

The Effects of Zinc on Earthworm Burrowing

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Abstract

The purpose of this experiment was to see if earthworm's can sense different concentrations of zinc and if so, does it affect them and where they burrow. To set up the experiment a dissecting tray was covered with a thin layer of soil and divided that soil into four quadrants. In those four quadrants we moistened 3 of those quadrants with the different concentrations of zinc and the fourth quadrant with the distilled water. The worm was placed in the center of the four quadrants and for a period of twenty minutes, the location it burrowed in was recorded. We repeated this procedure four times over the course of four days. We recorded that on each day the worm went to different quadrant, leading us to infer that earthworms are not able to sense the concentration of zinc when it is present in soil.

Introduction

Earthworms play an important role in the environment as they modify the chemical, physical, and biological properties of the soil profile. They do this by creating burrows which form pores through which oxygen and water can enter and carbon dioxide can leave the soil. Zinc enters our environment through human activities such as steel production and mining, as well as burning coal and certain wastes can release zinc into the environment. Another way for high levels of zinc to be released into the environment is by the unsuitable disposal of zinc-containing wastes from metal manufacturing industries and electric utilities. (Illinois Department of Public Health, 2016) The focus of our lab is how does the presence of zinc in the soil affects the burrowing of worms? Small amounts of zinc do not affect worms, but on the other hand a large amount of zinc can impact the earthworm population by decreasing it. The presence of

zinc in the environment does not just affect worms, it also affects human health.(Illinois Department of Public Health, 2016) Zinc can enter the body through skin and mouth contact, breathing in air near large industries, drinking beverages from metal cans, or eating vegetables that were grown in zinc contaminated soil. Zinc in small amounts can be beneficial but in large amounts it can cause health problems. The presence of zinc found in grown vegetables can cause a human to feel stomach pain and diarrhea. If you overdose on zinc supplements, you can experience stomach cramps, nausea, or vomiting. In order to test the effects of zinc, the worms will be placed in an environment containing distilled water, 10ppm, 100ppm, and 1000ppm of zinc. The prediction is if the worm is exposed to the soil containing zinc, it will spend the least amount of time in the quadrant containing 1,000 ppm of zinc, because it will sense the high levels of zinc.

Materials

- dissecting tray
- potting soil
- pipets
- distilled water
- zinc solutions (10ppm, 100ppm, 1000ppm)
- stopwatch
- 4 red worms

Methods

1. Take a tray and evenly spread across the whole tray a layer of potting soil.
2. Then divide it into 4 quadrants as in Fig. 1
3. Add 8 ml of 1,000ppm of zinc to quadrant 1

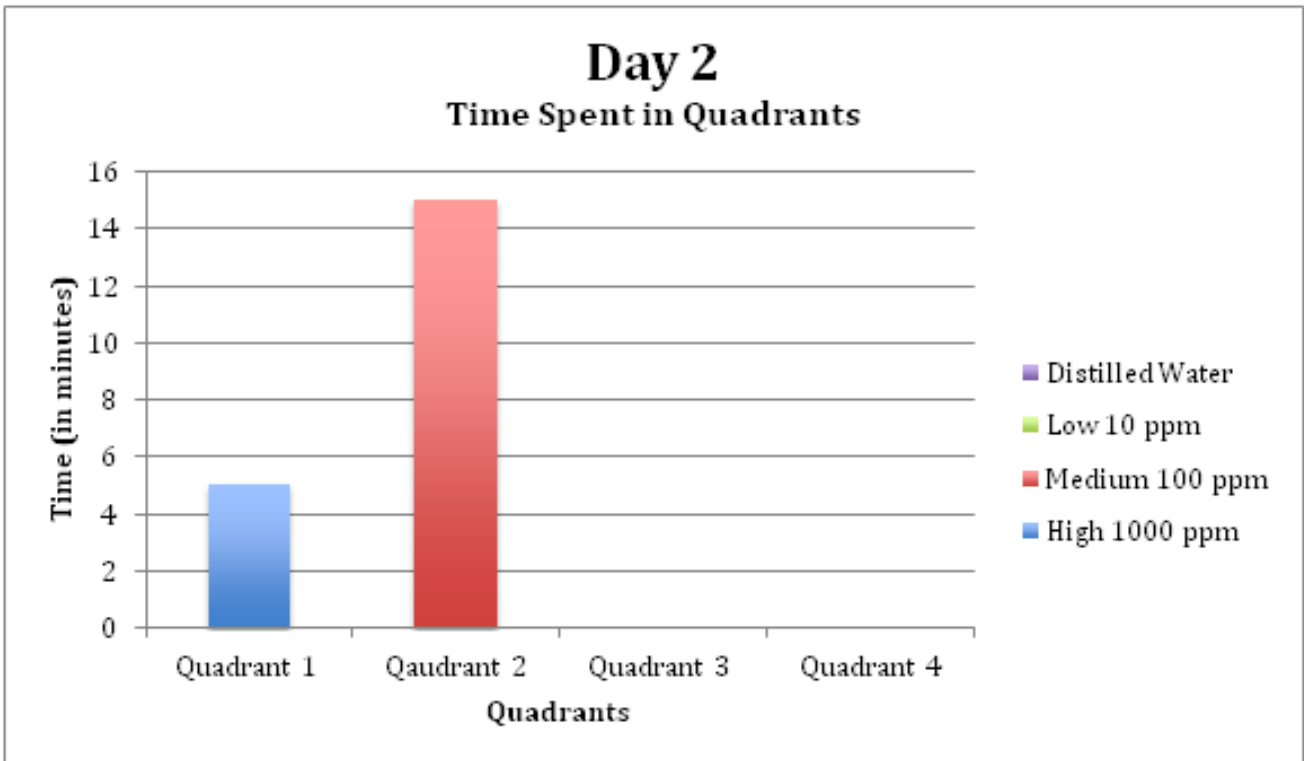
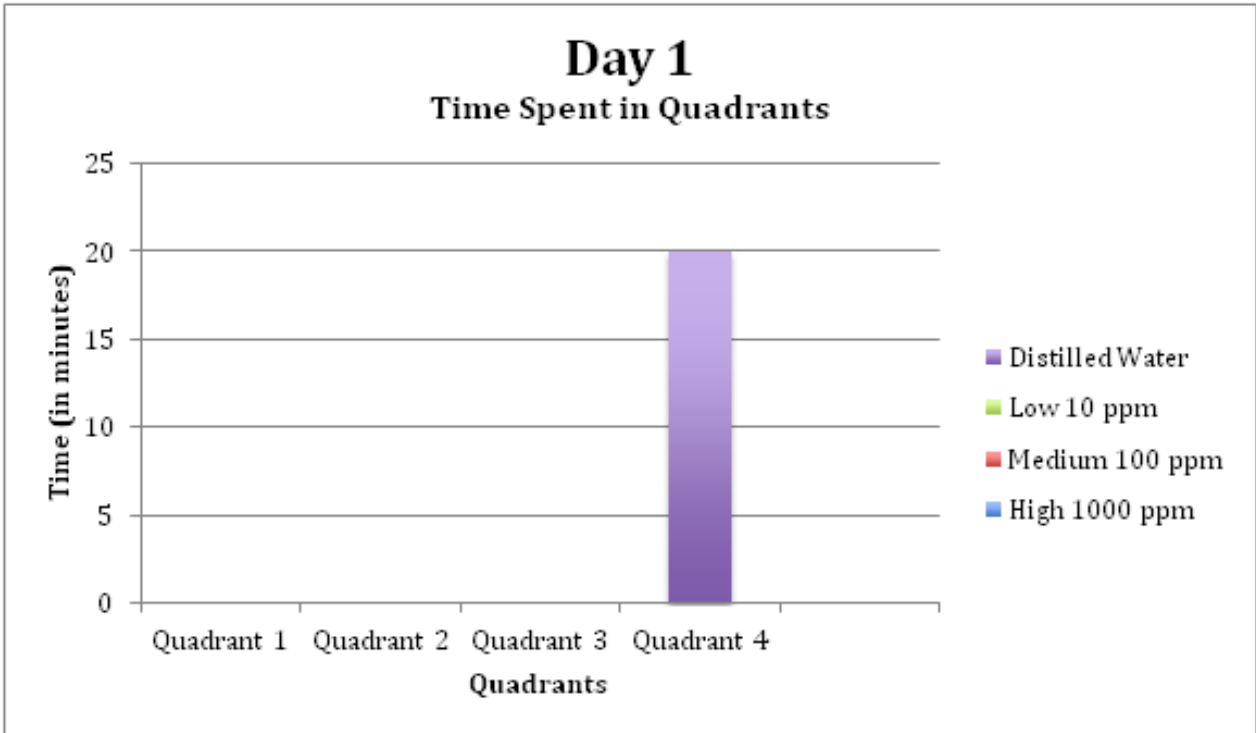
4. Add 8 ml of 100ppm of zinc into quadrant 2
5. Add 8 ml of 10ppm of zinc into quadrant 3
6. Add 8 ml of distilled water into quadrant 4
7. Place the worm in the middle of all four quadrants.
8. Record initial quadrant the worm goes into and record how much time the worm spends in each quadrant over 20 minutes
9. After 20 minutes remove the worm and rinse it with distilled water before packing back into the container.

Quadrant 1. 1000 ppm	Quadrant 2. 100 ppm
Quadrant 3 10 ppm	Quadrant 4. Distilled Water

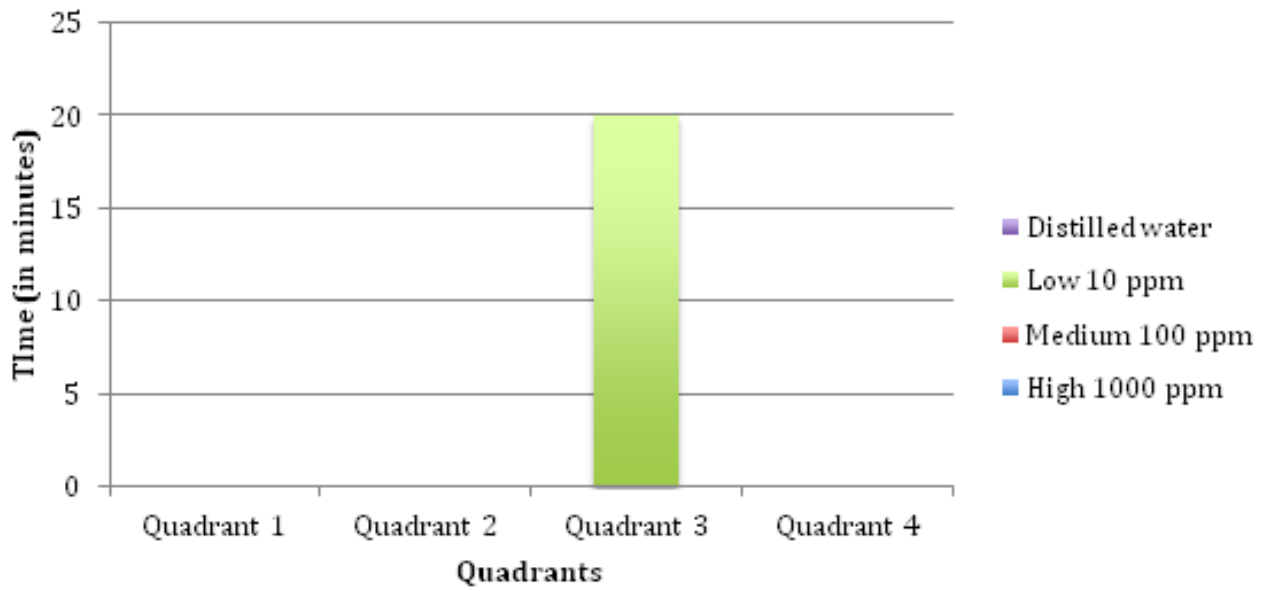
Fig. 1: The layout of the dissecting tray with the concentration of solution in each

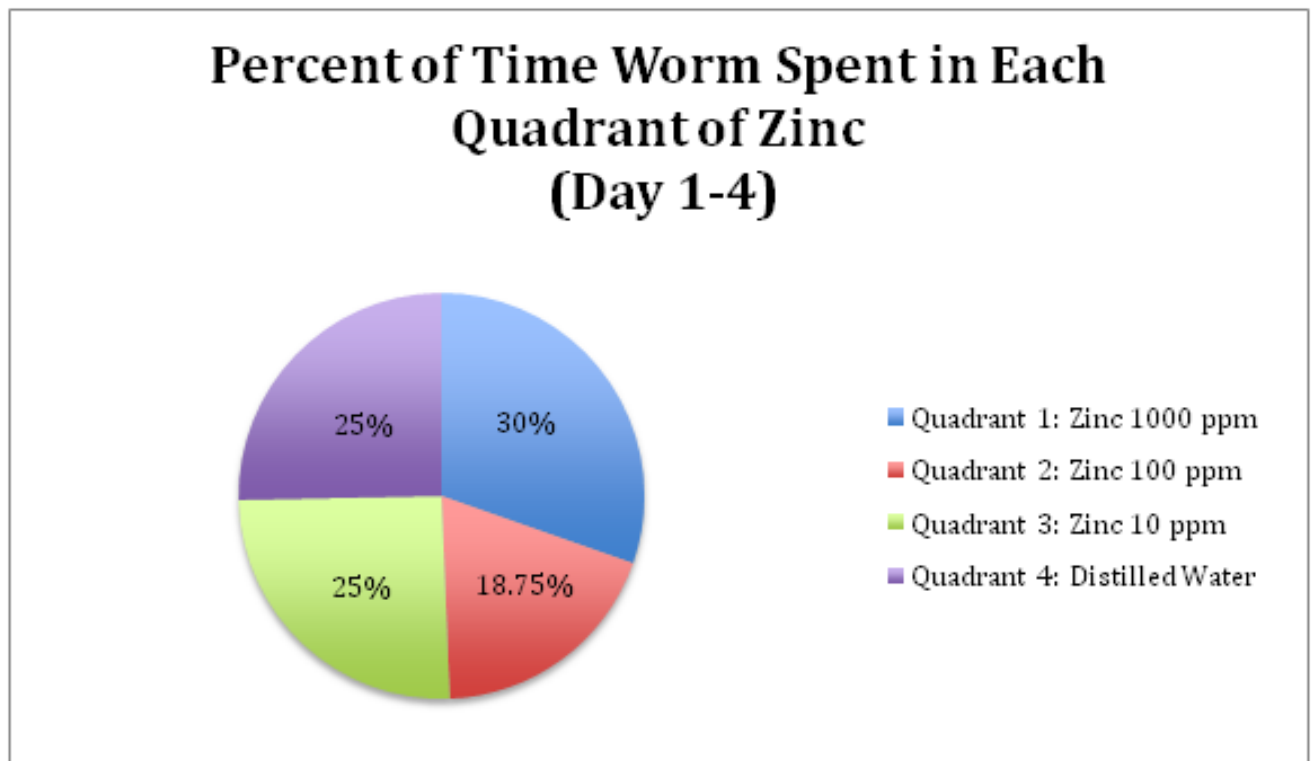
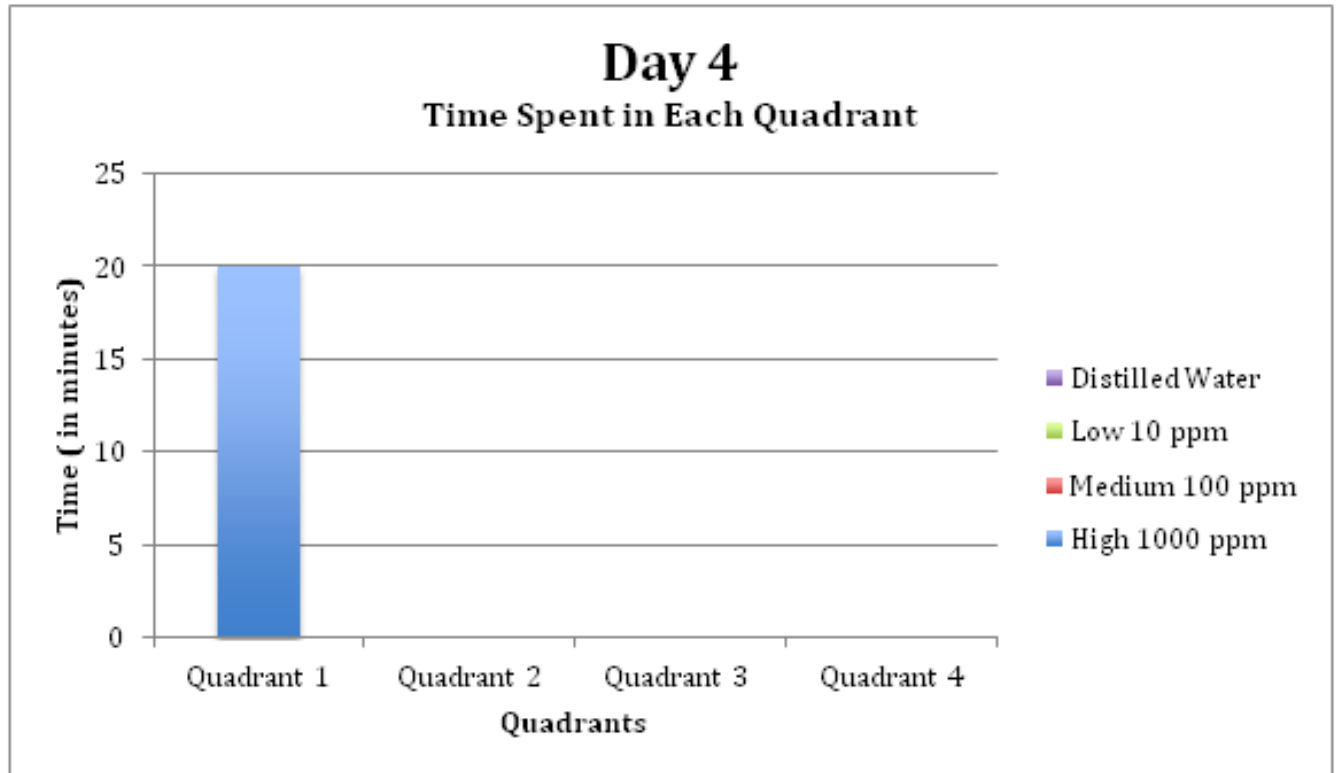
Data Table:

How Zinc Affects Earthworm Location		
Days of Experiment	Quadrants	Minutes
1	1	0:00
	2	0:00
	3	0:00
	4	18:24
2	1	4:33
	2	14:04
	3	0:00
	4	0:00
3	1	0:00
	2	0:00
	3	17:33
	4	0:00
4	1	18:18
	2	0:00
	3	0:00
	4	0:00



Day 3 Time Spent in Quadrants





Results

In our experiment, the independent variable is the concentration of zinc whereas the dependent variable is the amount of time the earthworm spent in each quadrant. The controlled variable in our lab is the amount of zinc and amount of soil we put in each quadrant. Each day the worms were placed in an environment containing different concentrations of zinc and were given the choice of what quadrant they wanted to burrow in. Throughout our four days of experimenting our data didn't show any specific trends, every day the earthworm would go into a different quadrant with a different concentration of zinc. There were no concrete trends seen throughout the data except for the fact that the worm visited quadrant 1 twice. The first time it went to the quadrant containing the highest level of zinc it spent a very little amount of time within it and left for quadrant two, which contains a lower amount of zinc. Although on the fourth day of testing the worm burrowed in the highest concentration of zinc for the entire period of 20 minutes.

Discussion

Our data did not fully support our hypothesis. In the beginning of the lab we thought that the worm placed in the potting soil would have sensed that it was being exposed to high levels of zinc and it would have decided to move to a different quadrant. Each worm showed different results during the time- span of four days. Day 1 the worm was placed in the middle of the four quadrants and it immediately went to quadrant four with water in it, leaving us to believe that this worm was able to sense the other quadrants were exposed with different amounts of zinc. On day 2 the worm went to the first quadrant with the highest level of 1,000 ppm zinc, it stayed there for five minutes and the exposure was not tolerable for the worm so it moved to the second quadrant containing 100 ppm of

zinc and remained there for the rest of the 20 minutes. On day 3 it went to quadrant 3 containing 10 ppm of zinc. Finally, on Day 4 the worm went to the first quadrant containing 1,000 ppm of zinc and had no initial reaction to the zinc, remaining still in this quadrant for the full 20 minutes. Since the worm ended up burrowing in all four of the quadrants it either could not sense that the zinc was present or the concentration of the zinc was not high enough to affect the worm. This data is relevant to human health because just like the worms being easily exposed in a way they are unaware of the main source we can also be easily exposed to different levels of zinc through things such as our water pipes. Being exposed to small concentrations of zinc can slowly begin to become more harmful over a long period of time and can cause various different diseases and can cause pain to the human body.

Further questions

After concluding this lab, a question that we have are would the results from our experiment change drastically if more worms were tested. This answer could be accomplished by completing this experiment with a larger amount of worms.

Work Cited

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