

Interactive comment on “Interactions between organisms and parent materials of a constructed Technosol shape its hydrostructural properties” by M. Deeb et al.

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This is an interesting study, which I consider appropriate for publication in SOIL after some improvements. My main concern is that some passages should be rearranged and that results and discussion should be carefully separated. In the following, all of my suggestions for improvement of the manuscript, are listed.

We are very thankful to Referee 2 for his helpful comments and the overall interest for our manuscript. We will do our best to take into account his comments.

Abstract:

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Page 1310

Line 2 and throughout the manuscript: "uptake of topsoil" sounds strange to me. Probably the authors mean the relocation of the topsoil? Relocation is not far from what we mean, but it doesn't imply the fact that the extracted soil is irreversibly damaged in the process, and that there is some selections that are made in the collected materials, as a plant would do when uptaking nutriments.

Lines 6 and 11: Do the authors mean the same when using the terms "deep horizons of soils" and "parent material"? Please be precise with these terms, especially as there is no unique definition of "subsoil" or "deep subsoil". Thanks you, we will change line 6 as followed: Parent materials, which were excavated deep horizons of soils and green waste compost (GWC), were mixed. . .

Line 11 and throughout the manuscript: Please write "parent material" without hyphen. We will follow your advice and write in all manuscript parent material without hyphen.

Introduction

Page 1311

Lines 1ff: I think the authors mean "Understanding of the influence of bioturbation: is not straightforward". Yes, that's what we mean, thank you for clarifying the idea, we will change as you suggested.

Line 12: See above (topsoil uptake). Unchanged, see above

Lines 13ff: Please give a reference for this. Is the release of CO₂ the only reason against the use of topsoil? You are right, there are many reasons. We will change the sentence to: Many urban planners and greenspace enterprises are interested in constructed Technosols because they are an alternative to topsoil uptake from the countryside and the damage implied on the collecting site which need ten thousand years at least for reconstruction. Also, transportation costs and downsides could be avoided. Moreover, Technosols offer an opportunity to recycle urban waste, such as excavated

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deep horizons/backfills from enterprises of the building sector, sewage sludge from waste water plants or green waste from greenspaces enterprises or local authorities. In this regard, Technosols offer another life to these materials, which accumulation is urgent to cope with, due to health and environmental problems (Nemerow, 2009; Marshall and Farahbakhsh, 2013) while they could be used to improve urban ecosystem services (Morel et al., 2014).

Line 21: Please write "pedogenesis of natural soils". We will write "pedogenesis of natural soils"

Lines 24ff: There is an abrupt change of the topic here. Please rephrase or rearrange. Line 25: "This has led to consider" sounds strange. Please rephrase. Line 24 to page 1312, line 2: This passage sounds a bit confuse and too defensive. It does not get clear to me what is the main statement here. We agree with you. We take the three comments into account. We will remove this part, from line 24 (page 1311) to line 2 (page 1312)

Page 1312, line 7ff: This is not necessarily true in all cases. Parent materials of soil formation may already have been exposed to vegetation. For instance, terrestrial eolian sediments like loess are wide-spread parent materials. For deposition of loess, at least a grass vegetation cover is required. Highly abundant microrhizoliths in this sediment (calcified fine roots, frequently called pseudomycelia under the assumption of abiotic formation) give evidence of this. Further, roots of many tree and shrub species are able to penetrate deeper parts of the soil as well as soil parent material, entailing incorporation of root- and microorganism-derived organic matter. Thanks for your interesting notice, to be more specific, we will add "in the specific case of this study" to clarify. . . .because parent materials have never been subjected to the activities of organisms such as plants and macrofauna before mixing in the specific case of this study.

Page 1312, line 23 to page 1313, line 24: The last two paragraphs of the Introduction are not very well structured. Both begin with "we were interested ". Please rearrange

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these parts and be more focused. In my opinion, they could be shortened a bit. We insisted on the action of both earthworms and plants over the soil structure to detail our hypothesis that both will help to improve the soils qualities. In our opinion, it's mandatory to detail the various aspects found in natural soils before measuring how it is in Technosols. We will however change the beginning of the first paragraph (line 23 page 1312) to avoid repetitions like this: "The aim of this study was to determine the influence. . ."

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Line 5: What are "rhizosphere inhabitants "? Do you mean microorganisms? Yes, that's what we mean, we will add "rhizosphere inhabitants (microorganisms)" to clarify.

Line 16: Please explain shortly to the reader what a soil shrinkage curve is. In this study, we were interested in the effect of two soil-forming factors, i.e. parent materials and organisms, on hydro-structural parameters via measurements of soil shrinkage curves (SSC), which represents the concomitant decrease in soil volume and water mass during drying (Haines, 1923).

Line 17: Please write "The influence of parent material properties: " We will add "properties" to this sentence.

Material and methods

Page 1314

Line 3: So far I thought that a constructed Technosol is build from soil parent material (or deep soil horizons), mixed with green waste. But here, I read that the deep soil material is the waste material. This is confusing for me. The term waste is defined, at least in French (http://www.empreintepositive.org/EmpreintePositive/images/download/Documents/Les_decl page 4), as "Is considered a waste any residue from a production, transformation or use process to be abandoned", which is precisely what is done with excavated

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materials, as building companies send them to a landfill site. Both material can thus be considered waste. Lines 10ff: To keep the manuscript a bit shorter and make it more clearly arranged, I suggest to put all of the soil parent material properties in a table. Thanks for your advice but this way of presentation allows to give short comment to every characteristic of the soil. It's a choice of presentation with no significant improvement of reading, and we will keep it unchanged unless the editors recommend it.

Line 12ff: Why do you once just mention the percentages of clay, silt and sand and then, in the second part of the sentence, explain the grain size boundaries? It should be the other way round. At the first part we give the percentages of clay, silt and sand after removing carbonate because clay percentage is the most important information here, but it's still of interest to quantify the granulometry analyses to our materials, so at this step we use "particle" instead of clay.

Lines 20ff: Would it be possible to give the information, which plants (grasses, shrubs?) and also which plant parts (roots, shoots, branches?) the green waste compost derives from? It is from urban green spaces waste, so we can imagine it contains municipal garden waste, plant tissues waste, sawdust. . . It is almost impossible to identify what is the precise composition or the type of plant we have.

Chapter 2.3: Do I understand it right that all the parameters were calculated only based on the uppermost 5 cm of the microcosms, whereas the microcosms had a height of 12.5 cm? I am not familiar with the SSC model, but it is likely that the microcosms, after 21 weeks of plant growth, were completely rooted. Therefore, I wonder if the total volume of the microcosms should be used to calculate these parameters.

We just used a norm already applied by Brodeau et al, 2004. milleret et al 2009, Boivin et al 2004, Shaffer et al 2008, Boivin et al 2009, kholer Milleret 2013, etc. . . We made the measurement on the same cylindrical volume for the 96 samples, so it's not necessary to compare the total volume.

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Page 1318, lines 14ff: Is it really necessary to mention all of these size classes for the roots? In the Results section, only two size classes are mentioned. The measure was on these five diameters classes but the effect of GWC and earthworm was not significant of the thickness of root as we mentioned in the results Page 1318 line 21, so to let the results simpler we calculated the sum of the roots when they were more than 400 μ m and less than 400 μ m. But having non-significant value for the other groups is still a result worth considering.

Results Page 1319, lines 21ff: It would be sufficient to give one decimal? In all the paragraphs we will change to one decimal.

A general remark on the Results section: In my opinion, there is already a lot of interpretation in this chapter (and at the end of section 3.1 even a small conclusion). If Results and Discussion sections are separated, then the former should contain only description of the obtained data. To follow your advice, In the section 3.1 page 1320 line 12 we will delete "we thus concluded. . . ." In the section 4.3 page 1326 line 14 we will delete "L. perenne had a positive effect on almost all hydro-structural parameters, with a 15 strong influence on the structural phase (Kst) slope. Moisture ratio in micropores, macropores and in the whole porosity and macropore or total volumetric available water content were also positively affected (Table 2)" and start directly with "The general . . ."

Page 1320, line 8 and throughout the manuscript: Please write "effects of GWC portions/ percentage" instead of "effects of GWC ". We will add in all the manuscript " effects of GWC percentage " instead of " effects of GWC " .

Section 3.2: If you mention figures with 4 (Fig. 3) or even 6 diagrams (Fig. 4), then it is appropriate to mention also, which part of the figure you refer to in the text (Fig. 3a, Fig. 4d etc.). We will follow your advice and mention the part of figure: Line 23: The positive effect of GWC was particularly important in treatments with plants at 50% GWC (Fig. 3c) and in treatment with earthworms and plants at 40 and 50% (Fig. 3d). Page

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1321 line 8, The moisture ratio was also positively affected by the GWC percentage, for example when we compared moisture ratio at macropore saturation we noticed an increase of 59% between treatments 0 and 50% GWC in the control without organisms (Fig. 3a). The percentage of GWC is enough to refer to the corresponding item on figure 4.

Page 1320, lines 28ff: Again, reducing the values to one decimal makes it easier to read the text. We will change to one decimal.

Page 1321 Line 14: The phrasing "looked smaller" sounds colloquial to me. Will be changed with "structural phase in the presence of earthworms reveals to be shorter for 40 and 50 %"

Lines 16f: Headings of sections 3.2 and 3.3 are nearly the same, and it does not get clear immediately what is the difference. Maybe these sections could be merged? We will merge the two sections.

Page 1322, line 22 to line 26: This information should not be part of the Results section. Yes, it is correct, we already presented this information in data analyses so we will start directly with "The complete Anova model with GWC. . .

Discussion Page 1324, line 21: "constructed" It will be changed

Page 1326, lines 14f: Isn't this a repetition from the Results section? As stated above, the authors should carefully distinguish between results and discussion. This information is used to clarify the point of dissection, it's only a little reminder.

Generally, when discussing the influence of roots and earthworms for soil, it could be helpful to cite the review by Kautz et al. (2013, SBB). I cannot find the reference you're talking about, but I'd be happy to consider it if you send me the correct one. Also I'm pretty sure the reference we mentioned was enough.

Section 4.3: Here, not only the influence of plants is discussed, but also the interaction of plants and earthworms. Thus, maybe sections 4.2 and 4.3 could be merged? In

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the section 4.2 we discussed the influence of earthworm the other section argument the effect of plant and then compared both effect so we don't see why they should be merged.

Page 1327, lines 7ff: Very long and complicated sentence. Please split. By introducing these organisms at the very beginning of Technosol creation, i.e. before compaction, managers could initiate a virtuous cycle in which organisms maintain loose soil structure. This favors the establishment of other organisms that maintain their own habitats, which in turn could benefit from plants and earthworms by preventing later compaction.

Page 1328, line 5: Do you mean "needs to include ecological aspects"? You are definitely correct. We will change as you suggest.

Conclusions

Page 1328, line 20: "in the same way LIKE: " "In the same way than" will be deleted and we will add "like earthworms" ————— As we follow reviewer advice we will add the follow references:

Page 1332, line 7 Marshall, R.E., and Farahbakhsh, K. Systems approaches to integrated solid waste management in developing countries. *Waste Manag.* 33, 988–1003, 2013. Page 1332, line 28 Nemerow, N.L.: *Environmental Engineering: Environmental Health and Safety for Municipal Infrastructure, Land Use and Planning, and Industry*, (sixth ed.) Wiley, Hoboken, N.J 2009.

Please contact me if you have any question. Sincerely, Best regards, Maha DEEB

Interactive comment on SOIL Discuss., 2, 1309, 2015.

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