

Does Watering Raphanus sativus Plants with Polluted Water Negatively Affect Their Growth?

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Grade Eight
Science Type Project

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researcher unless indicated otherwise.

Abstract:

The purpose of this research was to determine if using polluted water to hydrate *Raphanus sativus* seeds would negatively affect their growth. The hypothesis tested was that hydrating these common radishes with polluted river water would allow these seeds to germinate but would grow less and die off sooner than those watered with the control variable, bottled spring water. I think that watering *Raphanus sativus* plants with polluted water will negatively impact their growth because the pollutants in the water will stunt their growth and even cause early death to the plant.

The experiment design included ten trials using seeds planted in peat pots with potting soil, and watered every one to two days. Each pot received the same seed brand, sunlight, water, and growth opportunity. The only variable being measured was plant growth which was measured with a metric ruler once germination began. The control variable was bottled spring water which matched the ideal parameters for healthy plant growth. Each trial had plants measured that were watered by polluted urban rivers from Michigan and Ohio: The Rouge River, the Detroit River, Silver Creek, and the Ottawa River. Each river had been certified as a polluted urban river by their states' respective EPA (Environmental Protection Agency) Each plant was measured every three days once seedlings sprouted, for any growth and data recorded in logbook.

Each water source was measured for water quality using GLOBE protocols and uploaded into database. The data sadly, supported the hypothesis and results surprised this researcher.

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Introduction:

Does polluted water affect the growth of your plants?

- Water is a hot topic in our city. Constantly, people are worried about how healthy it is to drink the tap water, or should we drink bottled, or go without any at all. There are lead scares, heavy metal scares, and any other kind of pollution you can imagine scares.
- So, the question came up, does it matter what you water your plants with? Maybe plants can handle polluted water, even if humans cannot.
- The research began with looking for information about what kinds of plants could grow rapidly enough that they could be used in a short term project such as this one.
- *Raphanus sativus* plants (common radish) grow rapidly and would be the tested plant for this experiment.

Introduction:

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- The purpose of this research was to determine if using polluted water to hydrate *Raphanus sativus* seeds would negatively affect their growth.
- The hypothesis to be tested is that hydrating these common radishes with polluted river water will allow these seeds to germinate but will grow less and die off sooner than those watered with the control variable, bottled spring water.
- I think that watering *Raphanus sativus* plants with polluted water will negatively impact their growth because the pollutants in the water will stunt their growth and even cause early death to the plant.

Methods:

What is the experimental design?

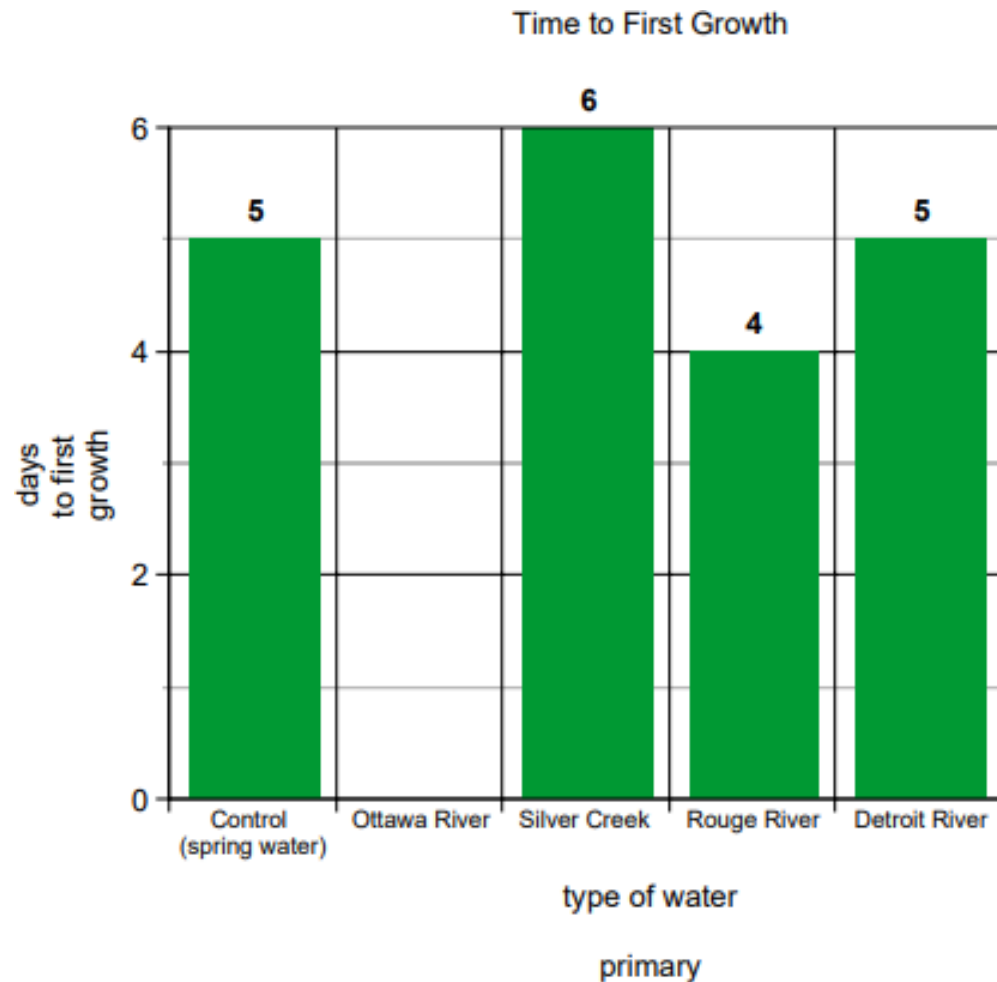
- The experiment design will include ten trials using seeds planted in peat pots with potting soil, and watered every one to two days.
- Each pot will receive the same seed brand, sunlight, water, and growth opportunity. The only variable being measured will be plant growth and measured with a metric ruler once germination has occurred.
- The control variable will be bottled spring water which matches the ideal parameters for healthy plant growth.
- Each trial will have plants measured that are watered by polluted urban rivers from Michigan and Ohio: The Rouge River, the Detroit River, Silver Creek, and the Ottawa River. Each river has been certified as a polluted urban river by their states' respective EPA (Environmental Protection Agency)
- Each plant will be measured every three days once seedlings sprout for any growth and data recorded in logbook.
- Should a plant die, the date will also be noted in the logbook.

Materials:

- 50 peat pots
- Medium bag of Miracle Grow potting medium
- Package of Burpee Raphanus sativus seeds (common radish).
- LaMotte test kits for pH, nitrates, phosphates, turbidity, dissolved oxygen
- Camera, centimeter ruler, log book
- Gallon jug of water from each of the following sources:
 - River Rouge
 - Detroit River
 - Silver Creek
 - Ottawa River
 - Meijer brand spring water (control water source)

Results:

What did the data show?

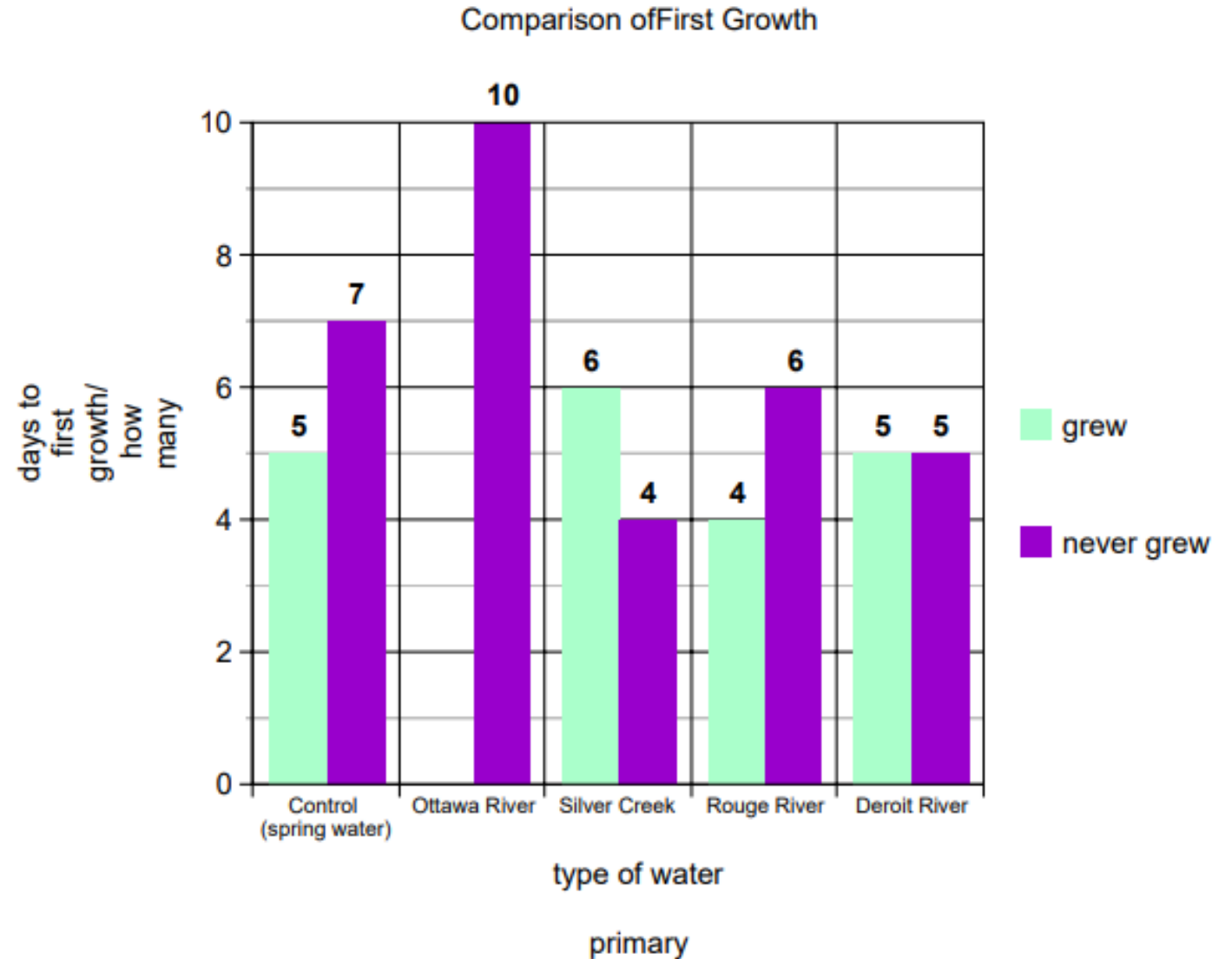


The data was not at all what was expected. This researcher expected all plants to grow but exhibit different kinds of growth related to the amount of pollution in the water.

Results:

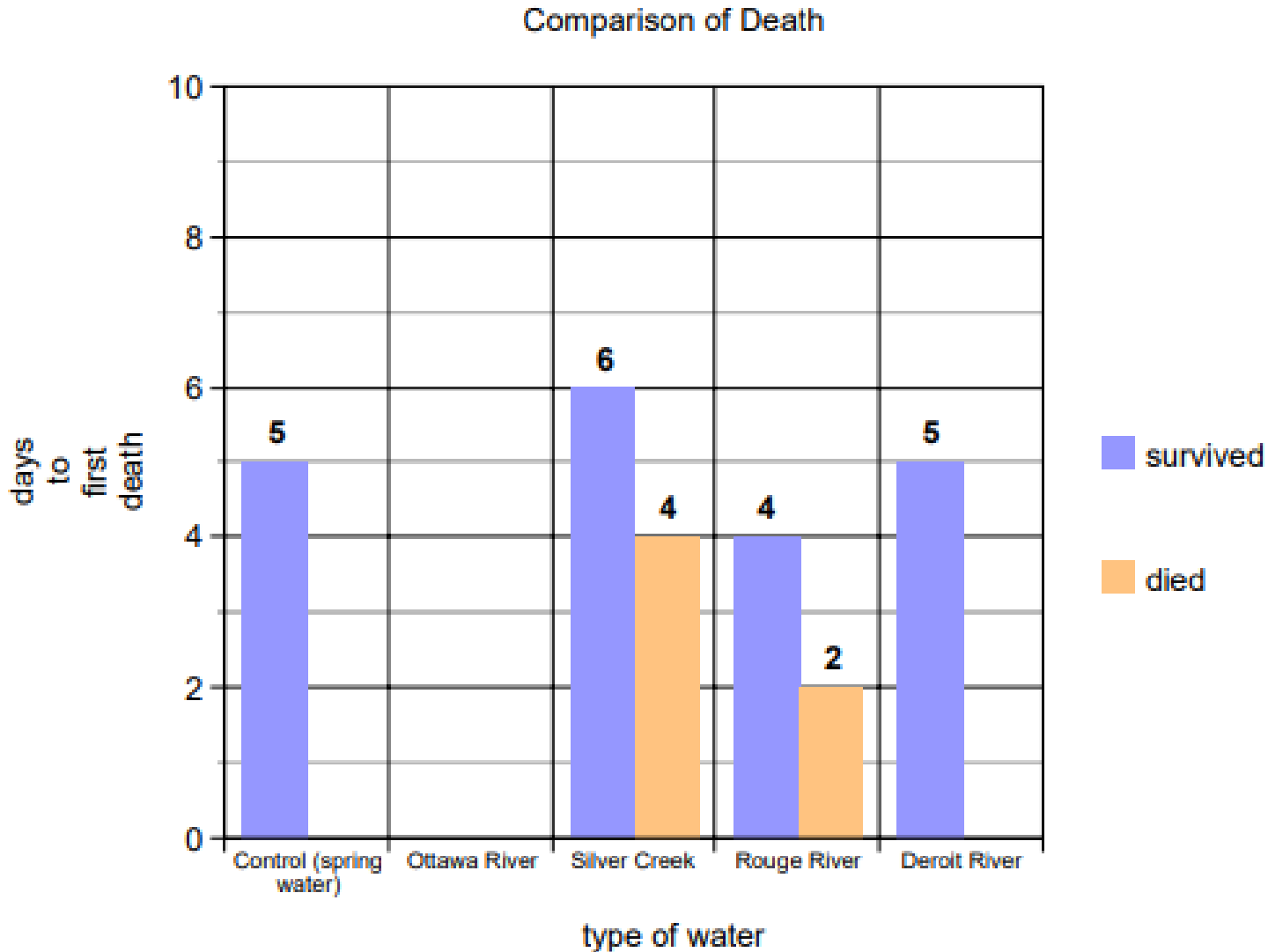
What did the data show?

The Ottawa river smelled so bad that the soil stank after watering the seeds. They never germinated.



Results:

What did the data show?



The data was concerning. This researcher thought the experiment was performed incorrectly but even the lack of growth is also data.

Results:

What did the data show? Polluted river WQ data

Name of Test	Trial 1
Dissolved oxygen	3
Nitrates	3
Phosphates	3
pH	7
Turbidity	0 JTU
Air temperature C	5 C
Water temperature C	-8.8 C

GPS Coordinates:

41.7287
-83.5090



Ohio River 1 Polluted water

Name of Test	Trial 1
Dissolved oxygen	2
Nitrates	30
Phosphates	4
pH	5
Turbidity	0
Air temperature C	2 C
Water temperature C	-6.8 C

GPS coordinates:

41.6130
-83.5829



Ohio River 2 Polluted water

Results:

What did the data show? Polluted river water WQ data

Name of Test	Trial 1
Dissolved oxygen	1
Nitrates	30
Phosphates	4
pH	8
Turbidity	0
Air temperature C	3
Water temperature C	0.2

Michigan River 1

GPS Coordinates:

42.3093

-83.2445



Name of Test	Trial 1
Dissolved oxygen	0
Nitrates	1
Phosphates	2
pH	7
Turbidity	0
Air temperature C	1
Water temperature C	-6.8

Michigan River 2

GPS Coordinates:

42.3371

-82.9997



Discussion:

What did the data mean?

- Data seems to indicate that the type of water you use does make a difference when watering plants! The Ottawa River performed the worst and was deadly to the seeds. They were even replanted, getting the same results as before.
- All rivers showed problems with growth. The control grew the same amount of plants as the Detroit River BUT some of those died while the control water plants continued to grow. As of the termination of this experiment, out of 50 seeds planted, 20 germinated and 14 survived the total process.
- The same seed brand, soil, peat pot, light and warmth were all given to the samples. The control variable was the type of water used.
- It seems this data does support the hypothesis.
- Although the samples are very small and the timeframe very short, the results are rather dramatic. I was looking forward to enjoying some radishes, but this does not seem to be the case this time.
- It is noted that due to the small sample size and the short time frame, the results are considered inconclusive without further research.
- The literature indicated that the type of water used to produce healthy *Raphanus sativus* plants was irrelevant as these plants can filter out what they need from the water they are given but this data does not support that analysis.

Conclusion:

- In conclusion, the data is inconclusive for a larger study but for this small study, it does support the hypothesis, that hydrating these common radishes with polluted river water will allow these seeds to germinate but will grow less and die off sooner than those watered with the control variable, bottled spring water.
- Concern is raised over the quality of the Ottawa River which runs through the center of Toledo. This research suggests that a much closer look at this river is of paramount importance and further study is vital.
- Some real world application for this project would be of interest to growers, water quality specialists, and farmers, who need healthy resources to feed the people of the Earth. City planners might also want to be aware of water quality that feeds their population.

References:

- [How Does Water Pollution Affect a Plant's Life Cycle? \(seattlepi.com\)](http://seattlepi.com)
- ["How Tap Water and Bottled Water Effects Plant Growth" by Karl Craig and Danna Goss \(swosu.edu\)](http://swosu.edu)
- [Is Your Water Safe For Plants: Learn About Water Quality In Gardens \(gardeningknowhow.com\)](http://gardeningknowhow.com)
- [The Effects of Bottled Water or Tap Water on Plant Growth | Hunker](#)
- [Which Types of Water Are the Best for Plant Growth? | Hunker](#)
- [Everything About Growing Radishes In Containers & Pots \(balconygardenweb.com\)](http://balconygardenweb.com)