**Table S3** Dataset information for the five phylogenies used in constrained and unconstrained trees

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Clades** | Vignea | Unispicate | Core Carex | Combined dataset (Vignea, Unispicate, core Carex) | Kobresia |
| **aTotal no. of taxa** | 240 | 134 | 572 | 938 | 42 |
| **No. of Himalayan taxa** | 16 | 30 | 59 | 105 | 28 |
| **No. of non-Himalayan taxa** | 220 | 100 | 509 | 829 | 10 |
| **bTotal character sites** | 2019 | 1849 | 2058 | 2080 | 1858 |
| **Model of evolution** | GTR+G | GTR+G | GTR+G | GTR+G | GTR+G |

aBoth constraint and unconstrained datasets contain same no. of taxa, in which 4 outgroup species also included

bTotal no. of character sites based on concatenated dataset alignment