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Responses of microbial respiration in grazed and ungrazed grasslands to glucose addition

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Grazing can change species composition, alter soil properties, and thus modify microbial activities, affecting biogeochemical processes in grasslands. However, it remains unclear how microbial respiration in grazed and ungrazed grasslands responds to glucose addition. Here we hypothesize that microbial respiration in grazed grasslands will respond more strongly to glucose addition than in ungrazed grasslands because moderate grazing can enhance microbial activity. To examine the hypothesis above, we collected the upper 10 cm soil from grazed and ungrazed grasslands at five sites of China. Three sites (Hulunbuir 1, Hulunbuir 2 and Xielingele) were located in Inner Mongolia and two in the Tibet Plateau) Soils were incubated with low glucose input (50% MBC), high glucose input (150% MBC), and water for 60 days in 21^{o}C. CO_2 released from soil was trapped with 1 M NaOH. The results showed that the effect of grazing on microbial respiration has two distinct patterns, depending on soil types and addition amount. After glucose addition, cumulative CO_2 efflux from grazed soils was significantly higher than from ungrazed soils in two temperate grasslands (Hulunbuir 1 and Xielingele). This may be ascribed to that moderate grazing promoted microbial activity. On the contrary, microbial respirations from grazed soils were lower than ungrazed soils in two alpine meadows of Haibei and Dangxiong and in Hulunbuir 2. This effect of grazing was not obvious in Hulunbeier 2 soils at low carbon addition level. Grazing may decrease soil organic carbon, nitrogen availability and thus microbial activity in alpine grasslands. These findings indicate that soil microorganisms could have different adaptation mechanisms to grazing in temperate and alpine grasslands.