**Supporting Information**

**Variation of Bacterial and Fungal Communities in Soils from Three Major Apple-Pear (*Pyrus bretschneideri Rehd.*) Orchards**

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**Figure S1. Map of sampling sites. YJ, LJ, and HL indicate Yanji, Longjing, and Helong, respectively.**

**Table S1. Soil properties and climate conditions of sampling area. MAT, MAP represented mean annual temperature and precipitation, respectively. EC, electrical conductivity salinity, WSOC, water soluble organic carbon, TN, soluble total nitrogen, TDP, total dissolved phosphorus.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | MAT oC | MAP mm | Altitude  m | Sample | EC  mS/cm | Clay g/100g | Silt g/100g | Sand g/100g | pH | WSOC mg/kg | TN mg/kg | NH4+ mg/kg | NO3- mg/kg | TDP mg/kg |
| Yanji | 5.8 | 527 | 227 | YJ1 | 124.60 | 21.34 | 72.29 | 6.36 | 6.03 | 7.96 | 25.45 | 2.46 | 20.61 | 7.43 |
| YJ2 | 220.50 | 18.52 | 73.94 | 7.54 | 6.82 | 11.51 | 48.43 | 1.88 | 37.05 | 1.88 |
| YJ3 | 58.50 | 15.11 | 74.56 | 10.34 | 6.97 | 19.47 | 7.70 | 4.25 | 2.50 | 3.63 |
| YJ4 | 95.30 | 17.68 | 72.52 | 9.80 | 6.77 | 19.76 | 19.63 | 3.09 | 7.77 | 3.14 |
| YJ5 | 105.95 | 10.18 | 62.40 | 27.42 | 7.13 | 10.92 | 15.93 | 1.69 | 5.73 | 1.64 |
| YJ6 | 99.75 | 13.20 | 72.20 | 14.60 | 7.10 | 17.33 | 17.34 | 1.98 | 10.28 | 2.24 |
| YJ7 | 96.10 | 14.22 | 74.76 | 11.02 | 7.04 | 15.20 | 13.17 | 1.74 | 6.26 | 1.82 |
| YJ8 | 65.00 | 16.89 | 72.88 | 10.24 | 7.05 | 21.94 | 7.76 | 1.57 | 0.83 | 1.28 |
| Longjing | 5.6 | 549 | 244 | LJ1 | 305.00 | 8.96 | 65.71 | 25.33 | 6.89 | 39.42 | 52.67 | 5.56 | 40.68 | 7.07 |
| LJ2 | 69.20 | 10.38 | 65.47 | 24.15 | 6.71 | 35.73 | 10.11 | 2.73 | 3.83 | 6.16 |
| LJ3 | 42.60 | 13.48 | 74.07 | 12.45 | 6.77 | 35.73 | 8.70 | 3.12 | 0.50 | 1.94 |
| LJ4 | 34.55 | 10.36 | 63.03 | 26.60 | 6.83 | 23.35 | 7.58 | 3.55 | 0.50 | 2.90 |
| LJ5 | 82.50 | 12.44 | 63.61 | 23.95 | 5.98 | 10.34 | 17.63 | 2.32 | 13.48 | 2.42 |
| LJ6 | 65.35 | 16.84 | 75.08 | 8.08 | 6.33 | 36.80 | 14.93 | 4.64 | 3.43 | 2.54 |
| LJ7 | 56.15 | 16.30 | 74.34 | 9.36 | 6.46 | 37.29 | 15.87 | 2.97 | 1.35 | 2.72 |
| LJ8 | 57.85 | 15.45 | 76.08 | 8.47 | 6.44 | 33.74 | 12.52 | 4.42 | 3.54 | 2.18 |
| LJ9 | 52.05 | 10.26 | 67.28 | 22.46 | 6.81 | 30.97 | 7.52 | 3.58 | 0.50 | 8.21 |
| LJ10 | 26.65 | 9.91 | 57.50 | 32.60 | 5.98 | 19.23 | 8.35 | 2.97 | 0.99 | 2.54 |
| LJ11 | 84.65 | 17.70 | 74.23 | 8.07 | 5.73 | 10.54 | 14.11 | 2.51 | 12.16 | 2.78 |
| Helong | 4.8 | 734 | 370 | HL1 | 59.45 | 18.88 | 73.82 | 7.30 | 6.88 | 40.20 | 4.82 | 3.99 | 0.50 | 4.05 |
| HL2 | 91.25 | 15.32 | 75.02 | 9.66 | 7.11 | 47.00 | 18.99 | 7.13 | 2.07 | 7.43 |
| HL3 | 58.80 | 13.25 | 74.04 | 12.71 | 7.06 | 26.90 | 8.52 | 3.79 | 1.46 | 7.55 |
| HL4 | 92.23 | 13.80 | 74.66 | 11.54 | 7.08 | 29.52 | 13.70 | 3.31 | 2.46 | 8.87 |
| HL5 | 66.20 | 18.13 | 74.29 | 7.58 | 7.06 | 27.72 | 13.70 | 3.53 | 0.91 | 3.66 |
| HL6 | 64.50 | 16.49 | 74.90 | 8.61 | 6.78 | 24.52 | 13.40 | 3.29 | 1.23 | 2.12 |
| HL7 | 76.85 | 14.09 | 71.93 | 13.98 | 6.91 | 19.13 | 20.63 | 3.10 | 4.60 | 8.93 |
| HL8 | 86.35 | 19.91 | 73.34 | 6.75 | 6.77 | 19.08 | 22.45 | 2.51 | 7.70 | 2.54 |
| HL9 | 69.93 | 14.91 | 74.57 | 10.52 | 6.82 | 18.64 | 20.63 | 1.84 | 0.92 | 3.81 |

**Table S2. Total bacterial sequences, OTU counts, Chao1 index, and Shannon index of each sample from apple-pear orchard located in Yanji, Longjing, and Helong**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Orchard | Sample | Sequence | OTU | | *Chao*1 | | *Shannon* | |
| Yanji | YJ1 | 36233 | 22284 | 3591 | | 10.32 | |
| YJ2 | 30996 | 15531 | 4567 | | 11.00 | |
| YJ3 | 37904 | 23366 | 4160 | | 10.86 | |
| YJ4 | 31196 | 15352 | 2125 | | 10.59 | |
| YJ5 | 32055 | 16933 | 2308 | | 10.61 | |
| YJ6 | 31631 | 15512 | 2153 | | 10.55 | |
| YJ7 | 33551 | 16499 | 2284 | | 10.71 | |
| YJ8 | 33620 | 17202 | 2431 | | 10.73 | |
| Longjing | LJ1 | 36996 | 21339 | 4528 | | 10.22 | |
| LJ2 | 32011 | 19298 | 4086 | | 9.77 | |
| LJ3 | 36231 | 20023 | 4033 | | 10.45 | |
| LJ4 | 27056 | 16714 | 2219 | | 10.07 | |
| LJ5 | 33266 | 21181 | 2373 | | 9.66 | |
| LJ6 | 35648 | 18950 | 3133 | | 10.70 | |
| LJ7 | 28214 | 17352 | 2679 | | 10.70 | |
| LJ8 | 27260 | 16598 | 2445 | | 10.60 | |
| LJ9 | 30914 | 15845 | 2120 | | 10.52 | |
| LJ10 | 38786 | 21187 | 3780 | | 10.32 | |
| LJ11 | 33778 | 20695 | 2816 | | 9.76 | |
| Helong | HL1 | 44101 | 26943 | 3779 | | 10.84 | |
| HL2 | 32995 | 16350 | 2294 | | 10.71 | |
| HL3 | 45611 | 30583 | 3123 | | 10.77 | |
| HL4 | 48568 | 26078 | 4229 | | 10.97 | |
| HL5 | 44611 | 26240 | 3920 | | 10.89 | |
| HL6 | 27774 | 14782 | 2188 | | 10.61 | |
| HL7 | 27590 | 14683 | 2196 | | 10.59 | |
| HL8 | 29691 | 16363 | 2376 | | 10.75 | |
| HL9 | 29407 | 14831 | 2287 | | 10.57 | |

**Table S3. Total fungal sequences, OTU counts, Chao1 index, and Shannon index of each sample from apple-pear orchard located in Yanji, Longjing, and Helong**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Orchard | Sample | Sequence | OTU | *Chao*1 | *Shannon* |
| Yanji | YJ1 | 43975 | 43084 | 395 | 4.85 |
| YJ2 | 39591 | 38745 | 540 | 5.78 |
| YJ3 | 44081 | 42243 | 475 | 5.68 |
| YJ4 | 45121 | 44350 | 571 | 6.19 |
| YJ5 | 44554 | 43269 | 552 | 6.73 |
| YJ6 | 45717 | 44598 | 681 | 6.62 |
| YJ7 | 46514 | 45297 | 586 | 6.40 |
| YJ8 | 44649 | 43511 | 505 | 6.36 |
| Longjing | LJ1 | 45137 | 44250 | 639 | 7.02 |
| LJ2 | 43529 | 42305 | 426 | 6.99 |
| LJ3 | 43701 | 41230 | 503 | 6.16 |
| LJ4 | 44732 | 43382 | 535 | 5.49 |
| LJ5 | 45153 | 43721 | 355 | 5.74 |
| LJ6 | 44997 | 43982 | 564 | 6.31 |
| LJ7 | 41139 | 38131 | 212 | 6.73 |
| LJ8 | 47718 | 46006 | 558 | 6.26 |
| LJ9 | 45405 | 42684 | 593 | 6.31 |
| LJ10 | 47050 | 44519 | 466 | 5.84 |
| LJ11 | 47622 | 46371 | 318 | 4.96 |
| Helong | HL1 | 45655 | 42195 | 631 | 5.96 |
| HL2 | 46059 | 44176 | 553 | 6.07 |
| HL3 | 50355 | 44164 | 607 | 6.85 |
| HL4 | 50355 | 44212 | 614 | 6.12 |
| HL5 | 37234 | 36659 | 593 | 6.28 |
| HL6 | 38412 | 35732 | 408 | 6.44 |
| HL7 | 45669 | 43601 | 524 | 6.27 |
| HL8 | 42735 | 40900 | 523 | 6.87 |
| HL9 | 39621 | 37751 | 464 | 5.99 |

**Table S4 Number of bacterial taxa at Phylum, Class, Order, Family, Genus, and Species levels identified in samples from different apple-pear orchards**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Orchard | Sample | Phylum | Class | Order | Family | Genus | Species | |
| Yanji | YJ1 | 17 | 52 | 78 | 158 | 284 | 156 | |
| YJ2 | 24 | 68 | 88 | 170 | 282 | 135 | |
| YJ3 | 21 | 65 | 99 | 190 | 318 | 170 |
| YJ4 | 18 | 58 | 79 | 151 | 241 | 112 | |
| YJ5 | 20 | 70 | 96 | 174 | 306 | 113 | |
| YJ6 | 16 | 49 | 70 | 140 | 228 | 109 | |
| YJ7 | 15 | 52 | 68 | 134 | 223 | 105 | |
| YJ8 | 18 | 58 | 84 | 157 | 249 | 132 | |
| Longjing | LJ1 | 17 | 62 | 85 | 173 | 272 | 139 | |
| LJ2 | 20 | 72 | 103 | 184 | 294 | 138 | |
| LJ3 | 17 | 60 | 87 | 155 | 242 | 122 | |
| LJ4 | 16 | 49 | 83 | 155 | 219 | 115 | |
| LJ5 | 22 | 67 | 96 | 164 | 189 | 98 | |
| LJ6 | 17 | 56 | 83 | 149 | 228 | 112 | |
| LJ7 | 20 | 61 | 80 | 152 | 221 | 106 | |
| LJ8 | 16 | 57 | 85 | 151 | 216 | 103 | |
| LJ9 | 17 | 54 | 79 | 157 | 230 | 102 | |
| LJ10 | 19 | 62 | 90 | 159 | 232 | 129 | |
| LJ11 | 17 | 57 | 97 | 172 | 255 | 130 | |
| Helong | HL1 | 20 | 63 | 91 | 176 | 269 | 129 | |
| HL2 | 15 | 56 | 78 | 144 | 195 | 99 | |
| HL3 | 22 | 72 | 99 | 173 | 241 | 111 | |
| HL4 | 21 | 69 | 99 | 183 | 276 | 143 | |
| HL5 | 22 | 69 | 99 | 177 | 254 | 132 | |
| HL6 | 16 | 63 | 79 | 147 | 187 | 99 | |
| HL7 | 18 | 61 | 85 | 154 | 233 | 112 | |
| HL8 | 23 | 72 | 97 | 171 | 248 | 121 | |
| HL9 | 22 | 74 | 94 | 162 | 215 | 112 | |

**Table S5. Number of fungal taxa at Phylum, Class, Order, Family, Genus, and Species levels identified in samples from different apple-pear orchards**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Orchard | Sample | Phylum | Class | Order | Family | Genus | Species |
| Yanji | YJ1 | 8 | 17 | 41 | 55 | 74 | 151 |
| YJ2 | 9 | 22 | 50 | 72 | 117 | 217 |
| YJ3 | 8 | 18 | 45 | 56 | 91 | 173 |
| YJ4 | 8 | 19 | 57 | 84 | 140 | 248 |
| YJ5 | 8 | 16 | 47 | 75 | 128 | 213 |
| YJ6 | 9 | 21 | 54 | 90 | 146 | 265 |
| YJ7 | 8 | 20 | 54 | 86 | 139 | 249 |
| YJ8 | 8 | 19 | 48 | 65 | 113 | 193 |
| Longjing | LJ1 | 9 | 21 | 62 | 97 | 152 | 264 |
| LJ2 | 9 | 20 | 48 | 66 | 95 | 172 |
| LJ3 | 9 | 17 | 50 | 69 | 104 | 191 |
| LJ4 | 9 | 18 | 54 | 78 | 112 | 203 |
| LJ5 | 9 | 17 | 38 | 57 | 87 | 148 |
| LJ6 | 9 | 17 | 54 | 88 | 137 | 235 |
| LJ7 | 8 | 16 | 44 | 58 | 71 | 122 |
| LJ8 | 8 | 18 | 54 | 81 | 121 | 204 |
| LJ9 | 9 | 14 | 50 | 79 | 124 | 213 |
| LJ10 | 9 | 16 | 48 | 73 | 98 | 178 |
| LJ11 | 7 | 14 | 36 | 42 | 70 | 125 |
| Helong | HL1 | 9 | 19 | 56 | 78 | 132 | 216 |
| HL2 | 9 | 18 | 50 | 72 | 110 | 184 |
| HL3 | 9 | 20 | 57 | 82 | 132 | 220 |
| HL4 | 9 | 16 | 49 | 83 | 125 | 215 |
| HL5 | 9 | 18 | 59 | 91 | 146 | 238 |
| HL6 | 9 | 19 | 45 | 68 | 97 | 164 |
| HL7 | 9 | 18 | 57 | 81 | 120 | 207 |
| HL8 | 9 | 19 | 57 | 89 | 127 | 220 |
| HL9 | 8 | 16 | 46 | 68 | 103 | 175 |

**Table S6. Taxonomy corresponding to key otu in *Zi*-*Pi* diagram**

|  |  |
| --- | --- |
| **ID** | **taxonomy** |
| botu91164 | *Gammaproteobacteria*, *Proteobacteria* |
| botu11251 | *Actinobacteria*, *Actinobacteria* |
| botu67292 | *Alphaproteobacteria, Proteobacteria* |
| botu54813 | KD4-96, *Chloroflexi* |
| botu11323 | *Alphaproteobacteria*, *Proteobacteria* |
| botu77391 | *Actinobacteria*, *Actinobacteria* |
| botu37802 | *Gammaproteobacteria*, *Proteobacteria* |
| botu46319 | *Anaerolineae*, *Chloroflexi* |
| fotu2107 | *Dothideomycetes*, *Ascomycota* |
| fotu8178 | No blast hit |

**Table S7. Pearson correlation between bacterial communities and physicochemical properties. \*, \*\*, and \*\*\* indicated p values were significant at 0.05, 0.01, and 0.001 level, respectively.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **EC** | **clay** | **silt** | **sand** | **pH** | **WSOC** | **TN** | **NH4+-N** | **NO3--N** | **TP** |
| PCoA1 | -0.173 | -0.190 | -0.486\*\* | 0.396\* | -0.827\*\* | -0.294 | -0.155 | -0.094 | 0.082 | -0.203 |
| PCoA2 | 0.443\* | 0.094 | -0.126 | 0.040 | -0.016 | -0.621\*\* | 0.372 | -0.286 | 0.491\*\* | -0.041 |
| PCoA3 | 0.167 | -0.358 | -0.271 | 0.330 | -0.043 | 0.177 | 0.196 | 0.104 | 0.106 | 0.399\* |

**Table S8. Pearson correlation between fungi communities and physicochemical properties. \*, \*\*, and \*\*\* indicated *p* values were significant at 0.05, 0.01, and 0.001 level, respectively.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **EC** | **clay** | **silt** | **sand** | **pH** | **WSOC** | **TN** | **NH4+-N** | **NO3--N** | **TP** |
| PCoA1 | 0.140 | 0.176 | 0.354 | -0.304 | 0.633\*\* | 0.279 | 0.096 | 0.161 | -0.107 | 0.313 |
| PCoA2 | -0.287 | -0.299 | -0.200 | 0.259 | -0.404\* | 0.221 | -0.238 | 0.190 | -0.242 | 0.243 |
| PCoA3 | 0.052 | -0.069 | -0.010 | 0.037 | -0.069 | 0.335 | 0.091 | 0.089 | -0.051 | 0.371 |