The rheology of rhizosphere formation by root exudates and soil microbes

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Background
- The rhizosphere is the interface between the plant and soil.
- Exudation and enhanced cycles of wetting and drying produce a highly aggregated soil structure that may improve the capture of resources and resilience to stress.
- Underlying processes causing rhizosphere structure formation are poorly understood.

Hypotheses
- Root exudates initially disperse soil, thus easing root penetration and releasing nutrients.
- Soil microbes then transform exudates into biological glues that gel soil.

Methods
- Three Cambisols - sandy loam, loam and clay loam.
- Amended with 0, 1.5 or 15 mg C/g soil of root exudate compounds (Paterson et al., 2007).
- Incubated for 14 days at 2 oC to suppress and 16 oC to allow for microbial decomposition.
- CO2 evolution measured by GC during incubation.
- Soils wetted to a range of water contents.
- Rheological behaviour tested in a parallel plate rheometer using an amplitude sweep test (Markgraf & Horn, 2007).

Results
- Background
  SEM from Dorioz et al. (1993) shows evidence of dispersion and aggregation in the rhizosphere.

- Hypotheses

- Methods

- Results
  Dorioz et al. (1993) show dispersion and aggregation in the rhizosphere.

- Conclusions
  Dispersion observed for soils with added root exudate compounds where microbial activity suppressed by 2 oC incubation.
  Gelling observed for soils with added root exudate compounds and microbial activity at 16 oC incubation.
  Impacts depend on soil texture and amount of added root exudate compounds.

The Scottish Crop Research Institute and the Macaulay Institute receive grant-in-aid support from the Scottish Government Rural and Environment Research and Analysis Directorate.