

Compost : A water saving solution

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Abstract

We are located in the South-East of France, in Avignon, which is a very dry area. Therefore we are interested in studying the possibilities to save water in agriculture. In addition, we noticed that not many people use compost, despite the fact that it is an interesting way to recycle organic matter, so we decided to work on compost. Our goal was to see if compost could help save water by retaining moisture. We also wanted to verify that soil with compost could allow plants to grow faster compared to just soil. The aim of our project is both to investigate the impact of compost on saving water, to encourage people to switch to composting and to create awareness of how beneficial compost is. In Experiment 1, we found that radishes were growing faster in the "Soil+compost" condition than in the "Only soil" condition. In addition, we studied the evolution of humidity levels. In both conditions the humidity was set at the same level at the beginning of the experiment, and we measured it for 12 days, without adding any water. We found that moisture was much more preserved in the "Soil+compost" condition than in the "Only soil" condition. The results were confirmed in Experiment 2, using a different protocol where we studied how much water was used depending on the condition, using a ceramic plant waterer and bottle with water. We found that the condition with the compost used 57% less water than the condition without the compost and allowed the radishes to grow more than in the condition without compost.

Introduction

We live in a very dry and warm area in the south-east of France. It is essential to develop strategies that include saving water, especially considering the current evolution of climate. We wondered if compost, in addition to recycling food waste and fertilising the land, can help to save water. At the community level, the confirmation that the use of compost can help to save water can become an incentive to motivate people to develop compost at the city scale. Currently, although a French law makes composting mandatory since January 2024, very few people are invested in composting and the society is not organised to facilitate it. Therefore we think that studying that question and communicating about it is important at the local community level, and we wish to use this study to encourage the development of composting in our school, and later at the city level.

Our experiments were designed to investigate the following research questions:

1. What is the impact of compost on soil moisture?
2. Does compost allow plants to grow faster?

Methods

In Experiment 1, in order to test our hypothesis, we used two flower-pots and collected soil from the highschool ground. In one pot we only put soil ("Only soil" condition), and in the other we put soil and compost ("Soil+compost" condition). We planted the same amount of radish seeds in each pot (15 seeds). Then we watered both flower-pots to ensure that the humidity starting point was the same in both conditions : 8/10 (minimal limit of the "wet" range"). After 6 days and 12 days we measured the humidity with the help of a moisture meter in each of the pots. We also measure plants in every pot to see which pot plants grow faster.

The moisture meter we used has 10 graduations : 0-3 = dry ; 4-7 = moist ; 8-10 = wet (see photo below). Every time we measured the humidity, we made sure the tester was at the same depth (see mark on the photo).



In Experiment 2, we used a ceramic plant waterer, in order to keep the soil at a comparable humidity level for both conditions (Only soil / Soil+compost). As for Experiment 1, we used two pots: in the first one we put high school soil ("Only soil" condition), and in the second, high school soil and compost (Soil+compost" condition). In each of these pots was a ceramic plant waterer with a bottle in which was 250ml of water. We waited a week to see which bottle had the most water. This experiment allows us to see if one of the conditions needs more water than the other. The less water left in the bottle, the more water the earth needs.



At the beginning of the experiment, the two bottles had the exact same quantity of water (250ml, measured with a measuring cylinder). We watered the soil to make sure the 2 conditions had the same humidity (6,5/10). The flower-pots were close to a window and a radiator, ensuring fast developpement of the plants.

Results

Experiment 1

In the first experiment, we observed that the humidity went down faster in the “Only soil” condition than in the “Soil+compost” condition. In the “Only compost” condition, the humidity went down from 8 to 3 in 12 days, reaching the “dry” range. In contrast, the humidity went from 8 to 5,5/10 (middle of the “moist” range).

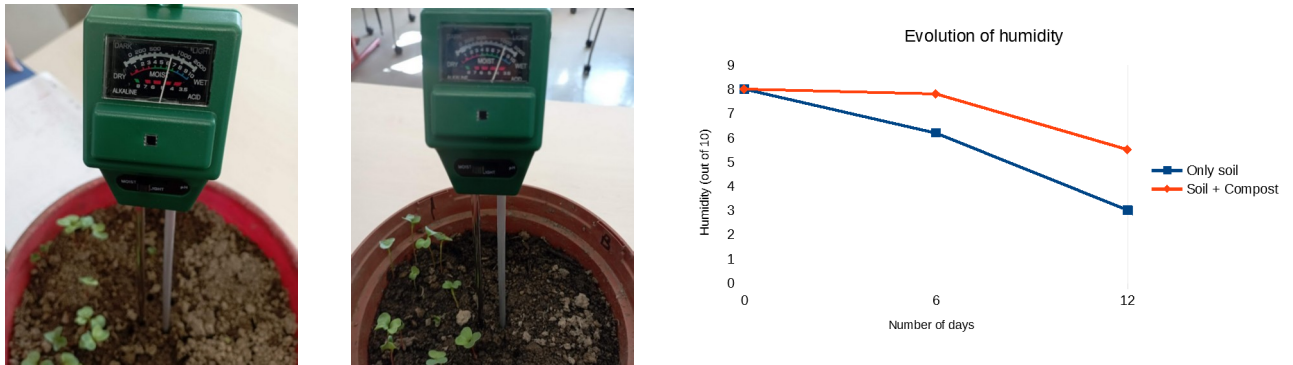


Figure 1 : Day 6, “Only soil” on the left, “Soil+compost” on the right, and graphic showing the evolution of humidity over time

We also observed that the radishes grew faster in the “Soil+compost” condition than in the “Only soil” condition. A test of Student showed that the difference was statistically significant ($p=0.0003$).

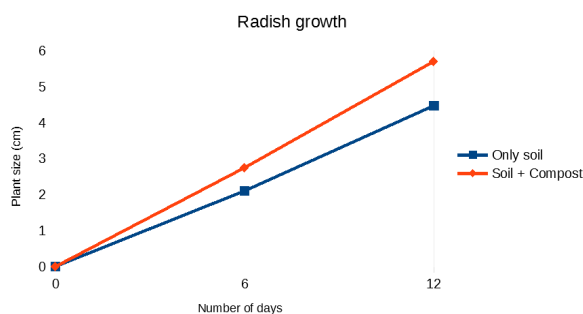
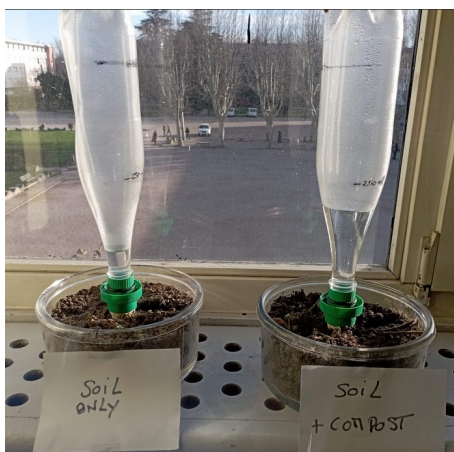


Figure 2 : Size of the radishes on day 6 and day 12 (in cm)

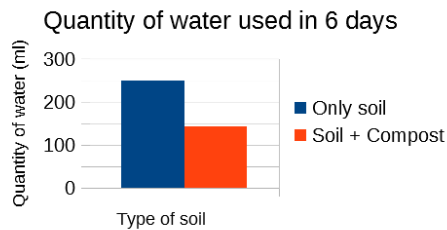
Experiment 2



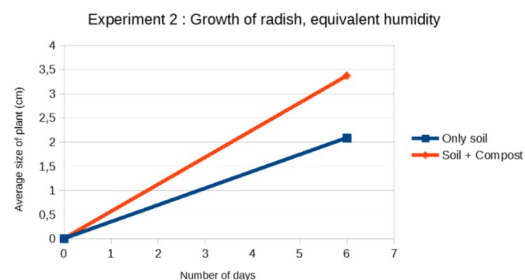
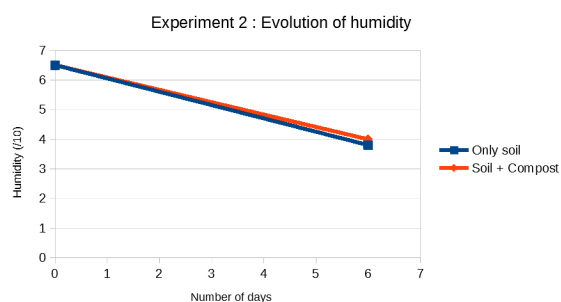
After 4 days (photo), we observed that the soil in the condition “only soil” used much more water than in the condition “soil+compost”.

After 6 days, the bottle was empty in the condition “Only soil”, and 107 ml was left in the other bottle (“soil+compost”). Hence we can deduce that 250ml was used in the “only soil” condition, and 143 ml was used in the “soil+compost” condition. Therefore the condition

with the compost used 57% less water than the condition without the compost.



The humidity was 6,5/10 at the beginning of the experiment, and went down to 3,8 (“only soil” condition) and 4/10 (“soil+compost” condition) after 6 days, but stayed in the “moist” range, and stayed equivalent for both conditions.



Like in Experiment 1, the radishes grew taller in the condition with compost than in the condition without compost. A test of Student showed that the difference was statistically significant ($p=0.017$).

Discussion

We can conclude that the results of both experiments show that compost can help us to save water : in Experiment 1 moisture is better preserved in the condition with the compost when the pots are not watered for 12 days, and in Experiment 2, 57% less water is used in the condition with compost when using a ceramic waterer to maintain moisture. We also confirmed that radishes grow taller with compost than without compost. In Experiment 1, this could be due to the fact that the moisture is more preserved in the compost condition. However, in Experiment 2, the moisture stayed equivalent in both conditions thanks to the ceramic waterer, and the radishes still grew taller with compost than without (although it is interesting to see that the difference is less important).

Conclusion

Our experiments confirmed that compost can both help saving water and fertilise the soil. The fact that the compost condition used 57% less water than the condition without compost (Experiment 2) while maintaining the humidity at a similar level and allowing the radishes to grow more than without compost is very encouraging. We think that we can use these results as an incentive to encourage people and organisations such as schools and companies to recycle food wastes and use the compost for agriculture and other plantations.

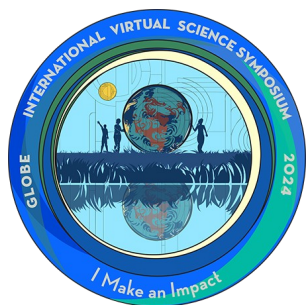
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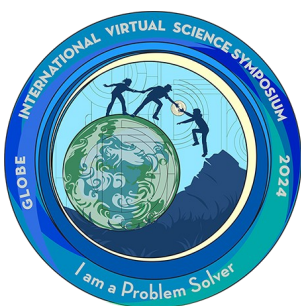
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BADGES



I MAKE AN IMPACT

Our project is based on a local issue, which is mostly droughts, that already starts to affect our local agriculture and could therefore affect our access to food in the future. This is why we decided to work on the impact of compost on moisture and soil enrichment. We wish to be part of finding solutions and heighten people's awareness about climate change, its consequences and the solutions that could be put in action.



I AM A PROBLEM SOLVER

Our questioning about global climate change and droughts at the local level motivated us to look into potential solutions concerning water saving and heightening of people's awareness about actions that could be locally developed and in which everybody could participate by implementing compost at the city level, involving every citizen.



I AM A COLLABORATOR

We are a team of seven students and a teacher. This experimental project was developed through research and collective discussions involving all team members (Addam Amin, Kherouaa Manel, Ilachat Manel, Benhida Asmae, Boudene El Haouhay Manal, Daffe Soumaya, El Fazazi Fatima-Zahraa, and our biology teacher, Ms Martin-Malivel). Working together on the project clearly participated in the development of the research questions and the decisions about the protocol. The experiments were realised by everyone (finding pots, collecting soil, planting seeds, collecting the data etc.). The report was mainly written by Manel Kherouaa, Manel Ilachat, and the poster was mainly written by Amin Addam, both with the help of Ms Martin-Malivel. In the process we started to contact research organisations in the area, which should lead to future collaborations.