Interactive comment on “The interaction between nitrogen and phosphorus is a strong predictor of intra-plant variation in nitrogen isotope composition in a desert species” by J. Zhang et al.

J. Zhang et al.
lianhong-gu@ornl.gov

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Comment: This paper from Zhang et al. is intituled “The interaction between nitrogen and phosphorus is a strong predictor of intra-plant variation in nitrogen isotope composition in a desert species”. In this paper, the authors aim to demonstrate the origin of the intraplant variations in δ¹⁵N by looking at its correlations with C,N,P concentration in different parts of the two desert plants in China. Response: We thank this referee for taking the time to review our manuscript. It is NOT our aim ‘to demonstrate the origin of the intraplant variations in δ¹⁵N’. Our objective, which was understood well by the first referee, is to ‘report new measurements of intra-plant variation in ¹⁵N, and discuss mechanisms that might be responsible for the observed patterns

(See Referee #1’s review). In this revision, we make sure our objective is clearly stated to avoid misunderstanding.

Comment: In general, this paper lacks details in background and analysis that makes it difficult to follow. In addition, the novelty of the paper stands at the comparison of δ¹⁵N with other nutrients content and the analysis of a particular plant in China. The analysis of the data is not convincing and lack of deep analysis. Finally, the discussion is long and purely speculative when many of the speculation could have been supported by data eventually. Here are specific details that could help improve the manuscript: Response: While we value this referee’s effort to help improve the manuscript, we have hard time to understand some of the comments made by this referee. This is made worse by the fact that symbols do not show up properly in the review text (perhaps because the review was written in a non-English Word editing software). When we feel we have a sufficient understanding of a comment made or when a suggestion is specific enough for us to act, we revise our manuscript accordingly if we deem appropriate. If any misunderstanding occurs on our part, we ask this referee to let us know so that we can improve the manuscript further to address his or her concerns adequately.

Comment: Introduction: This part is too long but somehow informative. Shortening the introduction incorporating specific details on fractionation factors and natural variations of δ¹⁵N. The introduction is plagued by a lack of precision in the words used, especially with unnecessary adverbs and superlative. Response: We try to remove any unnecessary words. Fractionation factors are now given. But we don’t completely understand the first two sentences of this comment; each sentence seems to contain contradictory meanings. Please clarify.

Comment:L.70: “plant photosynthesis, growth and metabolism and substrate supply for microbial activities” Why do you speak about microbial activity here, if you have no data to support it, why Photosynthesis if not measured? Response: We are puzzled by this comment. This is in the very first paragraph of the whole paper and we are trying
to place our particular study in a broader context. Also we are not sure why the referee thinks we need to measure microbial activity and photosynthesis for this study and why the two questions are asked together. Please clarify and help us to understand your intention.


Comment: L. 81: “types of mycorrhizal fungi” Are you planning to measure it? If so where are the data? Do you have measured soil δ¹⁵N? Response: This study is a report on intraplant variations. Future studies should look at these issues.

Comment: L.87: “relatively few studies” what does it mean? Response: This phrase is revised to make it clearer.

Comment: L.86-89: these 2 sentences seem in opposition. Response: Thanks for pointing this out. These two sentences have been revised.

Comment: L.100- 102: If both metabolisms are different could be useful to detail the discrimination factor and why is it so different. Response: Agree. Modeling approaches could be very useful here.

Comment: L.120: “This assumption led to the belief that organic N compounds: : ::” It sounds like you are saying that science believes not that science is based on fact! Need to be rephrased. Response: Suggestion adopted.

Comment: L.129: “which has a large isotope effect” how much? Response: Information is now added.

Comment: Results L.316-319: Since no data on the difference of δ¹⁵N in soil at both sites was given, it is difficult to tell if this conclusion is not only associated with soil δ¹⁵N variability. Response: Good point. We point this out in the revision.

Comment: L.340: “Since fine roots differ from other organs in that fine roots are the primary organs for nitrate reduction” Your data are actually showing the opposite since the δ¹⁵N is way above the δ¹⁵N of all organs. If fine roots were the main site of reduction of N then you should expect transport of amino acids to the leaves and a more homogeneous δ¹⁵N between roots and leaves. In addition, if this means for the authors that NH₄ is transported to the leaves, then there is still a 16-20 per mil fractionation by the NR that should be taken into account and should show the higher difference in δ¹⁵N. δ¹⁵N data should be presented relative to the substrate (soil NO₃ or NH₄) or relative to the origin (root). Response: Sharp eyes! Thanks for catching the problem this sentence causes. Clearly our data do not support the literal meaning of it and we actually did not mean it. We have revised the sentence to “Since fine roots differ from other organs in that fine roots are the primary organs for nitrogen acquisition”. Hopefully this revision clears up this referee’s concerns.

Comment: Finally, a lot of the correlations were made using the data for all organs and leaves. In many cases, the 6 data points of the leaves affect the correlation. If leaves are removed from the data for this analysis, a different correlation could be found. Finally, since metabolisms of roots and leaves are likely to be different as suggested by the authors, at least in term of reduction of N sources, it could be interesting to present correlation by organs instead of pooling them. In figure 3 and 5, if leaves are removed from the graph, the correlation between δ¹⁵N and P disappear highlighting the need to do the organ-specific analysis. Response: We are puzzled by this referee’s comment
on the impact of leaf and fine root samples on the correlation between d15N and N and P contents. We have conducted analyses by excluding leaf samples (Figure 3 and 4) and fine root samples (Figure 5) and found that the correlation is still statistically significant, which seems contradictory to what this referee is stating here. Since our primary interest was in across-organ variations, our measurements were not designed to examine variations within the same organs (the number of independent samples would be too few for this purpose).

Comment: Discussion Overall the discussion is very well written and clear. Response: Thanks.

Comment: It may lack a conceptual framework. Many of the explanation in the text stand on speculation more than the data presented. There is a clear disconnection between the interesting debate of the relationship between d15N and P and the data presented. An example of this discrepancy is the many recalls to the reader of the focus on leaves (L.404, L.419). Response: We basically agree with this assessment. We have struggled to come up with a reasonable explanation for the observed patterns. Unfortunately, actual measurements on intra-plant variations in d15N and their relationships with organ nutrient contents are extremely rare. We believe this makes this present study valuable. We'd love to hear from this referee if he or she thinks there is a better conceptual framework than we propose here to explain the observed patterns.

Comment: The utilization of unnecessary abbreviations clouds the main information. Response: Thanks. The revision now minimizes the use of abbreviations.

Comment: L. 361 – 363, why do you use EFO, IFO, and EIFT when you will be using it only 2-3 times? Simply use words, it is not much longer. Response: Suggestion adopted.

Comment: L.358-359: Is there a way to present this synthesis into a simple graph? Response: Excellent suggestion! A diagram is added.

Comment:L.363: “External factors include different sources of nitrogen” Since you recognized it is an important factor, why no data were shown? Response: This will be important for future studies when a convincing mechanistic explanation of the observed patterns is attempted. For the present study we are content with reporting a previously unreported phenomenon and developing testable hypotheses for future research.