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**Waste Not,
Grow A Lot:**

Coffee Grounds and Sustainable Farming

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Synopsis

Coffee is a daily favorite beverage for many Filipinos, but once the brew is done, the leftover grounds—known as spent coffee grounds (SCGs)—are usually tossed out. What most people don't realize is that these leftover grounds are packed with nutrients that can actually benefit our soil and boost plant growth. We tested discarded Robusta SCGs, both in their raw and burnt forms. It turned out that the SCGs could be used as organic fertilizers for tomato plants. How so?

Spent Coffee Grounds: A Hidden Resource for Greener Farming

Coffee is one of the world's most consumed beverages—second only to water—and in the Philippines, it's a daily habit for millions. With coffee shops sprouting up across the country, it is obvious that the demand on coffee is still high. But here's something most people don't realize: only about 30% of a coffee bean actually ends up in your cup. The rest? It becomes spent coffee grounds (SCGs), which usually get tossed out and end up in landfills.

What if that Coffee Waste Is Not Waste at All?

Recent research highlights that SCGs are rich in key nutrients like nitrogen, phosphorus, and potassium, which are essential elements plants need to thrive. These grounds also add organic matter to the soil, helping it hold water and support beneficial microbes. In short, SCGs might have untapped potential in the push for more sustainable farming, especially in a circular economy where waste becomes a resource.

Robusta coffee, which makes up about 85% of the Philippines's coffee production, is the most widely grown type in the country and is mostly used in instant coffee. On the other hand, tomatoes (*Solanum lycopersicum*)—a staple in Filipino kitchens—are crops that love soil with good moisture and plenty of organic matter. That makes them a great candidate for testing SCGs as a natural fertilizer.

We conducted an experiment to find whether spent Robusta coffee grounds—both burnt and unburnt—could help tomato plants grow better. We applied the grounds using two common fertilizing techniques: mixing them into the soil (basal application) and placing them around the plant as it grows (side-dressing). We tracked plant height, stem thickness, leaf number, and leaf size to see what effect the coffee grounds had.

By turning what's usually discarded into something valuable, we support smarter farming practices and offers a practical solution to reducing organic waste. For farmers, scientists, and environmentally minded citizens alike, it's a step toward more sustainable and circular agriculture.

Coffee Grounds vs. Commercial Fertilizer: Which Grows a Better Tomato?

What happens when we compare three different ways of fertilizing tomato plants—commercial fertilizer, spent Robusta coffee grounds, and no fertilizer at all? It turns out, that leftover coffee might just give store-bought fertilizers a run for their money.



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In this study, we tested how tomato plants responded to unburnt and burnt spent Robusta coffee grounds (SRCG), commercial fertilizer, and no fertilizer. We measured plant height, stem diameter, leaf count, and leaf width. Interestingly, while most growth measurements showed clear differences, the number of leaves didn't vary much among treatments.

Unburnt SRCG applied using the side-dressing method (placing fertilizer around the plant base) led the pack when it came to plant height, with tomato plants reaching an average of 23.65 cm. This suggests that the nutrients in the coffee grounds help the plant grow taller. Similarly, stem diameter was largest in plants treated with unburnt SRCG, averaging 0.459 cm. Thicker stems typically mean stronger plants with healthier root systems—ideal for absorbing water and nutrients more effectively.

Although commercial fertilizers did outperform the coffee grounds in leaf width (with an average of 4.03 cm), the coffee treatment still held its own. Most importantly, it did so without the potential downsides of synthetic fertilizers.

The results align with previous studies: spent coffee grounds can improve soil quality, boost microbial activity, and support plant growth, all while reducing environmental harm. Previous studies also

suggested that unburnt SCGs can even enhance carbon content and microbial life in the soil—key indicators of healthy farmland.

That said, it's not all smooth grounds. Coffee contains caffeine and other compounds that, if not properly broken down, might inhibit plant growth. But these same compounds can repel garden pests like slugs and snails. With time—roughly eight months of composting—these potentially harmful effects are neutralized, leaving behind a powerful, pest-resistant fertilizer.

In this experiment, the coffee grounds weren't composted for eight months, yet they still promoted growth and helped deter pests—possibly thanks to the natural characteristics of Robusta beans, which are less acidic than other varieties. Among the different ways of applying the fertilizer, side-dressing proved to be the most effective, especially for the unburnt coffee grounds.

Conclusion

Unburnt Robusta spent coffee grounds, previously seen as waste, when applied as side-dressing fertilizer, could actually be a valuable, eco-friendly alternative to synthetic fertilizers, offering a second life for coffee, a growth boost for crops, and a promising tool to support greener agriculture.



<https://www.lawnstarter.com/blog/lawn-care-2/difference-between-organic-synthetic-fertilizer/>



<https://elements.envato.com/the-farmer-harvests-tomatoes-in-the-garden-selecti-RSENQR6>

Future Direction: What's Next for Coffee Waste in Agriculture?

With promising results showing that spent Robusta coffee grounds (SRCG) can be upcycled into organic fertilizer, there's a strong case for digging deeper—both literally and scientifically.

To fully tap into its potential for sustainable farming, we suggest several next steps:

- **Expand the Measurements** – Future studies could look beyond just plant height and leaf size. Measuring how well plants absorb nutrients and monitoring more detailed growth indicators would help paint a clearer picture of SRCG's true impact.
- **Study the Long-Term Effects** – While short-term growth benefits are encouraging, it's also important to understand how SRCG affects plant health and crop yields over an entire growing season—or even across multiple harvests.

- **Test the Soil Before and After** – Conducting soil tests before and after applying SRCG can help assess how it changes the soil's nutrient profile. This includes measuring levels of important micro and macronutrients that are key to healthy plant growth.

By taking these steps, researchers can strengthen the case for using SRCG as a sustainable alternative to chemical fertilizers—supporting the broader mission of reducing organic waste and promoting a greener farming practices.

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