

Comments for the authors

This study aims to test the effect of grazing on litter decomposition and N release in an alpine Tibetan grassland system. The focus of the manuscript is interesting, and can contribute to the management practices at local and regional scale. However, the authors did not show the novelty found with this work. I think that the authors need to express explicitly in the manuscript the importance of the results found, in the context of general models of the effect of grazing on nutrient cycling and for the study system.

I find the redaction a little bit entangled. There are several paragraphs along the manuscript that are not clearly written, wording should be in general revised (see suggestions in Specific comments). I recommend that the manuscript be reviewed by a native English-speaking. I think that the authors could improve the manuscript with several structural and linguistic changes which require a substantial amount of work.

Specific comments

Title

I suggest replace “elevates” by “increase”, and “slows” by “decrease”

Abstract

The wording of the abstract should be revised in order to simplify the reading of it.

L. 12. For example, the authors could writing as follow: Litter decomposition and N release are key processes that determine strongly nutrient cycling, but still lack a clear understanding of how grazing affect these processes in alpine ecosystems.

L. 15. I suggest change by: In grazing (GP) and grazing exclusion paddocks (GEP) we identified litter species composition (palatable and unpalatable), and we measure litter quality and soil chemical characteristics. We also measure litter decomposition, using the litter bags methods, and N release in the paddocks over 799 days.

L. 18. Results are a little bit entangled. I suggest describe the pattern found in one of the treatment and compare with the other. For example, In grazed paddock the biomass of palatable plant species was lower than in ungrazing paddock, however the biomass of unpalatable plants was similar. The N and C content of the litter collected in grazing paddock was higher than in the litter of ungrazed paddock.

L. 20-21. Please, review the wording of this sentence.

L. 22-23. Please, remove this last sentence. I suggest conclude about the results found, and highlight the novelty of own work.

Introduction

The wording of this section should be revised.

L. 28. What kind of ecosystems?, If the authors refer to grasslands systems, I suggest directly write “grasslands systems”.

L.30. What is the meaning of “degradation rates”?, Soil degradation?, Soil erosion rates??. please, clarify.

L. 34. What are the authors referring to “soil property”?, Fertility?, Organic matter content?, Nutrients availability?, please, clarify.

L. 34. Please, add that grazing have an important impact on the structure and functioning of the ecosystem, because the changes in vegetation communities and soil structure and processes, which affect nutrient cycling.

- L. 34-36. Please, add (as I suggest in the Abstract) "...but still lack a clear understanding of how grazing affect these processes in alpine ecosystems."
- L. 40. Please change "overall litter quality" by "plant tissues, which is translate to litter quality".
- L. 43. Change "loss" by "consume"; and delete "caused" in L. 44
- L. 47. Change "will" by "may" (Please, check thoroughly the verb tense used throughout the manuscript)
- L. 49. Change "concentrate on" by "consume"
- L. 50. Change "will favor" by "promote the", and change "by the" by "of"
- L. 53. Change "soil nutrient cycle" by "decomposition"
- I suggest delete "still scarce", because there are a lot of works about the relationships between litter quality and decomposition.

In the two follow paragraph the authors describe how litter quality and environmental conditions affect litter decomposition, but do not describe how grazing affect these controls. Please, add.

- L. 59. Add "litter" between N and content
- L. 60. Add "litter" between lignin and content
- L. 63. Change "Except" by "Additionally"
- L. 66-73. I suggest that the authors re-write this paragraph, the ideas are mixed. Climate regulates decomposition process at global and regional scale, but microclimate (e.g., soil temperature and moisture) regulates decomposition process at local scale, through influence on microbial activity. At this scale, microclimate and litter quality interact strongly and the rates of decomposition are difficult to predict.
- L. 74. I suggest write as follow: "Most of the studies that evaluate the effect of grazing on litter decomposition usually are focused on....." (References).
- L. 75-77. I suggest delete this sentence.
- L. 79. I suggest write as follow: "Then, we investigate how litter quality affect litter decomposition....." Please, delete "by collecting litter mixtures....", it is not necessary here.
- L. 81. I suggest write as follow: We testes the following hypothesis (1) Grazing improved litter quality (i.e., litter with higher nutrient content as N) and promote plant communities with lower biomass of palatable plant species and higher biomass of unpalatable plant species, (2) Grazing increase litter decomposition and N release and thus improve soil properties. The follow sentence can be removed.

Reading the hypothesis exposed by the authors, I noted that in the first the idea is not clear. The palatable plants (that have higher litter quality) are consumed by herbivores, and then unpalatable plant dominates de community. If grazing promote the abundance and litter biomass of unpalatable plants, how could improve the litter quality of the community?? That is the reason because the second hypothesis contradicts the first. If grazing promote the dominance of plant species with poor litter quality, how could increase nutrient cycling?? Please, clarify, is really important that the hypotheses are well expressed.

Material and methods

- L. 91. Change "typical" by "an"
- L. 95. Before the reference, add (Supplemental Fig. 1), and delete the "...and the mean temperature and...."
- L. 97. What are the authors referring to "including experimental and buffer areas"?, please, clarify.
- L. 99. Please review this sentence: "...soil attributes in the experimental area were similar after long-term ...", what is the meaning of it?
- L. 101. I suggest add a Table or a description of the main soil characteristic.
- L. 112. I suggest write as follow: "We collected all plant litter from each quadrat of the GP and GEP for two purposes:..."

(*) Please, I suggest clarify if the quadrats were previous cleaning of litter (i.e., at the moment that the paddock were established) before the harvest. If not, the litter collected is the accumulated litter and no the annual produced litter. This could be a big mistake.

L. 118-120. I suggest remove this sentence.

L. 124-128. Please, remove. The Walkley-Black method is usually used for determination of organic C, it is not necessary it description.

L. 131. I suggest remove this sentence, it is not necessary.

L. 133. I suggest write as follow: "We randomly collected five soil samples in each grazing paddock (n=30 in total) at 0-10 cm depth using a"

L. 156. Deleted "packed"

L. 165. Litter quality or litter quantity??? Please, check.

L. 168. "so on"...???

Please, remove from this section the references to Tables or Figures.

L. 176-183. It is not clear for me the data used in the regression analysis. I understood that the authors used the data of litter decomposition (GE-GEP and GEP-GP) as a result of the soil environment effect, which denominates "site", but, What data are used as a result of litter quality??? For example in Vaieretti et al. (2013) (which the authors refer to perform this analysis), the decomposability of litter is used as an expression of litter quality

In situ litter decomposition is the dependent variable, as well as N release.

Please, clarify this analysis and data used, is really important.

Results

L. 189. Please, based on the comment referred with (*), check the term "annual litter mass", or change by "accumulated litter biomass".

L. 189-192. Why the authors described the differences between palatable and unpalatable plants performed with ANOVA analysis?, according to Statistical analysis section, these differences were tested using paired t-test. Please, check the entire paragraph.

L. 196. I suggest write as follow: "Litter collected from GP.....(Table 1)...."

L. 197. I suggest write as follow: "No significant differences were found for the rest of litter quality characters measured.

L. 199. All these characters were lower in GP compared with GEP, but the differences were not significant. Please, modify this sentence.

L. 207-212. Why the authors describe the dynamic of litter decomposition?, It is not an objective of this work. The same comment for N release. It has not sense analyses differences among the different incubations periods.

I suggest describe the percentage of mass remaining, for example, in the first year, and then for the second year, or the total mass loss in each treatment, and compare the curves.

I suggest change the columns of Figure 3 and Figure 4 by points (with SE) joined by a line.

It is interesting that the k is higher in GP-GP than GEP-GEP, but the mass remaining at the end of the experiment is similar. Moreover, the rate of litter decomposition (k) of GP litter was higher when was incubated in GP than in GEP (Home field advantage?), but the rate of decomposition of GEP litter similar in both paddocks, although the mass remaining of GEP was higher in GEP than GP.

The results are really interesting, please, describe and discuss deeply the patterns found.

L. 219. I suggest remove the first sentence.

L. 227-238. See comment for Lines 176-183. I can't evaluate this result if is not clear the data used on it.

Discussion

L. 245-246. The authors did not perform an analysis to evaluate differences in species composition. Please, modify this sentence.

L. 253-254. I suggest write as follow: The low mass of palatable species could be mainly attribute to, one the one hand, on Q-Tibetan Plateau grazing maintained short plant height and On the other hand,

At the same time, in this paragraph there are contradicts ideas. First the authors say that palatable plants are short, but immediately later the author say that, in the Q-Tibetan Plateau the most palatable plants are tall. Please, clarify. I suggest that the authors write explicitly the importance of the results found.

L. 264-271. Please, check the wording of the entire paragraph.

Is true that palatable species showed higher litter quality (mainly in terms of C and N content) in GP, however their biomass was significantly lower in this paddock. I suggest discuss these results and how could influence the soil nutrients availability in grazing paddocks compared to ungrazing paddocks.

L. 274-322. All this section is really confused. The authors discuss the effect of climate, which is not sense here, and also the dynamics of litter decomposition.

I suggest the authors concentrate in the comparison between litter decomposition in grazing and ungrazed paddocks, and its relation with litter quality and soil characteristics. The results are really interesting, but the discussion of the pattern found is really poor.

The same comment for "N release" section. Please, check the wording of the sentences, and discuss the patterns found with focus on the effect of grazing on N release.

L. 345-350. This paragraph describes a relationship between litter decomposition and relative litter N concentration, but is not discuss about the mechanisms.

L. 360-369. What the authors refer with "moderate stocking rate"? The treatments in this work were granzing and ungrazing paddock.

Please, highlight the novelty of the work.

Table titles

I suggest write as follow:

Table 1. Initial chemical characteristic (mean \pm SE) of litter collected in grazing paddock (GP) and ungrazed paddock (GEP). Different letter indicate significant differences at $P < 0.05$ level.

Table 2. Delete "Estimated"

Table 3. Delete "Estimated"

Figures captions

I suggest write as follow:

Fig. 1. Delete "Estimated". Please, see the comment regarding to annual or accumulated litter, and correct accordingly.

Fig. 2. (a) Soil total N, (b) soil total P and (c) soil organic C (SOC) content in the grazing (GP) and ungrazing paddock (GEP) in 2010, 2011 and 2012. Asterisk (*) denotes significant differences between grazing paddocks at level $P < 0.05$.

Fig. 3 and 4. Change to graphics of point connected by a line.