# **The Effect of** [**pH**](http://www.pleasanton.k12.ca.us/avh_science/Creek/data/pH.html) **Levels in Water on the**

# **Wild Radish (Raphanus sativus) Plant**

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## Project Introduction

Everyone knows that if you were to alter the way a plant is growing, the impact can be for better or for worse. Different levels of pH can be utilized to kill off unwanted plants. For example, in Iowa, farmers used chemicals plus different pH levels to kill weeds growing among their crop. What pH levels had they used to kill the weeds? At what level of pH can kill plants from our creek? Or will the pH help the plants in their growth?

## Problem

How does the pH of the water given to certain creek plants affect them?

## Hypothesis

If the wild  [radish](http://www.in.net/~radish/radish.html) plant found in the Arroyo Del Valle creek area grows well with the pH of the water and soil it gets in that area, then it will not grow as well in the substituted water and soil with different pH levels.

## Plant Information

The plant we used in our experiment was the  [Raphanus sativus](http://violet.mpiz-koeln.mpg.de/~rsaedler/schau/RaphanussativusLvarsativus/Salad_Radish.html),or in other words, a radish plant. Radishes are from the family cruciferae. They originated in southeast and central Asia about 20 centuries ago. Although in the Mediterranean, radishes grow free in the wild, especially in Greece. There are different types of radishes. Some are red, black, red and white, white, and purple. The radish plant itself grows to about 3-12 dm tall with leaves in the shape of lyres and rounded terminal lobes. Four white petals with rose, purple, or yellowish veins make up the flowers on the plant. Each petal is about 1.5-2 cm long. The flower has six stamens for reproducing. A round, pod-like structure that is about 2-3 cm long is the fruit of the radish plant. Since it blooms in February through July, the radish plant is perfect for this experiment. As well as the fact that they grow quickly.

## Equipment

#### This is a picture of what the drip bottle should look like. You can buy one for a cheap price at Longs Drugs, or any drugstore.

|  |  |
| --- | --- |
| * tester strips * plant seeds * 3 big pots * muriatic acid in drip bottle * ammonia in drip bottle * gardening soil * 2 containers to keep used chemicals + water in * 100mL beaker * 1 water pitcher * data tables * handshovels * water |  |

## Procedure

1. Mix 50mL of 31% concentrated muriatic acid with 50mL of water into one of the drip bottles. Or Make the solution with a 1:1 ration.
2. Put 100mL of normal house ammonia in the other drip bottle.
3. Label each bottle with ammonia or muriatic acid.
4. On creek days, go to the creek to observe the wild radish plants growing down there. As well as collect seeds from the plant for experimentation. The seeds should look like the picture to the below right----> Write down everything that has been done in a [journal.](http://docs.google.com/journal.htm)
5. Once you have obtained the radish seeds, lay them out in the sun for 1 day to allow them to dry before planting.
6. Practice how many drops of muriatic acid solution and ammonia it takes to get to the pH of 3 and 12 with 100mL of water. For our group, it took about 15 for the base and 10 for the acid.
7. Plant seeds in the 3 big pots with water of different pH levels:
   * neutral-7
   * acidic-3
   * basic-12
8. Be sure to label which pot has the neutral, acidic, and basic water.
9. Drop the ammount of drops needed for the 3 pH's into the water pitcher with the 100mL of water. Test the soil everyday to see where it lies on the pH scale. If you are going to mix in a Universal indicator to test the pH instead of using tester strips, this graphic shows what pH number each color is.   
   Make sure to water the plants everyday with the appropiate pH levels! Be sure to dispose of the chemical mixed water correctly. Check the pH with tester strips as well.
10. Draw or photograph progress day by day.
11. Take down data of:
    * Height of the plants.
    * Number of leaves.
    * Difference between heights of acid plant vs. neutral and basic plant vs. neutral.

#### This is a pH scale in which our set acid was 3 and our set base was 12. Which would be equivalent to cola and household ammonia.

## Data

#### This picture is what we thought would happen to the plants. A=acid, N=neutral, and B=base.

|  |  |  |  |
| --- | --- | --- | --- |
| The Growth Progress of the Radish Plant | | | |
| pH Level | Height | Number of Leaves | Difference |
| acidic | 0 | 0 | 0 |
| neutral | 0 | 0 | 0 |
| basic | 0 | 0 | 0 |

We figured that the acid would let the plant grow just okay, while the neutral will let the plant grow fuller, and the base will not let the plant grow normal.

## Interpretation

Unfortunately, our plants didn't grow. We suggest that if you were to do this experiment, to let the radish seeds dry out by setting them in the sun before planting them. Also, to get started way earlier to allow the growth of the plants. We either overwatered the plants or the set pH levels were too drastic. Maybe we should have planted another radish plant in the creek area with neutral water, so we could monitor how that plant grows in the creek environment. Although, if another group were to do this, a trip to the creek would have to take place everyday to take down information and to water it. If we were to set up a mock creek environment inside an aquarium, we would be able to survey the growth of the radish plant. But for pH monitoring, three separate aquariums would have to be obtained, which could be costly.

## Conclusion

We conclude that if we were able to finish our experiment, then the plants that were being grown would follow our hypothesis. Which is, if the plant being grown with a supply of water with a neutral pH level, then it would have grown higher and more healthy than the plants with a water supply of the acidic or basic pH levels. Thus, in order for this experiment to work, you would need more time than we had. Give at least a week or two for the radish plants to grow. We think that if the experimental plants were to grow, the one with an acidic pH would grow better than the plant with high alkalinity.

#### This is a picture of our plants with labels showing us which one is acidic, neutral, and basic.

This could happen because of the result of what acid rain is doing to our plant life today. Plants around the world are still growing with acid rain pouring down upon them. Even though they grow, the acidic supply of water will never beat the neutral water. Neutral is what plants most likely prefer. Therefore, our experiment sort of proved our hypothesis. The Raphanus sativus does not grow well in soil that is watered with acid and base pH's. Aside from our neutral plant not growing, the radish plant down at the Arroyo Del Valle creek is living just fine with the neutral water and soil there. So altering the living conditions for the wild radish will worsen the growth of the plant. Even though our plants didn't grow, we still learned about the radish plant and we think we made it possible for other groups to do the experiment correctly.

## References

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Jeff Bucchino, "The Wizard of Draws"

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