Submitted Abstract

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Abstract

Andean grasslands diversity and ecosystem functioning are threatened due to changes in climate and land use intensification. We studied to what extent grazing intensity (GI) and its interaction with abiotic factors explain plant diversity in northwestern Bolivia. We hypothesize that grazing and abiotic factors are regulating diversity of grasslands under a regime of low nutrient and water availability so that higher GI relates to lower diversity. This is relevant for the conservation of grasslands to secure the stability of primary productivity and therefore the economy of indigenous communities facing the challenges of climate change. However, the extent to which changes in herbivore-plant interactions are regulating plant diversity is not well understood for large areas in the Andes and shifts in trait values within the grasslands remain equivocal. We investigated multiple measures of diversity along a gradient of GI in six indigenous communities. We installed 105 plots maintaining constant aspect and slope. For each plot we measured species cover, leaf traits of dominant species and soil parameters. Climatic conditions were extracted from global databases. Results show that abiotic factors correlate strongly with altitude, i.e. pH and mean annual temperature are regulating changes in species composition at the plot level. Ordination analysis confirms that those abiotic variables explain the distribution of plant communities along the study area. At a larger scale, for sites with higher biotic homogenization GI seems to be an important factor regulating diversity. Plant communities where GI and precipitation seasonality are main regulators are characterized by higher Specific Leaf Area (SLA) and Leaf Nitrogen Content (LNC) and plant communities where altitude is the main regulator are characterized by higher Leaf Dry Matter Content (LDMC) and Leaf Carbon Content (LCC). These results are aligned with other studies in the Andes where high SLA is associated with lower costs of leaf construction and higher rates of herbivory, whereas plants with low SLA seem to predominate when GI is moderate or low and at higher altitude. Overall, grasslands' diversity at the humid puna of Bolivia is regulated by interdependent factors including climate, nutrient availability and GI. Further research can be undertaken to confirm whether the long history of grazing has favoured the dominance of short plants with high regrowth at sites with lower beta diversity. This study highlights the importance of investigating the impact of grazing intensification at diferent spatial scales to provide information concerning changes on ecosystem functioning and stability.