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Effects of Yak grazing on plant community characteristics of meadow grasslands in the Qinghai–Tibetan Plateau, China

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The Qinghai-Tibetan Plateau (QTP) is an important part of the global terrestrial ecosystem that provides many ecological roles such as biodiversity protection, upper watersheds for large rivers, circulation of materials, energy balance and provision of forage and habitat for livestock and wildlife. Approximately 40% of the QTP is alpine meadow grasslands and yak farming is one of the dominant land use activities. In recent years, the rapid increase in the number of yaks grazing on meadow grasslands has raised concerns about grassland degradation. In this study we examined the effects of yak grazing on the grassland community characteristics to evaluate the degradation potential of alpine meadow in the QTP. The experiment was carried out on three farms, in close proximity to each other, that were operating at different grazing intensities in Maqu county (N35°58′, E101°53′, altitude 3650m) of the QTP in the Gansu province in China. We tested 4 levels of yak grazing intensities; control (no grazing), light (2.6yak/ha), moderate (3.5yak/ha) and high (6.5yak/ha). We hypothesized that greater intensity of grazing would significantly impact the plant community characteristics through trampling effects above and below ground.

We found grazing significantly ($P<0.05$) impacted the above and below ground biomass. Above ground biomass was highest in the non grazed area and lowest in the high grazing farm. In contrast, below ground biomass was significantly greater ($p<0.05$) in the moderate grazing farm compared to the non grazed area. The plant community density and the proportion of edible grass biomass were not significantly affected by the grazing treatments. The species richness was significantly reduced ($p<0.05$) in the moderate and high intensity grazing farms compared to the non grazed area. The soil moisture at 0-10 cm depth was significantly lower at the high grazing intensity farm compared to the non grazed area and in contrast soil temperature was significantly higher.

Our results indicate that increasing the yak grazing pressure affected the plant community characteristics in alpine meadow in the QTP, indicating a potential for grassland degradation to occur in future. Therefore, further comprehensive research is warranted.

Key words: Qinghai-Tibetan Plateau; Yak grazing; Alpine meadow; Maqu county