Supplementary materials

Soil–plant interactions in a pasture of the Italian Alps

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**Table S1.** Vegetation types, CSR values (%) and CSR strategy class for each investigated point.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Point | Veg. Type | C | S | R | CSR class |
| 92 | S | 25.4 | 54.0 | 20.6 | S |
| 55 | S | 22.1 | 58.4 | 19.5 | S |
| 67 | S | 21.6 | 55.2 | 23.3 | S |
| 33 | S | 18.3 | 56.1 | 25.6 | S |
| 68 | S | 15.0 | 52.2 | 32.7 | S |
| 16 | RP | 27.0 | 48.9 | 24.1 | CS |
| 106 | RP | 22.8 | 56.0 | 21.2 | S |
| 29 | RP | 21.6 | 60.0 | 18.4 | S |
| RP2 | RP | 20.4 | 47.8 | 31.8 | SR |
| RP1 | RP | 20.2 | 46.3 | 33.5 | SR |
| 32 | RP | 20.1 | 60.7 | 19.1 | S |
| 39 | RP | 17.8 | 62.9 | 19.3 | S |
| RP3 | RP | 17.2 | 52.5 | 30.3 | S |
| 105 | RP | 16.7 | 55.7 | 27.6 | S |
| RN3 | RP | 12.0 | 66.0 | 22.0 | S |
| 44 | N | 17.5 | 51.2 | 31.2 | S |
| 86 | N | 15.4 | 66.2 | 18.4 | S |
| 70 | N | 12.1 | 66.3 | 21.6 | S |
| RN1 | N | 11.8 | 68.6 | 19.6 | S |
| 53 | N | 11.8 | 74.6 | 13.6 | S |
| 90 | N | 10.1 | 73.5 | 16.4 | S |
| RN2 | N | 9.6 | 69.0 | 21.4 | S |
| 49 | EH | 12.0 | 49.4 | 38.6 | SR |
| 37 | EH | 11.4 | 53.0 | 35.6 | S |
| 111 | EH | 9.6 | 75.9 | 14.5 | S |
| 36 | EH | 9.4 | 45.2 | 45.4 | SR |
| RS1 | B | 21.4 | 52.1 | 26.5 | S |
| RS2 | B | 19.1 | 56.6 | 24.3 | S |
| RS3 | B | 17.6 | 55.2 | 27.2 | S |
| 96 | B | 13.1 | 60.3 | 26.6 | S |
| 102 | B | 12.5 | 65.2 | 22.3 | S |
| 103 | B | 11.7 | 67.3 | 21.0 | S |
| 13 | B | 11.1 | 62.5 | 26.3 | S |
| 40 | B | 11.1 | 61.6 | 27.3 | S |
| 8 | B | 9.7 | 70.3 | 20.0 | S |

R: Rich pasture; EH: Earth hummocks; SV: *Sesleria varia* grassland; B: Bentgrass; N: *Nardus stricta* pasture.

S: stress-tolerant strategy ; C: competitive strategy; R: ruderal strategy; SC: stress-tolerant-competitive strategy ; SR: stess-tolerant-ruderal strategy.

**Table S2.** Mean estimates and their standard error of the fixed effects. The response variables are the soil and environmental variables; the fixed effect is vegetation type. For abbreviations of variables, see table 1.

Sp. (Gau): residuals were spatial correlated and the spatial covariance function of residuals was the Gaussian model; Non-sp.: residuals were non-spatial correlated; g defines gaussian variable

\* Different letters denote statistically significant (p value < 0.05) differences between vegetation types.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | Model Type | Statistics | B | EH | N | RP | S |
|  |  |  |  |  |  |  |  |
| SOCstock | Non-sp | estimate | 6.403 | 3.450 | 5.499 | 5.123 | 4.564 |
|  |  | SE | 0.379 | 0.568 | 0.429 | 0.359 | 0.508 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | a | c | ab | b | bc |
| gCHUM | Sp. (Gau) | estimate | -0.100 | -1.403 | 0.201 | 0.121 | -0.130 |
|  |  | SE | 0.338 | 0.558 | 0.342 | 0.363 | 0.411 |
|  |  | Pr > |t| | a | a | a | a | a |
| CFA | Non-sp. | estimate | 12.940 | 7.437 | 13.165 | 11.602 | 10.028 |
|  |  | SE | 0.778 | 1.167 | 0.882 | 0.738 | 1.044 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | a | c | a | ab | bc |
| CHA | Non-sp. | estimate | 25.10 | 9.0 | 22.90 | 19.81 | 22.55 |
|  |  | SE | 1.76 | 2.65 | 2.00 | 1.67 | 2.37 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | .0002 | <.0001 |
|  |  | \* | a | b | a | a | a |
| totN | Non-sp. | estimate | 0.832 | 0.300 | 0.814 | 0.737 | 0.864 |
|  |  | SE | 0.074 | 0.111 | 0.084 | 0.070 | 0.099 |
|  |  | Pr > |t| | <.0001 | .0116 | <.0001 | <.0001 | <.0001 |
|  |  | \* | a | b | a | a | a |
| gCN | Non-sp. | estimate | 0.075 | 1.415 | -0.182 | -0.559 | 0.106 |
|  |  | SE | 0.279 | 0.418 | 0.316 | -0.559 | 0.106 |
|  |  | Pr > |t| | .7888 | .0020 | .5679 | .0433 | .7792 |
|  |  | \* | b | a | b | b | b |
| pHw | Non-sp. | estimate | 4.92 | 4.57 | 4.91 | 5.09 | 6.44 |
|  |  | SE | 0.16 | 0.24 | 0.18 | 0.15 | 0.21 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | b | b | b | b | a |
| cSand | Sp. (Gau) | estimate | 370 | 279 | 319 | 381 | 397 |
|  |  | SE | 27.66 | 40.67 | 25.04 | 25.47 | 33.90 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | ab | bc | ac | ab | a |
| Silt | Non-sp. | estimate | 338 | 511 | 374 | 373 | 315 |
|  |  | SE | 21.2 | 31.8 | 24.0 | 20.1 | 28.4 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | b | a | b | b | b |
| Clay | Non-sp. | estimate | 76 | 80 | 73 | 71 | 59 |
|  |  | SE | 5.0 | 7.5 | 5.6 | 4.7 | 6.7 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | a | a | a | a | b |
| gBD | Non-sp. | estimate | 0.014 | 1.485 | -0.265 | -0.038 | -0.766 |
|  |  | SE | 0.274 | 0.411 | 0.310 | 0.259 | 0.376 |
|  |  | Pr > |t| | .9583 | .0011 | .3992 | .8847 | .0458 |
|  |  | \* | b | a | bc | bc | c |
| avP | Sp. (Sph) | estimate | 34.2 | 9.65 | 25.9 | 31.5 | 18.4 |
|  |  | SE | 6.0 | 9.0 | 5.2 | 5.3 | 6.8 |
|  |  | Pr > |t| | <.0001 | .3005 | <.0001 | <.0001 | .0116 |
|  |  | \* | a | c | abc | ab | bc |
| vfRoots | Non-sp. | estimate | 4.27 | 5.73 | 4.91 | 4.25 | 6.65 |
|  |  | SE | 0.81 | 1.22 | 0.92 | 0.77 | 1.09 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | + | b | ab | ab | b | a |
|  |  | estimate | -0.077 | 0.310 | -005 | -0.159 | 0.218 |
| gfRoots | Non-sp. | SE | 0.342 | 0.513 | 0.387 | 0.324 | 0.459 |
|  |  | Pr > |t| | .8217 | .5503 | .9883 | .6278 | .6383 |
|  |  | + | b | a | ab | ab | ab |
|  |  | estimate | 0.633 | -0.452 | -0.659 | -0.150 | 0.444 |
| gRad | Non-sp. | SE | 0.297 | 0.446 | 0.337 | 0.282 | 0.398 |
|  |  | Pr > |t| | .0414 | .3183 | .0601 | .5987 | .2744 |
|  |  | \* | a | ab | b | ab | a |
|  |  | estimate | 0.157 | -0.402 | -0.121 | -0.351 | 0.912 |
| gT | Non-sp. | SE | 0.311 | 0.467 | 0.353 | 0.295 | 0.417 |
|  |  | Pr > |t| | .6185 | .3956 | .7333 | .2440 | .0370 |
|  |  |  | a | a | a | a | a |
|  |  | estimate | 37.1 | 41.7 | 47.2 | 48.5 | 34.7 |
| WFPS | Non-sp | SE | 2.5 | 3.8 | 2.9 | 2.4 | 3.4 |
|  |  | Pr > |t| | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
|  |  | \* | b | ab | a | a | b |
|  |  | estimate | 23 | 1 | 39 | 11 | 37 |
| slope | Non-sp. | SE | 4.2 | 6.3 | 4.8 | 4.0 | 5.6 |
|  |  | Pr > |t| | <.0001 | .9071 | <.0001 | .0111 | <.0001 |
|  |  | \* | b | c | a | c | ab |
|  |  |  |  |  |  |  |  |

+ Different letters denote statistically significant (p value < 0.1) differences between vegetation types.