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Semester Soil Project

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Semester Soil Project

EDEN MCAVOY, FALL 2021, CHE141-404H, CARLSON

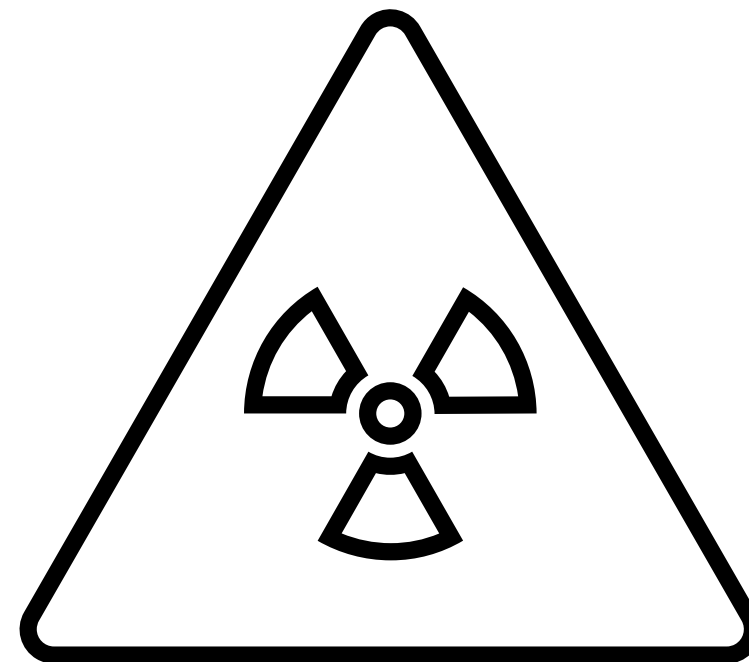
Literature Research: Overview

- ▶ What is the topic?
 - ▶ The topic I chose is how surrounding cities affect the minerals and integrity of the surrounding soil and how it can affect humans.
- ▶ Why this topic?
 - ▶ I chose this topic because I wanted to learn how soil integrity differs from place to place.



Literature Research: Focus

- ▶ The element I focused on for my literary research is lead (Pb). It's well known that lead can negatively affect the human body (CDC 1). I wanted to know what research has been conducted for areas with a greater exposure to lead, and how it affects children and their cognitive functions.




Literature Research: Why you should care

- ▶ Why should you care about this research?
 - ▶ The focus is lead levels in high populated areas, so if you want to move to a city, you will want to know what to avoid and know what could happen. This is especially important if you want to live in these areas for a long time, and if you choose to have children grow up in these cities.

Literature Research: Experimental Question and Set Up

The question for this research article was whether lead levels in the blood were inversely related to cognitive function in children (Jusko et al 243).



The way the research was set up was that they would run blood tests then compare to the control, which was bovine blood (Jusko et al 244). They would then give a select group of children that qualified for the research a test that would show the makeup of their intelligence (Jusko et al 244).

Literature Research: Set Up Continued



They would then compare the tests between the children who have normal lead levels and the children who have higher lead levels and see if there was a difference (Jusko et al 244).



This research ended up having a nonlinear result and they ended up doing a different study in the end that tested for a full IQ standpoint (Jusko et al 244-245). This experiment was similar, but it was more controlled and only studied peak lead levels in the blood (Jusko et al 245).

Literature Research: Control and Results

- ▶ To ensure that there were no outside variables or errors, the blood was tested 8 times for each child (Jusko et al 247).
- ▶ They eventually concurred that there was in fact a direct, inverse relation between IQ levels and lead levels in the blood (Jusko et al 246).

Literature Research: Soil and Lead levels in Children Relation

- ▶ Area
 - ▶ Children born in highly populated cities are known to have higher lead levels in their blood (Filipelli et al 6). These children are especially at risk if they live near a railroad or a factory (Filipelli et al 10).
- ▶ Why?
 - ▶ This is because the U.S. has deposited over 5 million tons of Pb into the environment, especially the soil, due to leaded gasoline and industrial factories (Filippelli, et al 5).

Experimental Research: Samples

- ▶ Which samples did I choose?
 - ▶ The samples I chose were soil from my lawn and soil from the corn field surrounding my house.
 - ▶ Why these samples?
 - ▶ I chose these samples because I wanted to know, and I also wanted to relay back the information to my dad because he's the farmer who owns the field surrounding my house.

Experimental Research: The Question

My experimental question is:

- ▶ How do my soils differ from one another due to their maintenance styles?

They are both the same type of soil, but because of how differently they are handled they most likely have some differences in their properties.

Experimental Research: The Tests

- ▶ The different tests that are going to be ran are the following:
 - ▶ Soil Texture/Type
 - ▶ Soil pH and Conductivity
 - ▶ P and K Analysis
 - ▶ Slake
 - ▶ Cotton
 - ▶ POXC
 - ▶ Microbial Activity

Experimental Research: Results

- ▶ Soil Texture/Type
 - ▶ My results for my soil texture and type are inconclusive due to a faulty scale, so my data for this is insufficient for both samples.
- ▶ pH
 - ▶ My pH for my sample of corn/soybean rotation currently on corn had a pH of 8.05, which is one of the higher pH's compared to my peers who also had this type of soil, but it is still within 0.5 of the majority of my peers. My lawn soil had a pH of 8.17, which fits the trend of others who also took samples from their own lawns.

Experimental Research: Results

▶ Conductivity

- ▶ The results are also faulty because the prelab was done with the same faulty scale as the texture/type, so my results are faulty. For my corn rotation soil, the conductivity was $152.1 \mu\text{S}$, and for my lawn soil the conductivity was $107.5 \mu\text{S}$. These are both extremely high compared to my peers, for obvious reasons.



Experimental Research: Results

▶ K Analysis

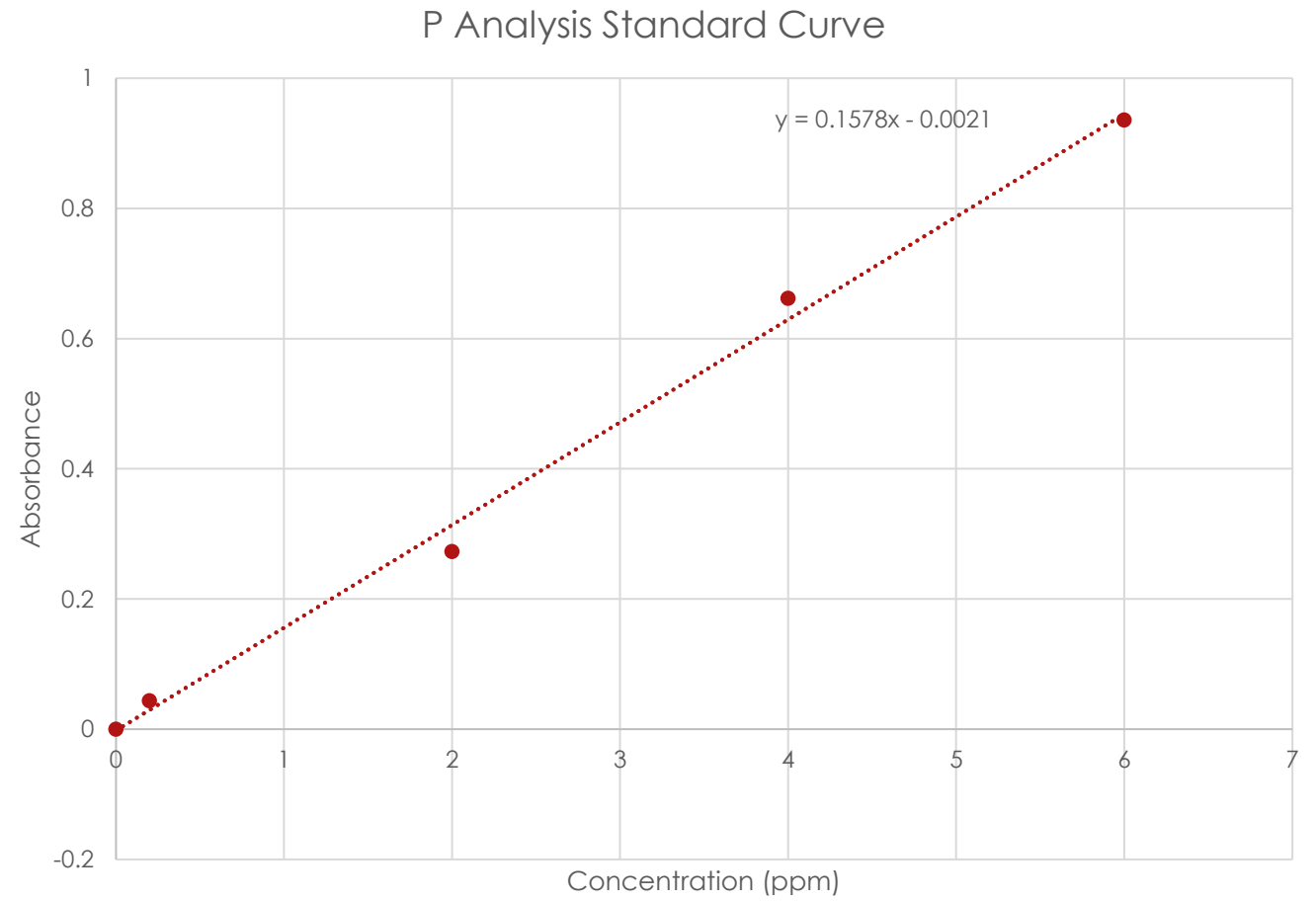
- ▶ For corn rotation soil, the K levels were at about 39.4 lbs K/acre. For the lawn soil, it was at about 69.6 lbs K/acre. Both of these fit the trends of measurements with my peers. Neither were high or low.

▶ P Analysis

- ▶ For corn rotation soil, the P levels were at about 31.8 lbs P/acre. For the lawn soil, it was at about 57.0 lbs P/acre. My corn rotation soil was right around the average measurement. My lawn soil was slightly higher compared to most of my peers, but not enough to consider issues.



P Analysis Standard Curve

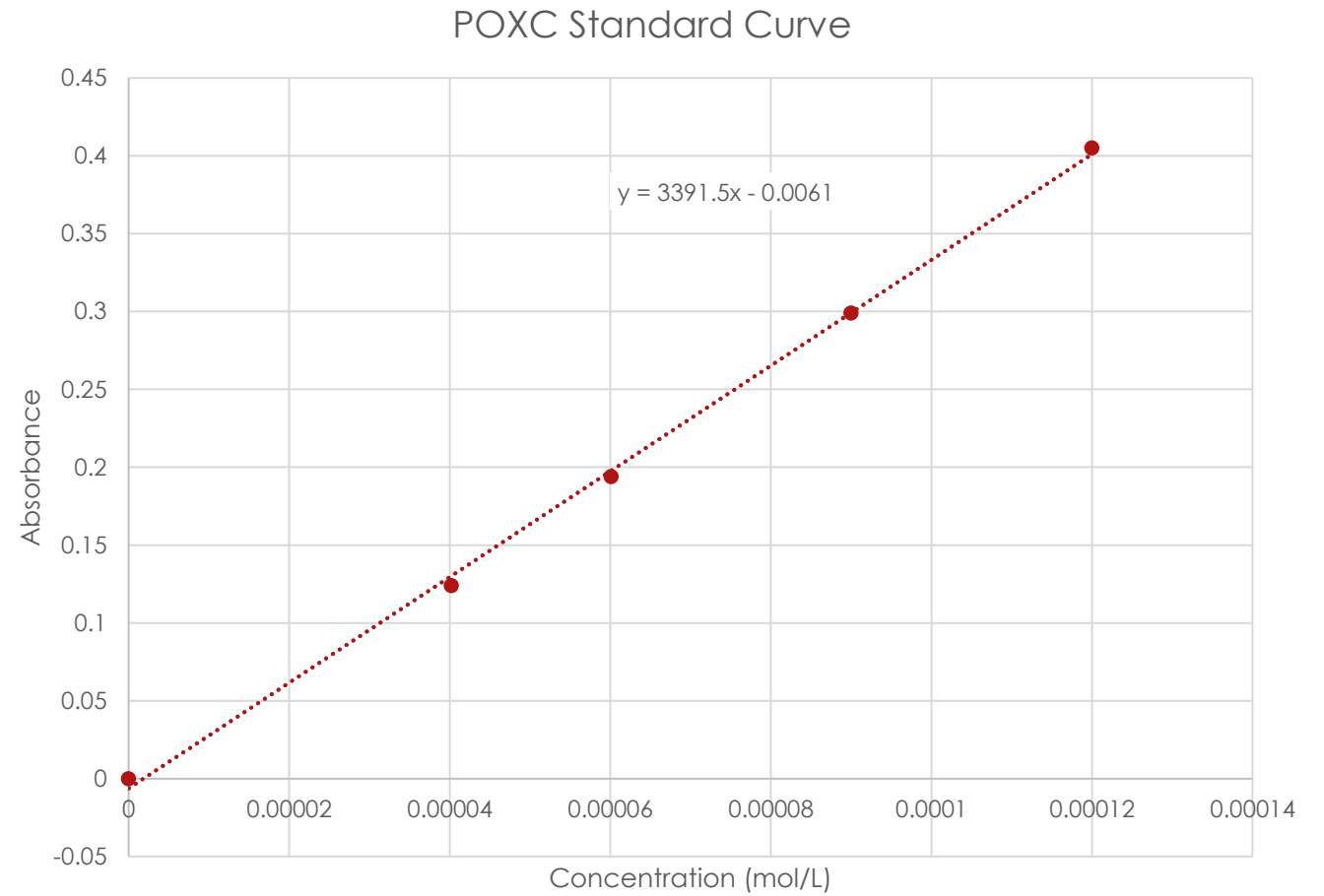


Experimental Research: Results

- ▶ Slake
 - ▶ For the slake test, the corn soil fell apart and was less stable than the lawn soil. I believe this is due to the fact that the lawn soil has grass fibers in it which made it more stable.
- ▶ Cotton
 - ▶ Both soil samples had roughly the same amount of decomposition of the cotton strip. Both soil samples created holes, had discoloration, and made the fabric very weak and easy to tear.
- ▶ POXC
 - ▶ My corn soil had a POXC of 864.0 mg RC/Kg Soil and my lawn soil had 1022.4 mg RC/Kg soil. The lawn soil was average compared to my peers, and the corn soil was also average compared to my peers.



POXC Standard Curve



Experimental Research: Results

▶ Microbial Activity

- ▶ My numbers were about average compared to my peers. The values weren't high or low compared to the others who had the same type of soil as me. My corn soil had a value of 58.3 mg CO₂/kg soil-day and my lawn soil had a value of 54.3 mg CO₂/kg soil-day. This makes sense because my corn soil has lots of insects attracted to it which brings along other organisms that produce CO₂, so it would be expected to have a higher value.



Experimental Research: Conclusion

In conclusion, there were some issues with my experimental research, but it worked out and I got sufficient information. What I've realized between my soils is that my corn rotation soil, in whole, had lower measurements than my lawn soil. There are a few exceptions, these being microbial activity and conductivity. I believe this is due to the corn taking the nutrients out of the ground, leading to a lesser amount of phosphorous, potassium, and structure. The involvement of organisms being attracted to the corn created a higher CO₂ value.

Experimental Research: Conclusion Continued

The involvement of metal machinery could possibly lead to the higher conductivity values compared to the lawn soil. There are also other factors as to why the lawn soil had higher potassium and phosphorous levels. This is that the lawn soil has natural fertilizer that comes from my four dogs, along with there being no retouching every harvest season like the corn field does. The maintenance between the two soils leads to one soil having more minerals, and the other having a higher conductivity and higher microbial activity.

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