Supporting Text 2 (S2 text)

**LEACHING OF SOIL MINERALS AND ABSORPTION BY ROOTS**

Fig.S2 shows a schematic of the absorption by roots of K+ ions released by the surface of a mineral (e.g., K‑feldspar). At the macroscale (Fig.S2A) the rate at which potassium becomes available in the soil solution (*R*1) is commonly thought to be that one determined with conventional weathering apparatuses in geochemistry literature [1]. However, in a system with at least one dimension in the microscale domain (Fig.S2B), for example a root growing in a soil microchannel, the rate at which potassium is available (*R*2) is higher, as demonstrated by results shown in Fig.2 of the main text of this work. Furthermore, the K+ concentration in a soil pore is higher than the average measured for a bulk system. Microfluidic tools permit investigating leaching rate of mineral surfaces in microenvironments.

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**Fig. S2 Microfluidic absorption of nutrients from roots.** Schematic of nutrient uptake by roots in (A) *macro*fluidic system where flow, roots and soils are investigated by measuring average bulk values of the parameters of interest and (B) *micro*fluidic system where a thin layer of soil solution is isolated from the soil bulk and only the roots in that layer (black bold) are considered. *R* is the rate at which K+ ions are available at the root surface (*R*2>*R*1 as demonstrated by data in Fig.2 of the main text); *F* is the flow rate; [K+] is the concentration of potassium ions at the roots surface ([K+]2>[K+]1). Note that the two drawings (A) and (B) as well as the several parts of the leek are not on scale. The schematic is highly idealized. It depicts a leek growing in a soil in contact with a fresh surface of K‑feldspar that leaches K+ ions upon contact with water. Water flows at an average flow rate *F*, in a parallel direction to that of the K‑feldspar surface.

References

1. Blum AE, Stillings LL. Feldspar dissolution kinetics. In: Chemical Weathering Rates of Silicate Minerals. Reviews in Mineralogy and Geochemistry. 311995. p. 291-351.