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Interactive comment on "Short term recovery of soil physical, chemical, micro- and mesobiological functions in a new vineyard under organic farming" *by* E. A. C. Costantini et al.

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Dear Referee, we uploaded an additional copy of our response as supplement pdf document, where the text formatting has been correctly maintained. At the end of the document are also the revised versions of the figures 3, 5, 6 and 7, according to your request.

Thank you very much Kind regards The authors

Abstract

Line 23 - Referee: Do not directly use abbreviations without describing them before.

- Authors: accepted "TOC, N, C/N and EC" will be changed as "total organic carbon, nitrogen, carbon to nitrogen ratio and electrical conductivity";

Line 27 - Referee: it seems here that precipitation is different in the old and new vineyards. - Authors: accepted the sentence will be rewritten as follows: "The microarthropod analysis showed significantly different abundances and community structures in relation to both vineyard and time. Rainfall appeared to have enhancing effect on microarthropod abundance, but only in the old vineyard, where the biota was more structured than in new one."

Introduction

Line 12 - Referee: "ensures" - Authors: accepted

Materials and Methods

Page 6, lines 9-17 - Referee: Give the mean annual temperature and the exact number of years of "the long-term average data" for climatic conditions (indicate the range of years better). - Authors: accepted "According to the long-term average data (1990–2010), the area has a mean annual temperature of 12.3 °C and precipitation of 800 mm, mostly concentrated in autumn and springtime. The potential evapotranspiration (ET0) from April to September is 850 mm (Hargreaves and Samani, 1982) and the Winkler index is 1.856 degree days."

Page 6, lines 18-23. - Referee: I see in Fig. 1B that the area where the old vineyard is located has flat and hilly sections. In which part did you carry out this study? Include the slope (and orientation if not flat) of your study area in both vineyards. - Authors: accepted The following lines will be added to the text in the site description: "The vineyards are both situated on the top of a small hill, at about 400 m a.s.l. altitude, with gentle slopes (near 5%). The new vineyard has a North-West aspect, whereas the old vineyard a South-West aspect."

Page 6, line 24: - Referee: Include the main species used for grass-cover. - Authors:

accepted More information will be provided on the grass-covered inter-row management. In particular, the latter were kept under natural weed development, which was periodically mowed (two or three times per year) and shredded together with plant residues, and left on the soil surface. Once a year, the grass-covered soil was scarified to 40-50 cm depth, without soil inversion, to allow soil aeration and avoid soil compaction.

Page 7, lines 26-29: - Referee: Explain better this lack of samples. I is not corrected addressed here. - Authors: accepted “Experimental data were not available for soil microarthropods in 2010 (both vineyards) and for soil properties in 2011 (old vineyard); therefore, for the mentioned years, not all selected variables were available for comparative evaluations.

Page 8, line1: - Referee: Why did you not record phenology nor production, because of the youth of the plants? Explain it better. - Authors: accepted Due to the youth of the plants and their delayed growth induced by poor soil conditions, no significant grape production was obtained from the new vineyard until the end of the experimental period, except for a few small clusters in 2013 and 2014, which however were not suitable for harvest or grape yield monitoring. Therefore, neither vine phenology nor production were recorded over the five years.

Page 8, lines 6-9: - Referee: Move this paragraph to Page7/Line 15 where you explain the sampling procedure. - Authors: Sampling for soil and microarthropod analysis followed different procedures (additional information on microarthropod sampling will be provided in the next revision of the manuscript); therefore we thought it would be better to describe the sampling procedures together with the specific laboratory analysis methods in separate paragraphs.

Page 8, lines 12-13: - Referee: Delete the sentence “Soil physical ... nitrogen.”, since you are explaining below all properties with the analytical methods. - Authors: accepted

Page 9, lines 4-6: - Referee: Explain how you measured CO2. - Authors: accepted

Estimation of soil organic OC mineralisation was performed by measuring the C-CO2 developed [mg (C-CO2) kg soil-1 day-1] from soil in closed jars (Isermeyer, 1952). A 25 g amount of oven-dried soil was rewetted to a -33 kPa water tension and incubated at 30°C. The CO2 evolution after a one day (representing the soil easily mineralisable C) was determined by back titration of the NaOH-absorbed CO2.

Page 10, lines 3-4: - Referee: Include the algorithms used for the indices used. - Authors: accepted The DGGE patterns and band intensity were used to calculate the Shannon-Wiener index (HâĂš) and the Simpson index (D), which, along with the number of DGGE bands, were used to characterize soil microbial diversity:

HâĂš = − SΣi = 1pi ln pi; D = − SΣi = 1pi2

where S is the total number of bands and pi is the relative abundance of the i band calculated as the ratio between i band intensity and the sum of the intensities of all the bands; All calculations were performed using the Gel Compare II software v 4.6 (AppliedMaths) (Fabiani et al., 2009).

Page 11, lines 4-5: - Referee: Indicate the length of the soil cores to know the depth of sampling. - Authors: accepted The following additional details on microartrhopod sampling will be added, also in response to a previous comment by another Referee:

All biological determinations were performed once a year, from 2011 to 2014, collecting 1/3 dm3 soil cores (sample depth = 10 cm) from 4 replicated zones within each vineyard. For the extraction of microarthropods, the soil samples were placed in Berlese-Tullgren funnels for 5 days. The soil was allowed to dry from the top down, by means of a heating light; the microarthropods moving through the soil were collected into a preservative solution (80 % ethanol) and afterwards identified to the order level using a stereomicroscope.

Results

Page 13, line 20: - Referee: You say that the Simpson index showed not significant

differences except for 2013. However, there are also differences in 2012 according to Fig 5. Correct. - Authors: accepted The Simpson index showed no significant differences at the start and at the end of the experimental period, while during 2012 and 2013 it averaged higher values in the new vineyard (statistical significance levels P = 0.1 and P = 0.05, respectively).

Page 13, lines 25-27: - Referee: In Fig 6, for 2012 data, there is a “ns” written, indicating not significant. Is it correct? It is strange that this high difference (around 50%) is not significant. - Authors: accepted a high within-vineyard variability during 2012 caused the differences between the two vineyards for soil microbial respiration to be statistically not significant.

Page 14, lines 1-6:

- Referee: According to Fig 7a, differences are not significant in 2012 and 2014, although visual differences are huge. I guess this is due to the high variability of data. Include the standard deviation in the graphs to show this variability. - Authors: accepted We can confirm that microarthropod abundance was characterized by high variability in the study years (as will be shown by the revised figures, including also the standard deviation). Encouraged by this referee’s observation (we are grateful to him for that), we checked our dataset and realized that a mistake had occurred in trasferring some data between files. Though the mistake had no substantial effect on the results, the correct data allowed an improvement in the statistical significance of the difference between the two vineyards in 2014 (P = 0.05). Accordingly, we updated the text at line 5 (and the figure 7A) as follows: “the difference was not statistically significant only in 2012”

Discussion

- Referee: In general de sentences are too long. Try to divide long sentences into smaller ones to make the text more comprehensive. - Authors: accepted.

Page 16, line 23: - Referee: Replace “poor statistical significance” by the actual P value. - Authors: accepted the sentence “though with poor statistical significance“ will be changed to: though the differences were not statistically significant in 2012 and 2013 (P > 0.1).

Page 18, line 24: - Referee: Since you indicated that you data did not follow a normal distribution, it is not suitable to use Pearson correlations. Use Spearman instead. - Authors: accepted Spearman ïĄš = 1.000; P = 0.01

Page 18, line 25: - Referee: Replace “Authors” by “authors” - Authors: accepted

Page 19, lines 1-7: - Referee: Provide quotations supporting this. - Authors: accepted (Kautz et al., 2006; Parisi et al., 2005)

Kautz, T.; López-Fando, C.; Ellmer, F.: Abundance and biodiversity of soil microarthropods as influenced by different types of organic manure in a long-term field experiment in Central Spain, Appl. Soil Ecol., 33, 278-285, 2006.

Page 19, line 15: - Referee: correct “were” - Authors: accepted

Page 19, line 20: - Referee: Could you hypothesize why? Could you see any change in some property, environmental variable, phenotopic or productive variables, etc which could explain this drastic change? - Authors: accepted In order to make the discussion clearer on this topic, we revised the lines 8-20 (page 19) as follows: Mites and springtails vary their abundance in a similar way (Narula et al., 1996). For both arthropods, vertical migrations have been observed in response to changes in soil moisture in grassland soils (Hassal et al., 1986). However, their abundance may follow different patterns over time, depending on the lifecycle length and reproductive strategy, as well as on their individual tolerance to temperature and moisture in the soil. It is known that the rate of increase of springtail population is highly dependent on optimal habitat with adequate N and C supply (Johnston, 2000) and is enhanced by rainfall (Schaefer, 1995; Badejo et al., 1998). In the present study, there was no significant evidence of

a relationship between the total microarthropod dynamics and soil OC and N changes over time. In the last year, the rise in the springtail population was presumably due to the high rainfall and was particularly emphasized in the old vineyard, as a result of a larger availability at the soil surface of microenvironments colonized by emi- and epiedaphic forms.

Page 19, line 22-25: - Referee: This is not exactly correct. PC1 actually separates the new and the old vineyards not because of the explained variance is higher. PC1 separates old vineyards with negative scores from new vineyards with positive scores (of viceversa), indicating different relationships among the properties related to that PC1 within both systems. Rewrite. - Authors: accepted The sentence will be re-written as follows: "The outcomes of the PCA showed a clear separation between the old and the new vineyard along the PC1 (Fig. 9), which explained from 53% to 69% of variance over the years (43.6% for the overall 2010–2014 period). The results, moreover, indicated a contrasting contribution of soil biological properties (negative loadings) and most of soil physical-chemical properties (positive loadings) (Fig. 8)"

Page 20, line 23: - Referee: Clay and EC cannot be considered biochemical variables. Replace by physicochemical and biochemical variables. - Authors: accepted

Page 21, line 4: - Referee: Correct “five years” - Authors: accepted

Conclusions

Page 21, line 14: - Referee: Correct “two soils” - Authors: accepted

Figure 1. - Referee: Explicitly indicate what P1-P8 means in the figure caption - Authors: accepted Figure 1. The new and the old vineyards with their respective monitoring sites (P1–P5 for the new vineyard, P6–P8 for the old vineyard).

Figures - Referee: Include the standard deviation as error bars in all graphs to visualize the variability of data. Use in the graphs “.” (dot) for decimals instead of “,” (comma). Use the same number of decimals in all the numbers of the axes. - Authors: accepted

Thank you very much for comments

Kind regards

The authors

Please also note the supplement to this comment:
http://www.soil-discuss.net/1/C762/2015/soild-1-C762-2015-supplement.pdf

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Interactive comment on SOIL Discuss., 1, 1165, 2014.

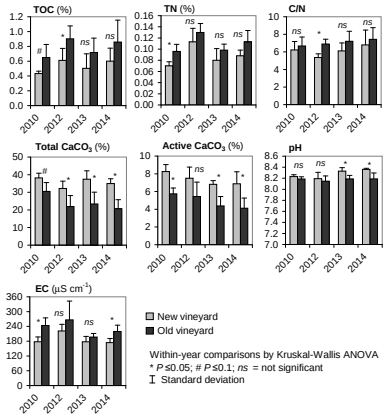

Fig. 1. Figure 3. Soil chemical properties in the new and the old vineyard during the experimental period.

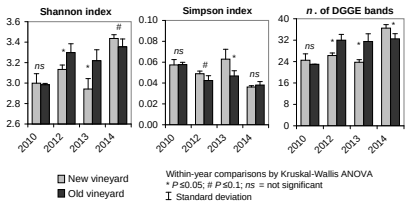

Fig. 2. Figure 5. Diversity indices and band number of the DGGE banding patterns

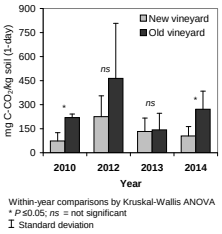

Fig. 3. Figure 6. Microbial respiration in the two vineyards during the experimental period.

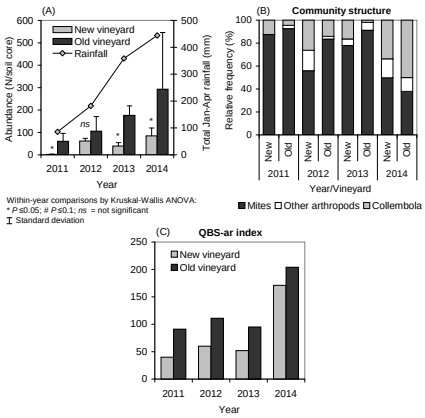

Fig. 4. Figure 7. Soil microarthropod community, biological quality index (QBS-ar) and cumulated rainfall in the months before sampling (January to April).