoff and erosion the results.

It is not clear whether the crust-forming rainfall was applied after the mulch was incorporated or if the mulch was incorporated after the crust was formed. If the B treatment was applied after the crusting, then the crust would be disturbed by the mulching and this combination would not be comparable to the others. A more concise presentation of the sequence of presentation of the plots is necessary to understand the experiment.

The methods indicate the Shapiro-Wilks test was used to test for normality. But Table 4 shows that the means for the sediment loss and concentration were very different from their medians, which is a very coarse indicator for non-normality. Were these data normal? If not this should ANOVA analysis should be revised, using either non-parametric methods, data transformation, or a statistical model that can accommodate non-normal distributions. Since some of the interactions were significant, the groups should not be pooled in the statistical analysis.

C516

The presentation of both infiltration and runoff and sediment concentration and soil losses is a bit redundant and could be simplified.

The discussion points do not show the importance of the study nor do they put the work in proper context of other work relating to mulching of agricultural soils.

The conclusions are mostly based on the results, but they are overly brief and do not address all of the key findings of the study.

Specific comments:

p. 1128 line 16-17 needs a reference.

p. 1128 line 1 there are many references relating use of mulches in burned areas, any of which would be more relevant than Leon et al. 2013 that relates to effects of ash cover.

p. 1129 line 26-27 could be a discussion point.

p.1130 line 10-11 the point is not clear

p. 1131 line 6 I suspect that infiltration rate and sediment concentration were calculated. If so the method should be stated. (see 1133 line 13)

p. 1131 line 9 state the general location of the river

p. 1131 line 12 how were the different soils selected?

p. 1132 line 5 the mulch dimensions are quite small. It would be useful to know how much mulch was removed in the simulations, even if this was not rigorously measured. Discussion about the movement of the mulch in the presence of other forces (wind, rilling) or the degradation of the mulch over time would also aid in the application of this mulch as an erosion control practice.

p. 1132 line 6 how was the soil packed in the trays? Was the soil bulk density measured and consistent across all trays?

C517

p. 1132 line 13-15 it is incorrect to say that previous research agrees with the current study. Rephrase to indicate you followed the guidance of the previous work.

p. 1132 line 15-17 were these attributes measured after the incorporation of the mulch? If so report the values, and if not delete or provide a citation.

p. 1132 line 20-23 should be in the introduction and not methods.

p. 1132 line 24-27 should be combined and moved to the preceding paragraph.

p. 1132 line 28 fig. 1, while quite informative, does not show the collector system.

Table 2 would be more informative if it showed the actual values and the significance for each interaction. Since some interactions are significant the groups should not be pooled.

Table 3 is unnecessary.

p. 1135 lines 3-4 are unclear.

p. 1135 line 8 it is not clear which treatment(s) had significantly different infiltration rates.

p. 1135 lines 18-19 are speculative, as the study did present the effect of the mulch on the soil properties.

p. 1135 lines 21-25 are unclear.

p. 1136 lines 8- 9 say that crusted soils and uncrusted soils both reduced the infiltration rate. This is counter intuitive and contrary to 1135 lines 13-14.

p. 1136 lines 11- 13 Figure 1 has a nice photo of the soil crust for a soil, but since the soil type and treatment for the soil in the photo are not identified or compared to other soils/treatments the photo does not support the statement that the high silt content in soil I produced thicker crusts.

Table 2 the values for runoff and average infiltration rate do not add up to the applied

C518

amount of rainfall. Perhaps this is due to the modeling of the infiltration rate using the Horton equation. The modeled and actual infiltration rates should be compared or the error (in modeled values, measured values, or applied rainfall rates) should be addressed. Sections 3.2 and 3.3 are largely redundant as the runoff and infiltration rates are complements. I don't see the value in presenting both analyses.

p. 1138 line 1-3 if the interaction between treatment and crusting did not produce significantly different sediment concentrations then why indicate the specific crust-treatment combinations that produced the highest and lowest sediment concentrations? The earlier statements are sufficient.

p. 1138 lines 4-20 are hard to follow as there are several points introduced in this single paragraph. Also this discussion would benefit from more explicit and clear presentation of the differences in the soil properties as they relate to the sediment concentration results. Also, the magnitude of the possible error of the inclusion of the husks in the sediment losses should be quantified. Additional discussion of the results for the crusted plots where rilling occurred would be useful.

p. 1138 lines 21-28 and p. 1139 lines 12-18 the studies by Groen and Woods and Prats et al. were in burned soils and are not directly comparable to the current study. The site details, especially the soil conditions, in the other cited works vary dramatically, and more explanation of the conditions would be useful to put the current study's results in context.

p. 1139 line 25 the presentation of the results is not sufficient to conclude that the residue is most effective at reducing soil loss in soils of low quality.

p. 1140 line 15 the soil loss was always greater than zero so the word 'avoided' should be deleted

The conclusions are overly brief and condensed. Specific statements about the effects of each factor (mulching, crusting, soil type) should be presented for the runoff and

C519

sediment production.

Interactive comment on Solid Earth Discuss., 6, 1127, 2014.

C520