Future Improvements

- Use a higher precision pH meter
- Run the experiment longer to allow the roots to take full effect
- Measure another variable, (plant height, germination rate).

Connection to Background Research

In acidic soils, low pH can reduce nutrient availability and increase metal toxicity, which stresses plants and alters normal growth. In this experiment, the contaminated soil and acidic input water were designed to model this kind of pH disturbance. The leachate pH data showed that bucketheart pots tended to stay closer to moderate pH than soil only pots, is consistent with the idea that plant roots and the surrounding rhizosphere help buffer chemical changes in the soil solution.

Error Analysis

Instrument limitations: pH meter and pH test strips can't detect small changes to the pH and will be rounded to a whole number.

Design Limitations: there are only 5 pots per group and measured in a short time frame (5-7 days).

Refined Procedure

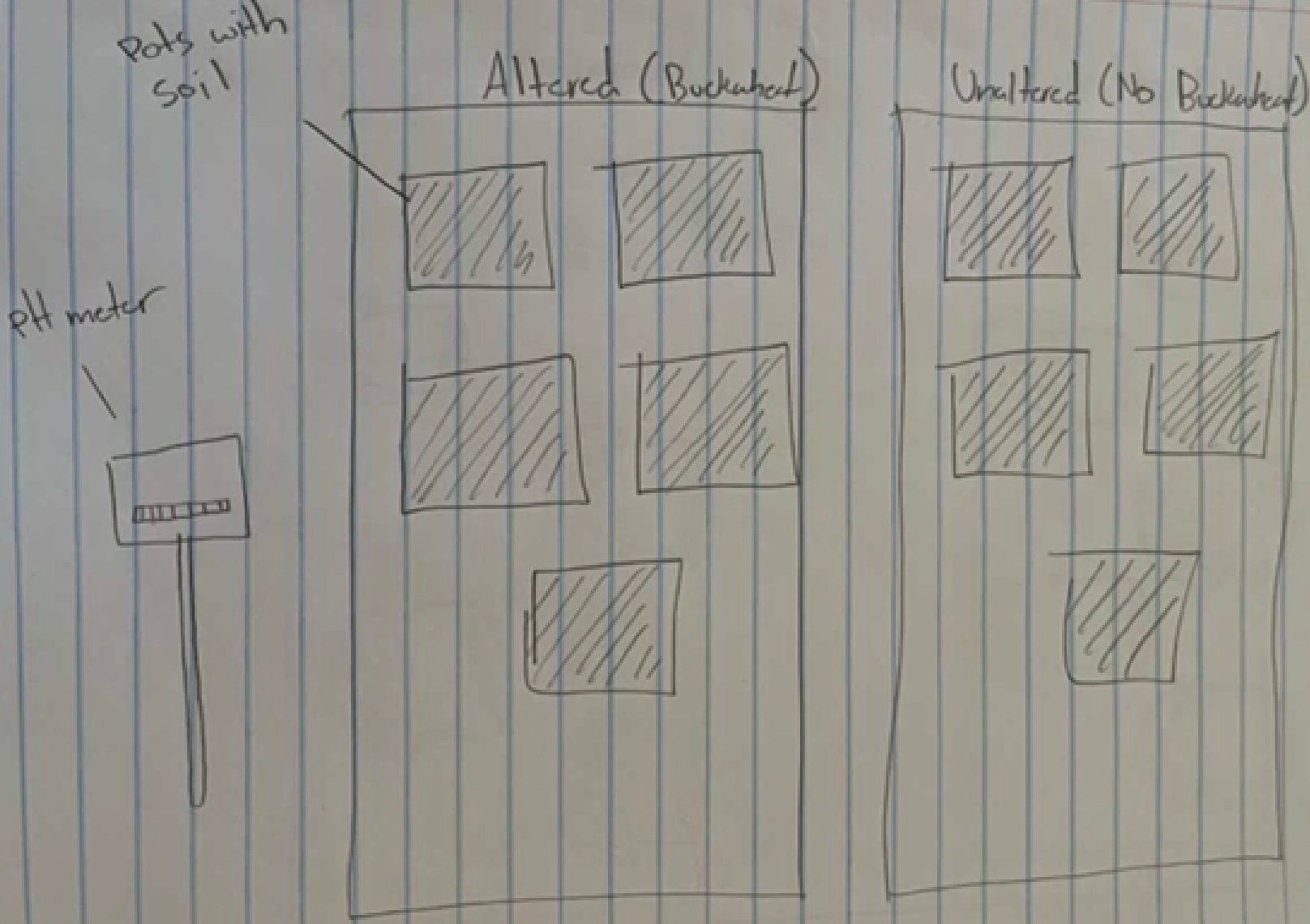
Because of the error with the Soil pH meter, the water will used as the pH indicator in order to get a more percise pH measurement.

The water will be altered to have a pH of 4 before being given to all pots in both groups.

The penetrated water will be caught with a plastic cup of all the pots. The change will be recorded.

Sketch of Trial 1

Sketch the trial to get an idea of how to set up experiment.



Sketch of Trial 2

PH of Water - Before After penetration through Soil

Pot ID	Day 1		Day 2		Day 3		Day 4		Day 5	
	Before	After	Before	After	Before	After	Before	After	Before	After
1	4	5	4	5	4	4	4	4	4	4
2	4	5	4	5	4	4	4	4	4	4
3	4	5	4	4	4	4	4	4	4	4
4	4	5	4	5	4	5	4	4	4	4
5	4	5	4	4	4	4	4	4	4	4
6	4	5	4	5	4	5	4	5	4	6
7	4	5	4	5	4	5	4	6	4	6
8	4	5	4	5	4	5	4	5	4	5
9	4	5	4	5	4	6	4	6	4	6
10	4	5	4	6	4	5	4	6	4	6

Data Table (pH overtime) - Data Check #1

Explanation:

The data shows that there is no change consistent with our hypothesis among the two groups tested (soil with buckwheat vs. soil without buckwheat). Because of the unexpected data, there will be another Data check, but instead of measuring the pH of the soil, the pH of the water will be tested.

Pot ID	Group	Day 0 pH	Day 3 pH	Day 7 pH
1	Buckwheat seed	7	6	6
2	Buckwheat seed	7	6	6
3	Buckwheat seed	7	6	6
4	Buckwheat seed	7	6	6
5	Buckwheat seed	7	6	6
6	20 seed	7	6	6
7	20 seed	7	6	6
8	20 seed	7	6	6
9	20 seed	7	6	6
10	20 seed	7	6	6

Materials List

1. Buckwheat seeds, enough for 5 trials x 5 pH treatments + extras - used to grow the experimental plant
2. 10 plastic pots (1 pint) - used to hold soil and plants
3. Organic potting mix (pre-mixed, in bulk) - used to grow the buckwheat plant
4. pH up and down kit - used to adjust the pH of the different groups of soil
5. pH meter - used to measure the pH of the soil before
6. Distilled water - 1 jug
7. pH Test strips - used to measure the pH of water
8. 10 cups - used to catch the penetrated water after flow through soil.

Procedure

Procedure:

Ten plastic pots were numbered and labeled. Then the soil samples were collected and divided into two groups: one group designated for planting buckwheat and one group left without plants. Equal amounts of the dilute water-soluble fertilizer solution were added to each soil sample to create controlled contamination. Buckwheat seeds were planted in the designated treatment group according to standard germination depth and spacing guidelines. All the soil samples were placed in identical environmental conditions, including light exposure, temperature, and container type, to ensure consistency. The samples were watered with equal amounts of water at consistent intervals to maintain similar moisture levels. The buckwheat plants were allowed to grow, and the soil was left undisturbed for a predetermined experimental period (e.g., several days or weeks). Soil pH measurements were taken for all samples at regular intervals using a calibrated pH meter or pH strips. The pH values were recorded and compared between the planted and unplanted groups to determine the effect of buckwheat on pH stabilization. Data was analyzed to evaluate whether buckwheat reduces the fertilizer-induced pH disturbance and brings soil pH closer to its original value.

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