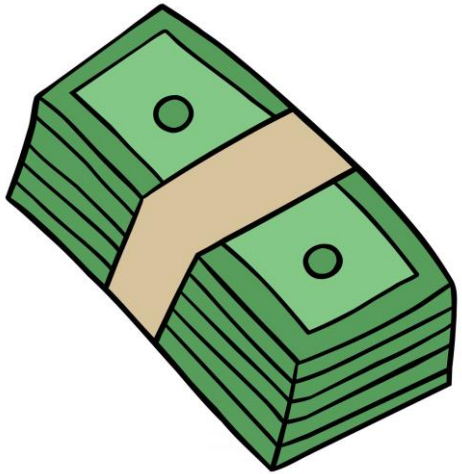
Cheng Lab
Biochar Remediation and NYCHA Leaf Mulching

Nya Gasowski, Linh Le, and Ella Hook

What is leaf mulching?

Why use leaf mulching in NYCHA?

- Cheap
- Reduces waste and greenhouse gas emissions
- May improve soil quality - we'll see



METHODS - Field and Lab

- Infiltration tests - runoff?
- Bulk density sampling - compaction?
- Laboratory analysis - nutrients, water holding capacity, microbial mass?
- What kinds of leaves are being mulched?


Galaxy S20 FE 5G

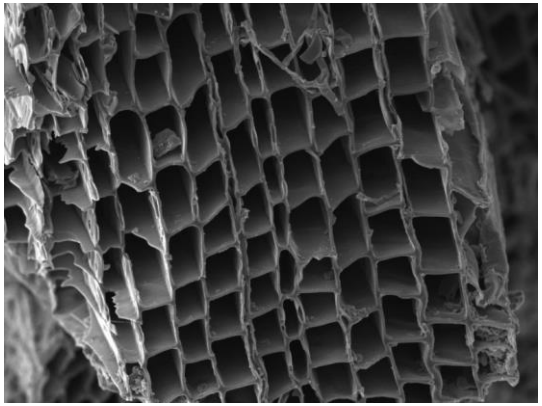

Galaxy S20 FE 5G


Galaxy S20 FE 5G

Results to come!

What is biochar? Why is it important?

- Carbon rich, porous material, produced by burning organic waste
- known for its effectiveness in stabilizing heavy metals in soil



Our goal:

Assessing the effects of biochar and compost on the mobility of Pb (lead) and As (arsenic) in two soils, along with general quality and nutrient availability.

What all are we testing? Why?

- **Phosphate and nitrate** (necessary for plant growth)
- **Pb and As** in soil and plant samples - how much made it to the plant tissue?
- **Cation exchange capacity (CEC)** (capacity to supply positively charged ions from nutrients for plant uptake) (University of Georgia, 2014)
- **pH**

Major determinants of soil quality.

Soil and tissue samples

- **183 soil samples** sorted, oven dried, and weighed out for the KCl extraction process
- Tissue samples of the **Brown Mustard and Kale plants** washed, cut, sorted and dried for analysis.

KCL extraction

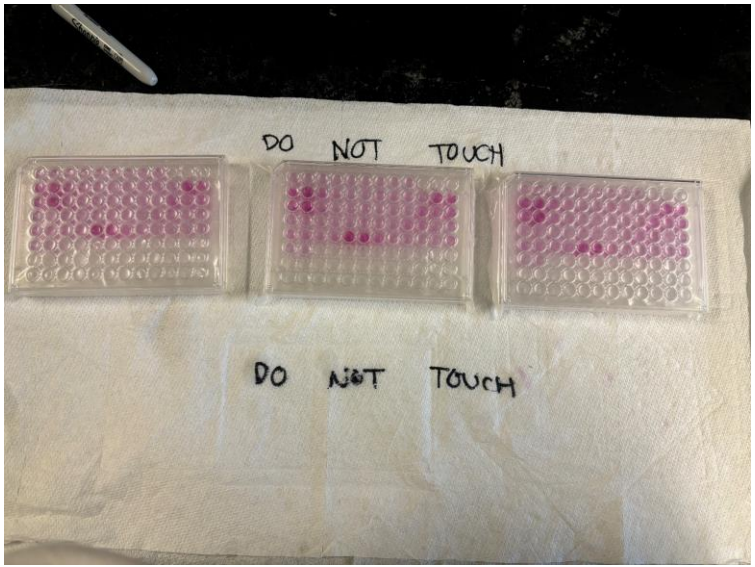
- Weighed out 8g of each soil sample
- Added 40 ml of 1M KCL reagent
- Put on rotating shaker for 30 minutes
- Filtered out the soil from the solution and poured back into original tubes

Nitrate Determination

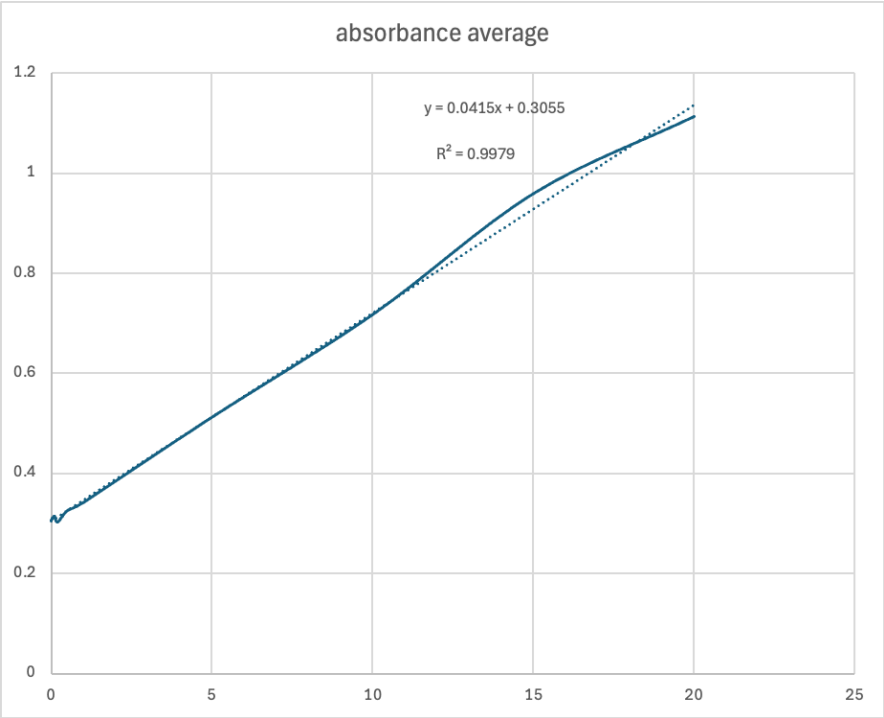
- Created calibration standards (0, 0.1, 0.2, 0.5, 1, 5, 10 , 15, 20) ppm
- 3 replicates for good calibration curve
- 20 microliters of calibration standard/sample into each well of the microplate
- 30 microliters of 1M* KCL into each well
- 250 microliters of VCL_3 into each well
- Seal each tray with parafilm

Challenges

- **Miscommunication** on the molar concentration of KCL to use in the nitrate determination process due to outdated protocol
- **Further dilution will be necessary** for most samples, therefore i will have to redo most of my samples



Example Data

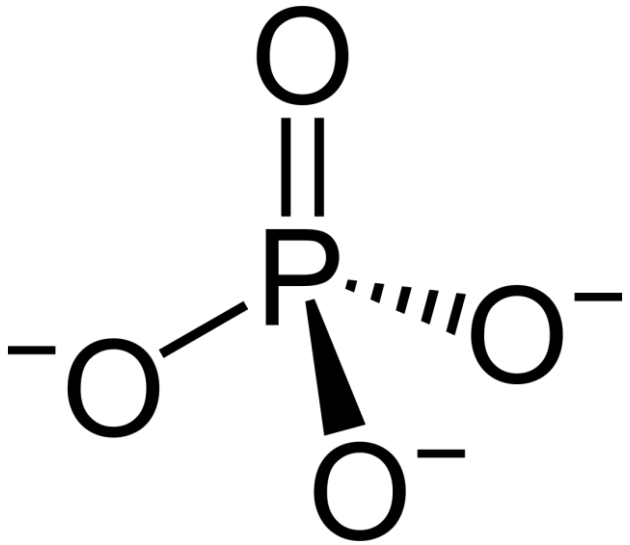


Calibration curve

Sample IDS	reading 1	reading 2	reading 3	average	concentrations (ppm)	Soil N-No3 (ppm)
DF BM + C+ B1% (1)	overflow	4.775	overflow	4.775	107.6987952	538.4939759
DF BM + C+ B1% (2)	4.281	4.213	3.916	4.13666667	92.31726908	461.5863454
DF BM + C+ B1% (3)	3.692	3.801	3.783	3.75866667	83.20883534	416.0441767
DF BM + C+ B1% (4)	2.101	2.303	2.151	2.185	45.28915663	226.4457831
DF BM + C+ B1% (5)	0.864	0.925	0.896	0.895	14.20481928	71.02409639
DF BM+B 2% (1)	0.92	0.893	0.902	0.905	14.44578313	72.22891566
DF BM+B 2% (2)	1.798	1.961	1.934	1.89766667	38.36546185	191.8273092
DF BM+B 2% (3)	1.526	1.601	1.625	1.584	30.80722892	154.0361446
DF BM+B 2% (4)	1.464	1.49	1.571	1.50833333	28.98393574	144.9196787
DF BM+B 2% (5)	0.485	0.496	0.543	0.508	4.879518072	24.39759036
DF BM + C (1)	4.761	4.438	4.699	4.63266667	104.2690763	521.3453815
DF BM + C (2)	overflow	overflow	overflow	overflow	#VALUE!	#VALUE!
DF BM + C (3)	4.484	4.47	4.429	4.461	100.1325301	500.6626506
DF BM + C (4)	4.273	4.16	3.975	4.136	92.30120482	461.5060241
DF BM + C (5)	2.111	2.16	2.175	2.14866667	44.41365462	222.0682731
SCF LK + B 1% (1)	0.657	0.679	0.682	0.67266667	8.847389558	44.23694779
SCF LK + B 1% (2)	0.619	0.566	0.696	0.627	7.746987952	38.73493976

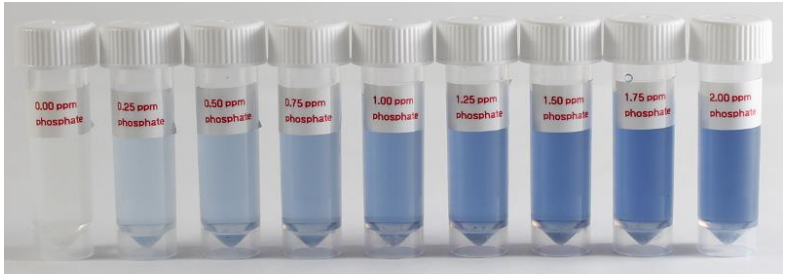
Phosphate

- Why we test for phosphate and the phosphorus cycle
- What phosphorus species are we detecting?



Phosphate Analysis

- Beer’s Law and absorbance
- Spectrophotometry
- Molybdenum blue method



Phosphate Results

- KCl vs. water extractions
- What next?

	soil concentration (ppm)
DF BM C B1%	1.32
DF BM B2%	1.03
DF BM C	1.14

The End

Questions?