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The Effects on Climate Change Due to Kitchen Waste Composting and Emissions of Carbon Dioxide

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ABSTRACT
The emission of greenhouse gases into the atmosphere due to anthropogenic activities, including the disposal of large quantities of organic kitchen waste into the environment. There is currently no evidence suggesting the likelihood of a future reversal or pause in emissions. The process of carbon sequestration serves to mitigate the emission of greenhouse gases from kitchen organic waste through the creation of compost. Composting is proposed as a potentially effective and cost-efficient solution to address the issue production of kitchen organic waste, which is contributing to environmental pollution. The escalation in complete carbon dioxide and microbial biomass carbon emissions can be attributed to a concurrent reduction in the levels of dissolved organic carbon as the treatments experienced a noteworthy decrease in dissolved organic carbon concentrations. The application of banana and potato compost has been found to have a positive impact on the macro aggregates of soil, leading to an increase in soil stability due to the compost's ability to stabilize soil particles. The study indicate that composting represents the most effective approach for mitigating greenhouse gas emissions originating from kitchen organic waste, while also enhancing the biological and physicochemical characteristics of soil.

Keywords: Organic kitchen waste, Carbon dioxide, Emissions, Microbial activities

INTRODUCTION
The production of kitchen waste is one of the most important fractions of urban waste, accounting for 50% of all generated waste, which depends on the eating habits of consumers (Cerda *et al*., 2018; Liu *et al*., 2019). Kitchen waste is known as the largest waste in our environment, contributing as domestic trash (57.9% on average) (Ghinea *et al*., 2012). The annual food waste generation is about 1. 3 billion tons (Gustavsson *et al*., 2011). Compared to other MSW sources, kitchen squander encompasses a dampness substance of 74 to 90%, an unstable solid to add up to solids proportion of 80 to 97%, and a C/N proportion of 14. 7 to 364% (Thi *et al*., 2015). Climate change poses another major threat to the world, caused primarily by human activities such as the generation of organic waste in the environment (Ahmed, 2020). So, composting is considered as an effective and sustainable method for converting kitchen waste into stabilized organic amendment for agricultural lands. Biofertilizers made from kitchen waste can be used as organic fertilizers to reduce the consumption of chemical fertilizers, improve soil quality and increase agricultural yields (Cerda *et al*., 2018). It is believed that fruit and vegetable compost can reduce CO_2 emissions and increase soil nutrients.

MATERIALS AND METHODS
Collection and processing of banana and potato peels
In the experimental field in 2022, banana peels, potato peels and the rest of the fruit stalls were collected and stored in plastic containers and all are in equal amount. To ensure natural air circulation, plastic containers were replaced by two layers of holes. The compost flow was monitored for ten weeks in normal room temperature. After six days of composting, the samples were mixed. The produced compost was used for research purposes. Wash half of skin thoroughly with running water to remove unwanted impurities. Peeled off, cut into small pieces (1-5 cm), and dried in the sun for 20 days. Sieve the separately crushed dried peel and stored at room temperature for later use.

Organic matter of soil: The Walkley-Black method was used to determine the amount of organic matter in the soil. It is air-dried and ground. 05 grams of soil is weighed, added to 20 ml of H_2SO_4 and 10 ml of potassium dichromate, mixed well, cooled for 30 minutes, then diluted to 200 ml of pure water. By adding 15 drops of diphenylamine as indicator and then titrating with 0. 5 N ferric ammonium sulfate solutions until an opaque green color appear.

Microbial biomass carbon of soil: After 60 days of incubation, the soil samples were fumigated with chloroform to determine the microbial biomass carbon. The purpose of chloroform is to kill microorganisms and release their contents into the soil solution. The difference between fumigated and unfumigated samples is soil microbial biomass carbon. The conversion coefficient between microbial carbon removal and microbial biomass carbon is 0. 45.

Carbon dioxide efflux

Table 1. Physical and chemical characteristics of compost and peels used in incubation experiment

Characteristics	Units	Banana Compost	Banana peels	Potato compost	Potato peels
pH		7.5±0.23	9.5±0.1	9.2±0.1	6.9±0.1
EC	dS m-1	3.14±0.12	5.6±0.6	2.55±0.34	7.2±0.4
Total P	mg kg-1	0.3±0.1	0.3±0.1	0.4±0.05	0.33±0.1
Total K	mg kg-1	11.33±0.6	12±5.2	11.7±3.1	11±5.3
Total N	%	0.5±0.02	0.6±0.3	0.7±0.3	0.9±0.2
Carbon	%	27.4±2	27.5±2.1	26.9±1.3	28±0.9

Carbon dioxide trapped in NaOH solution was measured by reverse titration with 0. 1 M HCl solution, 1 ml of NaOH trap solution was taken and 6-7 drops of BaC_{l2} solution were added, then 2-3 drops of phenolphthalein indicator appeared pink., then slowly titrated to a colorless endpoint.

RESULTS

1.1 Cumulative C-CO_2 emissions

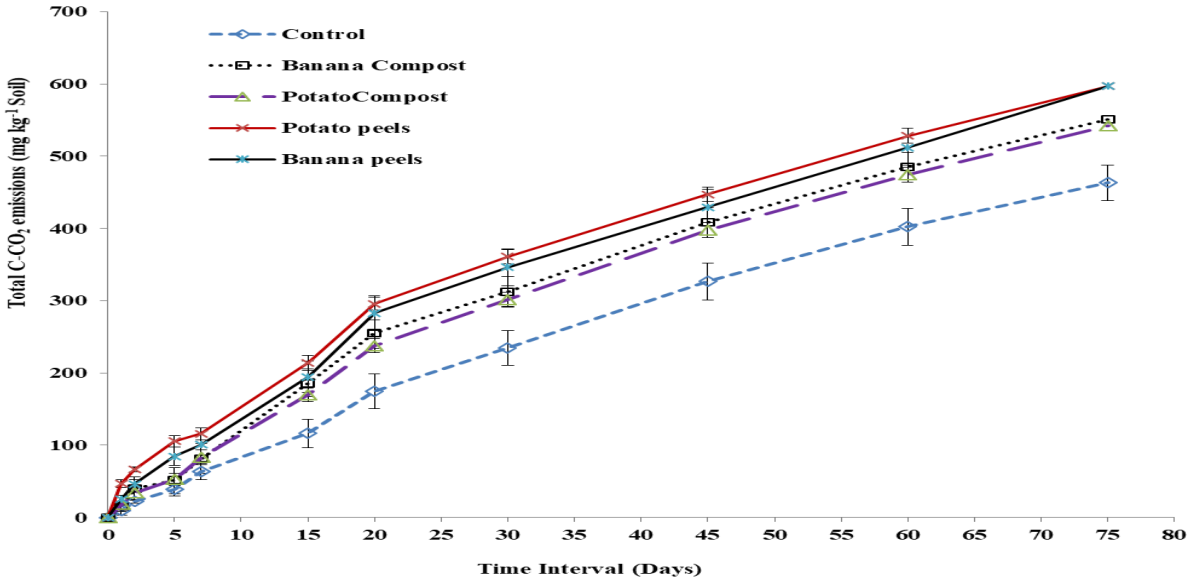

Figure 1. CO_2 release from soil (mg C kg-1 soil with the addition of potato and banana peels and compost at 5 g kg-1 soil. Incubation interval was from 1 to 75 days and data are representative as mean ± SE (n. = 4)

1.2 Cumulative C-CO_2 emissions

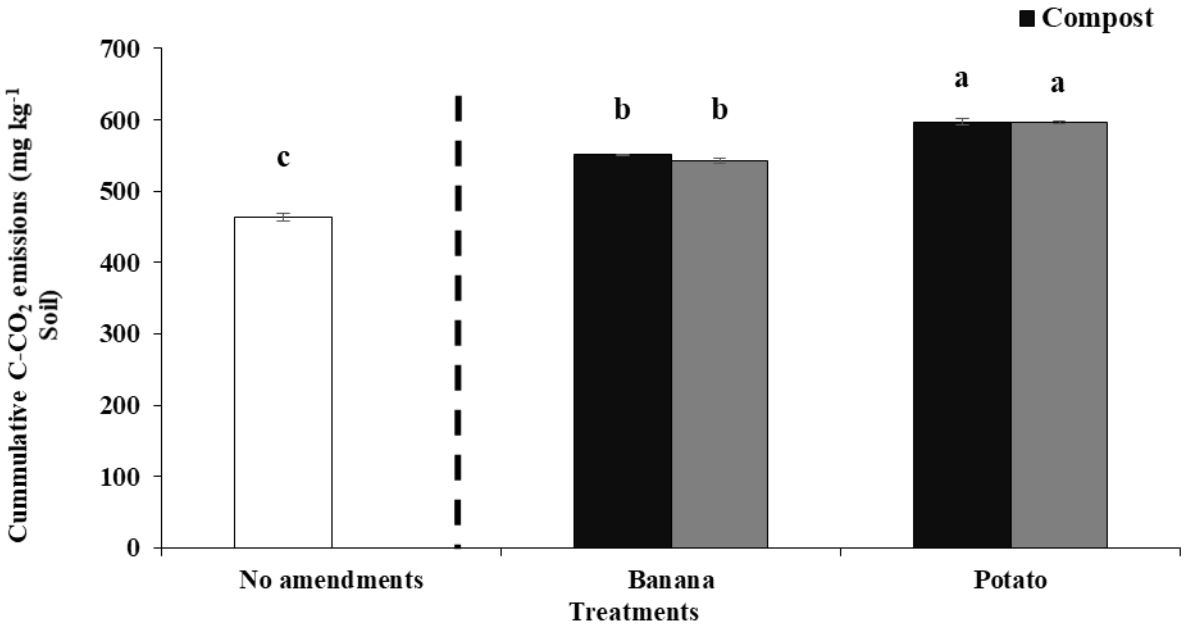

Figure 2. Cumulative CO2 emissions (mg C kg-1 soil) of addition of potato and banana peels and compost at 5 g kg-1 soil. The incubation period was 75 days and data are presented as mean ± SE (n=4).

1.3. Microbial biomass carbon

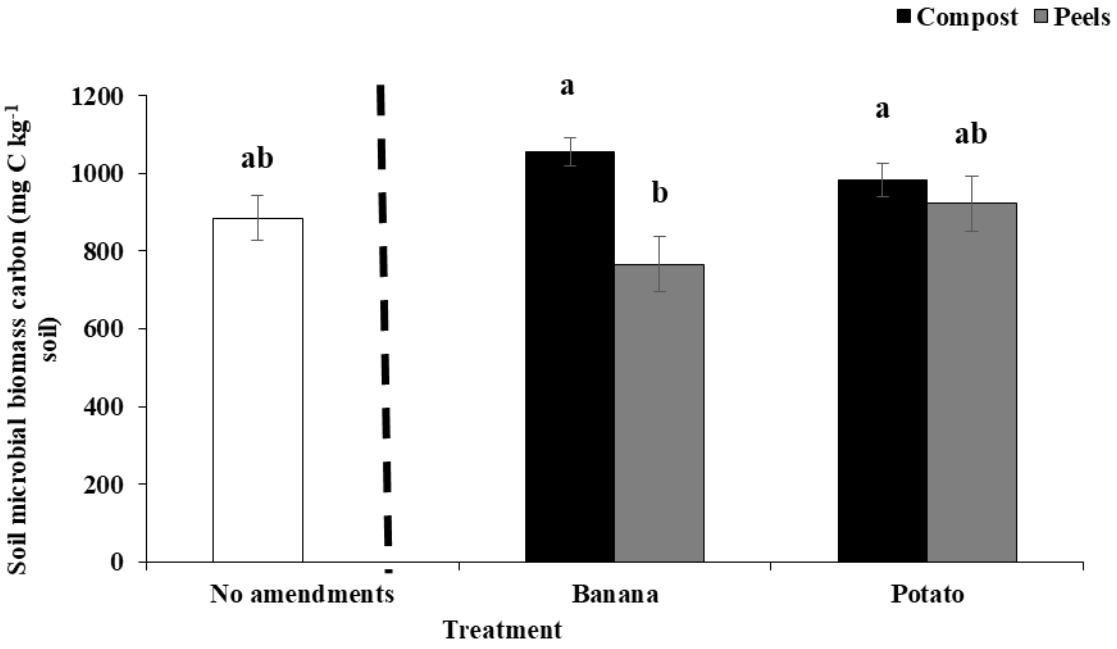

Figure 3. Soil microbial biomass C (mg C kg-1 soil) with the addition of potato and banana peels and compost at 5 g kg-1 soil. The incubation period was 75 days and data are presented as mean ± SE (n=4).

1.4. Soil dissolved organic carbon

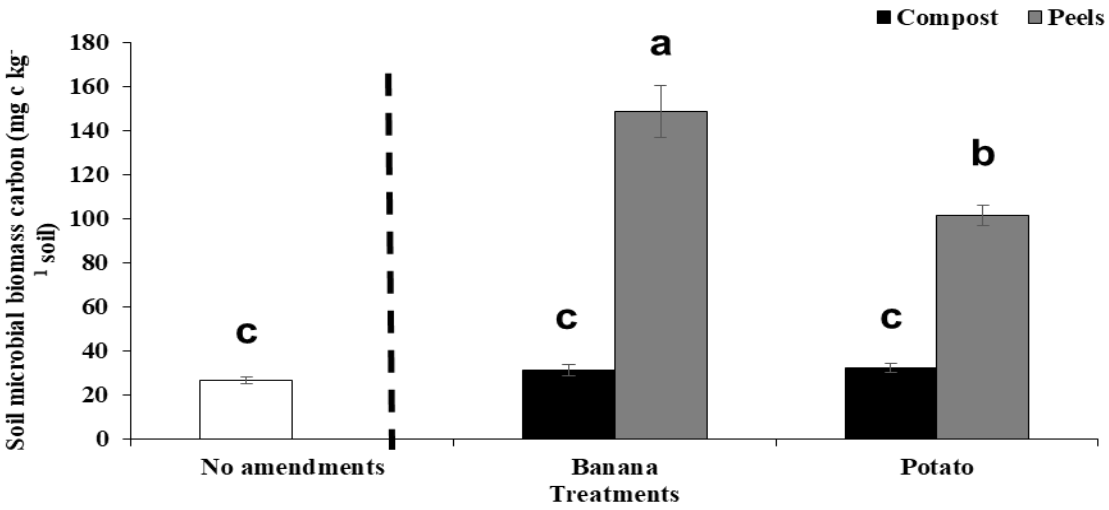

Figure 4. Dissolved organic C (mg kg-1 soil) with the addition of potato and banana peels and compost at 5 g kg-1 soil. The incubation period was 75 days and data are presented as mean ± SE (n=4).

DISCUSSION

The experiment confirmed that the addition of compost and banana and potato peels increased cumulative respiration and microbial biomass by increasing the proportion of low C:N applied earlier, and the C:N of compost and banana and potato peels added at the beginning of potato. Period was added. The incubation period has little effect. It was watched that the utilize of potato peels created the most elevated CO_2 emanations compared to compost and control. In expansion, leftover C contributed more to C collection within the potato than within the banana treatment, and the extent of C in potato peels was higher than in banana peels, which encouraged C discharge through microbial anabolism within the soil, showing versatility (Xu *et al.*, 2020).

CONCLUSION

The most greenhouse gasses are carbon dioxide, methane, nitrous oxide gas. Carbon dioxide emanations alone accounted for 76% of the four nursery gasses. Greenhouse gasses avoid warm from getting away into space by retaining and re-radiating long-wave radiation from the earth surface. Natural soil carbon plays an imperative part in keeping up the worldwide carbon cycle, advancing soil richness, supporting agribusiness and nourishment generation, and relieving climate change. Adding banana and potato peels to the soil greatly affected its properties. Composting is a very effective method of processing organic kitchen waste.

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