Lipid-Enhanced Oilcane Does Not Impact Soil Carbon Dynamics Compared with Wild-Type Sugarcane

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Background/Objective

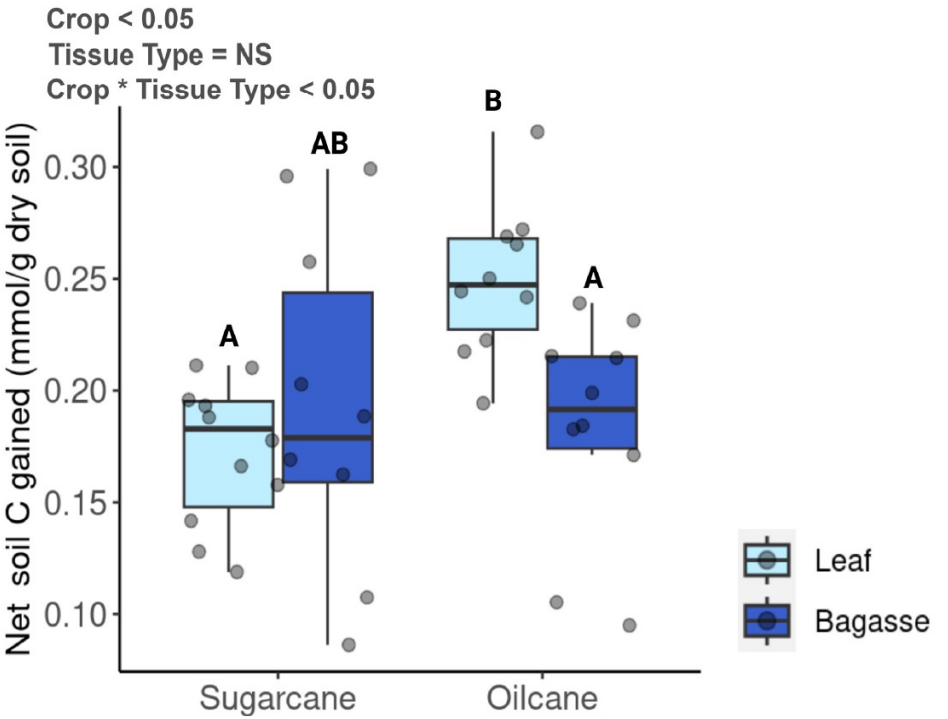
- Sugarcane is currently a widely used bioenergy crop and oilcane, a genetically modified sugarcane derivative with enhanced vegetative oil content, has the potential for future use as a bioenergy feedstock.
- Soil carbon (C) sequestration associated with bioenergy feedstock cultivation is important to the overall C balance of bioenergy systems.
- Here, researchers used natural abundance $\delta^{13}C$ isotope tracing to better understand the impact of sugarcane and oilcane litter on soil C formation and loss.

Approach

C4 sugarcane and oilcane leaves and bagasse (processed stem litter) were lab-incubated in C3 forest soils that differed in their natural abundance ^{13}C isotopic signatures. $\delta^{13}CO_2$ respiration was measured and after 11 weeks, the soil was density fractionated to quantify incorporation of litter C into the particulate and mineral associated organic carbon (POC and MAOC) fractions.

Results

After 11 weeks, no differences in cumulative, soil, or litter respiration between oilcane and sugarcane were identified. All litter treatments had net soil C gains. Oilcane had overall greater net soil C gains than sugarcane, and oilcane leaves had greater net soil C gains than oilcane bagasse.



Net soil C gained, calculated as the difference between soil C lost through priming and new soil C from the added litter. Data shown are 10 replicates, excluding outliers, for each treatment.

Significance/Impacts

This work suggests that a transition to oilcane as a bioenergy feedstock may enhance conversion efficiency without negatively impacting soil C sequestration. However, continued assessment of this relationship using future versions of oilcane that may have very different biomass composition will be important for forming a deeper understanding of potential impacts.

Pagliaro et al. 2023. "Lipid-Enhanced Oilcane Does Not Impact Soil Carbon Dynamics Compared with Wild-Type Sugarcane" *GCB Bioenergy.* DOI:10.1111/gcbb.13074.