Impacts of Nitrogen Addition on the Soil Microbial Community in Grass versus Legume Soil

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Introduction

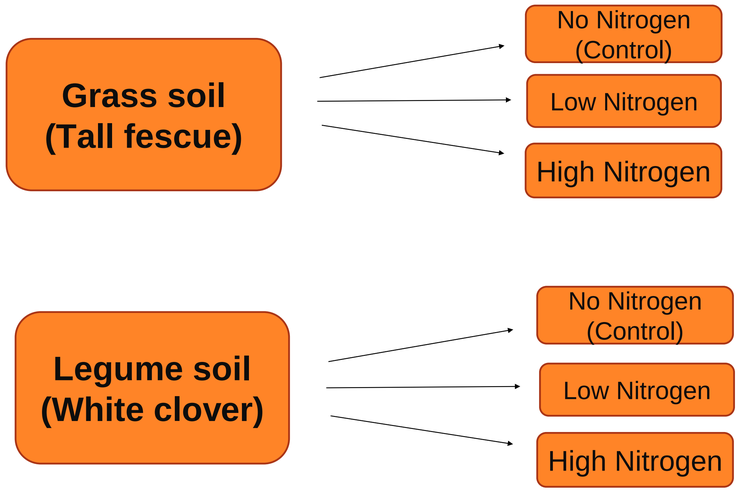
- The soil microbial community (SMC) plays a key role in various ecosystem functions.[1] The addition of nitrogen can alter the SMC, which can affect how soil completes its tasks.[2]
- Grasses and legumes are prominent crop types and given what we know about the importance of the SMC, a better understanding of the difference in the SMC between legume and grass crops is important.[3]

Research Questions

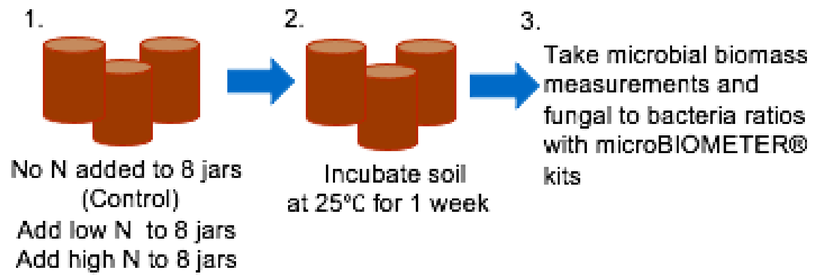
How does the addition of nitrogen impact the biomass and the fungal to bacterial ratio of the soil microbial community?

How do changes in microbial biomass and fungal to bacterial ratio differ in grass versus legume soil?

Experimental Design



Methods



Results

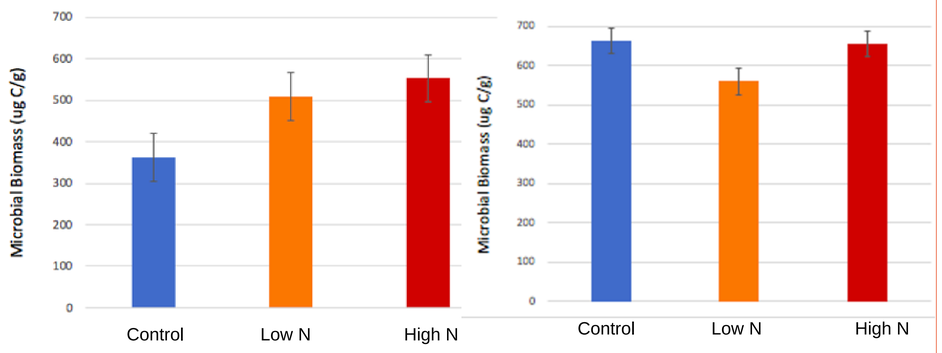


Figure 1. Biomass measurements. (A) Mean microbial biomass in the grass soil between the three N levels (ANOVA, $P = 0.003$). (B) Mean microbial biomass in the legume soil between the three N levels (ANOVA, $P = 0.296$).

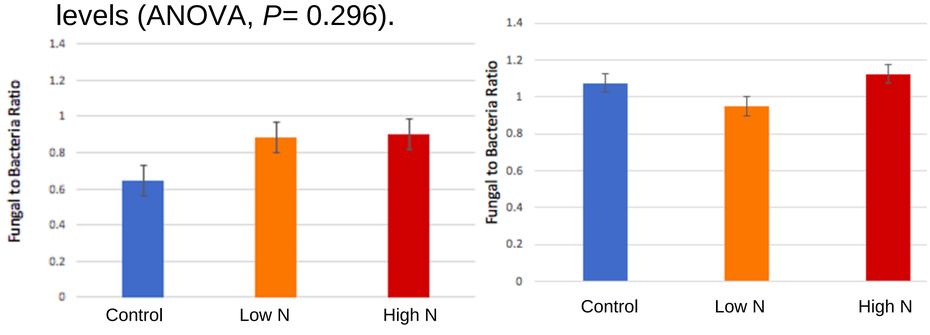


Figure 2. Fungal to bacterial ratios. (A) Mean fungal to bacteria ratio in the grass soil between the three N levels (ANOVA, $P = 0.064$). (B) Mean fungal to bacteria ratio in the legume soil between the three N levels (ANOVA, $P = 0.613$).

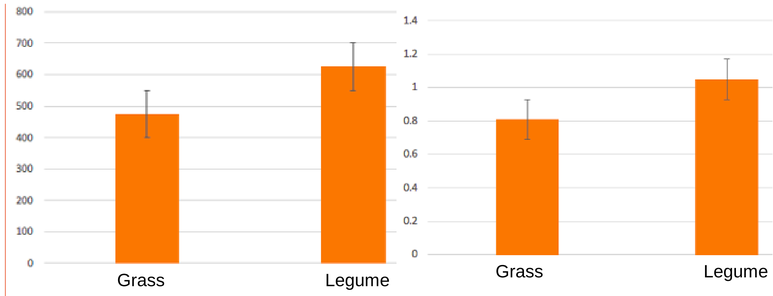


Figure 3. Biomass and fungal to bacteria ratio for grass versus legume soil (A) Mean microbial biomass in the grass soil and the legume soil (ANOVA, $P < 0.001$). (B) Mean fungal to bacteria ratio in the grass soil and the legume soil (ANOVA, $P = 0.009$).

Conclusions

The size of the microbial community in the grass soil was significantly affected by the added nitrogen, showing a trend of more biomass in the soils with nitrogen input.

The microbial biomass in the soil with legumes was higher than that in the soil with grasses, suggesting that the nutrients in legumes could be more readily available to the soil microbes.

The two plant groups also differed in soil microbial community composition, with the legume soil having a higher fungal to bacterial ratio. This suggests that legumes could be important in enhancing the ecological function of the soil through the production of more fungi.

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References

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