Comparative Quality of Cow Manure based Compost with or without Fermentation Additive and its Effect on the Germination of Pechay

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Abstract**—** *Utilizing cow manure for composting at the same time addressing environmental issues can be a feasible alternative for cow raisers. The study aimed to determine the effects of adding a rapid odor erasing and composting microbes (OECM) at different inclusion rates of; 350 grams per 110 kg raw material (50 kg cow manure + 60 kg fly ash) T2; 400 grams per 110 kg raw material (50 kg cow manure + 60 kg fly ash) T3, and 450 grams per 110 kg or raw material (50 kg cow manure + 60 kg fly ash) T4 on physical properties, temperature, pH, germination rate, and percentage compost recovery. The control T1 was 110 kg raw material with no OECM. A Randomized Complete Block Design (RCBD) was used consisting of 4 treatments with each treatment replicated thrice. Tukey HSD was used to further analyze significant differences.*

The odor of treated compost disappeared by day 13 in T2, T3, and T4. On the same day, the texture changed from coarse to fine, and the color shifted from black to brown in these treatments.

The temperature ($p. < 0.01$), pH ($p. < 0.01$), compost recovery ($p. < 0.01$), and germination rate ($p. < 0.01$) were significantly different over the control. Therefore, the OECM at 350 grams, 400 grams, and 450 grams per 110 kg raw material is an indispensable additive for cow-based manure as it significantly improved the varying compost quality parameters.

Keywords**— Cow manure, Composting, OECM, Fly ash, Organic fertilizer, Waste management, Germination rate, Compost recovery, pH, Temperature.***

I. INTRODUCTION

In the Philippines, farming is one of the main sources of income. Many farmers have found cows to be helpful in their agricultural endeavors. Cattle farming is commonly carried out in backyards or on commercial farms. Besides the meat and milk products that can be derived from rearing cows, this livestock animal can also be utilized for early grazing to control unnecessary weeds in the farm surroundings. According to the Philippine Statistics Authority Cattle Situation Report, as of March 31, 2023, the total cattle inventory reached 2.57 million heads. 3.6% of the total cattle population comes from commercial, 14.3% from semi-commercial, and 82.1% from smallholdings.

Environmental concerns relating to cattle in livestock production are taken for granted as this industry in the Philippines continues to grow. In fact, due to the methane and nitrous oxide emitted during digestion and excrement, cattle are said to be the major contributor to environmental degradation among livestock, with an emphasis on greenhouse gas emissions. Therefore, considering these environmental concerns, raisers should adopt a more consumer-friendly production strategy.

In recent years, organic farming has been gaining rapid popularity. This was made possible because of the government's ongoing support to the Organic Agriculture Act (RA 10068). There have been several technological interventions for waste utilization as a resource. Examples include research-based innovative strategies in animal feeding and nutrition; alternative approaches in cattle production; and an environmentally friendly waste management system.

Research and several studies have been conducted to improve agricultural practices by effectively using byproducts. Cow manure and other farm wastes, such as fly ash, rice straw, sawdust, and coco husk, are being utilized in a composting method to produce organic fertilizer that can be used to grow healthy plants, negating the need for synthetic chemical fertilizers. According to Zainudin et al. (2022), utilizing compost additives such as odor erasing and composting microbes (OECM) is one of the most efficient and suitable methods to accelerate the decomposition process when creating compost. OECM contains combinations of bacteria and fungi that work together to speed up the composting process. Composting is referred to as "natural recycling." Invertebrates eat carcasses after they have been broken down by microbes. The "compost" or nutrients formed are added back to the soil to help plants thrive. Compost improves the soil's water-holding capacity and overall quality. Composting could therefore contribute to a better environment for both people and other living organisms.

Composting is done all over the world. However, due to the time required for the mixture of byproducts to degrade, it is not a quick process. Composting can take up to two years, but by manually stirring the compost, it can be completed in two to six months. As science and technology advances, it opens the door for many scientists to develop a product that may help accelerate the process of decomposition. Recently, there has been a composting product on the market that can convert livestock manure into organic fertilizer in 14 days, and this investigation was done to confirm it.

II. METHODOLOGY

2.1 Cow Manure Collection:

The cattle manure used in this study was collected from the Beef Cattle Project of the University Business Affairs Program of Central Luzon State University Agribusiness Center. The cow manure was delivered directly to ELR Family Trading Co., Inc., located at Barangay Bagong Sikat Science City of Muñoz, Nueva Ecija, where the study was conducted.

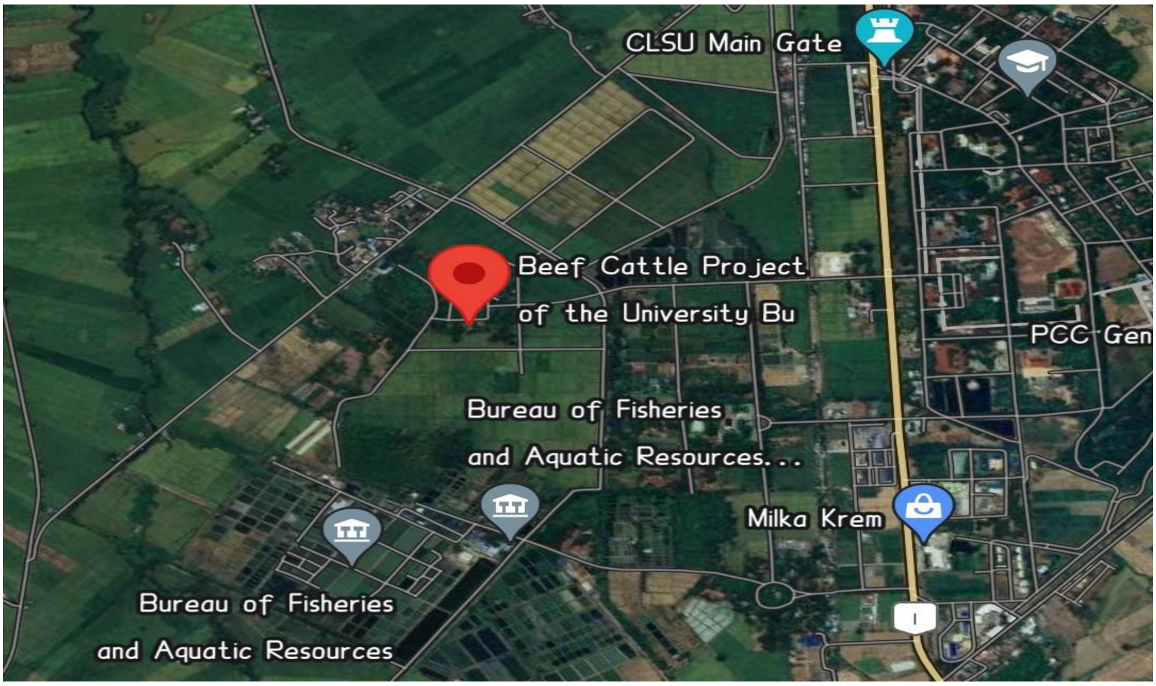

FIGURE 1: Cow Manure Collection Trace Map

2.2 The Composition and Preparation Process of the Odor Erasing Composting Microbes (OECM):

The OECM is organic based and was prepared as a concoction using the following: 7 bacteria for decomposition, enzyme production, and nutrients transformation; 3 bacteria for decomposition of polysaccharides and enzyme production; 3 bacteria for enhance decomposition, compost "sweetening" and probiotics; 5 bacteria for nitrogen fixation and nutrients transformation; 7 fungi for decomposition, probiotics production and nutrients transformation.

The preparation process involved the following: Classification of the substrate materials based on the modified growth media; comminution or griding of the substrate materials; mixing and blending of substrate materials for homogeneity; nutrient fortification of the substrate to enhance the growth of the super stain beneficial microbes; sterilization; inoculation and subsequent incubation of the beneficial microbes; and propagation and subsequent multiplication of the beneficial microbes in the prepared substrate.

The source of substrate were haystack and decaying woods, cattle manure and silage, dairy processing plant sewerage, fermented vegetables fruits, pineapple pulp, stale bread, waste lagoons, garbage landfills, biogas digester, soil in organic fertilizer plants, oxidation of sewage plants, decomposed sugar cane and waste mushroom substrate and waste effluent.

2.3 Compost Plot Preparation:

Twelve plots measuring 4 ft. x 4 ft. x 1 ft., representing 4 treatments, were replicated three times. Temperature, pH, and moisture were taken from three sampling sites (top, middle, and bottom of the treated plots). Replicates of samples from these treated plots were analyzed for temperature, pH, and moisture by a 4-in-1 soil survey instrument, while the odor, color, and texture were physically observed and recorded.

2.4 Treatment Assignments:

TABLE 1
TREATMENTS AND COMPOSITION OF COMPOST IN THIS STUDY

Treatments	Composition
Treatment 1 (control)	50 kg Cow Manure + 60 kg Fly Ash
Treatment 2	50 kg Cow Manure + 60 kg Fly Ash + 350 grams OECM
Treatment 3	50 kg Cow Manure + 60 kg Fly Ash + 400 grams OECM
Treatment 4	50 kg Cow Manure + 60 kg Fly Ash + 450 grams OECM

2.5 Treatment Plots Management:

All the experimental treatment plots were stirred vigorously and done at 6:00 AM; 2:00 PM, and 10:00 PM from Day 1 to Day 7, and 6:00 AM; 6:00 PM from Day 8 to Day 14. The following compost parameters were recorded immediately after every stirring session.

2.6 Data Gathered:

To address production performance and improvements, the following data was collected in order.

1. (%) Percent compost recovery = $\frac{\text{initial weight} - \text{final weigth}}{\text{initial weight}}$ x 100
2. Temperature, pH, and moisture – measured by a portable soil test kit and taken from three sampling sites (top, middle, and bottom of the treated plots).
3. Texture, Color and Smell – physically observed and recorded.
4. Germination Rate, (%) = $\frac{\text{numbers of seeds germinated}}{\text{total number of seeds sown}}$ x 100

2.7 Germination of Pechay Seed:

100 pechay seeds were sown directly into the treated compost media, keeping the compost moist until sprouts appeared. The counting of germination begins the moment the pechay seed sprouts. Counting terminates after 7 days only.

2.8 Statistical Analysis:

The variations in compost parameters between four combination ratios of treatment 1, 2, 3, and 4 were analyzed using two-way ANOVA, followed by a Tukey HSD mean comparison. SPSS version 20 was used for statistical analysis, and statistical mean differences were identified as significant at $p<0.05$.

III. RESULT AND DISCUSSION

3.1 Compost Temperature:

(Table 2a-b) shows the 14 days temperature mean values gathered during composting period from T1 (50 kg cow manure + 60 kg fly ash), T2 (50 kg cow manure + 60 kg fly ash + 350 grams OECM), T3 (50 kg cow manure + 60 kg fly ash + 400 grams OECM), and T4 (50 kg cow manure + 60 kg fly ash + 450 grams OECM).

TABLE 2 (a)
COMPARATIVE TEMPERATURE OF COW-BASED MANURE COMPOST WITH OR WITHOUT OECM

Treatment	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Treatment 1	29.67^{a}	29.33^{a}	29.22^{a}	30.33^{a}	30.56^{a}	29.56^{b}	29.78^{b}
Treatment 2	30.11^{a}	29.22^{a}	29.78^{a}	30.89^{a}	30.78^{a}	30.44^{a}	30.67^{a}
Treatment 3	30.00^{a}	29.89^{a}	30.11^{a}	30.22^{a}	30.56^{a}	30.22^{a}	31.00^{a}
Treatment 4	29.67^{a}	29.22^{a}	29.89^{a}	30.67^{a}	30.44^{a}	29.89^{ab}	30.56^{a}
p-value	0.337	0.27	0.067	0.112	0.614	0.013*	0.003*

*Note: *significant at 5% level*
Means with the common letters are not significantly different

TABLE 2 (b)
COMPARATIVE TEMPERATURE OF COW-BASED MANURE COMPOST WITH OR WITHOUT OECM

Treatment	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Treatment 1	30.33^{a}	29.67^{b}	28.33^{b}	28.67^{b}	29.00^{b}	29.17^{b}	28.83^{c}
Treatment 2	30.83^{a}	31.00^{a}	31.00^{a}	30.17^{a}	31.00^{a}	30.33^{a}	30.00^{a}
Treatment 3	30.67^{a}	30.83^{a}	30.50^{a}	30.00^{a}	30.50^{a}	30.67^{a}	30.50^{a}
Treatment 4	30.67^{a}	30.83^{a}	30.83a	30.17^{a}	31.00^{a}	30.67^{a}	30.50^{a}
p-value	0.614	<0.001*	<0.001*	0.002*	<0.001*	0.004*	<0.001*

*Note: *significant at 5% level*
Means with the common letters are not significantly different

The data results showed that there was no significant difference between T2, T3, and T4, whereas T1 was significantly different from T2, T3, and T4. Moreover, temperatures in compost piles range from 29 to 30 °C at the initial phase of composting. The mean temperature recorded after 14 days of composting ranged from a minimum of 28 °C for T1 (50 kg cow manure + 60 kg fly ash) to a maximum temperature of 31 °C. For T2 (50 kg cow manure + 60 kg fly ash + 350 grams OECM), 29 °C to 31 °C; the same for T3 (50 kg cow manure + 60 kg fly ash + 400 grams OECM) and T4 (50 kg cow manure + 60 kg fly ash + 450 grams OECM) (Table 2a-b).

According to Smith et al. (2017), the increase in heat during composting is a byproduct of bacterial replication in compost. The compost grows hot when there is a lot of bacterial activity. However, throughout the composting period, all experimentally treated piles were unable to attain the three temperature phases required for effective sanitization (CCME 2005; Eusufzai et al. 2013) of the feedstock and process efficiency: the mesophilic phase, where temperatures are between 15 and 45 °C; the thermophilic phase, with temperatures between 45 and 70 °C; and the cooling phase, when the pile temperatures drop below 60 °C. The study results showed that T1, T2, T3, and T4 failed to satisfy these criteria. The nitrogen source in this experiment was confined to cow manure. Compost nitrogen sources boost bacterial growth and cell yields. (Adnan, A., & Chai, J. M. 2018). Furthermore, the manure utilized in the study was gathered from a continuous pile that was exposed to direct sunlight and rainfall, which could have influenced the macronutrients present in the manure. The lack of nitrogen in the pile inhibits microbial activity throughout composting days, resulting in a constant temperature ranging from 28 to 32 °C.

3.2 Compost pH:

(Table 3a-b) shows the 14 days pH mean values gathered during the 14 days composting from T1 (50 kg cow manure + 60 kg fly ash), T2 (50 kg cow manure + 60 kg fly ash + 350 grams OECM), T3 (50 kg cow manure + 60 kg fly ash + 400 grams OECM), and T4 (50 kg cow manure + 60 kg fly ash + 450 grams OECM).

TABLE 3 (a)
COMPARATIVE pH OF COW-BASED MANURE COMPOST WITH OR WITHOUT OECM

Treatment	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Treatment 1	5.99^{b}	5.31^{b}	5.00^{b}	5.93^{a}	5.53^{a}	5.37^{a}	5.39^{b}
Treatment 2	6.31^{a}	6.37^{a}	5.40^{a}	5.60^{b}	5.46^{a}	5.56^{a}	5.51^{ab}
Treatment 3	5.70^{c}	6.07^{a}	5.18^{ab}	5.59^{b}	5.30^{a}	5.52^{a}	5.63^{a}
Treatment 4	5.48^{d}	6.33^{a}	5.27^{ab}	5.51^{b}	5.36^{a}	5.46^{a}	5.37^{b}
p-value	<0.001*	<0.001*	0.042*	0.010*	0.438	0.157	0.003*

*Note: *significant at 5% level*

Means with the common letters are not significantly different

TABLE 3 (b)
COMPARATIVE pH OF COW-BASED MANURE COMPOST WITH OR WITHOUT OECM

Treatment	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Treatment 1	5.30^{a}	5.45^{a}	5.22^{b}	5.08^{b}	4.95^{b}	5.30^{b}	5.22
Treatment 2	5.42^{a}	5.62^{a}	5.97^{a}	5.85^{a}	5.73^{a}	5.77^{a}	5.68
Treatment 3	5.30^{a}	5.70^{a}	5.90^{a}	5.72^{a}	5.90^{a}	5.55^{ab}	5.78
Treatment 4	5.40^{a}	5.48^{a}	5.87^{a}	5.62^{a}	5.73^{a}	5.70^{a}	5.73
p-value	0.521	0.313	0.006*	0.003*	<0.001*	0.007*	<0.001*

*Note: *significant at 5% level*

Means with the common letters are not significantly different

pH of compost piles ranges from 5.48 to 6.31 at the initial phase of composting. The mean pH values recorded after 14 days of composting ranged from 4.95 to 5.99 for T1, 5.4 to 6.37 for T2, 5.18 to 6.07 for T3, and 5.27 to 6.33 for T4. During 14 days of composting, the mean pH values recorded on T2, T3, and T4 were not significantly different, whereas T1 was significantly different to T2, T3, and T4.

Moreover, the final pH value gathered from different compost piles was 5.22 for T1, 5.68 for T2, 5.78 for T3, and 5.73 for T4. Based on the categories provided by the United States Department of Agricultural National Resources Conservation Service, T2, T3, and T4 pH values fall under moderate acidic (5.6–6.0), whereas T1 pH value were included as strongly acidic (5.1–5.5) (Burt, 2014). Beck-Friis et al. (2001) noted that the transition from mesophilic to thermophilic conditions correlated with a change in pH from acidic (pH = 4.5–5.5) to alkaline (pH = 8–9); however, none of the experimental plots in this study reached the thermophilic phase (45–70 °C) (Papale et al. 2021). The constant temperature (29–31 °C) throughout composting resulted in stable pH levels ranging from 4.95–6.37 from days 1–14. In accordance with Bunt (1988), the final pH values recorded from all experimental piles (Table 3b) were within the ideal range for growing media, which is between 5.2 and 7.3.

3.3 Harvest Recovery:

Harvest recovery is measured to differentiate the influence of compost additive to the mass of different compost treatments used in the study. Higher values in the provided data below means greater weight loss (Table 4).

TABLE 4
COMPARATIVE WEIGHT LOSS OF COMPOST WITH OR WITHOUT COMPOST ADDITIVE (%)

Treatment	Weight Loss
Treatment 1	30.303^{c}
Treatment 2	41.212^{b}
Treatment 3	43.939^{ab}
Treatment 4	44.848^{a}
p-value	<0.001*

*Note: *significant at 5% level*

Means with the common letters are not significantly different

**The weight of OECM in the treated plot was not included in the initial weight*

(Table 4) shows that there was a significant difference (p-<0.01) between T1 (control), T2, T3, and T4. The data results show that T1 was significantly different from T2, T3, and T4; T2 was not significantly different from T3 but significantly different from T1 and T4; T3 was not significantly different from T4 and T2 but significantly different from T1; and T4 was not significantly different from T3 but significantly different from T1. Among all the treatments, T1 had the lowest weight loss at 30.303, followed by T2 at 41.212, T3 at 43.939, and T4 had the highest weight loss recorded after the 14-day composting. In accordance with the study of (Breitenbeck and Schellinger, 2013; Tiquia et al., 2002; Van Lier et al., 1994), all experimentally treated piles in the study lost 10 to 50% of their initial weight (Table 4).

3.4 Odor, Color, and Texture:

Physical properties of compost, such as odor, color, and texture, are widely used as indicators to assess if the compost is mature enough and ready to harvest. During the 14-day composting period, the odor, color, and texture parameters were evaluated and recorded to determine the extent to which different compost treatments will degrade.

TABLE 5 (a)
DAILY PHYSICAL PARAMETERS OF COW-BASED MANURE WITHOUT OECM

Day	Treatment 1		
	Texture	Color	Odor
1	Coarse	Black	Slightly Offensive
2	Coarse	Black	Slightly Offensive
3	Coarse	Black	Slightly Offensive
4	Coarse	Black	Slightly Offensive
5	Coarse	Black	Slightly Offensive
6	Coarse	Black	Slightly Offensive
7	Coarse	Black	Slightly Offensive
8	Coarse	Black	Slightly Offensive
9	Coarse	Black	Slightly Offensive
10	Coarse	Black	Slightly Offensive
11	Coarse	Black	Slightly Offensive
12	Coarse	Black	Slightly Offensive
13	Coarse	Black	Slightly Offensive
14	Coarse	Black	Slightly Offensive

Table 5a shows that from day 1 to day 14, the texture of the cow-based manure compost appeared to be coarse, black in color, and had a slightly odor. There were no changes observed in treatment 1 physical parameters during 14 days of composting.

TABLE 5 (b)
DAILY PHYSICAL PARAMETERS OF COW-BASED MANURE WITH 350 GRAMS OECM

Day	Treatment 2		
	Texture	Color	Odor
1	Coarse	Black	Slightly Offensive
2	Coarse	Black	Slightly Offensive
3	Coarse	Black	Slightly Offensive
4	Coarse	Black	Slightly Offensive
5	Coarse	Black	Slightly Offensive
6	Coarse	Black	Slightly Offensive
7	Coarse	Black	Slightly Offensive
8	Slightly coarse	Black	Slightly Offensive
9	Slightly coarse	Black	Slightly Offensive
10	Slightly coarse	Brown	Odorless
11	Slightly coarse	Brown	Odorless
12	Slightly coarse	Brown	Odorless
13	Fine	Brown	Odorless
14	Fine	Brown	Odorless

Table 5b shows that from day 1 to day 7, the texture of the cow-based manure compost appeared to be coarse; on days 8 to 12, it was slightly coarse, then appeared to be fine on days 13 to 14. The color on days 1–9 was black and became brown on days 10–14. Further, the odor of the compost from day 1 to day 9 was slightly offensive, and on day 10 of composting, it became odorless. The result showed that the compost was ready to be used after 14 days of composting.

TABLE 5 (c)
DAILY PHYSICAL PARAMETERS OF COW-BASED MANURE WITH 400 GRAMS OECM

Days	Treatment 3		
	Texture	Color	Odor
1	Coarse	Black	Slightly Offensive
2	Coarse	Black	Slightly Offensive
3	Coarse	Black	Slightly Offensive
4	Coarse	Black	Slightly Offensive
5	Coarse	Black	Slightly Offensive
6	Coarse	Black	Slightly Offensive
7	Coarse	Black	Slightly Offensive
8	Slightly coarse	Black	Slightly Offensive
9	Slightly coarse	Black	Slightly Offensive
10	Slightly coarse	Brown	Odorless
11	Slightly coarse	Brown	Odorless
12	Slightly coarse	Brown	Odorless
13	Fine	Brown	Odorless
14	Fine	Brown	Odorless

Table 5c shows that from day 1 to day 7, the texture of the cow-based manure compost appeared to be coarse; on days 8 to 12, it was slightly coarse, then appeared to be fine on days 13 to 14. The color on days 1–9 was black and became brown on days 10–14. Further, the odor of the compost from day 1 to day 9 was slightly offensive, and on day 10 of composting, it became odorless. The result showed that the compost was ready to be used after 14 days of composting.

TABLE 5 (d)
DAILY PHYSICAL PARAMETERS OF COW-BASED MANURE WITH 450 GRAMS OECM

Days	Treatment 4		
	Texture	Color	Odor
1	Coarse	Black	Slightly Offensive
2	Coarse	Black	Slightly Offensive
3	Coarse	Black	Slightly Offensive
4	Coarse	Black	Slightly Offensive
5	Coarse	Black	Slightly Offensive
6	Coarse	Black	Slightly Offensive
7	Coarse	Black	Slightly Offensive
8	Slightly coarse	Black	Slightly Offensive
9	Slightly coarse	Black	Slightly Offensive
10	Slightly coarse	Brown	Odorless
11	Slightly coarse	Brown	Odorless
12	Slightly coarse	Brown	Odorless
13	Fine	Brown	Odorless
14	Fine	Brown	Odorless

Table 5d shows that from day 1 to day 7, the texture of the cow-based manure compost appeared to be coarse; on days 8 to 12, it was slightly coarse, then appeared to be fine on days 13 to 14. The color on days 1–9 was black and became brown on days 10–14. Further, the odor of the compost from day 1 to day 9 was slightly offensive, and on day 10 of composting, it became odorless. The result showed that the compost was ready to be used after 14 days of composting.

In general, tables 5a–d showed that there was no significant variation in physical parameters (odor, color, and texture) observed over 14 days of composting between treatments 2, 3, and 4, however T1 was found to be different throughout all the treatments treated with OECM. The final form of compost does not resemble the original form because it has been destroyed due to natural decomposition by microorganisms that live in the compost. *Thiobacillus thiooxidans* and *Thiobacillus ferrooxidans* microbes eliminated the slightly offensive odor in the piles. Furthermore, as described by Ayunin et al. (2016), characteristics of compost with inclusion rates of 350 grams, 400 grams, and 450 grams of OECM in this study display signs of maturation after only 13–14 days of composting, having a brown color, no foul odor, and a fine texture (Table 5a–d).

3.5 Germination Rate:

Germination Rate is measured to differentiate the effectiveness of cow manure-based compost on pechay germination, further, to showcase which among experimental treatments will stand out. Higher values for this measure indicate a greater rate of germination.

TABLE 6
GERMINATION RATES OF DIFFERENT COMPOST TREATMENTS (%)

Treatment	Germination
Treatment 1	28.333^{b}
Treatment 2	65.667^{a}
Treatment 3	77.667^{a}
Treatment 4	62.333^{a}
p-value	<0.001*

*Note: *significant at 5% level*
Means with the common letters are not significantly different

(Table 6) shows that there was a significant difference (p-<0.01) between T1 (control), T2, T3, and T4. T1 had the lowest germination rate having 28.333, followed by T4 62.333, T2 65.667 and T3, which get the highest germination rate among all the treatments having 77.667. (Table 6) revealed that there was no significant difference between T2, T3, and T4, whereas T1 is significantly different to T2, T3 and T4.

Germination rate has been widely used to assess, phytotoxicity and maturity of compost (Luo et al., 2018). The study by Kim et al. (2005) shows that adding 0.05% of microbial inoculants enhances the pig liquid fertilizer (PLF) and increases the germination index of Chinese cabbage. The study findings also indicated that aerobic processing of PLF for 107 days was superior to anoxic processing and produced more macronutrient fertilizer material such as nitrogen, potassium, and phosphorus. Furthermore, Sace (2018) stated that if the pH was too high (alkaline) or too low (acidic) the plants cannot absorb the nutrients properly that would show signs of deficiencies. As shown in (Table 3b), the final pH level recorded from T2, T3, and T4 satisfied the ideal pH level needed by pechay plant around 5.4 to 6.7 (Balce1 et al. 2016) that results in a higher germination rate in compared to T1 (control).

IV. SUMMARY

The aim of the study was to evaluate the effects of different inclusion rates of compost additive (OECM) in cow manure-based composts and how this compost will affect the germination rate of pechay. Specifically, the main objectives of the study were to (a) determine the odor, color, texture, temperature, pH, and moisture of the various compost treatments; (b) determine the harvest recovery of the various compost treatments; and (c) determine the germination rate of pechay seeds from the various compost media. 4 different treatments were used in the study: T1 (control) having 50 kg of cow manure and 60 kg of fly ash; T2 (50 kg of cow manure + 60 kg of fly ash + 350 grams OECM); T3 (50 kg of cow manure and 60 kg of fly ash + 400 grams OECM); and T4 (50 kg of cow manure and 60 kg of fly ash + 450 grams OECM). The study was conducted for 21 days: 14 days for composting and 7 days for pechay germination.

V. FINDINGS

There was a significant difference (p. <0.001) in pH level. T2, T3, and T4 were not significantly different, having a final pH of 5.68 for T2, 5.78 for T3, and 5.73 for T4. Furthermore, T1 had the lowest pH level. The recorded mean pH value for T1 (5.22) makes it significantly different from T2, T3, and T4.

There was a significant difference (p. <0.001) in harvest recovery: T1 got 30.303 weight loss, followed by T2 at 41.212, T3 at 43.939, and T4 at 44.848. Based on statistical analysis, treatments 2, 3, and 4 were not significantly different, whereas T1 recorded harvest recovery mean value was significantly different from T2, T3, and T4.

There was a significant (p. <0.01) difference in the germination rate between T1 (control), T2, T3, and T4. T1 had the lowest germination rate at 28.333, followed by T4 at 62.333, T2 at 65.667, and T3 at 77.667. Based on statistical analysis, treatments 2, 3, and 4 were not significantly different, whereas T1 recorded germination rate mean value was significantly different from T2, T3, and T4.

On physical parameters such as odor, color, texture, and moisture, all piles treated with OECM had the same outcome and decomposed on days 13–14 of composting.

In general, the study findings showed that all compost plots with inclusion rates of 350 grams, 400 grams, and 450 grams of OECM were not significantly different from all compost parameters used in the study. Moreover, all piles treated with OECM were significantly different from treatment 1 (control).

VI. CONCLUSION

- The temperature of the compost with OECM inclusion rates of 350 grams, 400 grams, and 450 grams were significantly different over the control.
- The pH of the compost with OECM inclusion rates of 350 grams, 400 grams, and 450 grams were significantly different over the control.
- The harvest recovery of the compost with OECM values rates of 350 grams, 400 grams, and 450 grams were significantly different over the control.
- The germination rate of the compost with OECM values rates of 350 grams, 400 grams, and 450 grams were significantly different over the control.

VII. RECOMMENDATION

Based on the findings of this study, all the OECM inclusion rates were significantly different over the control indicating the necessity of compost additive to improve germination rate and harvest recovery.

Considering the economics of the utilization of the OECM, a lower inclusion rate can thus be recommended to lower the production cost of the compost. Furthermore, in future investigation, other compost parameters namely; heavy metals, porosity, NPK, and C:N ratio can be included.

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