**Warming counteracts grazing effects on the functional structure of the soil microbial community in a Tibetan grassland**

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**Table S1**. Two-way ANOVA results for main effects of warming and grazing, as well as their interaction, on soil and plant characteristics.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Warming | |  | Grazing | |  | Warming × grazing | |
|  | | F value | P value |  | F value | P value |  | F value | P value |
| Soil properties | pH | 0.08 | 0.782 |  | 0.41 | 0.538 |  | 0.09 | 0.766 |
|  | ST\_10 cm (oC) | 50.49 | **<0.001\*\*** |  | 23.01 | **<0.001\*\*** |  | 0.24 | 0.630 |
|  | ST\_20 cm (oC) | 43.69 | **<0.001\*\*** |  | 22.99 | **<0.001\*\*** |  | 0.12 | 0.730 |
|  | SM (%) | 12.88 | **0.006\*\*** |  | 0.15 | 0.706 |  | 0.00 | 0.951 |
|  | NH4+-N (mg/kg) | 1.82 | 0.211 |  | 0 | 0.956 |  | 2.36 | 0.158 |
|  | NO3--N (mg/kg) | 0.30 | 0.167 |  | 0.28 | **0.049****\*\*** |  | 0.18 | 0.193 |
|  | Total C (%) | 1.21 | 0.300 |  | 1.34 | 0.276 |  | 2.07 | 0.184 |
|  | Total N (%) | 1.80 | 0.212 |  | 1.69 | 0.225 |  | 1.86 | 0.206 |
|  | Total P (mg/kg) | 1.70 | 0.224 |  | 0.01 | 0.939 |  | 0.02 | 0.898 |
|  | C/N | 1.07 | 0.327 |  | 0.46 | 0.513 |  | 0.00 | 0.947 |
|  | SOC (mg/kg) | 0.28 | 0.612 |  | 0.74 | 0.412 |  | 1.11 | 0.319 |
|  | SON (mg/kg) | 1.38 | 0.271 |  | 0.07 | 0.803 |  | 0.96 | 0.354 |
|  | MBC (mg/kg) | 1.34 | 0.279 |  | 0.04 | 0.852 |  | 0.49 | 0.500 |
|  | MBN (mg/kg) | 1.05 | 0.333 |  | 0.31 | 0.593 |  | 0.79 | 0.396 |
| Plant properties | Plant Richness | 11.69 | **0.008****\*\*** |  | 2.92 | 0.122 |  | 1.87 | 0.205 |
|  | Biomass*A* (g/m2) | 159.42 | **<0.001\*\*** |  | 304.85 | **<0.001\*\*** |  | 30.16 | **<0.001\*\*** |
|  | Biomass*B* 10cm (g/m2) | 0.01 | 0.932 |  | 0.98 | 0.348 |  | 0.88 | 0.372 |
|  | Biomass*B* 20cm (g/m2) | 6.56 | **0.031\*\*** |  | 0.3 | 0.599 |  | 2.24 | 0.169 |
|  | Plant diversity | 3.39 | 0.098 |  | 2.1 | 0.181 |  | 1.44 | 0.260 |
|  | Forbs coverage (%) | 7.39 | **0.024\*****\*** |  | 0.16 | 0.700 |  | 6.68 | **0.029\*\*** |
|  | Legumes coverage (%) | 10.43 | **0.010\*\*** |  | 28.41 | **0.001\*\*** |  | 0.10 | 0.754 |
|  | *Carex scabrirostris* coverage (%) | 1.02 | 0.338 |  | 5.28 | **0.047\*\*** |  | 0.21 | 0.657 |
|  | *Gueldenstaedtia divers folia* coverage (%) | 0.52 | 0.488 |  | 102.26 | **<.001\*\*** |  | 1.17 | 0.307 |
|  | *Thalictrum alpinum* coverage (%) | 3.10 | 0.112 |  | 3.10 | 0.112 |  | 0.09 | 0.768 |
|  | *Poa pratensis* coverage (%) | 0.01 | 0.924 |  | 19.62 | **0.002\*\*** |  | 0.09 | 0.774 |
|  | *Trigonella ruthenica*  coverage (%) | 4.52 | 0.062 |  | 0.72 | 0.417 |  | 0.01 | 0.918 |
| The data used in this table was reported previously Rui et al. (2011) and Wang et al. (2012).  \*\**P*<0.05.  Abbreviations: ST\_10cm, Soil temperature at 10 cm; ST\_20cm, Soil temperature at 20 cm; SM, Soil moisture; Total C, Total carbon; Total N, Total N; Total P; C/N, Soil carbon: nitrogen ratio; SOC, Soluble organic C and N; SON, Soluble organic N; MBC, microbial biomass C; MBN, microbial biomass N; Plant Richness, Plant species richness; Biomass*A*, Aboveground living present biomass; Biomass*B* 10cm, Belowground root biomass at 0-10 cm; Biomass*B* 20cm, Belowground root biomass at 10-20 cm; Plant diversity, Plant Shannon diversity index. | | | | | | | | | |

**Table S2** Plant and soil characteristics (mean± standard error) that were significantly altered by main effects of warming, grazing and their interaction in Two-way ANOVA (\*\*P<0.05). Different letters in parentheses indicated statistical differences at *P*<0.05, determined by *post-hoc* lsmeans test based on Two-way ANOVA.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Main effect of warming | |  | Main effect of grazing | |  | Treatments (n=4) | | | |
|  | | Warming  (n=8) | Control  (n=8) |  | Grazing  (n=8) | Control  (n=8) |  | C | G | W | WG |
| Soil properties | ST\_10cm (oC) | 13.28±0.26 | 11.74±0.23 |  | 13.03±0.31 | 11.99±0.34 |  | 11.16±0.05(c) | 12.31±0.05(b) | 12.81±0.05 (b) | 13.75±0.05(a) |
|  | ST\_20cm (oC) | 12.81±0.28 | 11.41±0.18 |  | 12.62±0.32 | 11.60±0.28 |  | 10.94±0.04(c) | 11.88±0.04 (b) | 12.26±0.04 (b) | 13.36±0.04(a) |
|  | Soil Moisture (%) | 0.28±0.01 | 0.37±0.01 |  | 0.33±0.02 | 0.32±0.02 |  | 26.24±2.00(a) | 25.54±1.06(a) | 20.57±1.43(b) | 20.06±1.44(b) |
|  | NO3--N (mg/kg) | 12.25±5.42 | 5.13±1.15 |  | 14.06±5.10 | 3.32±0.34 |  | 3.08±0.60(b) | 7.18±1.73(ab) | 3.56±0.36(b) | 20.94±9.3(a) |
| Plant properties | Plant Richness | 20.63±0.32 | 21.63±1.56 |  | 19.75±1.16 | 7.95±0.85 |  | 24.25±0.94(a) | 22.00±0.91(ab) | 20.75±0.63(b) | 20.5±0.28(b) |
|  | Biomass*A* (g/m2) | 381.39±25.01 | 309.81±14.36 |  | 296.10±9.53 | 395.09±20.17 |  | 343.73±7.34(b) | 275.89±11.86(d) | 446.45±9.29(a) | 316.33±3.26(c) |
|  | Biomass*B* 20cm (g/m2) | 598.55±31.04 | 473.96±39.16 |  | 523.00±49.69 | 549.51±32.97 |  | 523.59±36.49(ab) | 424.33±64.68(b) | 575.44±57.38(ab) | 621.68±29.09(a) |
|  | Legumes coverage (%) | 29.63±2.09 | 24.63±1.78 |  | 23.00±1.32 | 31.25±1.64 |  | 28.51±0.50(b) | 20.75±2.13(c) | 34.00±2.71(a) | 25.25±0.48(bc) |
|  | *Gueldenstaedtia diversifolia* coverage (%) | 9.63±1.53 | 9.13±1.23 |  | 5.88±0.30 | 12.88±0.55 |  | 12.25±0.63(a) | 6.00±0.41(b) | 13.50±0.87(a) | 5.75±0.48(b) |
|  | *Poa pratensis*  coverage (%) | 14.75±1.42 | 14.88±1.29 |  | 12.00±0.96 | 17.63±0.71 |  | 17.50±0.64(a) | 12.25±1.65(b) | 17.75±1.37(a) | 11.75±1.25(b) |

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