Outline

Frontiers in Environmental Science | Soil Processes (or the sustainable part of Frontiers)

~ Experiment performed with the intention of characterizing the microbial community and plant available nitrogen of soils amended with fertilizers available for use in organic agriculture. Understanding the bacterial community structure during decomposition and nutrient release of organic plant materials and compost and the associated soil nutrient profile will provide bacterial targets to be used as biological soil amendments intended to improve nutrient cycling in organic production systems.

We want to leverage an abundant natural resource (soil and bacteria) to improve crop production and ecosystem services/health in agroecosystems. We will do this first by characterizing the microbial (bacterial) community of agricultural soils under sustainable (organic) management. We will utilize bacterial characteristics to design biostimulants and bioaugmentations for soils that will improve soil fertility management in sustainable agroecosytems.

Introduction (4 – 10 paragraphs)

* Drawbacks of mineral fertilizers in agroecosystems
  + Water quality
  + Climate change (fossil fuel use)
* Green manures and compost (organic amendments) as alternative fertilizers
* Challenge facing: timing of nutrient release, microbial mediated component particularly not well characterized
  + C:N ratio impact on microbial response and nutrient release
  + C:N ratios below 25:1 (mineralization)
* Understanding nutrient release from organic amendments over time and the coupled bacterial community dynamics will improve our understanding of soil ecology in organic agroecosystems as well as contribute to the development of biological soil amendments
* ~~Ecological classification (slow vs. fast growers) who is likely to be responding to each amendment? Linked to treatment or time? (See Fierer et al. 2007, “Toward and ecological classification of soil bacteria”)~~ (better in discussion)
* **Do OTUs transfer from amendment to soil and persist? (little available research)**

Questions/Objective

* Characterizing the microbiome of organic amendments and baseline soils, and their change through combination
* Does this change come from the amendment or because the soil is changing?

Materials & Methods

* Highlight: controlled, replicated, broad (analyses)

Results

* How much does the soil microbiome/nutrients change
  + from amendment?
    - NMDS of all amendments and basesline soils and time
    - Line charts of nutrients
  + Per amendment / soils?
    - Barchart of phylogeny – fingerprint
    - Line charts of nutrients
  + What is the biggest factor in the changes we observe? (quantify the explanatory variables)
* Who is present? Distinction of transferers and responders.
  + Define Responders and specifically early and late responders
    - Clustering results – is this different for the amendments?
    - Defining what a “responder” and “Persistor” is
    - Outputs: Early and late natives and alients
      * # of OTUs that are early / late natives and aliens
      * Line chart of their abundance changing (LFC)
      * Is there a pattern of responders and persisters?

The phylogenetic characterization of these guys [phylogenetic tree / heatmap of the early and late native and alients per amendment]

Can we label the OTUs as slow or fast growing?

Discussion

* Timing of responses
* Specificity of amenments
* Origin stories of the response
* ecological class: slow (oligotrophic) and fast (copiotrophic) growing bacteria, differences between treatments? Time?

Conclusion