



EGUsphere, author comment AC3
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Reply on RC2

Nagham Tabaja et al.

Author comment on "Seasonal variation of mercury concentration of ancient olive groves of Lebanon" by Nagham Tabaja et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-174-AC3>, 2022

Please disregard the first response and check the second response to the comments given.

Response to the comment on EGU sphere-2022-174 by Hakan Pleijel (Referee 1) on the article " Seasonal variation of mercury concentration of ancient olive groves of Lebanon" by Tabaja et al. <https://doi.org/10.5194/egusphere-2022-174-RC1>, 2022

We are very thankful for your constructive comments and feedback on the manuscript submitted. We accepted all the comments provided and amended them accordingly.

Concerning the language and clarity in several statements were revised and improved. A native English speaker checked the manuscript and helped in improving the form. In regards to the phenology of leaf dynamics, it has been indicated that the collected samples were merged from three different years and merged for analysis. The phenological growth stages of olive trees described by Sanz-Cortès et al. (2002) in Spain suggest leaf development from March to November. Hence the Hg concentration measured on monthly collected leaves represents an average of Hg accumulated in young leaves (year N of collection) and older leaves (N-1 year and N-2 years) where N is equal to 2019 and 2020. According to Pleijel et al. 2021, young leaf has less mercury than older leaves generations. We can expect that our Hg concentration is lower during the growth of young leaves due to the Hg dilution signal with the low Hg content of the younger leaves. In a very simple approach, we can suggest the late winter-early spring should exhibit the lowest Hg contents. However, our results show the lowest values in summer when young leaves have already grown significantly. In addition, physiology has been more integrated into the text but of course, more detailed work can be made separately to focus on this aspect.

Line 21-22: It is corrected.

Line 22: It is corrected.

Line 27: It is corrected by "It is noteworthy that olive fruits also have low Hg concentration (~7-11 ng/g)."

Line 30: It is corrected by "This may draw an adequate baseline for Eastern

Mediterranean and region with similar climate inventories on Hg vegetation uptake and new studies on olive trees in the Mediterranean to reconstruct regional Hg pollution concentrations in the past and present.”

Line 38: It is corrected by “Mercury (Hg) is among the most widely distributed heavy metals polluting the Earth (Briffa et al. 2020).”

Line 51: It is corrected by “Forests are known to act as a sink of atmospheric Hg in the ecosystem.”

Line 52: It is corrected by “Plant foliage take up of Hg deposited on leaf surfaces through the stomata and leaf cuticles”.

Line 54-55: It is corrected by “where it accumulates with minimal mobility and small portions released back into the atmosphere or transferred to other plant organs”

Line 60: It is replaced from “is said” by “has been estimated”.

Line 64: It is replaced from “earth” by “terrestrial”.

Line 68: It is corrected by “Soil can release Hg to the atmosphere (Luo et al., 2016; Yang et al., 2018a; Assad, 2017; Schneider et al., 2019; Gworek et al., 2020; Pleijel et al., 2021) and also behave as a source of Hg to the plants.”

Line 69: It is corrected by “Trees are hence considered as important drivers of Hg exchange between the atmosphere and the soil (Yang et al. 2018).”

Line 72-73: The sentence starting “Differences ...” is not clear. This sentence is removed.

Line 94: It is corrected by “an air pollution emission area.”

Line 111: “outcomes and consumed”? Not clear. It is replaced by “for consumption.”

Lines 114-115: then sentence starting “In addition ...” is not complete. This sentence is removed.

Line 117-119: The objectives are amended as per the feedback received. “In this study two sites, known for their century-old olive groves and located at two different altitudes in Lebanon, were selected to assess the Hg contents. In these remote areas, no direct sources of mercury contamination are reported and hence we expect very low Hg concentrations. However, due to atmospheric transport of Hg, deposition can be expected in remote areas (Grigal, 2003). The main objectives of this study are to examine and compare Hg levels in foliage, stems, fruits, litter and soil measured in each of these two olive groves, which we monitored monthly for 18 months. The second objective is to analyze the relative importance of Hg uptake from the soil to the foliage in comparison with the assimilation of atmospheric Hg by the leaves. Is the uptake of Hg from soil to foliage low in sites without local Hg contamination? Since the distribution of Hg pollution is by nature geographically widespread, and given the extent of Hg pollution in the Mediterranean and the transfer of pollution by wind and the Mediterranean Sea, long-distance contamination occurs over large areas. This study will fill the data gap on Hg pollution in the Eastern Mediterranean and may draw an adequate baseline for Eastern Mediterranean and region of similar climates inventories on Hg vegetation uptake and new studies on olive trees in the Mediterranean to reconstruct regional Hg pollution concentrations in the past and present.”

Line 142: it does not become clear if Chekka town is a source of Hg emission or only of other pollutants. This sentence is cleared by "To our knowledge no direct Hg pollution is reported at Chekka and Selaata sites."

Line 143: It is corrected by "carbon monoxide".

Line 224: It is corrected by "For the statistical analysis we used the R 4.1.0 program. Our data are not normally distributed, so for the effect of tissue type on Hg concentration, Wilcoxon test was used with the tissue type (foliage and stems) as the main effect."

Line 247-249: why is not the concentrations of fruits included in these comparisons? The fruits are added.

Line 266-267: It is corrected by "A seasonal effect on foliage and stems was registered".

Line 282 and section 3.3: It is rearranged and corrected by "3.3. Tree comparison

In the upper terrace of BC grove, the foliage average Hg concentration of BCO4 and BCO1 varied between 42.4 ± 11.5 ng/g and 44.6 ± 13.3 ng/g respectively showing no significant difference (p-value = 0.8225). In the lower terrace of the same site, foliage average Hg concentrations of trees BCO12 and BCO9 were found to vary from 45.6 ± 12.7 ng/g to 60.7 ± 12.7 ng/g respectively (Figure 2a,c). Significant differences are shown between foliage of the tree BCO9 and BCO1 (p-value= 0.0019), BCO4 and BCO12, p-value=0.00047) respectively).

In the upper terrace of BC grove, the stems average Hg concentration of BCO4 and BCO1 varied between 7.0 ± 2.8 ng/g and 7.1 ± 2.9 ng/g respectively showing no significant difference (p-value= 0.94). In the lower terrace, stems average Hg concentrations of BCO12 and BCO9 are 6.4 ± 2.2 ng/g and 11.2 ± 5.2 ng/g respectively showing a significant difference of p-value= 0.0054 (Figure 2a,c). For BCO1 and BCO12 there was no significance difference registered with p-Value= 0.5725, the same goes for BCO4 and BCO12 no significance difference was registered with p-value= 0.523.

The average concentration per tree in foliage and stems were 32.4 ± 12.2 ng/g and 8.5 ± 4.0 ng/g respectively for KWO1, 32.8 ± 14.7 ng/g and 8.9 ± 6.0 ng/g for KWO2, 37.6 ± 14.0 ng/g and 9.3 ± 6.7 ng/g for KWO3 and 37.7 ± 13.6 ng/g and 9.6 ± 4.0 ng/g for KWO4 (Figure 2b,d). In KW grove, comparison of the foliage Hg concentration between the four studied trees shows no significant difference ($0.22 < p\text{-value} < 1$) so did the stems ($0.21 < p\text{-value} < 0.96$).

In BC grove, the trees located on the lower terrace recorded higher Hg concentration values than those of the upper terrace especially tree BCO9. While KW grove had similar Hg concentration among all four trees."

Line 298: It is corrected and values of foliage and stems are separated.

Line 343: It is amended by "In parallel, the litter showed higher Hg concentration than that in foliage in both BC (62.9 ± 17.8 ng/g) and KW (75.7 ± 20.3 ng/g) (Table 1) likely explained by the process of the Hg input into the litter through foliage shedding its oldest foliage to the forest floor which have accumulated Hg during the longest period of time and thus have higher Hg concentrations than the remaining foliage have on average since they consist of both younger and older foliage (Rea et al. 1996; Pleijel et al. 2021)."

Line 353: It is corrected by "accumulation in leaves after stomatal uptake."

Line 440: since the distribution of Hg pollution is by nature geographically very

widespread, long-distance contamination occurs and it may be better to say "In sites without local contamination" instead of "In uncontaminated sites". Similarly on line 452 it would be appropriate to say "locally uncontaminated" rather than "non-contaminated". It is corrected.

Why are some references in capitals, e.g., lines 512-513, lines 521-523, lines 712-715. Pleijel et al and Wohlgemuth et al are no longer preprints. Those references are corrected.

Font size in figures should be increased to improve readability. It is amended.