PLEASE, IN RED YOU FIND OUR REPLIES, IN GENERAL AND POINT-TO-POINT TO REFEREE

Interactive comment on "Study of microarthropod communities to assess soil quality in different managed vineyards" by E. Gagnarli et al.

Anonymous Referee #1

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Study of microarthopod communities to assess soil quality in different managed vineyards

Referee comment

GENERAL COMMENTS Soil biodiversity response to landscape management has been recently identified as a priority for environmental research based on growing evidence that landscape management can significantly modulate the effects of climate change on global biogeochemical cycles and the carbon balance of terrestrial ecosystems.

However, soil biodiversity databases are still very poor with most available information referring to microbes. Soil biodiversity protection relies on fluent cooperation between scientific and policy makers and there is an increasing requirement for effective monitoring of soil biodiversity at all levels of the soil trophic web. And, with this aim, defining sensitive biological quality indicators is essential This paper deals with soil mi-croarthropods and their usefulness to evaluate effects of agricultural practices on soil biodiversity and, therefore, points out a very hot topic. I deeply appreciate the effort required to manipulate and classify soil fauna because of its abundance and small size and I especially welcome data coming from calcareous soils around the Mediterranean basin where soil inventories are particularly scarce. The paper, however, contains

methodological flows. I sincerely encourage authors to review their work in deep to improve the quality of the results.

We are thankful to the anonymous referee for the very valuable advices and comments. These comments are a useful input to understand that some of our design/results have perhaps not been clearly explained and, consequently, not adequately appreciated. We thank you again for the comments and our intention is to accept and review the ms according the suggestions and corrections of the referees.

MAIN ISSUES

A

Work focus. Generally speaking, there is a lack of focus all throughout the paper: authors state that the main objective of their work is "to assess the effect of two types of management of vineyards (Organic and IPM) on soil biological quality", but they do not even describe them. The introduction is poor and the discussion should be totally rewritten.

As you pointed out, the problem may rise in consideration to identify exactly the main objective of the ms. We'll corroborate this part by inserting some traits referring to the two different managements. Furthermore we to strengthen the aim and conclusions on the basis of these comments. In this context: we modified the title (we calibrate to a 'case study' the ms); we tried to sensibly implement the introduction and discussion; we detailed concerning the different managements

B. Sampling design (i). Sampling design is totally unbalanced. An unknown number of samples has been collected from 11 sites located in two different geographic areas (Asti and Cuneo), with 9 sites located in Asti and only 2 in Cuneo. There are 7 plots to represent the organic treatment but only 4 plots represent the IPM treatment. All organic treatment plots are located in Asti, while 2 IPM plots are in Asti and 2 in Cuneo. The "Area" effect has not been taken into account in the statistic treatment.

It was right. We carefully set the exp design to smooth un-balancement and to reach 4+4 vineyards. Furthermore, we enforced that the choice of sites was related to the attempt to find soil conditions (soil texture, TOC, pH and so on...) as similar as possible for both managements. Climatically and geographically the areas were described. In this study, the vineyards considered are in close areas (this is now indicated in the ms) and meteo data reported by three meteo stations in the farms are not different.

C. Sampling design (ii). Samples were collected in two different dates (March 2011 and May 2012) which is not justified (no available climatic data) from the point of view of seasonality or inter-annual variability. It is also unknown why the authors decided to sample soil

at three different depths. The fact is that the information provided by both factors (sampling date and depth) is trivial for the main research question and induces noise all throughout the paper.

The sampling period is related to the vegetative stage of the plant and the before and after treatments (before, however, the summer period and the harvesting of grapes). To integrate these aspects, we asked the farmers and reported data on the 120 days before the samplings.

We agreed with your consideration on different depths: effectively, this aspect caused 'noise' and we pooled the different depths.

D. Soil biological quality indicators. Soil quality indicators used in this work are based on soil microarthropods and include: total abundance, four different indexes of biodiversity and evenness, and an integrated index (Biological Quality Index -BQI-) based on animal morphological adaptations to life in soil. I'd like to see some justification of this choice, particularly of the interest of calculating four biodiversity indexes. Putting this aside, there are two serious methodological shortcomings should be considered: (i) all animals extracted from samples under Berlese funnels have been taken into account, including accidental passersby that inhabit the aboveground subsystem; some orders that are not correctly extracted under Berlese funnels should also be removed from calculations.

Bioindicators for soil quality are less developed than those of water and air but are rapidly evolving. Generally, tthe evaluation of biodiversity is performed by the application of the main ecological indexes. Here, we added also the QBSar evaluation as for its morphofunctional indexing could be fitting to our purposes.

Concerning QBS, there are different types of environments in the soil and subsoil and the method of Parisi does not exclude forms aboveground. Takes this into account by scoring irrelevant (1) compared to other biological forms more adapted (20), the epigeic forms did not affect significantly the index. On the top of Berlese funnels it was placed a net to avoid the collection of 'external' arthropods (for example, flies)

E. BQI calculation. I don't find classification of microarthropods to Order adequate to calculate BQI, given the great variety of morphological and functional traits pooled together at this level. For instance, Collembola includes very contrasting taxa: Sminthuridae and Entomobryomorpha include a number of epi-edaphic forms, while other suborders are richer in eu-edaphic species (colorless, blind, no furca, no scates....). I deeply recommend revisiting samples and reclassifying them before redoing statistic treatments.

I partially answered the question above for the adaptations of springtails to life underground. Basically, we wanted to consider all the microarthropod community and applied the BSQar index. We did not consider the calculation of the BSQ-c.

SHORT SPECIFIC COMMENTS

Sorry, as the strong revision of the ms, some concepts and corrections can be moved from the original number of page and line

Pg 68 Line 21. What do you mean with "biotic components?" belowground preys for aboveground consumers, perhaps?

Done.

Pg 69. Line 19. Ladygina and Hedlund (2010) paper is about effects of plant species on soil microbial community composition; for the opposite sense (effects of soil biota on plant diversity) I suggest you consider reading De Deyn et al (2003) Nature:422, 711-713.

Sentence removed and thanks for indication.

Pg 70 Lines 5 to 11. Please, clarify the geographical location of your plots. Looking at Table 1, it looks like you have been working in two localities: Asti and Cuneo. If I'm not wrong, Cuneo is closer than Asti to the Alps and also more elevated. This could cause significant climate differences between both areas. Whatever the case, you should include the area effect in your statistics.

Done. See also main issues a) and B)

Pg 70 Line 8, and about Table 1. Please, describe "organic" and "IPM" treatments. Do you know how long these treatments have been applied? which size are the fields in each site?

Done.

Pg 70 Line 8. "climate zone is typically of class E". Do you mean the "Polar and Alpine" climates (E Group) in Köppen's classification? Please mention the classification you are using. Could you also provide real climatic descriptions of both (Asti and Cuneo) sampling zones?

It was reported in the text, in sites description.

Pg 70 Line 11. Your samplings were done in March (very late winter, almost spring) and May (spring): did you find contrasting T or rainfall conditions that justify sampling in these dates and areas? Please, provide these data.

For us it was important that, in the different sites, there was quite homogeneous T and rainfall conditions in the same periods.

Pg 70 Line 12. How many samples did you take per site? Did you set up plots (size of plots and number of samples per plot) or transects (number and length)? How did you choose the sampling points? Any particular distance from vine tree rows or individuals?
Detailed.

Pg 70 Line 17. Same questions about "additional samples". About results in Table 2: Means of how many values? Since you have the mean, please, also provide dispersion estimates (stdev or SE)
The Anova was performed by Catmod module and by classifying the categories on the basis of the USDA range. They are not pure 'means' statistically e normally. Our interest was to have information and characterize the soil. This analysis, now, is cut off. In the Material and Methods, this part is more detailed.

Pg 71 Line 3. As you cite QBS was first described by Parisi (2001). Unfortunately, this document is not easily accessible and, moreover, is totally cryptic for non-Italian readers. So, I suggest you explain what the index is about or/and you cite later publications that explain its meaning and details for calculation (i.e. Parisi et al. 2005, Agriculture, Ecosystems Environment, 105: 323-333
Done.

Pg 71 Lines 11 to 15. You calculate a great deal of biodiversity indexes. Is there any particular reason to do so? Please, explain differences between them.
We inserted comparison of the indexes calculated and discussed meaning of difference.

Pg 72 Line 3. "4322 individuals" does not mean anything per se. Please, provide values per unit area (or per unit soil volume or weight) as mean±stdev (or SE) so that we can make comparisons with other published data (also in tables)
Done.

Pg 72 Line 4. You cannot compare the sum of 7 plots with the sum of 4 plots... !!!!!! Please, calculate means and standard deviations of the abundances per area unit. But, before doing this, please eliminate from your counting all animal groups (Table 3) that are not edaphic..!!! many of the groups you have listed are simply passer-by (i.e. Rhynchota or Diptera), or Berlese-Tullgren extractors are not adequate to capture them (i.e. coleoptera). Table 3. Please once you've solved the abovementioned problems, reorganize Table 3: put the groups in both lists in the same order.
Concerning abundance /unit area: Very appreciated the indication and corrected.
As already reported, the epigeic groups must to be considered: not all individuals of these group are flier, for example, some of them could be recently emerged.

Pg 72 lines 10 to 13. Some of the mentioned seven taxa are totally heterogeneous in relation to soil horizon preference. i.e. Collembola include epigeous forms (most Symphypleona and big Entomobryomorpha) as well as other tiny, colorless, blind and no tailed forms typically endogeous (How did you calculate QBS then ???) Same for mites depending on sclerotisation, legs length, etc.
Some groups display a range of EMI values (e.g., for Collembola and Coleoptera), because these groups have species with different soil adaptation levels. Whenever two eco-morphological forms are present in the same group, the final score is determined by the higher EMI. As regards the Collembolans, in each sample, the euedaphic forms were present by scoring EMI=20. The acari no living in soil were not considered. We attributed correct EMI value for each group on the basis of Parisi indications.

Pg 72 Lines 15 to 21. This part should not be there. Move the paragraph forward to the description of the plot environment.
Done.

Pg 71 Lines 21 to 24. How did you apply ANOVA here? TOC is expressed as percentages (one per sample) but this is not a factor with a given number of levels.... Same doubt for texture.
The parts are strongly restructured. Please, see the previous reply.

Pg 73. Lines 3 to 5. I would say that the main interest of this paper is to compare two types of management for their effect on soil microarthropod abundance and diversity. So, why don't you run any statistical test on effects on biodiversity indexes?
Done.

Pg 73 Lines 11 to 13. You sampled soil only for arthropods and don't know anything about total soil fauna, so you cannot tell anything about arthropod proportion in your samples
Right and revised.

Pg 74 lines 12 to 13. Why did you expect this result? Please discuss it
Done
Fig 1 and Table 3 are redundant.
The Fig 1 was deleted. The Table 3 was modified.