Variations in soil physical and chemical properties and microbial community compositions during plant growth in soils collected from three different regions

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Soil microorganisms play key roles in various biogeochemical processes. For instance, microorganisms can make inorganic nutrients (e.g., P and Fe) in soil minerals available for plants in nutrient poor environments. Particularly, iron is essential for plant growth and can be taken up as the soluble form - ferrous iron (Fe^{2+}) or chelated ferric iron (Fe^{3+}). Because of the low solubility of ferric iron under aerobic conditions, iron deficiency often results in a pale green leaf color(chlorosis). However, siderophore-producing bacteria (SPB) (e.g., *Bacillus, Streptomyces*) or iron reducing bacteria (IRB) (e.g., *Shewanella, Geobacter*) have the capacity to increase Fe uptake by plants from soil minerals. To understand the relationship between iron availability and microorganisms in soils during plant growth, we examined geochemical properties, microbial commmunity compositions, and plant growth (i.e., *Aster koraiensis* - Korean starwort) in soils from three different regions (NF, JS, and KT) in eastern part of Korea. The NF soil contained high organic matter (%) and showed relatively high iron concentration, low pH(< 4.9) and low concentrations of nitrogen (N), phosphorous (P), and potassium (K). By contrast, JS indicated very high nutrient concentrations and KT showed the least amount of nutrients. NF and JS soils have relatively high proportion of fine particles than KT, which can affect nutrient holding capacity. To minimize environmental variability, the plant growth experiments were also conducted in a greenhouse using the same soils. Microbial community compositions were clearly different in each soil regardless of field and greenhouse experiments suggesting that the soil properties mainly control the community composition rather than weather conditions. Interestingly, in soils supplied with high amount of water, the relative abundance of *Bacillus* and *Streptomyces* decreased, while IRB such as *Geobacter* increased. In addition, total Fe(II) concentrations in soils increased with watering, but decreased over time during the plant growth suggesting that Fe(II) produced by IRB might be taken up by the plant.