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Assessing the effects of abiotic stress and livestock grazing disturbance on an alpine grassland with CSR model

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How the abiotic factors represented by cold environment and biotic factors represented by livestock grazing will affect the vegetation structure of alpine grassland is a core issue in understanding the cause of biodiversity change on Tibetan Plateau. Past studies on changes of floristic composition, growth forms did not adequately answer question. Given the fact that the response of plant to environment change depend on its life strategy, a synthetical method that based on plant life strategy may deepen our understanding of the mechanism. Using Grime's concept of CSR plant classification, we carried out a vegetation survey along a gradient (three levels) of graze intensity on the south-east of Tibet Plateau, in order to evaluate the role and mechanism of abiotic stress and grazing disturbance in driving plant diversity change, by analyzing the plant life strategy compositions in each of the community and by comparing the characteristic of the strategy compositions along the graze gradient. When the graze intensity was relative low, the dominant plant life strategy gathered in the stress tolerance corner, which conformed the theory of environmental filter, indicating that the ideal top plant community may be dominated by the species with stress tolerant strategy. We also found that the response of strategy dominance to graze intensity increase is positively correlated with the competitive capacity (R^2=0.671; P<0.001) and negatively correlated with the capacity of tolerating stress (R^2=0.378; P=0.011), but is not affected by the ruderal strategy (R^2=0.047; P=0.42). This reflected a general shift of plant strategy from stress tolerant to competitive (rather than ruderal as expected) and suggested that the mechanism of graze to affect plant community is different from that of other disturbance like fire, clipping, till, etc. The particular selective foraging and escaping from feces may provide more opportunities for competitive than ruderal strategy to dominant the community. This study demonstrated that CSR plant strategy be a useful tool to evaluate the effects of abiotic and biotic factors on plant community assembly of alpine grassland, which may contribute to predict the impacts of climate change and human activity on alpine grassland plant diversity and ecosystem service function related.