How Wood Ash in Soil Affects an Earthworm’s Burrowing Time

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ABSTRACT
This lab inquires about the effects of ash in soil for worms. The experiment tests how long it takes for worms to burrow when the soil is exposed to different concentrations of wood ash. To do this, four different worms were put into cups with soil of different ash contents. They were timed from the moment they hit the soil to when their tail tips disappeared into the soil. We did this test in four trials. With the compiled data, we found that worms tend to burrow faster in the soil with no ash than the soil with more ash, which shows that ash has a negative impact on the worm’s willingness to burrow. Further studies may need to be made to reach a solid conclusion, as the data fluctuated.

INTRODUCTION
In this experiment, we observed how the content of ash in soil affected how fast a worm burrowed. We conducted this experiment to get a better understanding of how we can encourage worms to improve the environment and how worms react when an event like a forest fire or volcanic eruption happens. In gardens, ashes (or biochar) are commonly mixed in with soil for beneficial purposes. Since it is so frequent that ashes are being mixed in with soil, we studied how this change affects the earthworms that are burrowing in it. A worm is a good model organism because the worm may react in a way that represents how another organism might react. It is also a small organism, one that is plentiful and simple to handle. Ash is slightly basic (Griffin, 2006). Since worms prefer soil that is close to neutral pH (Duiker & Stehouwer, 2008), we concluded that an increase in soil pH would make them uncomfortable. Additionally, staying in dry soil can be detrimental to their health (Díaz Cosín et al, 2006).

WORKS CITED


METHODS
1. Plastic cups and an electronic balance were gathered.
2. Stein’s potting soil was put into all four cups.
3. The soil cups were all stirred until ash was evenly distributed.
4. The earthworms were gathered.
5. One worm was placed into one cup.
6. The earthworms were watched.
7. Time was written down into a data table.
8. Worms in the cups were then left and monitored.
9. Worms were watched and recorded.
10. Steps 7-8 were repeated for all the other cups, then the entire process was repeated 4 times over the course of three days.

MATERIALS
• 16 earthworms
• 1.36 pounds of Stein’s potting soil
• Wood ash and charcoal
• Moist paper towel
• Dart 9 oz. clear plastic cups
• Ohaus Scout SC4010 electronic balance
• Glass stirring rod
• Two plastic spoons
• iPhone clock app
• Masking tape
• Pen and Expo marker

RESULTS
Overall, our data shows that as the number of ash increases, the time it takes for the worm to burrow completely also increases. The average of the trials shows this increase as well, where the 0 grams ash, 2 grams ash, 5 grams ash, and 10 grams ash came out with mean values of 5:30 minutes, 7:23 minutes, 7:30 minutes, and 8:29 minutes, respectively. The other trials have a couple of outliers. Trial 2 and 3 showed some times going above 8 minutes, unlike the other trials that usually came out around 4 and 7 minutes.

CONCLUSION
Since the average time of burrowing increased in cups with more ash, we can conclude that ash concentration and burrowing time are slightly correlated, but not always, since there were some errors. Going back to our hypothesis that worms in more ash would burrow slower, this experiment supports our prediction because the average time of burrowing for each of the cups shows an increase in time from the 0 grams cup to the 10 grams ash cup.

<table>
<thead>
<tr>
<th>Time for Worms in Different Ash Concentrations to Burrow</th>
<th>0 grams ash</th>
<th>2 grams ash</th>
<th>5 grams ash</th>
<th>10 grams ash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1 time (minutes)</td>
<td>4:34</td>
<td>4:16*</td>
<td>5:21</td>
<td>6:29</td>
</tr>
<tr>
<td>Trial 2 time (minutes)</td>
<td>4:06</td>
<td>8:47</td>
<td>6:06</td>
<td>9:47</td>
</tr>
<tr>
<td>Trial 3 time (minutes)</td>
<td>9:00</td>
<td>10:07</td>
<td>11:47</td>
<td>10:53</td>
</tr>
<tr>
<td>Trial 4 time (minutes)</td>
<td>4:19</td>
<td>6:20</td>
<td>6:46</td>
<td>6:47</td>
</tr>
<tr>
<td>Average</td>
<td>5:30</td>
<td>7:23</td>
<td>7:30</td>
<td>8:29</td>
</tr>
</tbody>
</table>

* On Trial 1, the 2 grams ash cup was spilled, upsetting the soil and the worm. The time when it was spilled was listed instead of the burrowed time. Note that the worm in the cup was close to completely burrowed by the time it was overturned.