

Alshouf International schools -Jordan

Pedosphere protocol

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Abstract

Worldwide, an estimated 400 billion to 1 trillion cups of coffee are consumed annually. Regardless of the exact figure, the substantial amount of coffee consumed results in a significant volume of spent coffee grounds. Utilizing these grounds in the garden not only diverts them from the waste stream but also offers gardeners an alternative for nurturing plants and addressing slug issues. Coffee grounds can be an effective deterrent for slugs and snails in gardening, as they can cause problems for plants. Some experts recommend using them to help combat these pests. Slugs harm radishes by feeding on leaves, stems, and roots, causing irregular holes and stunted growth. This damage reduces yield and makes plants more prone to diseases. Protective measures like barriers or natural deterrents such as coffee grounds can prevent slug damage in the garden. We conducted an experiment to examine how various types of coffee influence the growth of radish seeds and their impact on snails. Coffee grounds contain a slug-toxic alkaloid, causing severe dehydration and deterring slugs from areas where the grounds are used, making it a helpful but not foolproof method for gardeners.

BIG GOAL

- To Use coffee grounds as natural fertilizers and pesticides

BIG QUESTION

- How do we compare coffee grounds to other fertilizers and pesticides on the environment?

Questions

1. What benefits do coffee grounds have on the soil?
2. How to use coffee to deter snails and slugs?
3. How Do I Apply Coffee Grounds To My Garden?
4. Why don't Slugs like coffee?

Introduction

Due to different natural and human causes, the petroleum infrastructure is frequently subject to disasters and environmental contingencies along the different stages of the petroleum lifecycle and its derivatives. Bioremediation is used to reduce the environmental impacts, to detoxify the contaminants in different environments by using microorganisms, plants, etc, or with strategic composting systems or enzymatic treatments. The use of agro-industrial wastes such as coffee husk could be a solution to diminish the hydrocarbons.

Coffee production includes first postharvest processing that helps to separate the seed from the remaining parts of the fruit to ensure the final product quality. Coffee husk is the main residue obtained during drying. For every ton of coffee harvested, 0.18 tons of coffee husk are produced .

These by-products pose an environmental threat to coffee producing countries, as they pollute surrounding water due to their high caffeine content. However, due to their composition, numerous applications have also been suggested. Both coffee husk and pulp have been used as organic soil amendments. by-products improved the soil's increased its organic carbon and nitrogen and water retention capacity.

They have also been used for composting or vermicomposting .The second processing step is coffee roasting, which is very important not only for the formation of specific compounds responsible for the organoleptic properties of coffee beverage but also because some of these compounds have a deep effect on the use of spent coffee grounds as a soil amendment .

Finally, coffee can be brewed following different techniques such as decoction, infusion or pressure. Spent coffee grounds (SCG) are the main by-product obtained during coffee brewing.

They are mainly produced in coffee shops, restaurants, households and during the industrial production of instant coffee. Instant coffee-derived residues usually present a poorer concentration of chemicals due to a more extensive extraction process . Worldwide, approximately 15 million tons of SCG are produced each year.

Potential Applications of Spent Coffee Grounds

SCG can be recycled in different ways to produce several types of biofuels, such as biohydrogen, biobutanol, biodiesel, fuel pellets, bio-oil, bioethanol, biogas, and hydrocarbon fuels. compounds and compounds for the food industry and the pharmaceutical, agricultural, or cosmetic industry, among others. Here, we will focus on the re-use of SCG as an organic amendment, directly or modified through composting, co-composting, and vermicomposting.

Brown Gold for the Garden

Coffee grounds are praised for acidifying the soil, disease control, enhanced plant growth, and improved soil tilth. There are many theories about the benefits of using coffee grounds in gardens and landscapes, but let's start with a few **coffee ground facts**:

- Coffee grounds contain approximately 2 percent nitrogen, 0.06 percent phosphorus, and 0.6 percent potassium by volume. They also contain many micronutrients including calcium, magnesium, boron, copper, iron, and zinc.
- The nitrogen in coffee grounds is primarily found in proteins and other organic molecules unavailable to the plants **until soil microorganisms break them down** into simple ions. As a result, the **nitrogen** in coffee grounds is **released slowly over time as the plants need it.**
- Coffee grounds are slightly acidic (5.5 to 6.8 pH).
- Coffee grounds make **an excellent compost feedstock**, with a carbon/nitrogen ratio of 20-24:1.
- Use of coffee grounds in amending mineral soils up to 35 percent by volume has been shown to improve soil structure both short-term and long-term, while **improving the availabilities of phosphorus, potassium, magnesium, and copper.**
- Humic substances, which are the major organic constituents of the soil (humus), are produced through coffee ground degradation.
- Coffee grounds can moderate soil temperature and increase soil water retention.
- Coffee grounds, along with other sources of soil organic matter, **can bind pesticide residues**, preventing movement into the surrounding environment.

Composting

Composting coffee grounds is the best thing to do before putting them in the garden. Use no more than 20-35 percent by volume of coffee grounds in a compost pile. Higher percentages have been shown to have harmful effects on the compost mixture, such as preventing the compost heap from heating up enough to decompose. Most coffee grounds have pH levels ranging from mildly acidic to somewhat alkaline, and as coffee grounds decompose, the pH neutralizes. Leaves and sawdust are great materials for mixing with coffee grounds in a compost pile.

According to research, the fungal species that work to decompose coffee grounds have been shown **to suppress some common fungal rots and wilts**. These include Fusarium, Pythium, and Sclerotinia species that affect potatoes, tomatoes, peppers, eggplants, and herbaceous, succulent plants.

Soil Amendment

Apply no more than one-half inch of coffee grounds when putting fresh coffee grounds directly to the ground as mulch. Because coffee grounds are finely textured and easily compacted, thick layers of coffee grounds as mulch can act as a barrier to moisture and air movement in soils. So if you are using coffee grounds as a “dressing” for specific plants or trees, apply the grounds in a thin layer or work into the top layer of the soil. Coffee grounds can be worked directly into the soil during planting; however, Oregon State University scientists suggest adding a nitrogen fertilizer at the same time. Coffee grounds encourage the growth of microbes in the soil, which use nitrogen for growth and reproduction. While the microbes are breaking down the grounds, the additional nitrogen from the fertilizer will provide a source of nutrients for plants.

In lawns, coffee grounds can be sprinkled into the grass for a java nutrient boost! Let the sprinkler or rainfall brew the nutrients into your lawn. Or you can make a coffee ground “tea.” Add two cups of used coffee grounds to a five-gallon bucket of water. Let the “tea” brew for a few hours or overnight. Use the mixture as a liquid fertilizer for the garden, yard, or container plants.

Plants that respond well to coffee grounds include blueberries, cabbage, soybeans, fruit trees, tomatoes, corn, roses, camellias, rhododendrons, and azaleas. In one trial with bush beans, the addition of coffee grounds showed detrimental effects to the bean plants. Coffee grounds have been shown to reduce seed germination and plant growth in some crops and ornamental species, so coffee grounds are not a “one-size fits all” for a garden. While there is some belief using coffee grounds as mulch will help repel pests, including squirrels, rabbits, cats and **slugs**, there is no research available on this topic.

Vermicomposting

Vermicomposting (composting using worms) can be a great way to manage large or small amounts of coffee grounds or other kitchen waste. If using coffee grounds, be sure to provide worms with a balanced diet of shredded paper or leaves and kitchen scraps so they can process the coffee grounds without issues.

The most consumed drink in the world has more benefits than just keeping us awake. Spent coffee grounds can be used as a soil amendment and compost ingredient, **while liquid coffee acts as an effective slug killer.**

More exciting than the positive effect of coffee grounds as a compost and soil amendment, is its potential as a slug killer, Brewer said. Research shows that using a 1% to 2% solution mixed with water as a soil drench caused 100% of slugs to leave the treated soil and subsequently die of caffeine poisoning. A 2% solution of caffeine applied to the growing medium of orchids killed 95% of orchid snails and gave better control than a liquid metaldehyde product – the common slug bait.

Coffee grounds contain **caffeine, which is toxic to slugs** and snails. When these creatures ingest caffeine, it can kill them. So, using ground coffee as a barrier around your plants may help to keep them safe from these critters.

For this reason, slugs will avoid areas where coffee grounds have been sprinkled. While coffee grounds may not be the most effective way to keep slugs out of the garden, they can be a helpful tool in deterring these pests.

Coffee grounds are often used as a natural way to deter pests like slugs. But **how effective are coffee grounds at deterring these slimy creatures?**

Coffee grounds contain caffeine, which is toxic to snails. When these creatures ingest coffee grounds, they become dehydrated and eventually die. Additionally, the sharp edges of coffee grounds can deter snails from crawling over them. Studies have shown that coffee grounds are an effective way to deter snails (and other pests). In one study, coffee grounds were found to reduce the number of snails by up to 50%. In another study, coffee has been shown to reduce the number of slugs by up to 90%. Overall, coffee grounds are a safe and effective way to deter snails and other pests.

How to Use Coffee to Deter Snails and Slugs?

One of the ways to deter snails from the garden is coffee. While most gardeners focus on using chemicals to kill or repel pests, coffee is a natural, inexpensive alternative that can be just as effective.

Quick guide on how to use coffee to deter snails:

- Brew a strong pot of coffee, using twice the amount of grounds you would normally use.
- Let the coffee cool, then pour it into a spray bottle.
- liberally spray plants and soil around your garden, taking care to target areas where snails are likely to congregate.
- Repeat the process every few days, or as needed.

How Do I Apply Coffee Grounds To My Garden?

There are multiple ways to incorporate used coffee grounds into your growing space. It is important to use used grounds, as the caffeine content of freshly ground coffee may cause unwanted complications or affect local wildlife.

Drip coffee grounds, rather than boiled coffee, tend to contain a higher nitrogen level; all types of soil will also receive copper, phosphorus, magnesium, and potassium, helping to condition the soil and increase its structure and fecundity. The grounds are also great for tomatoes, carrots, lettuce, radishes, fruit trees, berry shrubs, etc.

Additional Benefits of Applying Coffee Grounds to your Garden

As an added bonus, slugs and snails tend to be deterred, and cats may also be repelled through the use of coffee grounds.

Research Methods and Materials (Including GLOBE Data!):

1. We began the experiment by determining the beaker's mass.
2. We filled four cups with an equal amount of soil after measuring how much was needed for the experiment.
3. After that, we measured 65 grams of Turkish and American coffee into the beaker respectively.
4. Next, we blended the water and coffee in the measuring cylinder after adding 30 ml of water to it.
5. Next, we measured the pH of the water and Turkish coffee mixture, and the result was 6. We also measured the pH of the water and American coffee mixture, which came out to be 5.2, and the pH of water, which was 7.
6. Next, we filled the four cups of soil with the seeds.
7. Next, we filled two cups with water and the remaining two with Turkish and American coffee.
8. Finally, we put the snails into three coffee glasses and one water cup.



THE SECRET OF COFFEE

an organic fertilizer and pesticide



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KEYWORDS

coffee, soil, slugs, snail, PH, fertilizer, experiment, pesticides, mixture.

ABSTRACT

Worldwide, an estimated 400 billion to 1 trillion cups of coffee are consumed annually. Regardless of the exact figure, the substantial amount of coffee consumed results in a significant volume of spent coffee grounds. Utilizing these grounds in the garden not only diverts them from the waste stream but also offers gardeners an alternative for nurturing plants and addressing slug issues. Coffee grounds can be an effective deterrent for slugs and snails in gardening, as they can cause problems for plants. Some experts recommend using them to help combat these pests. Slugs harm radishes by feeding on leaves, stems, and roots, causing irregular holes and stunted growth. This damage reduces yield and makes plants more prone to diseases. Protective measures like barriers or natural deterrents such as coffee grounds can prevent slug damage in the garden. We conducted an experiment to examine how various types of coffee influences the growth of radish seeds and their impact on snails. Coffee grounds contain a slug-toxic alkaloid, causing severe dehydration and deterring slugs from areas where the grounds are used, making it a helpful but not foolproof method for gardeners.

RESULTS

The experiment produced interesting results. In the American coffee and soil mixture, the slugs died first, followed by the Turkish coffee and soil mixture, while the slugs did not die in the water and soil mixture. Additionally, the reddish plant grew the longest in the American coffee and soil combination, followed by the Turkish coffee and soil combination, and the growth was not as good in the water and soil mixture. These findings show that American and Turkish coffee may have positive effects on plant growth when combined with soil.

GLOBE Data!

THE GLOBE PROGRAM SCIENCE Data Entry

Welcome Reem Dahnous

Data Entry Home / AI Shouf International Schools / AI Shouf international schools / Soil pH

😊 Observation created successfully. [Print this submission](#)

Soil pH *Editing*

Horizon 1 (0cm - 10cm)

pH Method *

pH Meter

Sample 1

Soil pH *

5.2

✖ Remove Sample

Sample 2

Soil pH

6

✖ Remove Sample

* Indicates required sections or fields

Result:

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Discussion:

The results of the experiment present a compelling insight into the potential effects of different coffee and soil combinations on both slug mortality and plant growth. The distinct outcomes observed in each mixture provide valuable information for understanding the impact of coffee on these biological aspects.

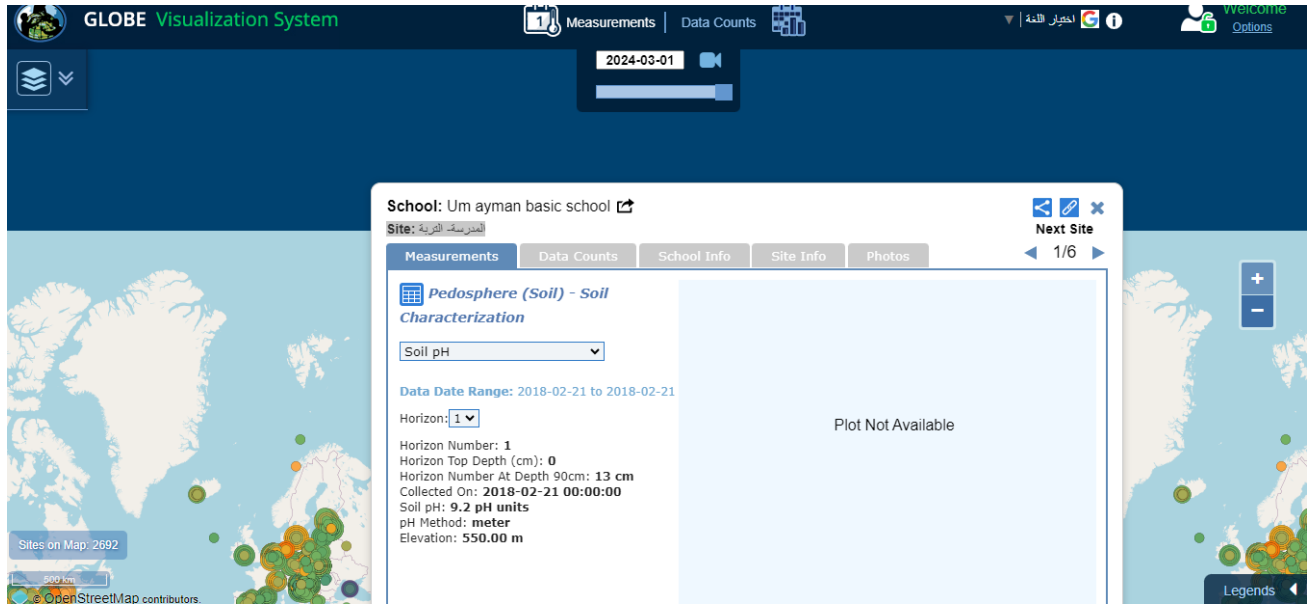
One of the notable findings was the variation in slug mortality rates among the different coffee and soil combinations. The American coffee and soil mixture exhibited the highest slug mortality, suggesting a potential repellent or toxic effect on slugs. Following closely was the Turkish coffee and soil combination, indicating a similar but slightly less pronounced impact. In contrast, the water and soil mixture did not show any slug mortality, hinting that the water alone did not contribute to slug control, emphasizing the significance of coffee components in this context.

The observed differences in plant growth further contribute to the complexity of the results. The reddish plant displayed superior growth in the American coffee and soil mixture, followed by the Turkish coffee and soil combination. Conversely, the water and soil mixture showed less favorable conditions for plant growth compared to the coffee-infused mixtures. These findings suggest that both American and Turkish coffee may contain elements that positively influence plant development when incorporated into soil.

Conclusion:

In conclusion, spent coffee grounds can be used to improve soil quality, deter pests, and provide nutrients for plant growth in gardening and composting. They offer a sustainable solution for repurposing coffee waste and promoting eco-friendly practices.

Bibliography/Citations:



The comparison of soil pH measurements between the American and Turkish coffee treatments in our experiment and the baseline pH of Um Ayman Basic School in Oman reveals interesting insights into the potential impact of these coffee types on soil acidity. The results indicate that both American and Turkish coffee lead to lower pH levels compared to the initial pH of the school's soil.

The soil pH of 5.2 for the American coffee treatment and 6 for the Turkish coffee treatment suggests that these coffee-infused mixtures have an acidic effect on the soil. In contrast, the baseline pH of 9.5 at Um Ayman Basic School indicates an alkaline soil environment. This disparity in pH levels prompts consideration of the intended use or crops to be cultivated in the soil.

The preference for acidic or alkaline soil depends on the specific requirements of plants. Some plants thrive in slightly acidic conditions, while others prefer alkaline environments. Therefore, the choice between American and Turkish coffee-infused soil amendments should be made based on the desired pH range for the targeted plants.

Given that both American and Turkish coffee treatments resulted in lower pH values, it may be suitable for plants that thrive in acidic conditions. However, it is crucial to acknowledge that sustained use of coffee amendments may lead to further changes in soil properties over time, and periodic monitoring of pH levels is advisable.

Recommendations

It would be beneficial to consider the types of crops or plants commonly grown at Um Ayman Basic School and their preferred soil pH range. If the existing vegetation or planned cultivation favors acidic conditions, the use of either American or Turkish coffee amendments could be a viable option.

References

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Why Should We Be Concerned with the Use of Spent Coffee Grounds as an Organic Amendment of Soils? A Narrative Review

<https://www.uwyo.edu/barnbackyard/files/documents/magazine/2017/summer/plantsperk0717.pdf> - Using coffee pot leftovers delivers a java jolt and fertile grounds