

**Title** Differentiation and connection of the bacterial community associated with *Silene nigrescens* along the soil-to-plant continuum in the sub-nival belt of the Qiangyong Glacier

## **Authors**

Wangchen Sonam, Yongqin Liu, Luming Ren

This supplementary file included Table S1-S8; Figure. S1-S2

**Table S1** The geographic information of the *Silene nigrescens* (*S.nigrescens*) were collected from the sub-nival belt of the Qiangyong glacier.

**Table S2** The differences in levels and ratios of total nitrogen (TN), total phosphorus (TP), and total potassium (TK) among soil, roots, and leaves. Different lowercase letters denote significant differences in the levels and ratios of total nitrogen (TN), total phosphorus (TP), and total potassium (TK) among soil, roots, and leaves, as identified by the Wilcoxon Test with a significance level of  $P < 0.05$ .

**Table S3.** The correlation between the levels and ratios of TN (total nitrogen), TP (total phosphorus), and TK (total potassium) and the bacterial community composition was determined using the Mantel test.

**Table S4.** Keystone nodes in the co-occurrence networks of the bacterial communities associated with the rhizosphere soil, root endosphere, and leaf endosphere.

**Table S5.** Keystone nodes in the co-occurrence networks of bacterial community, encompassing all taxa present in rhizosphere soil, root endosphere, and leaf endosphere.

**Table S6.** The Spearman correlation between alpha diversity and the average variation degree (AVD) of the bacterial community. \*\*\* $P < 0.001$ .

**Table S7.** Amplicon Sequence Variants (ASVs) that are common among the rhizosphere soil, root endosphere, and leaf endosphere.

**Table S8.** Key topological properties of bacterial co-occurrence networks, encompassing all taxa within the rhizosphere soil, leaf endosphere, and root endosphere.

**Figure S1.** The location of the Qiangyong glacier (a, b), and the *Silene nigrescens* (*S.nigrescens*)

grow in the Qiangyong glacier terminus (c).

**Figure S2.** Rarefaction curves of ASV richness and Shannon diversity.

**Table S1** The geographic information of the *Silene nigrescens* (*S.nigrescens*) were collected from the sub-nival belt of the Qiangyong glacier.

| Sample ID               | Longitude (N) | Latitude (E) | Elevation (m) |
|-------------------------|---------------|--------------|---------------|
| <i>S.nigrescens</i> _1  | 28°52'36.31"  | 90°13'29.74" | 5110          |
| <i>S.nigrescens</i> _2  | 28°52'37.00"  | 90°13'30.63" | 5091          |
| <i>S.nigrescens</i> _3  | 28°52'40.88"  | 90°13'35.42" | 5072          |
| <i>S.nigrescens</i> _4  | 28°52'41.71"  | 90°13'29.97" | 5061          |
| <i>S.nigrescens</i> _5  | 28°52'39.32"  | 90°13'30.35" | 5059          |
| <i>S.nigrescens</i> _6  | 28°52'42.37"  | 90°13'37.12" | 5035          |
| <i>S.nigrescens</i> _7  | 28°52'47.53"  | 90°13'33.72" | 4995          |
| <i>S.nigrescens</i> _8  | 28°52'49.25"  | 90°13'33.38" | 4978          |
| <i>S.nigrescens</i> _9  | 28°52'49.45"  | 90°13'33.35" | 4974          |
| <i>S.nigrescens</i> _10 | 28°52'51.05"  | 90°13'33.48" | 4962          |

**Table S2** The differences in levels and ratios of total nitrogen (TN), total phosphorus (TP), and total potassium (TK) among soil, roots, and leaves. Different lowercase letters denote significant differences in the levels and ratios of total nitrogen (TN), total phosphorus (TP), and total potassium (TK) among soil, roots, and leaves, as identified by the Wilcoxon Test with a significance level of  $P < 0.05$ .

|          | Soils            | Roots           | leaves           |
|----------|------------------|-----------------|------------------|
| TN       | 0.339 ± 0.097c   | 5.786 ± 0.095b  | 27.491 ± 1.870a  |
| TP       | 0.639 ± 0.041b   | 0.528 ± 0.035a  | 0.534 ± 0.217a   |
| TK       | 13.274 ± 0.3623a | 4.561 ± 0.369b  | 2.886 ± 0.252c   |
| TN:TP:TK | 0.040 ± 0.012c   | 2.422 ± 0.207b  | 20.379 ± 7.363a  |
| TN:TP    | 0.536 ± 0.166c   | 10.996 ± 0.563b | 59.142 ± 23.093a |
| TN:TK    | 0.025 ± 0.007c   | 1.276 ± 0.111b  | 9.559 ± 0.694a   |
| TP:TK    | 0.048 ± 0.003c   | 0.116 ± 0.013b  | 0.188 ± 0.084a   |

**Table S3.** The correlation between the levels and ratios of TN (total nitrogen), TP (total phosphorus), and TK (total potassium) and the bacterial community composition was determined using the Mantel test.

| Variable | Mantel test ( $r$ statistics) | $P$ -value |
|----------|-------------------------------|------------|
| TN       | 0.599                         | 0.0004     |
| TP       | 0.135                         | 0.0766     |
| TK       | 0.692                         | 0.0001     |
| TN:TP:TK | 0.459                         | 0.0011     |
| TN:TP    | 0.445                         | 0.0005     |
| TN:TK    | 0.517                         | 0.0007     |
| TP:TK    | 0.166                         | 0.0557     |

**Table S4.** Keystone nodes in the co-occurrence networks of the bacterial communities associated with the rhizosphere soil, root endosphere, and leaf endosphere.

| ASV ID | Within module connectivities | Among module connectivities | Degree | Modularity | Type       | Taxonomy                                                  | Plant compartment niche |
|--------|------------------------------|-----------------------------|--------|------------|------------|-----------------------------------------------------------|-------------------------|
| ASV143 | -2.28                        | 0.75                        | 2      | 7          | Connectors | <i>Pseudomonas</i>                                        | Rhizosphere soil        |
| ASV245 | -0.30                        | 0.75                        | 2      | 3          | Connectors | Rhizobiales                                               | Rhizosphere soil        |
| ASV134 | -0.30                        | 0.75                        | 2      | 3          | Connectors | Acetobacteraceae                                          | Rhizosphere soil        |
| ASV30  | -1.40                        | 0.75                        | 2      | 19         | Connectors | <i>Devosia</i>                                            | Rhizosphere soil        |
| ASV305 | -0.54                        | 0.75                        | 2      | 15         | Connectors | Oxalobacteraceae                                          | Rhizosphere soil        |
| ASV416 | -0.59                        | 0.75                        | 2      | 20         | Connectors | <i>Craurococcus-Caldovatus</i>                            | Rhizosphere soil        |
| ASV94  | -1.09                        | 0.69                        | 4      | 19         | Connectors | <i>Brevundimonas</i>                                      | Rhizosphere soil        |
| ASV135 | -0.54                        | 0.75                        | 2      | 15         | Connectors | <i>Conexibacter</i>                                       | Rhizosphere soil        |
| ASV104 | -0.50                        | 0.75                        | 2      | 14         | Connectors | <i>Mycobacterium</i>                                      | Rhizosphere soil        |
| ASV75  | -1.40                        | 0.78                        | 3      | 19         | Connectors | <i>Solirubrobacter</i>                                    | Rhizosphere soil        |
| ASV81  | -0.60                        | 0.75                        | 2      | 2          | Connectors | <i>Actinoplanes</i>                                       | Rhizosphere soil        |
| ASV522 | -0.59                        | 0.75                        | 2      | 20         | Connectors | <i>Rathayibacter</i>                                      | Rhizosphere soil        |
| ASV91  | -0.67                        | 0.69                        | 4      | 12         | Connectors | <i>Lautropia</i>                                          | Rhizosphere soil        |
| ASV415 | -0.59                        | 0.75                        | 2      | 20         | Connectors | <i>Sphingomonas</i>                                       | Rhizosphere soil        |
| ASV301 | -0.60                        | 0.75                        | 2      | 2          | Connectors | Gaiellales                                                | Rhizosphere soil        |
| ASV28  | -0.50                        | 0.75                        | 2      | 14         | Connectors | <i>Pseudonocardia</i>                                     | Rhizosphere soil        |
| ASV64  | -1.98                        | 0.75                        | 2      | 11         | Connectors | <i>Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium</i> | Rhizosphere soil        |
| ASV802 | -0.50                        | 0.75                        | 2      | 14         | Connectors | Hyphomicrobiaceae                                         | Rhizosphere soil        |
| ASV605 | -0.54                        | 0.75                        | 2      | 15         | Connectors | Frankiales                                                | Rhizosphere soil        |
| ASV390 | -0.54                        | 0.75                        | 2      | 15         | Connectors | <i>TK10</i>                                               | Rhizosphere soil        |
| ASV76  | -1.26                        | 0.75                        | 2      | 17         | Connectors | <i>Pseudomonas</i>                                        | Rhizosphere soil        |
| ASV348 | -0.50                        | 0.75                        | 2      | 14         | Connectors | <i>Solirubrobacter</i>                                    | Rhizosphere soil        |
| ASV43  | -0.30                        | 0.78                        | 3      | 3          | Connectors | <i>Lechevalieria</i>                                      | Rhizosphere soil        |
| ASV147 | -1.34                        | 0.75                        | 2      | 12         | Connectors | <i>Kineosporia</i>                                        | Rhizosphere soil        |
| ASV266 | 0.00                         | 0.6875                      | 4      | 22         | Connectors | Beijerinckiaceae                                          | Rhizosphere soil        |

|        |        |        |   |    |             |                                       |                  |
|--------|--------|--------|---|----|-------------|---------------------------------------|------------------|
| ASV82  | -1.12  | 0.78   | 3 | 10 | Connectors  | <i>IMCC26256</i>                      | Rhizosphere soil |
| ASV11  | 0.00   | 0.75   | 2 | 24 | Connectors  | <i>Actinoplanes</i>                   | Rhizosphere soil |
| ASV339 | -0.99  | 0.75   | 2 | 1  | Connectors  | <i>Geodermatophilus</i>               | Rhizosphere soil |
| ASV127 | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Pedomicrobium</i>                  | Rhizosphere soil |
| ASV79  | -1.09  | 0.68   | 5 | 19 | Connectors  | <i>Solirubrobacter</i>                | Rhizosphere soil |
| ASV535 | -1.401 | 0.78   | 3 | 19 | Connectors  | <i>Clavibacter</i>                    | Rhizosphere soil |
| ASV89  | 0.00   | 0.75   | 2 | 10 | Connectors  | <i>Sphingomonas</i>                   | Rhizosphere soil |
| ASV24  | -0.99  | 0.75   | 2 | 1  | Connectors  | <i>Pseudonocardia</i>                 | Rhizosphere soil |
| ASV8   | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Pseudomonas</i>                    | Rhizosphere soil |
| ASV387 | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Nakamurella</i>                    | Rhizosphere soil |
| ASV208 | -0.30  | 0.75   | 2 | 3  | Connectors  | <i>Microbacterium</i>                 | Rhizosphere soil |
| ASV197 | 0.00   | 0.75   | 2 | 24 | Connectors  | <i>Geodermatophilus</i>               | Rhizosphere soil |
| ASV315 | -0.50  | 0.75   | 2 | 14 | Connectors  | <i>Reyranelia</i>                     | Rhizosphere soil |
| ASV341 | -0.54  | 0.75   | 2 | 15 | Connectors  | <i>Sphingomonas</i>                   | Rhizosphere soil |
| ASV120 | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Bradyrhizobium</i>                 | Rhizosphere soil |
| ASV40  | -0.30  | 0.75   | 2 | 3  | Connectors  | <i>Nocardioides</i>                   | Rhizosphere soil |
| ASV85  | 0.00   | 0.75   | 2 | 10 | Connectors  | Microtrichales                        | Rhizosphere soil |
| ASV201 | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Geodermatophilus</i>               | Rhizosphere soil |
| ASV117 | -1.26  | 0.75   | 2 | 17 | Connectors  | Rhizobiales                           | Rhizosphere soil |
| ASV318 | -1.35  | 0.75   | 2 | 12 | Connectors  | <i>Devosia</i>                        | Rhizosphere soil |
| ASV213 | -1.40  | 0.75   | 2 | 21 | Connectors  | <i>Blastococcus</i>                   | Rhizosphere soil |
| ASV152 | -1.26  | 0.75   | 2 | 17 | Connectors  | Frankiales                            | Rhizosphere soil |
| ASV90  | -1.35  | 0.69   | 4 | 12 | Connectors  | <i>Nakamurella</i>                    | Rhizosphere soil |
| ASV389 | -0.50  | 0.75   | 2 | 14 | Connectors  | <i>Methylobacterium-Methylorubrum</i> | Rhizosphere soil |
| ASV25  | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Devosia</i>                        | Rhizosphere soil |
| ASV22  | -0.60  | 0.78   | 3 | 2  | Connectors  | Frankiales                            | Rhizosphere soil |
| ASV292 | -0.30  | 0.75   | 2 | 3  | Connectors  | <i>Pseudonocardia</i>                 | Rhizosphere soil |
| ASV87  | 0.00   | 0.75   | 2 | 24 | Connectors  | <i>Pseudonocardia</i>                 | Rhizosphere soil |
| ASV216 | -0.46  | 0.6875 | 4 | 1  | Connectors  | <i>Nocardioides</i>                   | Rhizosphere soil |
| ASV194 | 0.40   | 0.68   | 5 | 2  | Connectors  | <i>Conexibacter</i>                   | Rhizosphere soil |
| ASV157 | -0.60  | 0.75   | 2 | 2  | Connectors  | 67-14                                 | Rhizosphere soil |
| ASV141 | -1.79  | 0.75   | 2 | 7  | Connectors  | <i>Microbacterium</i>                 | Rhizosphere soil |
| ASV53  | -1.09  | 0.69   | 4 | 19 | Connectors  | <i>Blastococcus</i>                   | Rhizosphere soil |
| ASV349 | 2.80   | 0.21   | 9 | 1  | Module hubs | Rhizobiales                           | Rhizosphere soil |
| ASV184 | -0.60  | 0.75   | 2 | 2  | Connectors  | <i>Modestobacter</i>                  | Rhizosphere soil |
| ASV291 | -0.50  | 0.75   | 2 | 14 | Connectors  | <i>Quadrirphaera</i>                  | Rhizosphere soil |
| ASV173 | -0.59  | 0.75   | 2 | 20 | Connectors  | <i>Microvirga</i>                     | Rhizosphere soil |
| ASV70  | -2.02  | 0.78   | 3 | 6  | Connectors  | <i>Blastococcus</i>                   | Rhizosphere soil |
| ASV444 | -1.12  | 0.75   | 2 | 10 | Connectors  | <i>Rhodoplanes</i>                    | Rhizosphere soil |
| ASV116 | -0.99  | 0.75   | 2 | 1  | Connectors  | <i>Mycobacterium</i>                  | Rhizosphere soil |
| ASV394 | -0.54  | 0.75   | 2 | 15 | Connectors  | <i>Sulfurirhabdus</i>                 | Rhizosphere soil |
| ASV733 | -0.59  | 0.75   | 2 | 20 | Connectors  | <i>Phycoccus</i>                      | Rhizosphere soil |
| ASV63  | 0.87   | 0.75   | 2 | 6  | Connectors  | <i>Saccharothrix</i>                  | Root endosphere  |

|        |       |      |   |    |            |                                                           |                 |
|--------|-------|------|---|----|------------|-----------------------------------------------------------|-----------------|
| ASV32  | -1.62 | 0.75 | 2 | 3  | Connectors | <i>Delftia</i>                                            | Root endosphere |
| ASV150 | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Aureimonas</i>                                         | Root endosphere |
| ASV28  | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Pseudonocardia</i>                                     | Root endosphere |
| ASV199 | 1.15  | 0.75 | 2 | 13 | Connectors | <i>Pseudomonas</i>                                        | Root endosphere |
| ASV161 | 0.00  | 0.75 | 2 | 12 | Connectors | <i>Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium</i> | Root endosphere |
| ASV80  | -0.73 | 0.75 | 2 | 7  | Connectors | Micrococcaceae                                            | Root endosphere |
| ASV316 | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Sphingobium</i>                                        | Root endosphere |
| ASV370 | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Asticcacaulis</i>                                      | Root endosphere |
| ASV35  | -0.43 | 0.75 | 2 | 4  | Connectors | Stappiaceae                                               | Root endosphere |
| ASV18  | -1.62 | 0.75 | 2 | 3  | Connectors | <i>Bosea</i>                                              | Root endosphere |
| ASV8   | 1.15  | 0.75 | 2 | 15 | Connectors | <i>Pseudomonas</i>                                        | Root endosphere |
| ASV1   | 1.15  | 0.75 | 2 | 14 | Connectors | <i>Pseudomonas</i>                                        | Root endosphere |
| ASV4   | 0.00  | 0.75 | 2 | 12 | Connectors | <i>Conyzicola</i>                                         | Root endosphere |
| ASV40  | 0.87  | 0.75 | 2 | 6  | Connectors | <i>Nocardioides</i>                                       | Root endosphere |
| ASV13  | -0.45 | 0.75 | 2 | 8  | Connectors | <i>Pseudomonas</i>                                        | Root endosphere |
| ASV23  | -0.73 | 0.75 | 2 | 7  | Connectors | <i>Gaiella</i>                                            | Root endosphere |
| ASV513 | -0.73 | 0.75 | 2 | 7  | Connectors | <i>Sphingomonas</i>                                       | Root endosphere |
| ASV15  | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Tardiphaga</i>                                         | Root endosphere |
| ASV34  | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Mesorhizobium</i>                                      | Root endosphere |
| ASV55  | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Altererythrobacter</i>                                 | Root endosphere |
| ASV36  | -0.71 | 0.69 | 4 | 1  | Connectors | <i>Brevundimonas</i>                                      | Root endosphere |
| ASV118 | -0.87 | 0.69 | 4 | 3  | Connectors | <i>Acidovorax</i>                                         | Root endosphere |
| ASV52  | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Pseudolabrys</i>                                       | Root endosphere |
| ASV70  | 0.00  | 0.75 | 2 | 12 | Connectors | <i>Blastococcus</i>                                       | Root endosphere |
| ASV112 | -0.43 | 0.75 | 2 | 4  | Connectors | <i>Aminobacter</i>                                        | Root endosphere |
| ASV49  | -0.39 | 0.75 | 2 | 1  | Connectors | <i>Pseudomonas</i>                                        | Leaf endosphere |
| ASV14  | -0.39 | 0.75 | 2 | 1  | Connectors | <i>Pseudomonas</i>                                        | Leaf endosphere |
| ASV140 | 1.15  | 0.75 | 2 | 3  | Connectors | <i>Pseudomonas</i>                                        | Leaf endosphere |
| ASV2   | -0.39 | 0.75 | 2 | 1  | Connectors | <i>Pseudomonas</i>                                        | Leaf endosphere |

**Table S5.** Keystone nodes in the co-occurrence networks of bacterial community, encompassing all taxa present in rhizosphere soil, root endosphere, and leaf endosphere.

| ASV ID | Within module connectivities | Among module connectivities | Degree | Modularity | Type       | Taxonomy                  | Counts |
|--------|------------------------------|-----------------------------|--------|------------|------------|---------------------------|--------|
| ASV257 | -1.27                        | 0.75                        | 2      | 4          | Connectors | Acetobacteraceae          | 1      |
| ASV185 | 1.15                         | 0.75                        | 2      | 8          | Connectors | Beijerinckiaceae          | 2      |
| ASV266 | -0.14                        | 0.69                        | 6      | 4          | Connectors | Beijerinckiaceae          |        |
| ASV211 | -0.70                        | 0.68                        | 5      | 1          | Connectors | Microbacteriaceae         | 1      |
| ASV227 | -0.88                        | 0.65                        | 11     | 3          | Connectors | Rhizobiales               | 1      |
| ASV372 | -0.73                        | 0.75                        | 2      | 7          | Connectors | <i>67-14</i>              | 2      |
| ASV313 | -0.14                        | 0.63                        | 7      | 4          | Connectors | <i>67-14</i>              |        |
| ASV55  | -0.99                        | 0.75                        | 2      | 2          | Connectors | <i>Altererythrobacter</i> |        |
| ASV119 | -0.86                        | 0.78                        | 3      | 6          | Connectors | <i>Arthrobacter</i>       | 2      |

|        |       |      |    |   |            |                                       |   |
|--------|-------|------|----|---|------------|---------------------------------------|---|
| ASV295 | -1.24 | 0.75 | 2  | 3 | Connectors | <i>Arthrobacter</i>                   |   |
| ASV249 | -0.96 | 0.78 | 3  | 1 | Connectors | <i>Aureimonas</i>                     | 2 |
| ASV261 | -0.19 | 0.76 | 5  | 6 | Connectors | <i>Aureimonas</i>                     |   |
| ASV56  | -0.99 | 0.75 | 2  | 2 | Connectors | <i>Brevundimonas</i>                  | 1 |
| ASV45  | -0.73 | 0.75 | 2  | 7 | Connectors | <i>Conexibacter</i>                   |   |
| ASV135 | -0.89 | 0.75 | 2  | 4 | Connectors | <i>Conexibacter</i>                   | 3 |
| ASV214 | -0.70 | 0.71 | 7  | 1 | Connectors | <i>Conexibacter</i>                   |   |
| ASV77  | -1.27 | 0.75 | 2  | 4 | Connectors | <i>Conyzicola</i>                     | 1 |
| ASV151 | -0.14 | 0.64 | 6  | 4 | Connectors | <i>Cryobacterium</i>                  | 1 |
| ASV32  | 1.15  | 0.75 | 2  | 9 | Connectors | <i>Delftia</i>                        | 1 |
| ASV162 | -0.96 | 0.78 | 3  | 1 | Connectors | <i>Devosia</i>                        | 2 |
| ASV318 | -1.22 | 0.75 | 2  | 1 | Connectors | <i>Devosia</i>                        |   |
| ASV252 | -0.14 | 0.63 | 7  | 4 | Connectors | <i>Herbaspirillum</i>                 | 1 |
| ASV82  | -1.00 | 0.64 | 6  | 3 | Connectors | <i>IMCC26256</i>                      | 1 |
| ASV99  | -0.96 | 0.81 | 4  | 1 | Connectors | <i>Mesorhizobium</i>                  | 1 |
| ASV296 | -0.89 | 0.78 | 3  | 4 | Connectors | <i>Methylobacterium-Methylorubrum</i> | 1 |
| ASV37  | -0.99 | 0.75 | 2  | 2 | Connectors | <i>Microbacterium</i>                 | 1 |
| ASV184 | 1.15  | 0.81 | 4  | 5 | Connectors | <i>Modestobacter</i>                  | 1 |
| ASV126 | -0.96 | 0.69 | 4  | 1 | Connectors | <i>Mycobacterium</i>                  |   |
| ASV347 | -0.73 | 0.75 | 2  | 7 | Connectors | <i>Mycobacterium</i>                  | 4 |
| ASV29  | -0.58 | 0.75 | 2  | 8 | Connectors | <i>Mycobacterium</i>                  |   |
| ASV186 | -0.99 | 0.75 | 2  | 2 | Connectors | <i>Mycobacterium</i>                  |   |
| ASV319 | -1.24 | 0.78 | 3  | 3 | Connectors | <i>Nocardioides</i>                   | 1 |
| ASV69  | -0.99 | 0.78 | 3  | 2 | Connectors | <i>Phyllobacterium</i>                | 1 |
| ASV253 | -0.14 | 0.64 | 6  | 4 | Connectors | <i>Pseudarthrobacter</i>              | 2 |
| ASV335 | -0.14 | 0.64 | 6  | 4 | Connectors | <i>Pseudarthrobacter</i>              |   |
| ASV52  | -0.99 | 0.75 | 2  | 2 | Connectors | <i>Pseudolabrys</i>                   | 1 |
| ASV6   | -0.86 | 0.75 | 2  | 6 | Connectors | <i>Pseudomonas</i>                    |   |
| ASV49  | -0.86 | 0.75 | 2  | 6 | Connectors | <i>Pseudomonas</i>                    |   |
| ASV3   | -0.86 | 0.75 | 2  | 6 | Connectors | <i>Pseudomonas</i>                    | 5 |
| ASV1   | 0.48  | 0.64 | 6  | 6 | Connectors | <i>Pseudomonas</i>                    |   |
| ASV13  | -0.86 | 0.75 | 2  | 6 | Connectors | <i>Pseudomonas</i>                    |   |
| ASV165 | -0.52 | 0.69 | 4  | 4 | Connectors | <i>Pseudonocardia</i>                 | 2 |
| ASV292 | -1.24 | 0.75 | 2  | 3 | Connectors | <i>Pseudonocardia</i>                 |   |
| ASV290 | -1.12 | 0.69 | 4  | 3 | Connectors | <i>Pseudoxanthomonas</i>              | 1 |
| ASV269 | -0.43 | 0.64 | 6  | 1 | Connectors | <i>Rhodococcus</i>                    | 1 |
| ASV206 | -0.14 | 0.64 | 6  | 4 | Connectors | <i>Roseococcus</i>                    | 1 |
| ASV209 | 0.09  | 0.65 | 10 | 1 | Connectors | <i>Sphingomonas</i>                   | 2 |
| ASV89  | -0.17 | 0.63 | 7  | 1 | Connectors | <i>Sphingomonas</i>                   |   |
| ASV242 | -0.89 | 0.75 | 2  | 4 | Connectors | <i>Thiobacillus</i>                   | 1 |
| ASV229 | -0.14 | 0.64 | 6  | 4 | Connectors | <i>Variovorax</i>                     | 1 |

|        |       |      |   |   |            |            |   |
|--------|-------|------|---|---|------------|------------|---|
| ASV152 | -0.58 | 0.75 | 2 | 5 | Connectors | Frankiales | 2 |
| ASV200 | -0.89 | 0.75 | 2 | 4 | Connectors | Frankiales |   |

**Table S6.** The Spearman correlation between alpha diversity and the average variation degree (AVD) of the bacterial community. \*\*\* $P < 0.001$ .

|          | AVD   | Richness | Shannon | Pielou | Chao1 | ACE |
|----------|-------|----------|---------|--------|-------|-----|
| AVD      |       | ***      | ***     | ***    | ***   | *** |
| Richness | 0.970 |          | ***     | ***    | ***   | *** |
| Shannon  | 0.946 | 0.949    |         | ***    | ***   | *** |
| Pielou   | 0.909 | 0.911    | 0.985   |        | ***   | *** |
| Chao1    | 0.970 | 1.000    | 0.949   | 0.911  |       | *** |
| ACE      | 0.968 | 0.999    | 0.946   | 0.907  | 0.999 |     |

**Table S7.** Amplicon Sequence Variants (ASVs) that are common among the rhizosphere soil, root endosphere, and leaf endosphere.

| ASV ID                                                                           | Taxonomy                                                  | Count |
|----------------------------------------------------------------------------------|-----------------------------------------------------------|-------|
| The ASVs shared among the rhizosphere soil, root endosphere, and leaf endosphere |                                                           |       |
| ASV198                                                                           | <i>0319-7L14</i>                                          | 1     |
| ASV21                                                                            | <i>Allorhizobium-Neorhizobium-Pararhizobium-Rhizobium</i> | 1     |
| ASV88, ASV120                                                                    | <i>Bradyrhizobium</i>                                     | 2     |
| ASV94, ASV155                                                                    | <i>Brevundimonas</i>                                      | 2     |
| ASV174                                                                           | <i>Clavibacter</i>                                        | 1     |
| ASV4                                                                             | <i>Conyzicola</i>                                         | 1     |
| ASV30                                                                            | <i>Devosia</i>                                            | 1     |
| ASV95                                                                            | <i>Escherichia-Shigella</i>                               | 1     |
| ASV23, ASV102                                                                    | <i>Gaiella</i>                                            | 2     |
| ASV82, ASV108, ASV330                                                            | <i>IMCC26256</i>                                          | 3     |
| ASV141                                                                           | <i>Microbacterium</i>                                     | 1     |
| ASV126                                                                           | <i>Mycobacterium</i>                                      | 1     |
| ASV90                                                                            | <i>Nakamurella</i>                                        | 1     |
| ASV40, ASV47, ASV66                                                              | <i>Nocardioides</i>                                       | 3     |
| ASV69                                                                            | <i>Phyllobacterium</i>                                    | 1     |
| ASV44, ASV65, ASV73                                                              | <i>Pseudarthrobacter</i>                                  | 3     |
| ASV395                                                                           | <i>Pseudolabrys</i>                                       | 1     |
| ASV1, ASV2, ASV3, ASV5, ASV6, ASV9, ASV13, ASV14, ASV16, ASV17, ASV76, ASV93     | <i>Pseudomonas</i>                                        | 12    |
| ASV932                                                                           | <i>Rubrobacter</i>                                        | 1     |
| ASV79                                                                            | <i>Solirubrobacter</i>                                    | 1     |

|                                                                                     |                                                  |    |
|-------------------------------------------------------------------------------------|--------------------------------------------------|----|
| ASV89, ASV101                                                                       | <i>Sphingomonas</i>                              | 2  |
| ASV96                                                                               | <i>Stenotrophomonas</i>                          | 1  |
| ASV22                                                                               | Frankiales                                       | 1  |
| ASV57                                                                               | Gemmatimonadaceae                                | 1  |
| ASV117                                                                              | Rhizobiales                                      | 1  |
| ASV139                                                                              | Acetobacteraceae                                 | 1  |
| ASV273                                                                              | Actinomarinales                                  | 1  |
| ASV285, ASV42                                                                       | Microbacteriaceae                                | 2  |
| ASV10                                                                               | <i>Variovorax</i>                                | 1  |
| ASV35                                                                               | Stappiaceae                                      | 1  |
| ASV54                                                                               | Sporichthyaceae                                  | 1  |
| ASV80                                                                               | Micrococccaceae                                  | 1  |
| ASV85                                                                               | Microtrichales                                   | 1  |
| ASV353                                                                              | Propionibacteriaceae                             | 1  |
| The ASVs shared between the rhizosphere soil and root endosphere                    |                                                  |    |
| ASV198, ASV410                                                                      | <i>0319-7L14</i>                                 | 2  |
| ASV423, ASV456, ASV485                                                              | <i>67-14</i>                                     | 3  |
| ASV359, ASV644                                                                      | <i>Actinophytocola</i>                           | 2  |
| ASV11                                                                               | <i>Actinoplanes</i>                              | 1  |
| ASV21, ASV33, ASV64, ASV161, ASV195, ASV281, ASV308, ASV486, ASV547, ASV623, ASV679 | <i>Allorhizobium-Neorhizobium-Pararhizobium-</i> | 11 |
|                                                                                     | <i>Rhizobium</i>                                 |    |
| ASV517                                                                              | <i>Amaricoccus</i>                               | 1  |
| ASV112, ASV512                                                                      | <i>Aminobacter</i>                               | 2  |
| ASV260                                                                              | <i>Amycolatopsis</i>                             | 1  |
| ASV403                                                                              | <i>Ancylobacter</i>                              | 1  |
| ASV119, ASV166, ASV295                                                              | <i>Arthrobacter</i>                              | 3  |
| ASV137, ASV150, ASV191, ASV249, ASV261                                              | <i>Aureimonas</i>                                | 5  |
| ASV653, ASV690                                                                      | <i>Bacillus</i>                                  | 2  |
| ASV27, ASV50, ASV70, ASV218                                                         | <i>Blastococcus</i>                              | 4  |
| ASV18, ASV202                                                                       | <i>Bosea</i>                                     | 2  |
| ASV88, ASV120, ASV175                                                               | <i>Bradyrhizobium</i>                            | 3  |
| ASV56, ASV94, ASV155                                                                | <i>Brevundimonas</i>                             | 3  |
| ASV721                                                                              | <i>CL500-29_marine_group</i>                     | 1  |
| ASV174                                                                              | <i>Clavibacter</i>                               | 1  |
| ASV677                                                                              | <i>Clostridium_sensu_stricto_13</i>              | 1  |
| ASV194, ASV651                                                                      | <i>Conexibacter</i>                              | 2  |
| ASV4, ASV680                                                                        | <i>Conyzicola</i>                                | 2  |
| ASV181                                                                              | <i>D05-2</i>                                     | 1  |
| ASV25, ASV30, ASV162, ASV309, ASV1240                                               | <i>Devosia</i>                                   | 5  |
| ASV95                                                                               | <i>Escherichia-Shigella</i>                      | 1  |
| ASV23, ASV102, ASV231                                                               | <i>Gaiella</i>                                   | 3  |
| ASV160                                                                              | <i>Geodermatophilus</i>                          | 1  |
| ASV164                                                                              | <i>Hyphomicrobium</i>                            | 1  |
| ASV358                                                                              | <i>Ilumatobacter</i>                             | 1  |

|                                                                                                          |                           |    |
|----------------------------------------------------------------------------------------------------------|---------------------------|----|
| ASV82, ASV108, ASV330, ASV376, ASV763                                                                    | <i>IMCC26256</i>          | 5  |
| ASV147                                                                                                   | <i>Kineosporia</i>        | 1  |
| ASV207                                                                                                   | <i>Kocuria</i>            | 1  |
| ASV436                                                                                                   | <i>Kribbella</i>          | 1  |
| ASV91                                                                                                    | <i>Lautropia</i>          | 1  |
| ASV43                                                                                                    | <i>Lecchevalieria</i>     | 1  |
| ASV310                                                                                                   | <i>Leifsonia</i>          | 1  |
| ASV204                                                                                                   | <i>Marmoricola</i>        | 1  |
| ASV106                                                                                                   | <i>MB-A2-108</i>          | 1  |
| ASV34, ASV99                                                                                             | <i>Mesorhizobium</i>      | 2  |
| ASV37, ASV141, ASV652                                                                                    | <i>Microbacterium</i>     | 3  |
| ASV357, ASV573                                                                                           | <i>Micromonospora</i>     | 2  |
| ASV122, ASV173                                                                                           | <i>Microvirga</i>         | 2  |
| ASV232, ASV346                                                                                           | <i>Modestobacter</i>      | 2  |
| ASV29, ASV104, ASV126, ASV186, ASV324, ASV368                                                            | <i>Mycobacterium</i>      | 6  |
| ASV90                                                                                                    | <i>Nakamurella</i>        | 1  |
| ASV515, ASV1081                                                                                          | <i>Nitrospira</i>         | 2  |
| ASV40, ASV47, ASV66, ASV98, ASV169, ASV180, ASV271, ASV299                                               | <i>Nocardioides</i>       | 8  |
| ASV361                                                                                                   | <i>Noviherbaspirillum</i> | 1  |
| ASV59                                                                                                    | <i>Novosphingobium</i>    | 1  |
| ASV267                                                                                                   | <i>Oryzihumus</i>         | 1  |
| ASV649                                                                                                   | <i>Pedomicrobium</i>      | 1  |
| ASV434                                                                                                   | <i>Phenyllobacterium</i>  | 1  |
| ASV69                                                                                                    | <i>Phyllobacterium</i>    | 1  |
| ASV19                                                                                                    | <i>Polaromonas</i>        | 1  |
| ASV44, ASV65, ASV73, ASV461                                                                              | <i>Pseudarthrobacter</i>  | 4  |
| ASV52, ASV395                                                                                            | <i>Pseudolabrys</i>       | 2  |
| ASV1, ASV2, ASV3, ASV5, ASV6, ASV8, ASV9, ASV13, ASV14, ASV16, ASV17, ASV46, ASV68, ASV76, ASV93, ASV156 | <i>Pseudomonas</i>        | 16 |
| ASV24, ASV28, ASV87, ASV165, ASV288, ASV289, ASV292, ASV625                                              | <i>Pseudonocardia</i>     | 8  |
| ASV383                                                                                                   | <i>Pseudorhodoplanes</i>  | 1  |
| ASV598                                                                                                   | <i>Ramlibacter</i>        | 1  |
| ASV315                                                                                                   | <i>Reyranella</i>         | 1  |
| ASV469                                                                                                   | <i>Rhodococcus</i>        | 1  |
| ASV105, ASV384, ASV402                                                                                   | <i>Rhodomicrobium</i>     | 3  |
| ASV311, ASV444, ASV770                                                                                   | <i>Rhodoplanes</i>        | 3  |
| ASV326, ASV932                                                                                           | <i>Rubrobacter</i>        | 2  |
| ASV63, ASV312                                                                                            | <i>Saccharothrix</i>      | 2  |
| ASV890                                                                                                   | <i>Skermanella</i>        | 1  |
| ASV75, ASV79, ASV293, ASV300, ASV404, ASV516                                                             | <i>Solirubrobacter</i>    | 6  |
| ASV78, ASV89, ASV101, ASV103, ASV124, ASV144                                                             | <i>Sphingomonas</i>       | 6  |
| ASV96                                                                                                    | <i>Stenotrophomonas</i>   | 1  |
| ASV382                                                                                                   | <i>Steroidobacter</i>     | 1  |
| ASV412, ASV552                                                                                           | <i>Streptomyces</i>       | 2  |
| ASV15                                                                                                    | <i>Tardiphaga</i>         | 1  |

|                                                                  |                                                                      |   |
|------------------------------------------------------------------|----------------------------------------------------------------------|---|
| ASV422                                                           | <i>TK10</i>                                                          | 1 |
| ASV401                                                           | <i>TR43-20</i>                                                       | 1 |
| ASV22, ASV484                                                    | Frankiales                                                           | 2 |
| ASV57                                                            | Gemmatimonadaceae                                                    | 1 |
| ASV83, ASV285, ASV211, ASV294, ASV514, ASV42, ASV80, ASV314      | Microbacteriaceae                                                    | 8 |
| ASV117, ASV227                                                   | Rhizobiales                                                          | 2 |
| ASV139, ASV257                                                   | Acetobacteraceae                                                     | 2 |
| ASV182, ASV304                                                   | Sutterellaceae                                                       | 2 |
| ASV185, ASV203, ASV266, ASV385                                   | Beijerinckiaceae                                                     | 4 |
| ASV219, ASV301                                                   | Gaiellales                                                           | 2 |
| ASV273                                                           | Actinomarinales                                                      | 1 |
| ASV345                                                           | Sphingomonadaceae                                                    | 1 |
| ASV643, ASV842                                                   | Xanthobacteraceae                                                    | 2 |
| ASV889, ASV85, ASV575                                            | Microtrichales                                                       | 3 |
| ASV10                                                            | <i>Variovorax</i>                                                    | 1 |
| ASV35                                                            | Stappiaceae                                                          | 1 |
| ASV54, ASV111                                                    | Sporichthyaceae                                                      | 2 |
| ASV192                                                           | Comamonadaceae                                                       | 1 |
| ASV193                                                           | Solirubrobacterales                                                  | 1 |
| ASV303                                                           | Caulobacteraceae                                                     | 1 |
| ASV305, ASV501                                                   | Oxalobacteraceae                                                     | 2 |
| ASV353                                                           | Propionibacteriaceae                                                 | 1 |
| ASV396                                                           | Xanthomonadaceae                                                     | 1 |
| ASV574                                                           | Micromonosporaceae                                                   | 1 |
| ASV624                                                           | Devosiaceae                                                          | 1 |
| ASV882                                                           | Rhizobiales                                                          | 1 |
| The ASVs shared between the rhizosphere soil and leaf endosphere |                                                                      |   |
| ASV198                                                           | <i>0319-7L14</i>                                                     | 1 |
| ASV569                                                           | <i>67-14</i>                                                         | 1 |
| ASV81                                                            | <i>Actinoplanes</i>                                                  | 1 |
| ASV21, ASV297                                                    | <i>Allorhizobium-Neorhizobium-Pararhizobium-</i><br><i>Rhizobium</i> | 2 |
| ASV284                                                           | <i>Amaricoccus</i>                                                   | 1 |
| ASV528                                                           | <i>Angustibacter</i>                                                 | 1 |
| ASV92, ASV399                                                    | <i>Arthrobacter</i>                                                  | 2 |
| ASV88, ASV120                                                    | <i>Bradyrhizobium</i>                                                | 2 |
| ASV94, ASV155                                                    | <i>Brevundimonas</i>                                                 | 2 |
| ASV174                                                           | <i>Clavibacter</i>                                                   | 1 |
| ASV214                                                           | <i>Conexibacter</i>                                                  | 1 |
| ASV4, ASV77, ASV221                                              | <i>Conyzicola</i>                                                    | 3 |
| ASV748                                                           | <i>Craurococcus-Caldovatus</i>                                       | 1 |
| ASV30                                                            | <i>Devosia</i>                                                       | 1 |
| ASV95                                                            | <i>Escherichia-Shigella</i>                                          | 1 |
| ASV23, ASV102, ASV482, ASV1051                                   | <i>Gaiella</i>                                                       | 4 |

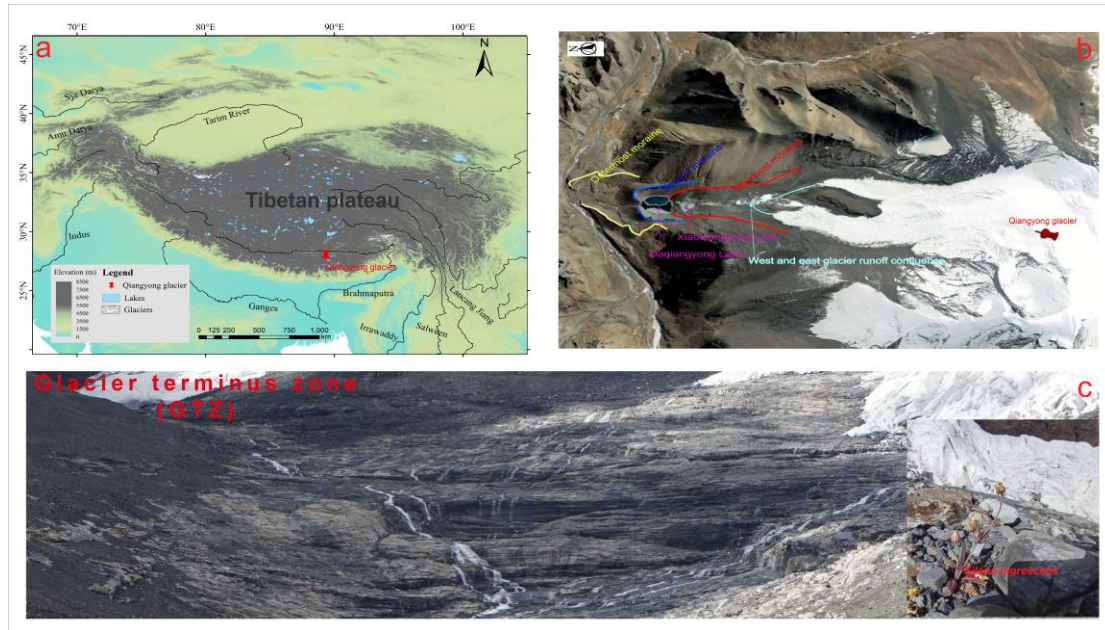
|                                                                                              |                          |    |
|----------------------------------------------------------------------------------------------|--------------------------|----|
| ASV201                                                                                       | <i>Geodermatophilus</i>  | 1  |
| ASV82, ASV108, ASV330, ASV421                                                                | <i>IMCC26256</i>         | 4  |
| ASV38                                                                                        | <i>MB-A2-108</i>         | 1  |
| ASV755                                                                                       | <i>Methylotenera</i>     | 1  |
| ASV141                                                                                       | <i>Microbacterium</i>    | 1  |
| ASV172                                                                                       | <i>Modestobacter</i>     | 1  |
| ASV126                                                                                       | <i>Mycobacterium</i>     | 1  |
| ASV636                                                                                       | <i>Myxococcus</i>        | 1  |
| ASV90                                                                                        | <i>Nakamurella</i>       | 1  |
| ASV40, ASV47, ASV66                                                                          | <i>Nocardioides</i>      | 3  |
| ASV238                                                                                       | <i>Oryzihumus</i>        | 1  |
| ASV127                                                                                       | <i>Pedomicrobium</i>     | 1  |
| ASV715                                                                                       | <i>Phycoccus</i>         | 1  |
| ASV69                                                                                        | <i>Phyllobacterium</i>   | 1  |
| ASV44, ASV65, ASV73                                                                          | <i>Pseudarthrobacter</i> | 3  |
| ASV395                                                                                       | <i>Pseudolabrys</i>      | 1  |
| ASV1, ASV2, ASV3, ASV5, ASV6, ASV9, ASV13, ASV14, ASV16, ASV17, ASV76, ASV93, ASV143, ASV790 | <i>Pseudomonas</i>       | 14 |
| ASV290                                                                                       | <i>Pseudoxanthomonas</i> | 1  |
| ASV291                                                                                       | <i>Quadrisphaera</i>     | 1  |
| ASV269                                                                                       | <i>Rhodococcus</i>       | 1  |
| ASV618                                                                                       | <i>Romboutsia</i>        | 1  |
| ASV932                                                                                       | <i>Rubrobacter</i>       | 1  |
| ASV79                                                                                        | <i>Solirubrobacter</i>   | 1  |
| ASV89, ASV101, ASV641, ASV756                                                                | <i>Sphingomonas</i>      | 4  |
| ASV96                                                                                        | <i>Stenotrophomonas</i>  | 1  |
| ASV337                                                                                       | <i>Sulfurifustis</i>     | 1  |
| ASV394                                                                                       | <i>Sulfurirhabdus</i>    | 1  |
| ASV757                                                                                       | <i>Thiobacillus</i>      | 1  |
| ASV637, ASV670                                                                               | <i>TK10</i>              | 2  |
| ASV22, ASV152, ASV226                                                                        | Frankiales               | 3  |
| ASV57                                                                                        | Gemmatimonadaceae        | 1  |
| ASV117                                                                                       | Rhizobiales              | 1  |
| ASV139                                                                                       | Acetobacteraceae         | 1  |
| ASV168                                                                                       | Gaiellales               | 1  |
| ASV273                                                                                       | Actinomarinales          | 1  |
| ASV285, ASV42, ASV509                                                                        | Microbacteriaceae        | 3  |
| ASV432, ASV274, ASV344                                                                       | Solirubrobacteraceae     | 3  |
| ASV10                                                                                        | Comamonadaceae           | 1  |
| ASV35                                                                                        | Stappiaceae              | 1  |
| ASV54                                                                                        | Sporichthyaceae          | 1  |
| ASV80                                                                                        | Micrococcaceae           | 1  |
| ASV85                                                                                        | Microtrichales           | 1  |
| ASV230                                                                                       | Sphingomonadaceae        | 1  |
| ASV322                                                                                       | Rhodobacteraceae         | 1  |

|                                                                                                          |                                           |    |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------|----|
| ASV353                                                                                                   | Propionibacteriaceae                      | 1  |
| The ASVs shared between the root endosphere and leaf endosphere                                          |                                           |    |
| ASV198                                                                                                   | 0319-7L14                                 | 1  |
| ASV118                                                                                                   | Acidovorax                                | 1  |
| ASV21, ASV615                                                                                            | Allorhizobium-Neorhizobium-Pararhizobium- | 2  |
|                                                                                                          | Rhizobium                                 |    |
| ASV283                                                                                                   | Anaerococcus                              | 1  |
| ASV88, ASV120                                                                                            | Bradyrhizobium                            | 2  |
| ASV94, ASV155, ASV158, ASV217                                                                            | Brevundimonas                             | 4  |
| ASV251, ASV545, ASV872                                                                                   | Chryseobacterium                          | 3  |
| ASV174                                                                                                   | Clavibacter                               | 1  |
| ASV481                                                                                                   | Conexibacter                              | 1  |
| ASV4, ASV41                                                                                              | Conyzicola                                | 2  |
| ASV154, ASV616, ASV714, ASV833                                                                           | Corynebacterium                           | 4  |
| ASV60, ASV67                                                                                             | Cutibacterium                             | 2  |
| ASV32                                                                                                    | Delftia                                   | 1  |
| ASV30                                                                                                    | Devosia                                   | 1  |
| ASV95, ASV145                                                                                            | Escherichia-Shigella                      | 2  |
| ASV23, ASV102                                                                                            | Gaiella                                   | 2  |
| ASV1221                                                                                                  | Gemella                                   | 1  |
| ASV408                                                                                                   | Geodermatophilus                          | 1  |
| ASV82, ASV108, ASV330                                                                                    | IMCC26256                                 | 3  |
| ASV834                                                                                                   | Lactobacillus                             | 1  |
| ASV352                                                                                                   | Lawsonella                                | 1  |
| ASV259, ASV264, ASV393, ASV480                                                                           | Massilia                                  | 4  |
| ASV141                                                                                                   | Microbacterium                            | 1  |
| ASV126                                                                                                   | Mycobacterium                             | 1  |
| ASV90                                                                                                    | Nakamurella                               | 1  |
| ASV40, ASV47, ASV66, ASV594, ASV669                                                                      | Nocardioides                              | 5  |
| ASV130                                                                                                   | Noviherbaspirillum                        | 1  |
| ASV712                                                                                                   | Pandoraea                                 | 1  |
| ASV468                                                                                                   | Pelagibacterium                           | 1  |
| ASV565                                                                                                   | Peptoniphilus                             | 1  |
| ASV69                                                                                                    | Phyllobacterium                           | 1  |
| ASV44, ASV65, ASV73                                                                                      | Pseudarthrobacter                         | 3  |
| ASV395                                                                                                   | Pseudolabrys                              | 1  |
| ASV1, ASV2, ASV3, ASV5, ASV6, ASV7, ASV9, ASV13, ASV14, ASV16, ASV17, ASV26, ASV39, ASV49, ASV72, ASV76, | Pseudomonas                               | 18 |
| ASV93, ASV140                                                                                            |                                           |    |
| ASV932                                                                                                   | Rubrobacter                               | 1  |
| ASV825                                                                                                   | Shinella                                  | 1  |
| ASV985                                                                                                   | SJA-28                                    | 1  |
| ASV79                                                                                                    | Solirubrobacter                           | 1  |
| ASV89, ASV101, ASV265                                                                                    | Sphingomonas                              | 3  |
| ASV129, ASV619                                                                                           | Staphylococcus                            | 2  |

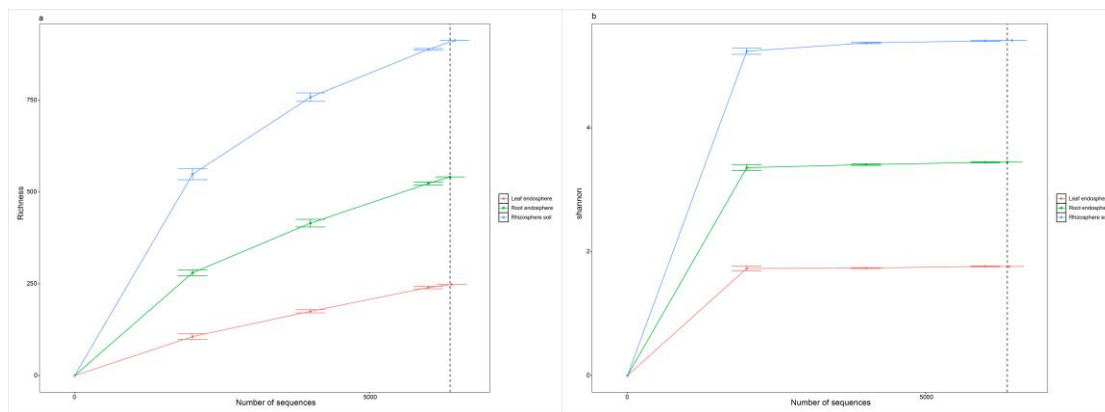
|               |                         |   |
|---------------|-------------------------|---|
| ASV96         | <i>Stenotrophomonas</i> | 1 |
| ASV747        | <i>TK10</i>             | 1 |
| ASV22         | Frankiales              | 1 |
| ASV57         | Gemmatimonadaceae       | 1 |
| ASV117        | Rhizobiales             | 1 |
| ASV139        | Acetobacteraceae        | 1 |
| ASV273        | Actinomarinales         | 1 |
| ASV285, ASV42 | Microbacteriaceae       | 2 |
| ASV10         | <i>Variovorax</i>       | 1 |
| ASV35         | Stappiaceae             | 1 |
| ASV54         | Sporichthyaceae         | 1 |
| ASV80         | Micrococcaceae          | 1 |
| ASV85         | Microtrichales          | 1 |
| ASV353        | Propionibacteriaceae    | 1 |
| ASV466        | Hyphomicrobiaceae       | 1 |
| ASV510        | Enterobacteriaceae      | 1 |

**Table S8.** Key topological properties of bacterial co-occurrence networks, encompassing all taxa within the rhizosphere soil, leaf endosphere, and root endosphere.

| Network properties |       |                        |                     |            |               |          |                |
|--------------------|-------|------------------------|---------------------|------------|---------------|----------|----------------|
| Observed networks  |       |                        |                     |            |               |          |                |
| Edges              | Nodes | clustering coefficient | Average path length | Modularity | graph.density | Diameter | Average degree |
| 947                | 230   | 0.48                   | 3.69                | 0.45       | 0.04          | 12.48    | 8.23           |
| Random networks    |       |                        |                     |            |               |          |                |
|                    |       | Clustering coefficient | Average path length |            | Modularity    |          |                |
|                    |       | 0.036 ± 0.004          | 2.79 ± 0.007        |            | 0.31 ± 0.007  |          |                |



**Figure S1.** The location of the Qiangyong glacier (a, b), and the *Silene nigrescens* grow in the Qiangyong glacier terminus (c).



**Figure S2.** Rarefaction curves of ASV richness and Shannon diversity.