VERMICOMPOST: ITS PHYSICO-CHEMICAL PROPERTIES AND EFFECTS ON SWEET CORN *(Zea mays convar. saccharata*

Rhea Mae Domingo Diolata[1]

[1] *OJT Coordinator, CFCST- Antipas Extension Unit, Doroluman, Arakan, Cotabato, Philippines*

ABSTRACT

This study was conducted from June 29, 2023 to September 12, 2023 at Diolata's Farmlot in Barangay Camasi, Pres. Roxas, Cotabato to evaluate the physico-chemical properties of vermicompost and its effects on sweet corn, evaluate the physico-chemical properties of vermicompost and its effects on sweet corn production. Furthermore, analyze the cost and return of sweet corn production after 75 days from sowing. The researcher set up the experiment using a Randomized Complete Block Design with six treatments and four replications of each treatment. The treatments were RiBaChi, RiBaGo, CoBaChi, CoBaGo, and inorganic fertilizer. All the sweet corn plants survived. The analysis showed significant differences between the treatments with different vermicompost substrates. The sweet corn plants treated with inorganic fertilizer grew the tallest (80.33 cm), had the earliest tassels (47.25 days), earliest silks (49.25 days), longest ears (25.15 cm), highest marketable yield (22,786 kg/ha), and highest total yield (32,098 kg/ha). Among the vermicompost treatments, RiBaChi produced the most ears per plant. The inorganic fertilizer treatment gave the highest profit of ₱145,101 pesos or a 239% return on investment after 75 days. However, the RiBaChi vermicompost treatment also gave a good net profit of ₱139,594 pesos or a 150% return on investment. Therefore, if farmers cannot afford inorganic fertilizers, it is recommended to use RiBaChi or CoBaChi vermicompost instead. These are environmentally-friendly and cost-effective, with RiBaChi giving a net profit of 150% after 75 days from sowing.

Keyword: - *Vermicompost, physico-chemical properties, and sweet corn.*

---

1. INTRODUCTION

Vermicomposting is a cost-effective, environmentally friendly, and sustainable alternative to chemical methods, offering an effective way to produce organic agricultural products without harming soil and human health (Adhikary, 2012). Sweet corn, a vegetable rich in carbohydrates and nutrients, is primarily grown for human consumption especially in the Philippines. The remaining stover is utilized for animal feed and other purposes.

The quality of vermicompost is heavily influenced by the nature and characteristics of the feedstock materials used. Many waste materials have been successfully used for vermicomposting, including animal wastes (Raza et al., 2022; Hussain & Abbasi, 2018; Jayakumar et al. 2011;), sewage sludge (Hu et al., 2021; Hait & Tare, 2011), paper industry waste (Quintern, 2014), plant residues (Morales-Corts et al., 2014), human feces (Yadav et al., 2010), and food industry wastes (Kostecka et al.,2018; Pączka & Kostecka, 2013). The quality of vermicompost is mostly dependent on the types of raw materials utilized and the species of earthworm (Jafarpour et al., 2017).

With a growing population and livestock industry, the demand for sweet corn in local markets is expected to increase (Ambos et al., 2017). Sweet corn cultivation demands significant nutrients, which could cause soil degradation and yield reduction over time. Using vermicomposting offers a solution by providing nutrients and improving soil structure (Oyege & Balaji Bhaskar, 2023). Although feedstock materials influence vermicompost quality and effectiveness as a fertilizer, further research is needed to evaluate using locally available materials as substrates (Diny et al., 2022).

As a result, the researcher had conducted this study with the aim of producing low-cost fertilizer, in the form of vermicomposts, for sweet corn cultivation using locally available substrates such as rice straw, banana pseudostem, chicken, and goat manure.

This study was conducted to evaluate the physico-chemical properties of vermicompost from the different substrates and further determine its effect on sweet corns *(Zea mays convar. saccharata).*

Specifically, this study aimed to:

1. determine the physico-chemical properties of vermicompost;
2. determine the effect of vermicompost substrates on the growth and yield of sweet corns in terms of survival rate, plant height, number of days to tassel, number of days silking, number of ears per plant, length of ears, marketable and non-marketable yield, and total yield;
3. record the pest and disease occurrence on sweet corns as applied with vermicompost; and,
4. analyze the cost and return of sweet corn production as applied with vermicompost.

2. METHODOLOGY

Research Design

The study used Randomized Complete Block Design (RCBD) with six (6) treatments and replicated four (4) times. Treatments were as follows:

T_0 - Control

T_1 - RiBaChi (50% Rice straw+20% Banana Pseudostem: 30% Chicken manure)

T_2 - RiBaGo (50% Rice straw+20% Banana Pseudostem: 30% Goat manure)

T_3 - CoBaChi (50% Rice straw+20% Banana Pseudostem: 30% Chicken manure)

T_4 - CoBaGo (50% Rice straw+20% Banana Pseudostem: 30% Goat manure)

T_5 - Inorganic Fertilizer

Materials

This study used the following materials and equipment such as: sweet corn seeds (Macho F1), African Night Crawler (ANC) earthworms, coco coir, rice straw, chicken manure, goat manure, inorganic fertilizer, banana pseudostem, plow, harrow, vermibed, plastic container, shovel, knapsack sprayer, meter stick, bamboo, bolo, orchid net, pen, record book, calculator, twine, knife, scissor and plastic bag.

Time and Place of the Study

The researcher conducted the experiment at Camasi, President Roxas, Cotabato from June 29, 2023 to September 12, 2023 as shown in figure 2. Camasi is situated at approximately 7.2129, 125.0831, located in the municipality of President Roxas, Cotabato Province, Mindanao, Philippines.

Methods

Field Lay-out

The experimental field followed a Randomized Complete Block Design with four blocks in a 20m x 15m area. Each block had 0.5m alleys separating it into six plots of 1m x 4m size, with specific treatments randomly assigned to each plot, as shown in Figure 3.

Field Lay-out in Randomized Complete Block Design (RCBD)

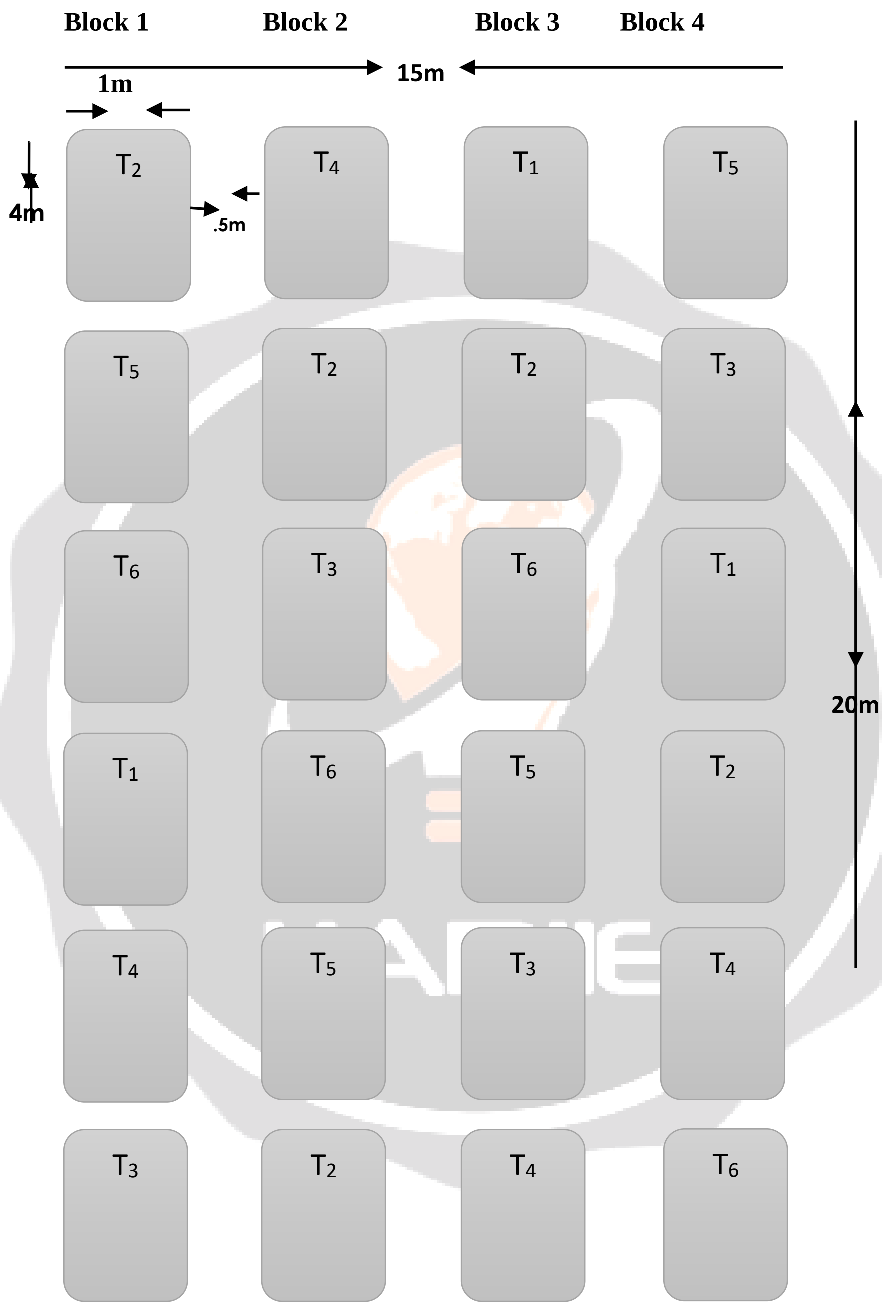

Figure. 3 Field lay- out of the study

Experimental Process

Preparation of Vermibed and Procurement of Materials

The researcher constructed a concrete vermibed in 1 x 5 x 0.5 meters. Then, the researcher collected the rice straw, coco coir, banana pseudostem, chicken and goat manures within the locality, while the African night crawler earthworms were procured at Lenkoy's farm, President Roxas, Cotabato.

Preparation of Substrates

The researcher gathered agricultural wastes like banana plant stems, rice straw, coconut husk, and animal manure (chicken and goat) from around the experimental area. The researcher then chopped the banana stems into smaller pieces to help them break down faster by allowing more air and microbes to get into the material. After that, the researcher let the chicken and goat manure dry in the air before mixing it with the coconut husk and rice straw according to the specific ratios needed for each treatment.

Although earthworms can digest a wide range of organic materials and produce high-quality vermicompost, it was preferred to feed worms with pre-decomposed organic waste for faster action and compost creation. Worms thrived on pre-decomposed garbage. To accomplish this, the researcher have placed the mixture in plastic sacks and pre-decomposed in the shade for 15 days (Manaig et al., 2016). Finally, the substrates were agitated and air-dried for one day after 15 days of pre-decomposting to dissipate heat.

Vermicomposting Process

Following the procedures outlined by Guerrero (2010), the researcher set up the vermicompost by involving the careful insertion of a substrate mixture weighing 100 kg (according to treatments) into vermiboxes measuring 1m x 5m x 0.5 meters. Then, the researcher moistened the substrate by spraying it with water. Each box was populated with 1.5 kilograms of African night crawlers (Eudrilus eugeniae) at a ratio of 1.5 kilograms per 100 kilograms of substrate. To maintain optimal conditions, the researcher had regularly sprayed the combined substrates with water to prevent drying, ensuring a moisture level of around 60-70 percent. After one month, the worms were extracted from the substrates, and the resulting vermicompost were gathered using a sieving procedure that separated any undecomposed material using an orchid net. Finally, the researcher had air-dried the vermicompost at room temperature for three days before being packed ready for use.

Care and maintenance of Beds

The researcher regularly watered the bed to maintain the pile's moisture content, ensuring watering at least twice a week, and cleaned periodically the surroundings. Moreover, the researcher employed the use of nets to enclose the area, preventing the presence of natural enemies of earthworms such as chickens, birds, lizards, toads, beetles, centipedes, and more.

Nutrient Analysis of Vermicompost

After applying the treatments, the researcher randomly collected 1 kg surface sample of vermicompost, air-dried at a room temperature, carefully packed, labeled, and subsequently sent to the Regional Soils Laboratory Department of Agriculture, Davao Region for Physico-chemical analysis.

Pre-planting Soil Physico-chemical Analysis

The researcher randomly collected the soil samples at a depth of 20 cm from the experimental area, following a zigzag direction, before land preparation. Then, the researcher air-dried the samples at room temperature, passed through a 2 mm sieve, and then sent to the Regional Soils Laboratory Department of Agriculture, Davao Region for analysis.

Land Preparation

To get the soil ready for planting, the researcher first cleared an area of 300 square meters by plowing it twice and then harrowing it once. After that, the researcher divided the cleared area into four equal blocks. Each block was then split into six smaller plots. This layout allowed the researcher to assign different treatments to each plot within the blocks. Doing it this way helps make sure the experiment is set up properly and the results are accurate.

Application of Treatments

Two weeks before planting, the researcher put 8 kilograms of vermicompost in each plot, based on the assigned treatments. To make sure the right amount goes into each planting hole, the researcher divided the 8 kg of vermicompost into 30 equal parts. This means around 266 grams of vermicompost were placed in each planting hole.

Sowing

The researcher sowed two (2) to three (3) seeds at a distance of 30 cm between rows and 25 cm between hills. Each plot was planted with sixty plants, out of which thirty plants per plot were randomly tagged as sample plants (Corn Techno Guide, 2012).

Thinning

The researcher pulled out the excess seedlings, leaving only two seedlings per hill, seven days after planting, to remove undesirable seedlings and alleviate overcrowding. This action allowed better penetration of sunlight, facilitated proper aeration, and minimized nutrient competition.

Care and Management

The researcher immediately initiated care and management practices right after sowing and continued until harvest. The weed population was closely monitored to prevent potential nutrient competition. On the other hand, the pests and diseases were closely monitored and recorded at day's interval from the seeds were germinated up to the harvesting time. Moreover, watering was done when necessary to ensure that the crop received sufficient water.

Tagging of Data Plants

The researcher randomly selected 15 sample plants from data rows in each experimental plot. Then, the sheet of the white plastic folder was stapled to each data plant to serve as a marker and guide during data collection.

Harvesting

The researcher manually harvested the sweet corns at the dough stage, which occurred 75 days after planting (DAP).

Post-Plant Soil Sampling Analysis

The researcher collected the soil samples in the experimental area upon the termination of this study. There were air dried and sent to the Regional Soils Laboratory Department of Agriculture, Davao Region for the analysis of macronutrients (N-P-K)

Data Gathered

The researcher collected and analyzed data on pre-plant soil properties, survival rate, plant height, days to tasseling/silking, ears per plant, ear length/circumference, corn weight, marketable/non-marketable yield, total yield, return on investment, pest/disease incidence, and post-plant soil properties. Statistical Tool for Agricultural Research (STAR) was used to analyze the data, employing the Least Significant Difference (LSD) test to determine significant treatment differences.

Pre-Plant Soil Physico-Chemical Properties. The researcher determined the soil texture, pH, organic matter, macronutrients, and micronutrients by sending the vermicompost samples to the Regional Soils Laboratory, Department of Agriculture, Davao Region.

Physico-chemical Properties. The researcher collected the vermicompost samples, air-dried, and then sent to the Regional Soils Laboratory Department of Agriculture Davao Region for the Physico-chemical analysis. The data gathered were as follows:

1. Physical Properties such as:
    a. Texture
    b. Color

2. Chemical Properties such as:
    a. pH
    b. OM Content
    c. Macro Nutrients (%)
    d. Micro Nutrients (%)

Survival Rate (%). The researcher counted and recorded the survived plants upon the termination of the study and determined the survival rate using the formula below:

$$\text{Survival Rate (\%)} = \frac{\text{No. of Plant Survived}}{\text{Total no. of plants}} \times 100$$

Plant Height (cm). The researcher tagged and determined the plant height of every sample plant by measuring its base up to the shoot tip, excluding the tassel, upon the termination of the study.

Number of Days to Tasseling. The researcher counted and recorded the days from sowing up to the first appearance of the tassel for the sample plants.

Number of Days to Silking. The researcher counted and recorded the days of the sample plants from sowing up to the first emergence of silk.

Number of Ears per Plant. The researcher counted and recorded the developed ears per plant from 30 sample plants per treatment.

Length of Ears (cm). The researcher determined the length of ears of every sample plant by measuring its base to the tip using a tape measure during harvest, as shown in Figure 6.

Figure. 6. Length of Ears

Circumference of Ears (cm). The researcher determined the ear circumference of each sample plant by measuring it across its length using a tape measure during harvest.

Weight of corn ears. The researcher identified such weight by weighing the corn ears per treatment in kilogram (kg) during harvest.

Marketable Yield (kg). The researcher identified the marketable yield by weighing the sweet corns that have no defects and damages during harvest.

Non-marketable Yield (kg). The researcher identified the non-marketable yield by weighing the sweet corns that has defects and damages during harvest.

Total Yield (kg). The researcher added the weight of the marketable to the non-marketable yield during harvest in identification of the total yield.

Return of Investment (%). The researcher recorded all the expenses incurred in the study and computed the return on investment (ROI) using the formula below:

$$ROI (\%) = \frac{\text{Gross sales} - \text{Total expenses}}{\text{Total expenses}} \times 100$$

Incidence of Insect Pests and Diseases. The researcher evaluated the incidence of insect pests and diseases on a per plot basis using the following scale by Ocbus (2012):

Rating Scale	Description
1	No disease (No plant infested)
2	Slight incidence (1-19% of plant is infested per plot)
3	Moderate incidence (20-39% of plant is infested per plot)
4	Severe incidence (40% or more of the plants is infested per plot)

Post- Plant Soil Physico-chemical Properties. The researcher sent the soil samples to the Regional Soils Laboratory Department of Agriculture Davao Region to determine the soil texture, pH, organic matter, macro and micronutrients.

Statistical Treatment and Analysis

The researcher analyzed the data using the Statistical Tool for Agricultural Research (STAR). Furthermore, the Least Significant Difference (LSD) test was used to determine the significant differences among treatments (IRRI, 2013).

3. RESULTS AND DISCUSSION

This study investigated the effects of different vermicompost substrates on the growth, yield, and profitability of sweet corn production compared to inorganic fertilizer and a control treatment. The researcher evaluated various parameters, including plant height, days to tasseling and silking, number of ears, ear length and circumference, marketable and non-marketable yield, total yield, pest and disease incidence, and return on investment. The vermicompost substrates consisted of combinations of rice straw, banana pseudostem, coco coir, chicken manure, and goat manure. The analysis involved examining the physico-chemical properties of the vermicompost substrates, as well as pre-plant and post-plant soil analyses.

Physico-Chemical Properties of Soil and Vermicompost Substrates

Pre-Plant Soil Physico-Chemical Analysis

Table 1 shows the result of the pre-plant soil physico-chemical analysis of the experimental area in Camasi, Pres. Roxas, Cotabato. The said area has a soil pH of 6.10, which is slightly acidic. It contains 2.46% organic matter, described as medium. The organic carbon is 1.43% and the potassium is 493.30 ppm, both described as very high. Lastly, the phosphorus is 5.81ppm, which is very low.

The slightly acidic pH and medium organic matter content are generally favorable conditions for most crops. Additionally, the very high organic carbon level contributes to the soil's ability to retain moisture and nutrients effectively. However, the very low phosphorus level presents a significant concern. Phosphorus plays a crucial role in root development, flowering, and seed production in plants. Without adequate phosphorus, crop growth and yields may be severely limited. To address this deficiency, applying a phosphorus-rich fertilizer or incorporating organic matter high in phosphorus could help increase the soil's phosphorus levels to a more optimal range.

Moreover, the very high potassium level in the soil could potentially lead to nutrient imbalances or toxicity if left unchecked. Excessive potassium can interfere with the uptake of other essential nutrients by plants. Monitoring and managing the potassium levels through appropriate fertilization practices or soil amendments may be necessary to prevent any adverse effects on crop performance. In summary, while the soil conditions are favorable in some aspects, addressing the phosphorus deficiency and maintaining a proper nutrient balance, particularly with potassium, will be crucial for optimizing soil conditions and supporting healthy plant growth and maximum crop yields.

Table 1. Pre-Plant Soil Physico-Chemical Analysis Result. Regional Soils Laboratory, Department of Agriculture (DA) Region 11. 2024.

Soil Testing	Value	Interpretation
pH (1:1)	6.10	Slightly Acidic
OM (%)	2.46	Medium
OC (%)	1.43	Very High
P (ppm)	5.81	Very Low
K (ppm)	493.30	Very High

Legend:

Sli. A. – Slightly acidic
VL- very low
VH- Very High

Physical Analysis of Vermicompost Substrates

Table 2. Physical Analysis Result of Vermicompost Substrates. Munsell Soil Color Charts.2000

Treatment	Hue	Value	Chroma	Color Description	Texture
RiBaChi	7.5 YR	2.5	3	Very Dark Brown	Sandy Loam
RiBaGo	7.5 YR	2.5	2	Very Dark Brown	Sandy Loam
CoBaChi	2.5 YR	2.5	3	Dark Reddish Brown	Sandy Loam
CoBaGo	2.5 YR	2.5	3	Dark Reddish Brown	Sandy Loam

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

As shown in Table 2, the results of the physical analysis of vermicompost substrates are presented using the Munsell soil color charts. The Rice straw + Banana pseudo stem + Chicken manure has a hue of 7.5 YR, value of 2.5 and chroma of 3, described as very dark brown color and sandy loam texture. On the other hand, the Rice straw + Banana pseudo stem + Goat manure same hue and value with the chroma of 2, described as very dark brown color and sandy loam texture. Lastly, Coco coir + Banana pseudo stem + Chicken manure and Coco coir + Banana pseudo stem + Goat manure has a hue of 2.5 YR, value of 2.5, and a chroma of 3, described as very dark reddish brown color and sandy loam texture.

Physico-Chemical Properties of Vermicompost Substrates

As shown in Table 3, valuable insights into the chemical properties of different vermicompost substrates are provided. The highest nitrogen content was observed in RiBaGo with 1.01%, while the lowest nitrogen content was found in CoBaGo with 0.40%. RiBaChi exhibited the highest phosphorus content at 0.80%, while the lowest was recorded in CoBaGo with 0.19%. Regarding potassium content, RiBaChi showed the highest percentage at 0.83%, whereas RiBaGo had the lowest with 0.27%. The highest sodium content was found in RiBaChi at 0.06%, while the lowest was recorded in RiBaGo and CoBaGo with 0.01%. CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure) exhibited the highest calcium content, while CoBaGo had the lowest with 0.07%. Similarly, CoBaChi had the highest magnesium content at 0.21%, and CoBaGo had the lowest with 0.12%. The highest sulfur content was recorded in CoBaGo with 0.15%, while the lowest was in RiBaChi with 0.12%. CoBaGo exhibited the highest organic carbon content at 14.09%, while RiBaChi had the lowest with 10.28%. In terms of organic matter, CoBaGo had the highest percentage at 24.23%, while the lowest was recorded in RiBaChi with 17.68%. CoBaGo also exhibited the highest soil pH at 7.3, while CoBaChi had the lowest at 6.7.

In summary, the vermicompost substrates displayed variations in nutrient content. RiBaGo had the highest nitrogen content at 1.01%, while RiBaChi had the highest phosphorus content at 0.80%. In terms of potassium content, RiBaGo demonstrated the highest percentage at 0.83%. Furthermore, RiBaChi contained the highest sodium content at 0.06%. RiBaGo had the highest calcium content at 0.17%. Among the substrates, CoBaGo had the highest magnesium content at 0.21% and recorded the highest sulfur content at 0.19%. Finally, CoBaGo exhibited the highest organic carbon content at 14.09% and organic matter content at 24.23%. This implies that the choice of vermicompost substrate can significantly impact nutrient availability, soil fertility, and plant growth. Farmers or gardeners can utilize this information to select the most suitable substrate for their specific crop requirements and optimize their agricultural practices.

Table 3. Physico-Chemical Properties of Vermicompost Substrate. Regional Soils Laboratory, Department of Agriculture (DA) Region 11. 2024.

Description	Total N	P_2O_5	K_2O	Na	Ca	Mg	S	OC	OM	pH
RiBaChi	0.92	0.80	0.83	0.06	0.11	0.20	0.12	10.28	17.68	7.0
RiBaGo	1.01	0.31	0.27	0.01	0.17	0.16	0.14	10.76	18.51	7.1
CoBaChi	0.40	0.52	0.69	0.05	0.13	0.21	0.19	11.98	20.60	6.7
CoBaGo	0.64	0.19	0.40	0.01	0.07	0.12	0.15	14.09	24.23	7.3

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

This is in line with the study conducted by Jafarpour et al. (2017), which suggests that the quality of vermicompost is primarily influenced by the raw materials used and the species of earthworms involved. Additionally, rice straw is an inexpensive source of organic fertilizer with a high carbon-to-nitrogen ratio (Manaig, 2016). Furthermore, organic waste such as chicken manure is suitable as a vermicompost substrate due to its high concentration of macronutrients, including nitrogen, phosphorus, and potassium, which are essential for plant growth and development, as stated by Pujiastuti et al. (2018). Goat manure can also be utilized as a vermicompost substrate, as it contains both macro and micronutrients and organic acids that can enhance soil quality and support plant health. Additionally, the use of coco coir as a substrate can provide essential nutrients for plants and contribute to the overall fertility of the resulting vermicompost (Patil et al. 2017).

Post-Plant Soil Physico-Chemical Analysis

Table 4 presents the results of the post-plant soil physico-chemical analysis conducted in the experimental area located in Camasi, Pres. Roxas, Cotabato. The area was planted with sweet corn and treated with various vermicompost substrates. All vermicompost substrates have low nitrogen content ranging from 0.24 to 0.26% and an adequate amount of phosphorus ranging from 248.19 to 566.25 ppm. The soil pH for all substrates is moderately acidic, except for RiBaChi, which has a slightly acidic soil pH of 6.2.

Table 4. Post- Plant Soil Analysis of Sweet Corn as Affected by Different Vermicompost Substrates. Regional Soils Laboratory, Department of Agriculture (DA) Region 11. 2024.

Treatment	pH		N		P	
RiBaChi	6.2	Slightly Acidic	0.26	Low	566.25	Adequate
RiBaGo	5.6	Moderately Acidic	0.26	Low	248.19	Adequate
CoBaChi	5.6	Moderately Acidic	0.26	Low	503.61	Adequate
CoBaGo	5.6	Moderately Acidic	0.24	Low	340.87	Adequate

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Effect of Vermicompost in Sweet Corn Production

The following are the impact of vermicompost on sweet corn production in terms of growth, yield, disease occurrence and return on investment. Additionally, the results highlight the potential benefits of utilizing vermicompost as a sustainable and organic approach to enhance sweet corn production.

Survival Rate (%)

As depicted in Table 5, the results of the survival rate analysis for sweet corn plants treated with vermicompost are presented. The results revealed that 100% sweet corn plants have survived. This implies that all of sweet corn planted in the study were able to survive.

In relation to the result, experts say that for plants to grow and develop well, the temperature around them, the nutrients available in the soil, and the right amount of these nutrients (not too little or too much) are important (Grimblatt et al. 2019). Vermicompost is an excellent planting medium that can improve plant growth at different stages, from sprouting to fully grown (Ebrahimi et al. 2021). It is rich in plant growth hormones, enzymes that help plants, and beneficial microorganisms introduced by the earthworms. Using vermicompost instead of chemical fertilizers is a long-lasting and environmentally-friendly way to promote strong, healthy plant growth and survival (Rehman et al. 2023; Sinha et al. 2010).

Table 5. Survival Rate of Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres. Roxas, Cotabato, 2024.

Treatment	Mean
T_0- Control	100
T_1- RiBaChi	100
T_2- RiBaGo	100
T_3- CoBaChi	100
T_4- CoBaGo	100
T_5- Inorganic Fertilizer	100

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Plant Height (cm)

As presented in Table 6, the results of the plant height analysis for sweet corn plants treated with vermicompost substrates are displayed. The tallest plants, with a height of 280.33 cm, were obtained from the application of inorganic fertilizer. The analysis of variance indicated significant effects among the treatments. However, within the vermicompost substrates, CobaGo and RiBaChi significantly produced the tallest plants with a mean of 273.20 cm and 270.77 cm, respectively. Moreover, the substrates CobaGo and RiBaChi showed significant differences from the other vermicompost substrates. The results imply that CoBaGo and RiBaChi produced significantly taller plants among the vermicompost substrates, indicating their potential for enhancing plant height growth.

This result can be attributed to the vermicompost fertilizer analysis, which state that RiBaChi exhibited the highest phosphorus content of 0.80%, and also showed the highest potassium percentage of 0.83% with the second-highest nitrogen content of 0.92%. Furthermore, CoBaGo exhibited the highest organic carbon content of 14.09% and had the highest organic matter percentage of 24.23%, while ranking third-highest in nitrogen content of 0.64%, which can enhance the growth of sweet corn production in terms of plant height as shown in Appendix 2c. Thus, rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost, since the analysis of variance revealed a significant effect at 5% level.

The result aligns with the statement of Kakar et al. (2020) that the application of inorganic fertilizers contributes to the rapid growth of plants due to their readily water-soluble nutrients, ensuring an immediate and swift impact since these fertilizers contain a comprehensive array of essential nutrients readily available for plant uptake. Supporting the result of organic substrates such as CobaGo and RiBaChi produced the tallest plants, several researchers have highlighted some statements. Fernandez et al. (2010) noted that plant growth is highly stimulated by vermicompost; it contains nutrients and other essential nutrients like phosphorus and potassium. In particular, Mariotti et al. (2007) said that coco coir provides a favorable balance between air and water, higher re-wetting capacity, higher pH, and lower cation exchange capacity (CEC) compared to coco peat.

Moreover, Parmar et al. (2019) stated that banana pseudostem, when used in vermicomposting, seemed to be richer in NPK content than other substrates. In addition, Tilley (2018) stated that the application of goat manure in adequate amounts helps for the optimal growth of the plant that contains a higher level of nitrogen. The study proves that vermicompost serves as an excellent conditioner to improve soil texture and structure. It can hold much water and more nutrients.

Table 6. Plant Height of Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean
T_0- Control	200.22[d]
T_1- RiBaChi	270.77[b]
T_2- RiBaGo	256.90[c]
T_3- CoBaChi	245.22[c]
T_4- CoBaGo	273.20[b]
T_5- Inorganic Fertilizer	280.33[a]
F Value	**4.34***
CV	**2.014**

Means with the same letter are not significantly different at 0.05 LSD test
*- significant

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Number of Days to Tassel Formation

The impact of vermicompost on the number of days needed for tassel formation in sweet corn plants is depicted in Table 7. It was observed that the plants treated with inorganic fertilizer exhibited the earliest tassel formation with a mean of 47.25 days after sowing. The analysis of variance unveiled a significant distinction among the treatments in terms of the timing of tassel formation. Further analysis using the Least Significant Difference (LSD) test indicated that while the earliest tassel formation occurred in sweet corns treated with inorganic fertilizer, it was not significantly different from the sweet corns treated with any of the vermicompost substrates. This implies that both the inorganic fertilizer and vermicompost substrates resulted in significantly earlier tassel formation compared to untreated plants.

Based on the physico-chemical properties of vermicompost substrates as shown in Appendix 2c, RiBaGo exhibited the highest total nitrogen content of 1.01%, indicating its potential to provide better nitrogen nutrition to plants, which is crucial for vegetative growth, leaf development, and overall plant health. RiBaChi had the highest phosphorus content of 0.80%, suggesting its ability to promote root development, flowering, and fruiting in plants, as phosphorus is an essential macronutrient for plant growth and productivity.

Additionally, RiBaChi also had the highest potassium content of 0.83%, which can enhance plant vigor, disease resistance, and overall quality, as potassium plays a vital role in water regulation, enzyme activation, and nutrient translocation within plants. CoBaGo exhibited the highest organic carbon content of 14.09% and organic matter content of 24.23%, which improves soil structure, water-holding capacity, and nutrient retention, thereby promoting overall soil health and fertility.

Furthermore, CoBaGo had the highest pH value of 7.3, falling within the slightly alkaline range, which is generally suitable for most crops as it facilitates the availability of essential nutrients for plant uptake. The high nutrient content and organic matter levels observed in the vermicompost substrates, particularly RiBaChi, RiBaGo, and CoBaGo, suggest their potential to enhance plant growth, yield, and overall productivity by providing a balanced supply of essential nutrients and improving soil conditions, leading to better crop performance. This finding rejects the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost, since the analysis of variance revealed a significant effect at 5% level.

The increasing levels of inorganic fertilizers (NPK) result in earlier flowering (Dikir & Belete, 2017). As reported by Singh et al. (2015), inorganic fertilizers contain essential plant nutrients such as N, P, K, Ca, Fe, S, Mg, and micronutrients in a balanced amount, along with biofertilizers, which contribute to earlier flowering and fruiting. This finding is also supported by Adhikary's (2012) that vermicompost promotes excellent growth in vegetable crops, resulting in more flowers and fruit development.

Table 7. Number of Days to Tassel Formation of **Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.**

Treatment	Mean
T_0- Control	50.25^b
T_1- RiBaChi	48.75^b
T_2- RiBaGo	48.00^b
T_3- CoBaChi	48.75^b
T_4- CoBaGo	49.50^{ab}
T_5- Inorganic Fertilizer	47.25^a
F Value	**4.58***
CV	**1.909**

Means with the same letter are not significantly different at 0.05 LSD test
**- significant*

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Number of Days to Silking of Sweet Corns

As presented in Table 8 the result pertaining to the number of days required for silking formation in sweet corns, considering the influenced of vermicompost was observed that the plants treated with inorganic fertilizer exhibited the earliest silking with a mean of 49.25 days. The analysis of variance indicated a significant effect among the treatments in terms on the number of days required for silking formation. Further analysis using the Least Significant Difference (LSD) test revealed that inorganic fertilizer treatment, was not significantly different from the sweet corns treated with vermicompost.

This suggests that both the application of inorganic fertilizer and vermicompost substrates a significant impact on the timing of silk formation in sweet corn. This result can be attributed to the physico-chemical properties of the vermicompost substrates as shown in Appendix 2c, wherein, RiBaGo exhibited the highest total nitrogen content of 1.01%, indicating its potential to provide better nitrogen nutrition to plants, which is crucial for vegetative growth, leaf development, and overall plant health.

RiBaChi had the highest phosphorus content of 0.80%, suggesting its ability to promote root development, flowering, and fruiting in plants, as phosphorus is an essential macronutrient for plant growth and productivity.

Additionally, RiBaChi also had the highest potassium content of 0.83%, which can enhance plant vigor, disease resistance, and overall quality, as potassium plays a vital role in water regulation, enzyme activation, and nutrient translocation within plants. CoBaGo exhibited the highest organic carbon content of 14.09% and organic matter content of 24.23%, which improves soil structure, water-holding capacity, and nutrient retention, thereby promoting overall soil health and fertility.

Furthermore, CoBaGo had the highest pH value of 7.3, falling within the slightly alkaline range, which is generally suitable for most crops as it facilitates the availability of essential nutrients for plant uptake. The high nutrient content and organic matter levels observed in the vermicompost substrates, particularly RiBaChi, RiBaGo, and CoBaGo, suggest their potential to enhance plant growth, yield, and overall productivity by providing a balanced supply of essential nutrients and improving soil conditions, leading to better crop performance.

This implies that vermicompost has the potential to contribute to the promotion of flowering and fruiting in plants which rejects the null hypothesis that here is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost. Thus, rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost, since the analysis of variance revealed a significant effect at 5% level.

singh to Singh et al. (2015), inorganic fertilizer is a readily available source of essential plant nutrients that promotes earlier flowering and early silk formation. This finding aligns with the observations of Singh et al. (2015) who cited Arancon et al. (2006), suggesting that vermicompost, due to its ability to enhance microbial diversity and activity during the vermicomposting process, may act as a primary source of plant growth regulators resulting from interactions between microorganisms and earthworms. This implies that vermicompost has the potential to contribute to the promotion of flowering and fruiting in plants.

Furthermore, Adhikary (2012) emphasized the positive impact of vermicompost on the growth of vegetable crops, leading to enhanced fruit development.

The findings aligned with the study of Singh et al. (2015) that inorganic fertilizer is a readily available source of essential plant nutrients that promotes earlier flowering and early silk formation. This finding also conforms with the observations of Singh et al. (2015), suggesting that vermicompost, due to its ability to enhance microbial diversity and activity during the vermicomposting process, may act as a primary source of plant growth regulators resulting from interactions between microorganisms and earthworms. Furthermore, Adhikary (2012) emphasized the positive impact of vermicompost on the growth of vegetable crops, leading to enhanced fruit development. Lastly, Singh et al. (2020) highlighted the significant influence of vermicompost on crop fruiting, indicating its potential for improving yields.

Table 8. Number of Days to Silking of Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean
T_0- Control	53.75[b]
T_1- RiBaChi	50.25[a]
T_2- RiBaGo	50.50[a]
T_3- CoBaChi	49.75[a]
T_4- CoBaGo	50.50[a]
T_5- Inorganic Fertilizer	49.25[a]
F Value	**4.58***
CV	**1.912**

Means with the same letter are not significantly different at 0.05 LSD test

**- significant*

Legend:

- T_0 – Control
- T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
- T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
- T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
- T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
- T_5 – Inorganic Fertilizer

Number of Ears

Based on the data presented in Table 9, it was observed that the greatest number of ears were obtained from plants treated with RiBaChi, with a mean of 1.03, and CoBaChi, also with a mean of 1.03. The analysis of variance (ANOVA) showed a significant effect among the treatments in terms of the number of ears. The Least Significant Difference (LSD) further reveals that most ears were from sweet corn applied with RibaChi and CoBaChi but not significantly different from the sweet corns applied with CoBaGo. The result of the physico-chemical analysis of the vermicompost substrate implies that RiBaChi exhibited a high total nitrogen content of 0.92%, which enhanced vegetative growth, leaf development, and overall plant health.

It contained the highest phosphorus level of 0.80% among all substrates, promoting root development, flowering, and fruiting, as phosphorus is essential for plant growth and productivity. RiBaChi also had the highest potassium content of 0.83%, enhancing plant vigor, disease resistance, and overall quality. Potassium plays a crucial role in water regulation, enzyme activation, and nutrient translocation within plants. Furthermore, RiBaChi had an organic carbon content of 10.28% and an organic matter content of 17.68%, contributing to improved soil structure, water-holding capacity, and nutrient retention. Notably, its pH of 7.0 is within the neutral range, suitable for most crops and facilitating the availability of essential nutrients. On the other hand, CoBaChi had a lower total nitrogen content of 0.40% compared to RiBaChi, potentially limiting vegetative growth and plant health.

However, its phosphorus content of 0.52% is still a good source for promoting root development, flowering, and fruiting, although lower than RiBaChi's. CoBaChi had a potassium content of 0.69%, contributing to improved plant vigor, disease resistance, and overall quality, though lower than RiBaChi's. Significantly, CoBaChi had higher organic carbon (11.98%) and organic matter (20.60%) content than RiBaChi, improving soil structure, water-holding capacity, and nutrient retention, promoting overall soil health and fertility. Notably, its pH of 6.7 falls within the slightly acidic range, which may still be suitable for many crops, but some nutrients may be less available for plant uptake compared to a neutral or slightly alkaline pH. Thus, rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost since the analysis of variance revealed a significant effect at 5% level.

Table 9. Number of Ears of Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean
T_0- Control	1.00^b
T_1- RiBaChi	1.03^a
T_2- RiBaGo	1.00^b
T_3- CoBaChi	1.03^a
T_4- CoBaGo	1.01^{ab}
T_5- Inorganic Fertilizer	1.00^b
F Value	**4.59***
CV	**1.906**

Means with the same letter are not significantly different at 0.05 LSD test
**- significant*
Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

The result aligns with Munroe's statement in 2007 that the rice straw exhibits high absorbency, good bulking potential, and a high carbon-to-nitrogen ratio. Parmar et al. (2019) also noted that the banana pseudo stem, when used as a substrate in vermicomposting, contains a richer NPK content compared to others. Additionally, coco coir is rich in potash but low in nitrogen and phosphorus; however, it contains an appreciable amount of micronutrients that can be utilized in nutrient uptake by plants (Steve, 2018).

Similarly, with the beneficial effects of chicken manure as a source of nutrients and high CEC, it can enhance crop yield and improve the quality of the crop yield (Dikinya & Mufwanzala, 2010 as cited by Ndubuaku et al., 2014). Furthermore, Gichaba et al. (2020) reported that the maximum yield was attributed to goat manure-based vermicompost application in the soil, enhancing the biochemical potential of the soil, which in turn affected plant production.

Length of Ears (cm)

As shown in Table 10, the results regarding the length of ears in sweet corn, considering the effect of vermicompost treatments, are presented. The analysis of variance revealed significant effects among the treatments in terms of the length of ears. The longest ears were obtained from plants treated with inorganic fertilizer, with a mean of 25.15 cm. However, this result was not significantly different from the untreated plants and those treated with vermicompost substrates, specifically RiBaChi with a mean of 23.64 cm, RiBaGo with a mean of 23.30 cm, and CoBaChi with a mean of 23.05 cm. Consequently, it can be inferred that untreated plants and plants treated with inorganic fertilizer, RiBaChi, RiBaGo, and CoBaChi significantly contributed to the longest ears.

This result can be attributed to the physico-chemical analysis of the vermicompost substrates, as shown in Appendix 2c. RiBaChi exhibited a high total nitrogen content of 0.92%, enhancing vegetative growth, leaf development, and overall plant health. It contained the highest phosphorus level of 0.80%, promoting root development, flowering, and fruiting, as phosphorus is essential for plant growth and productivity. RiBaChi also had the highest potassium content of 0.83%, enhancing plant vigor, disease resistance, and overall quality, as potassium plays a crucial role in water regulation, enzyme activation, and nutrient translocation within plants. Furthermore, RiBaChi had an organic carbon content of 10.28% and an organic matter content of 17.68%, contributing to improved soil structure, water-holding capacity, and nutrient retention. Its pH of 7.0 is within the neutral range, suitable for most crops and facilitating the availability of essential nutrients.

RiBaGo exhibited the highest total nitrogen content of 1.01%, indicating its potential to provide better nitrogen nutrition for plants, which is crucial for vegetative growth, leaf development, and overall plant health. However, it had lower phosphorus (0.31%) and potassium (0.27%) contents compared to RiBaChi, potentially limiting its ability to promote root development, flowering, fruiting, and overall quality to the same extent. CoBaChi had lower total nitrogen (0.40%) and potassium (0.69%) contents than RiBaChi, potentially limiting vegetative growth, plant health, and quality. Nevertheless, its phosphorus content of 0.52% is still considered a good source for promoting root development, flowering, and fruiting. Significantly, CoBaChi had the highest organic carbon (11.98%) and organic matter (20.60%) content, improving soil structure, water-holding capacity, nutrient retention, and overall soil health and fertility.

Its pH of 6.7 falls within the slightly acidic range, which may still be suitable for many crops, but some nutrients may be less available for plant uptake compared to a neutral or slightly alkaline pH. This finding proves that vermicompost can be a substitute for inorganic fertilizer in sweet corn production. These findings align with the results of this study, rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost since the analysis of variance revealed a significant effect at 5% level.

The used of rice straw, coco coir, banana pseudostem, chicken manure, and goat manure increases the length of sweetcorn, which conforms to the statement of Saputra et al. (2017) that coco coir, particularly, has better aeration and a better balance of air and water, as well as a stronger rewetting capability. If it is added to the vermicomposting, the worms can decompose the substrates faster. Banana pseudostem when used in vermicomposting seemed to be richer in NPK content than other substrates (Parmar et al., 2019). In addition, as per Munroe (2007) and Manaig (2016) rice straw is used as bedding material because it has high absorbency, good bulking potential, and a high carbon-to-nitrogen ratio that can increase the decomposition in vermibed.

Furthermore, Wah & Eyo (2014) highlighted that goat manure was also found to be an efficient source of N, P, K, Ca, Mg, and organic matter that significantly increased the length of ears of corn, okra, and celosia. In addition, chicken manure acts as a good soil amendment and fertilizer that provides nutrients such as Nitrogen, Phosphorus, and Potassium concentrations (Agaba et al., 2023; Duncan, 2005). One of the benefits of chicken manure is the improvement of soil fertility and crop yield as stated by Thepsilvisut et al. (2022) that can be observed on the yield performance of the sweet corn. This once again proves the null hypothesis, that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost, cannot be accepted.

Table 10. Length of Ears of Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean
T_0- Control	23.53^{b}
T_1- RiBaChi	23.64^{b}
T_2- RiBaGo	23.30^{b}
T_3- CoBaChi	23.05^{cb}
T_4- CoBaGo	22.22^{c}
T_5- Inorganic Fertilizer	25.15^{a}
F Value	**4.36***
CV	**1.962**

Means with the same letter are not significantly different at 0.05 LSD test
**- significant*
Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Marketable Yield (kg)

As presented in Table 11, the results regarding the marketable yield of sweet corn, considering the influenced of vermicompost substrates, are provided. The statistical analysis indicated a significant variance among the treatments in terms of marketable yield. It is worth noting that the highest marketable yield, measuring 22786.45 kg/ha, was observed in plants treated with inorganic fertilizer. However, among the vermicompost substrates sweet corn treated with RiBaChi exhibited the highest yield among all the treatments, with 15531.25 kg/ha. This implies the physico-chemical analysis of the vermicompost substrates, as shown in Appendix 2c, revealed that RiBaChi exhibited a high total nitrogen content of 0.92%, enhancing vegetative growth, leaf development, and overall plant health. It contained the highest phosphorus level of 0.80%, promoting root development, flowering, and fruiting, as phosphorus is essential for plant growth and productivity.

RiBaChi also had the highest potassium content of 0.83%, enhancing plant vigor, disease resistance, and overall quality, as potassium plays a crucial role in water regulation, enzyme activation, and nutrient translocation within plants. Furthermore, RiBaChi had an organic carbon content of 10.28% and an organic matter content of 17.68%, contributing to improved soil structure, water-holding capacity, and nutrient retention. Its pH of 7.0 is within the neutral range, suitable for most crops and facilitating the availability of essential nutrients.

These findings suggest that while inorganic fertilizer can result in the highest marketable yield, the specific vermicompost treatment of RiBaChi also has the potential to significantly enhance the yield of sweet corn. The results also suggest that both inorganic fertilizer and RiBaChi contribute to maximizing sweet corn yield. The increased yield observed in sweet corn treated with vermicompost can be attributed to its properties. Vermicompost provides a rich source of nutrients and contributes to soil improvement through enhanced cation exchange capacity and soil texture. This highlights the potential of vermicompost as a standalone treatment for sweet corn development. These findings align with the results of this study, rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost since the analysis of variance revealed a significant effect at 5% level.

The findings are aligned to the study of Soyfan and Sara (2018) highlighted the efficacy of inorganic fertilizers in enhancing yield, attributing it to their ability to deliver nutrients promptly to crops, particularly during the early vegetative growth stage, and their effectiveness extending up to the reproductive stage. Rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost.

Table 11. Marketable Yield (kg/ha) of Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres. Roxas, Cotabato. 2024.

Treatment	Mean (kg/ha)
T_0- Control	6598.95^{d}
T_1- RiBaChi	15531.25^{b}
T_2- RiBaGo	12359.37^{c}
T_3- CoBaChi	14000.00^{bc}
T_4- CoBaGo	12067.70^{c}
T_5- Inorganic Fertilizer	22786.45^{a}
F Value	**3.62***
CV	**2.72**

Means with the same letter are not significantly different at 0.05 LSD test
**- significant*

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Non-Marketable Yield (kg)

As shown in Table 12, the results regarding the non-marketable yield of sweet corn, considering the effect of vermicompost treatments, are presented. The analysis of variance revealed a significant effect among the treatments in terms of the non-marketable yield. Further analysis using the Least Significant Difference (LSD) test revealed that the untreated sweet corn exhibited the least non-marketable yield. This implies that the absence of any treatment resulted in the lowest non-marketable yield, indicating the potential benefits of implementing vermicompost treatments in reducing the non-marketable yield in sweet corn production. As per observation, there were more ears developed, but not all were marketable since some of them had abnormal ears.

Table 12. Non- Marketable Yield (kg/ha) of Sweet Corns as Applied with Vermicompost with Six (6) Treatments Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean (kg/ha)
T_0- Control	8494.79[a]
T_1- RiBaChi	10572.92[b]
T_2- RiBaGo	11630.21[b]
T_3- CoBaChi	11703.13[c]
T_4- CoBaGo	18302.08[d]
T_5- Inorganic Fertilizer	9311.46[ab]
F Value	**3.54***
CV	**2.543**

Means with the same letter are not significantly different at 0.05 LSD test
**- significant*
Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Total Yield (kg)

Based on the data presented in Table 13, the total yield of sweet corn as affected by different vermicompost treatments. Notably, the highest yield was recorded in plants treated with inorganic fertilizer. The statistical analysis revealed significant variations among the treatments concerning total yield, as confirmed by the Least Significant Difference (LSD) test. Although inorganic fertilizer yielded the highest output of 32097.92 kg/ha, it was statistically indistinguishable from sweet corns treated with CoBaGo vermicompost with 30369.79 kg/ha. Consequently, both inorganic fertilizers and vermicompost substrates demonstrated their effectiveness in maximizing the sweet corn yield.

This implies that total yield was significantly affected by the physico-chemical analysis as shown in appendix 2c which revealed that the vermicompost substrate CoBaGo contained a total nitrogen content of 0.64%, lower than RiBaChi (0.92%) and RiBaGo (1.01%) but higher than CoBaChi (0.40%). This nitrogen level supported vegetative growth and plant health, but was not as optimal as substrates with higher nitrogen contents. CoBaGo exhibited the lowest phosphorus content of 0.19% among all substrates, limiting root development, flowering, and fruiting, as phosphorus is essential for these processes. Its potassium content was 0.40%, lower than RiBaChi (0.83%) and CoBaChi (0.69%) but higher than RiBaGo (0.27%), contributing to improved plant vigor, disease resistance, and overall quality, but not to the same extent as substrates with higher potassium levels.

Significantly, CoBaGo had the highest organic carbon (14.09%) and organic matter (24.23%) contents, improving soil structure, water-holding capacity, nutrient retention, and overall soil health and fertility, which are crucial for plant growth and productivity. Its pH of 7.3 was within the slightly alkaline range, suitable for most crops and facilitating nutrient availability. The high organic matter content of CoBaGo compensated for its lower nitrogen, phosphorus, and potassium levels, improving soil structure and fertility. The slightly alkaline pH favored nutrient availability and plant growth, but the low phosphorus content required supplementation for optimal plant development. The moderate nitrogen and potassium levels supported vegetative growth and plant health but may need additional sources for higher yields and better crop quality.

CoBaGo was suitable for crops thriving in slightly alkaline soils and tolerating lower phosphorus levels or when supplemented with additional nutrients. Overall, CoBaGo's high organic matter content and suitable pH provided significant benefits for soil health and fertility, making it a viable option for crop production when combined with appropriate nutrient management strategies. Both inorganic fertilizer and vermicompost substrates have proven to be effective in maximizing sweet corn yield, therefore rejecting the null hypothesis that there is no significant effect on the growth and yield of sweet corn production using different substrates of vermicompost since the analysis of variance revealed a significant effect at 5% level.

The efficacy of inorganic fertilizers in enhancing yield is underscored by this outcome, attributed to their ability to deliver nutrients promptly to crops, particularly during the early vegetative and reproductive growth stages. Studies by Babbu et al. (2015) have demonstrated that chemical fertilizers contribute to higher cation exchange capacity, leading to improved soil texture and plant growth. On the other hand, vermicompost substrates, especially incorporated with coco coir, provide an optimal environment for growth, characterized by a balanced air-water ratio, pH levels, and re-wetting capacity. However, their cation exchange capacity is lower compared to coco peat (Nichols, 2007).

Furthermore, the utilization of banana pseudo stem in vermicompost production enriches the substrate with essential nutrients, as reported by Kavitha et al. (2010). Vermicomposting with banana pseudo stem results in a substrate with higher NPK content compared to other materials (Parmar et al. 2019). Additionally, goat manure, another component of vermicompost, contains a wide range of nutrients, organic acids, and hormones that are not typically found in inorganic fertilizers. These components, along with observed enhancements in plant biomass, highlight the potential of vermicompost to efficiently boost crop yield. The efficacy of vermicompost in enhancing crop yield aligns with earlier qualitative assessments, as emphasized by Lazcano and Domínguez (2011), further solidifying its importance in modern agricultural practices.

Table 13. Total Yield (kg/ha) of Sweet Corns as Applied with Vermicompost with Six (6) Treatments Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean (kg/ha)
T_0- Control	15093.75[a]
T_1- RiBaChi	26104.17[b]
T_2- RiBaGo	23989.58[b]
T_3- CoBaChi	25703.13[b]
T_4- CoBaGo	30369.79[c]
T_5- Inorganic Fertilizer	32097.92[c]
F Value	**3.85***
CV	**2.304**

Means with the same letter are not significantly different at 0.05 LSD test
**- significant*

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

Pest and Disease Occurrence

The results indicated that the RiBaGo treatment, had a mean rating of 2.75, suggesting a "Moderate Incidence" of pests and diseases. In contrast, all other treatments, including the control, RiBaChi, CoBaChi, CoBaGo, and the inorganic fertilizer, had mean ratings ranging from 3.25 to 4.00, indicating a "Severe Incidence" of pests and diseases. These findings implied that the RiBaGo vermicompost treatment was the most effective in reducing the occurrence of pests and diseases on sweet corn plants compared to the other treatments. The RiBaGo treatment exhibited a moderate level of pests and diseases, while the other treatments experienced severe incidences. The lower incidence observed in the RiBaGo treatment could be attributed to the suppressive effects of the vermicompost substrate, which potentially enhanced the diversity and activity of beneficial microbes and nematodes, leading to the suppression of soil-borne phytopathogens.

The result conforms to the statement of Yatoo et al. (2021) that vermicompost with its rich nutrient content, plant growth promoters like auxins, gibberellins, cytokinins, and beneficial microbes not only improves the growth and yield of crops but also increases the diversity and activity of antagonistic microbes and nematodes, which helps to suppress pests and diseases caused by soil-borne phytopathogens.

Table 14. Pest and Disease Occurrence on Sweet Corns as Applied with Vermicompost with Six (6) Treatments and Replicated Four (4) Times. Camasi, Pres.Roxas, Cotabato. 2024.

Treatment	Mean	Description
T_0- Control	4.00	Severe Incidence
T_1- RiBaChi	3.25	Severe Incidence
T_2- RiBaGo	2.75	Moderated Incidence
T_3- CoBaChi	4.00	Severe Incidence
T_4- CoBaGo	4.00	Severe Incidence
T_5- Inorganic Fertilizer	3.50	Severe Incidence

Legend:

Rating Scale		*Description*
1	*0:05-1:00*	*No Incidence*
2	*1:01-2:00*	*1-19% Slight Incidence*
3	*2:01-3:00*	*20-39% Moderate Incidence*
4	*3:01-4:00*	*40% 0r more severe Incidence*

Cost and Return on Investment (ROI)

As shown on the table 15 is the profitability of sweet corn production using different soil amendments, including control (no amendment), four vermicompost treatments (RiBaChi, RiBaGo, CoBaChi, CoBaGo), and inorganic fertilizer. The marketable yield column showed the amount of sweet corn that could be sold in the market, measured in kilograms per hectare (kg/ha). The gross sale column indicated the total money earned. The total expenses column represented the cost of all inputs and labor required for sweet corn production. The net income column displayed the profit obtained after subtracting expenses from the gross sale. The ROI (Return on Investment) column revealed how much profit was earned for every peso spent on sweet corn production.

The inorganic fertilizer treatment resulted in the highest marketable yield and gross sale. However, this treatment also had the highest total expenses, reducing the net income. Among the vermicompost treatments, RiBaChi had the highest marketable yield, gross sale, net income, and second-highest ROI. The control treatment without any soil amendment had the lowest marketable yield, gross sale, net income, and ROI. The higher ROI represented a more profitable treatment for the farmer. Therefore, the inorganic fertilizer treatment got the highest ROI of 239.31%, earning ₱569,661.45. This implies that for every peso spent, a profit of ₱1.39 will be made after 75 days of sweet corn cultivation. While in the RiBaChi treatment, the farmer earned a profit of ₱0.50 for every peso spent, with an ROI of 150.30%.

In summary, while the inorganic fertilizer treatment provided the highest yield and income, it incurred high production costs; the RiBaChi vermicompost treatment, on the other hand, was also highly profitable with a lower total expense, making it a cost-effective and environmentally friendly alternative to chemical fertilizers for sweet corn production.

Table 15. Return on Investment (ROI) of Sweet Corns in kg/ha as Applied with Vermicompost with Six (6) Treatments Replicated Four (4) Times for 75 Days After Planting. Camasi, Pres.Roxas, Cotabato. 2024.

Treatments	Marketable Yield (kg/ha)	Gross Sale	Total Expenses	Net Income	ROI
T_0- Control	6598.96	164,973.96	145125.00	138,526.04	13.68
T_1- RiBaChi	15531.25	388,281.25	155125.00	139,593.75	150.30
T_2- RiBaGo	12359.38	308,984.38	155125.00	142,765.63	99.18
T_3- CoBaChi	14000.00	350,000.00	155125.00	141,125.00	125.62
T_4- CoBaGo	12067.71	301,692.71	155125.00	143,057.29	94.48
T_5- Inorganic Fertilizer	22786.45	569,661.46	167887.50	145,101.04	239.31

Legend:

T_0 – Control
T_1 – RiBaChi (70% Rice straw + Banana Pseudostem: 30% Chicken manure)
T_2 – RiBaGo (70% Rice straw + Banana Pseudostem: 30% Goat manure)
T_3 – CoBaChi (70% Coco Coir + Banana Pseudostem: 30% Chicken manure)
T_4 – CoBaGo (70% Coco Coir + Banana Pseudostem: 30% Goat manure)
T_5 – Inorganic Fertilizer

4. CONCLUSIONS

It is concluded that RiBaGo had the highest nitrogen and potassium levels, CoBaGo had the highest organic carbon and organic matter, and RiBaChi was richest in phosphorus and sodium. Generally, sweet corn was significantly affected by CoBaGo in terms of plant height, RiBaGo in terms of the number of days to tassel formation, CoBaChi in terms of the number of days to silking, RiBaChi and CoBaChi in terms of the number of ears, and RiBaChi in terms of ear length. On the other hand, RiBaChi produced the highest marketable yield and non-marketable yield and CoBaGo produced the highest total yield. Lastly, RiBaGo was the most effective in reducing the incidence of pest and diseases on sweet corn, and RiBaChi produced plants with the highest ROI.

5. REFERENCES

Abdel-Aal, el-S. M., Akhtar, H., Zaheer, K., & Ali, R. (2013). Dietary sources of lutein and zeaxanthin carotenoids and their role in eye health. *Nutrients*, 5(4), 1169-1185. https://doi.org/10.3390/ nu5041169

Adhikary, S. (2012). Vermicompost, the story of organic gold: A review. *File.scirp.org, 2012*. https://doi.org/ 10.4236/ as.2012.37110

Adiaha, M. S., & Agba, O. A. (2016*). Influence of different methods of fertilizer application on the growth of maize (Zea mays L.) for increased production in South Nigeria*. *WSN, 54, 73-86. EISSN*: 2392-2192.

Ambos, A. L., & Calipusan, B. C. (2017). Growth and yield performance of sweet corn (*Zea mays* L.) intercropped with sweet potato (*Ipomoea batatas* L.) applied with mushroom spent and rice ash. *Science International (Lahore)*, 29(2), 87-95.

Agaba, J., Osiru, D., & Ndizihiwe, D. (2023). Effect of different poultry manure on the performance of tomatoes (Lycopersicon esculentum mill). *American Journal of Agriculture,* 5, 1-21. https://doi.org/ 10.47672/aja.1315

Agbede, T. M., & Adeyemo, A. (2008). Effect of poultry manure on soil physical and chemical properties, growth and grain yield of sorghum in Southwest, Nigeria. *American-Eurasian Journal of Sustainable Agriculture*, 2(1), 72-77.

Akef, S., Dhen, N., Helaoui, S., Ammar, B., Al Bouthaina, & Al Mohandes Dridi, B. (2022). Effect of vermicompost soil additive on growth performance, physiological and biochemical responses of tomato plants (Solanum lycopersicum L. var. Firenze) to salt stress. *Emirates Journal of Food and Agriculture*, *34(4), 316-328*. https://doi.org/10.9755/ejfa.2022.v34.i4.2844

Ala-Kokko, K., Nalley, L. L., Shew, A. M., Tack, J. B., Chaminuka, P., Matlock, M. D., & D'Haese, M. (2021). Economic and ecosystem impacts of GM maize in South Africa. *Global Food Security, 29, 100544*. https://doi.org/10.1016/j.gfs.2021.100544

Allam, M., Radicetti, E., Quintarelli, V., Petroselli, V., Marinari, S., & Mancinelli, R. (2022). Influence of organic and mineral fertilizers on soil organic carbon and crop productivity under different tillage systems: A meta-analysis. *Agriculture, 12(4), 464*. https:// doi.org/ 10.3390 / agriculture 12040464

Ali, M. (2012). Integrated management of phosphorus and potassium for maize (Zea mays L.) [Doctoral dissertation, University of Agriculture Faisalabad, Pakistan]. https:// www.academia.edu/download / 78757872/1793S. pdf

Ambos, A. L., & Calipusan, B. C. (2017). Growth and yield performance of sweet corn (Zea mays L.) intercropped with sweet potato (Ipomoea batatas L.) applied with mushroom spent and rice ash. *Sci.Int.(Lahore)*, 29(2), 87-87.

Ansari, R., & Sadegh, M. (2007). Application of Activated Carbon for Removal of Arsenic Ions from Aqueous Solutions. *E-Journal of Chemistry, 4(1), 103–108*. https://doi.org/10.1155/2007/829187

Arnarson, A. (2023). Corn 101: Nutrition facts and health benefits. Healthline. https://www.healthline.com/nutrition/foods/corn

Aslam, Z., Bashir, S., Hassan, W., Bellitürk, K., Ahmad, N., Niazi, N. K., Khan, A., Khan, M. I., Chen, Z., & Maitah, M. (2019). Unveiling the efficiency of vermicompost derived from different biowastes on wheat (Triticum aestivum L.) plant growth and soil health. *Agronomy, 9(12), 791*. https://doi.org/ 10.3390/ agronomy9120791

Atiyeh, R. M., Arancon, N., Edwards, C. A., & Metzger, J. (2002*). The influence of earthworm-processed pig manure on the growth and productivity of marigolds. Bioresource Technology, 81, 103-108.* https://doi.org/10.1016/S0960-8524(01)00122-5

Awodun, M., Omonijo, L. I., & Ojeniyi, S. (2007). Effect of goat dung and NPK fertilizer on soil and leaf nutrient content, growth and yield of pepper. *International Journal of Soil Science, 2(2), 142-147.* https://doi.org/10.3923/ijss.2007.142.147

Azarmi, R., Sharifi Ziveh, P., & Satari, M. (2008). Effect of vermicompost on growth, yield and nutrition status of tomato (Lycopersicum esculentum). *Pakistan Journal of Biological Sciences: PJBS, 11, 1797-1802*. https://doi.org/10.3923/pjbs.2008.1797.1802

Babbu Singh Brar, Jagdeep Singh, Gurbir Singh and Gurpreet Kaur (2015*) Effects of Long Term Application of Inorganic and Organic Fertilizers on Soil Organic Carbon and Physical Properties in Maize–Wheat Rotation*, *Agronomy 2015, 5, 220-238*; doi:10.3390/agronomy5020220

Bajal, S., Subedi, S., & Baral, S. (2019). Utilization of agricultural wastes as substrates for vermicomposting. *ResearchGate*. https://doi.org/10.9790/2380-1208017984

Blouin, M., Barrere, J., Meyer, N., Lartigue, S., Barot, S., & Mathieu, J. (2019). Vermicompost significantly affects plant growth: A meta-analysis. *Agronomy for Sustainable Development*, 39(3), 34. https://doi.org/10.

Brandenberger, L., Kahn, B., & Rebek, E. (2017). Sweet corn production (Publication No. HLA-6021). Oklahoma Cooperative Extension Service.

Brookes, G., & Dinh, T. X. (2021). The impact of using genetically modified (GM) corn/maize in Vietnam: Results of the first farm-level survey. *GM Crops & Food*, 12(1), 71-83. https: // doi.org /10.1080 / 21645698.2020.1816800

Canatoy, R. (2018). Effects of fertilization on the growth and yield of sweet corn under no-tillage in Bukidnon, Philippines. *International Journal of Scientific and Research Publications* (IJSRP), 8. https:// doi.org/ 10.29322/IJSRP.8.7.2018.p7971

Canatoy, R. (2018). Effects of vermicompost on the growth and yield of sweet corn in Bukidnon, Philippines. *Asian Journal of Soil Science and Plant Nutrition*, 3. https://doi.org/ 10.9734/ AJSSPN/ 2018/42273

Case, S., Oelofse, M., Hou, Y., Oenema, O., & Jensen, L. S. (2017). Farmer perceptions and use of organic waste products as fertilisers – *A survey study of potential benefits and barriers. Agricultural Systems*, 151, 84-95. https://doi.org/10.1016/j.agsy.2016.11.012

Corn Techno Guide Final PDF | PDF | Fertilizer | Soil. (2012). Scribd. https://www.scribd.com/document/452571865/corn-techno-guide-final-pdf

Dikinya, O., & Mufwanzala, N. (2010). Chicken manure-enhanced soil fertility and productivity: Effects of application rates. *Journal of Soil Science and Environmental Management*, 1(3), 46-54. http://www.academicjournals.org/JSSEM

Dikir, W., & Belete, K. (2017). Review on the effect of organic fertilizers, biofertilizers and inorganic fertilizers (NPK) on growth and flower yield of marigold (*Tagetes erecta L.*). *Agricultural Research Journal*, June 2017. https://doi.org/10.14662/ARJASR2017.016

Diny, R., Muktamar, Z., Hasanudin, Anandyawati, & Allsari, V. (2022). The quality of vermicompost from various sources composted with earthworm Perionyx excavates. *IOP Conference Series: Earth and Environmental Science*, 1005, 012006. https://doi.org/10.1088/1755-1315/1005/1/012006

Domínguez, J. (2004). *State-of-the-art and new perspectives on vermicomposting research.* In Earthworm Ecology (pp. 401-424). CRC Press.

Dos Santos, O. F., de Lima, S. F., Neto, V. B. D., Piati, G. L., Osorio, C. R. W. D., & de Souza, H. M. (2017). Defoliation of sweet corn plants under irrigation depths and its impact on gas exchange. *Revista Brasileira de Engenharia Agrícola e Ambiental*, 21, 822-827. https://doi.org/10.1590/1807-1929/agriambi.v21n12p822-827

Duncan J (2005). Composting chicken manure. WSU Cooperative Extension, King County Master Gardener and Cooperative Extension Livestock Advisor

Duruigbo, C. I., Obiefuna, J. C., & Onweremadu, E. U. (2007). Effect of poultry manure rates on soil acidity in an Ultisol. *International Journal of Soil Science*, 2(2), 154-158. https://doi.org/10.3923/ ijss.2007.154.158

Dwijatenaya, I. B. M. A. (2017). Sweet corn farming: The effect of production factor, efficiency and return to scale. Directory of Open Access Journals (Sweden). Retrieved from https://worldwidescience.org/topicpages/s/sweet+corn+production.html

Ebrahimi, M., Souri, M. K., Mousavi, A., & Sahebani, N. (2021). Biochar and vermicompost improve growth and physiological traits of eggplant (Solanum melongena L.) under deficit irrigation. *Chemical and Biological Technologies in Agriculture*, 8(1), 1–14. [Google Scholar]

Edwards, I., Jones, M., Carr, J., Braunack-Mayer, A., & Jensen, G. M. (2011). Clinical reasoning strategies in physical therapy. *Physical Therapy*, 84(4), 312-330. https://doi.org/ 10.1093/ ptj/84.4.312

Enebe, M. C., & Erasmus, M. (2023). Vermicomposting technology - A perspective on vermicompost production technologies, limitations and prospects. *Journal of Environmental Management*, 345, 118585. https://doi.org/ 10.1016/ j.jenvman.2023.118585

Erdal, N. B., & Hakkarainen, M. (2022). Degradation of cellulose derivatives in laboratory, man-made, and natural environments. *Biomacromolecules, 23(7),* 2713-2729. https://doi.org/10.1021/acs.biomac.2c00336

Erenstein, O., Jaleta, M., Sonder, K., Mottaleb, K. A., & Prasanna, B. M. (2022). Global maize production, consumption and trade: Trends and R&D implications. *Food Security*, 14, 1295–1319. https://doi.org/10.1007/s12571-022-01288-7

Fernandez-Gomez, M., Nogales, R., Insam, H., Romero, E., & Goberna, M. (2010). Continuous-feeding vermicomposting as a recycling management method to revalue tomato-fruit wastes from greenhouse crops. *Waste Management, 30, 2461–2468*. https://doi.org/10.1016/j.wasman.2010.07.005

Ganeshnauth, V., Jaikishun, S., Ansari, A., & Homenauth, O. (2018). *The effect of vermicompost and other fertilizers on the growth and productivity of pepper plants in Guyana*. In A. Editor & B. Editor (Eds.), *Book Title* (pp. xxx-xxx). Publisher. https://doi.org/ 10.5772/ intechopen.73262

Ghadimi, M., Sirousmehr, A., Ansari, M. H., & Ghanbari, A. (2021). Organic soil amendments using vermicomposts under inoculation of N2-fixing bacteria for sustainable rice production. *PeerJ, 9, e10833*. https://doi.org/ 10.7717/ peerj.10833

Gichaba, V., Ndukhu, H., Muraya, M., Odilla, G., & Ogolla, F. (2020). Preparation and evaluation of goat manure-based vermicompost for organic garlic production in Manyatta sub-county, Kenya. *International Journal of Environment, Agriculture and Biotechnology*, 5, 51-55. https://doi.org/10.22161/ijeab.51.7

Google Map (2023). Camasi, Pres. Roxas, Cotabato. Retrieved from https://www.google.com/maps/place/Camasi,+President+Roxas,+Cotabato/data=!4m2!3m1!1s0x32f8e7003e06ada7:0x55190f85da106dee?sa=X&ved=1t:242&ictx=111

Goswami, L., Gorai, P. S., & Mandal, N. C. (2021). Microbial fortification during vermicomposting: A brief review. In S. D. Mandal & A. K. Passari (Eds.), Recent Advancement in Microbial Biotechnology (pp. 99-122). *Academic Press*. https://doi.org/10.1016/B978-0-12-822098-6.00011-2

Grimblatt, V., Ferré, G., Rivet, F., Jego, C., & Vergara, N. (2019). Precision agriculture for small to medium size farmers — An IoT approach [Conference presentation]. 2019 *IEEE International Symposium on Circuits and Systems (ISCAS), Sapporo, Japan*. https://doi.org/10.1109/ISCAS.2019.8702563

Guerrero III, R. (2010). Vermicompost production and its use for crop production in the Philippines. *International Journal of Global Environmental Issues*, 10(3/4), 378-383. https:// doi.org/10.1504/ IJGENVI.2010.037278

Guo, D. (2015). Kernel and bulk density changes due to moisture content, mechanical damage, and insect damage (Publication No. 512) [Master's thesis, Purdue University]. Purdue e-Pubs. https://docs.lib.purdue.edu/open_access_theses/512

Gutiérrez-Miceli, F. A., Santiago-Borraz, J., Montes Molina, J. A., Nafate, C. C., Abud-Archila, M., Oliva Llaven, M. A., Rincón-Rosales, R., & Dendooven, L. (2007). Vermicompost as a soil supplement to improve growth, yield and fruit quality of tomato (Lycopersicum esculentum). *Bioresource Technology*, *98(15), 2781–2786.* https:// doi.org/ 10.1016/ j.biortech.2006.02. 032

Hait, S., & Tare, V. (2011). Vermistabilization of Primary Sewage Sludge. *Bioresource Technology, 102(3), 2812-2820*. https://doi.org/10.1016/j.biortech.2010.10.031

Horswill, P., O'Sullivan, O., Phoenix, G., Lee, J., & Leake, J. (2008). Base Cation Depletion, Eutrophication and Acidification of Species-rich Grasslands in Response to Long-term Simulated Nitrogen Deposition. *Environmental Pollution, 155, 336-349.* https://doi.org/10.1016/j.envpol.2007.11.006

Hu, X., Zhang, T., Tian, G., Zhang, L., & Bian, B. (2021, May 1). Performance and mechanism of high-speed vermicomposting of dewatered sludge using a new type of laboratory earthworm reactor. *Environmental Science and Pollution Research, 28*. https://doi.org/10.1007/s11356-021-12438-3

Hussain, N., & Abbasi, S. A. (2018). Efficacy of the vermicomposts of different organic wastes as “clean” fertilizers: State-of-the-art. *Sustainability, 10(4), 1205*. https://doi.org/10.3390/su10041205

IRRI. (2013, August). IRRI biometrics group releases statistical tool for Windows. International Rice Research Institute News. https://news.irri.org/2013/08/irri-biometrics-group-releases.html

Jafarpour, Pessarakli, & Kazemi, 2017 Effects of Raw Materials on Vermicompost Qualities. Retrieved from https: // www.researchgate. net / publication/312306031

Jayakumar, R., Prabaharan, M., Sudheesh Kumar, P. T., Nair, S. V., & Tamura, H. (2011). Biomaterials based on chitin and chitosan in wound dressing applications. *Biotechnology Advances, 29(3), 322-337*. https://doi.org/10.1016/j.biotechadv.2011.01.005

Joshi, R., Singh, J., Vig, A.P. (2015). Vermicompost as an Effective Organic Fertilizer and Biocontrol Agent: Effect on Growth, Yield and Quality Plants. *Reviews in Environmentat Science and Bio/Technology, 4(1):137-159*, doi: 10.1007/s11157-014-9347-1.

Joshi, A. (2024). Vermicomposting and its uses in Sustainable Agriculture. ResearchGate. https:// www.researchgate.net/ publication/ 377158925_Vermicomposting_and_its_uses_in_Sustainable_Agriculture

Kakar, K., Xuan, T. D., Noori, Z., Aryan, S., & Gulab, G. (2020). Effects of organic and inorganic fertilizer application on growth, yield, and grain quality of rice. *Agriculture, 10(11), 544*. https://doi.org/10.3390/agriculture10110544

Kanianska, R., Jaďuďová, J., Makovníková, J., & Kizeková, M. (2016). Assessment of relationships between earthworms and soil abiotic and biotic factors as a tool in sustainable agriculture. Sustainability, 8(9), 906. https://doi.org/10.3390/su8090906

Kashem, M., Sarker, A., Hossain, M. I., & Islam, M. (2015). Comparison of the effect of vermicompost and inorganic fertilizers on vegetative growth and fruit production of tomato (*Solanum lycopersicum* L.). *Open Journal of Soil Science, 5*, 53-58. https://doi.org/10.4236/ojss.2015.52006

Kaur, T. (2020). Vermicomposting: An Effective Option for Recycling Organic Wastes. Intech

Kavitha, P., Ravikumar, G., & Manivannan, S. (2010). *Vermicomposting of banana agro-waste using an epigeic earthworm Eudrilus eugeniae (kinberg)*. https: // www.semanticscholar.org/ paper/ Vermicomposting -of-banana-agro- waste-using-an-Kavitha-Ravikumar / f2ac17cc96b05ab928b616ae2ddc475de81e8014

Kiyasudeen, K., Ibrahim, M., Quaik, S., & Ismail, S. A. (2016). Prospects of organic waste management and the significance of earthworms. https://doi.org/10.1007/978-3-319-24708-3

Königer, J., Lugato, E., Panagos, P., Kochupillai, M., Orgiazzi, A., & Briones, M. J. I. (2021). Manure management and soil biodiversity: Towards more sustainable food systems in the EU. *Agricultural Systems, 194, 103251*. https://doi.org/ 10.1016/j.agsy.2021.103251.

Kopp, C. M. (2023). The world's 6 biggest corn producers. Investopedia. https:// www.investopedia.com/ articles/ markets-economy/ 090316/6-countries-produce-most-corn. asp

Kostecka, J., Garczyńska, M., Podolak, A., Pączka, G., & Kaniuczak, J. (2018). Kitchen organic waste as material for vermicompost and a source of nutrients for plants. *Journal of Ecological Engineering, 19(6)*, 267–274. https://doi.org/10.12911/22998993/99691

Lascano, R., Bavel, C., & Evett, S. (2010). A field test of recursive calculation of crop evapotranspiration. *Transactions of the ASABE, 53(3).* https://doi.org/10.13031/2013.32601

Lazcano, C. (2011). *The use of vermicompost in sustainable agriculture: impact on plant growth and soil fertility*. In Soil Fertility (pp. xx-xx). Nova Science Publishers.

Lazcano, C., Domínguez, J., Cabello, E., & E-36208 Bouzas -Vigo. (n.d.). In: Soil Nutrients the Use of Vermicompost in Sustainable Agriculture: Impact on Plant Growth and Soil Fertility. http:// jdguez.webs.uvigo.es/wp content/uploads/2012/01/the-use-of-vermicompost.pdf

Lazcano, C., Revilla, P., & Malvar, R. (2011). Yield and fruit quality of four sweet corn hybrids (Zea mays) under conventional and integrated fertilization with vermicompost. *Journal of the Science of Food and Agriculture, 91(7), 1244-1253.* https://doi.org/10.1002/jsfa.4306

Li, Z., Hong, T., Zhao, Z., Gu, Y., Guo, Y., & Han, J. (2022). Fatty acid profiles and nutritional evaluation of fresh sweet-waxy corn from three regions of China. *Foods, 11(17), Article 2636*. https://doi.org/10.3390/foods11172636

López-Masquera, M. E., Cabaleiro, F., Sainz, M. S., López-Fabal, A., & Carral, E. (2008). Fertilizing value of broiler litter: Effects of drying and pelletizing. *Bioresource Technology, 99, 5626-5633*.

Loss, A., Couto, R., Brunetto, G., Veiga, M., Toselli, M., & Baldi, E. (2019). Animal manure as fertilizer: Changes in soil attributes, productivity and food composition. *International Journal of Research - GRANTHAALAYAH, 7, 307-331.* https:// doi.org/ 10.29121/ granthaalayah.v7.i9.2019.615

Manaig, E. (2016). Vermicomposting Efficiency and Quality of Vermicompost with Different Bedding Materials and Worm Food Sources as Substrate. Research Journal of Agriculture and Forestry Sciences, 4(1), 1–13. http:// www.isca.in/AGRI_FORESTRY/ Archive/v4/i1/1.ISCA-RJAFS-2015-057.pdf

Manogaran, M. D., Shamsuddin, R., Mohd Yusoff, M. H., Lay, M., & Siyal, A. A. (2022). A review on treatment processes of chicken manure. Cleaner and Circular Bioeconomy, 2, 100013. https://doi.org/10.1016/j.clcb.2022.100013.

Mal, D., Chatterjee, R., & Nimbalkar, K. (2014). Effect of vermi-compost and inorganic fertilizers on growth, yield and quality of sprouting broccoli (Brassica oleracea L. var. italica Plenck). *International Journal of Bio-resource and Stress Management, 5(4), 507-512*. https://doi.org/10.5958/0976-4038.2014.00606.X

Mariotti, B., Martini, S., Raddi, S., Tani, A., Jacobs, D. F., Oliet, J. A., & Maltoni, A. (2020). Coconut coir as a sustainable nursery growing media for seedling production of the ecologically diverse Quercus species. Forests, 11(5), 522. https://doi.org/10.3390/f11050522

Meena, S., Bharose, R., David, A., Thomas, T., & Kumar, A. (2023). Response of inorganic fertilizers and vermicompost on growth and yield of maize (Zea mays L.) inoculated with Azotobacter, var. DHM-1. *International Journal of Plant & Soil Science, 35, 416-420.* https://doi.org/10.9734/ijpss/2023/v35i153122

Mehta, N., & Karnwal, A. (2013). Solid waste management with the help of vermicomposting and its applications in crop improvement. Undefined. https:// www.semanticscholar.org/ paper/Solid-waste-management-with-the-help-of-and-its-in-Mehta-Karnwal / cd96 dfc 65 a5aa16 189c4d ddaa4ab5ab4e7 a 482 88

Middleton, A. J. (2015). Nutrient availability from poultry litter co-products [Master's thesis, Virginia Polytechnic Institute and State University]. VTechWorks. https://vtechworks.lib.vt.edu/handle/10919/73646

Morales-Corts, M. R., Gómez-Sánchez, M. A., & Pérez-Sánchez, R. (2014). Evaluation of green/pruning wastes compost and vermicompost, slumgum compost and their mixes as growing media for horticultural production. *Scientia Horticulturae, 172, 155–160*. https://doi.org/10.1590/1678-992X-2016-0439

Muktamar, Z., Adiprasetyo, T., Yulia, Suprapto, Sari, L., Fahrurrozi, F., & Setyowati, N. (2018). Residual effect of vermicompost on sweet corn growth and selected chemical properties of soils from different organic farming practices. *International Journal of Agricultural Technology, 14, 1471-1482*.

Mulwa, R., Emrouznejad, A., & Muhammad, L. (2009). Economic efficiency of smallholder maize producers in western Kenya: A DEA meta-frontier analysis. *International Journal of Operational Research, 4*(4), 250–267. https://doi.org/10.1504/IJOR.2009.023284

Munroe, G. (2007). Manual of On-Farm Vermicomposting and Vermiculture. *Publication of Organic Agriculture Centre of Canada, Nova Scotia. - References - Scientific Research Publishing. (2015). Scirp.org.* https:// scirp.org/ reference/ referencespapers.aspx? referenceid=1527658.

Munsell, A. H. (2000). *Gretag Macbeth: Munsell Color*, New Windsor, N.Y., 2000.

Murphy, R. P. (2020). *Effects of vermicompost applications on aphid densities and growth characteristics of romaine lettuce (Lactuca sativa L. var. longifolia)* (Master's thesis). California State Polytechnic University, Pomona. Retrieved from https:// scholarworks.calstate.edu/ downloads/fq978051n

Nichols, M. A., & Savidov, N. A. (2009). Recent advances in coir as a growing medium. Acta Horticulturae, 843, 333-336. https://doi.org/10.17660/ActaHortic.2009.843.44

Ndubuaku UM, Nwankwo VU, Baiyeri KP (2014). *Influence of poultry manure application on the leaf amino acid profile, growth and yield of moringa (Moringa oleifera Lam)*. Albanian J. Agric. Sci. Albania 13(1):42-47.

Oyege, I., & Balaji Bhaskar, M. S. (2023). *Effects of vermicompost on soil and plant health and promoting sustainable agriculture*. Soil Systems, 7(4), 101. https://doi.org/10.3390/soilsystems7040101

Pączka G., Kostecka J. (2013). The influence of vermicompost from kitchen waste on the yield-enhancing characteristic of peas Pisum sativum L. Var. Saccharatum Ser. Bajka variety. *Journal of Ecological Engineering, 14, 49-53*.

Palcon, B. S., & Ratilla, B. C. (2023). Response of hybrid sweet corn (Zea mays L. saccharata) varieties to the time of planting string bean (Phaseolus vulgaris) intercrop. *Journal Title, Volume(Issue), pp-pp.* https:// philjournalsci.dost.gov.ph/ images/pdf/pjs_pdf/vol152no6B_Dec2023/response_of_hybrid_sweet_corn_varieties_to_time_of_planting_string_bean_intercrop_.pdf

Parastesh, F., Alikhani, H. A., & Etesami, H. (2019). Vermicompost enriched with phosphate–solubilizing bacteria provides plant with enough phosphorus in a sequential cropping under calcareous soil conditions. *Journal of Cleaner Production, 221, 27-37*. https://doi.org/10.1016/j.jclepro.2019.02.234

Parmar, H. C., Mor, V., & Patel, S. (2019). Vermicomposting of banana pseudostem and maize fodder (waste) using Eudrilus eugeniae. *Current Journal of Applied Science and Technology.* https://doi.org/10.9734/CJAST/2019/v36i130215

Patil, S. S., Dhopavkar, R. V., Kasture, M. C., & Parulekar, Y. R. (2017). Vermicomposting of coconut coir waste by utilizing epigeic earthworm species. *JEZS, 5(6), 2266-2271*. https://doi.org/10.1017/jezs.2017.xxxx

Pattnaik, S., & Reddy, M. V. (2010). Nutrient Status of Vermicompost of Urban Green Waste Processed by Three Earthworm Species—Eisenia fetida, Eudrilus eugeniae, and Perionyx excavatus. *Applied and Environmental Soil Science, 2010, 1–13.* https://doi.org/10.1155/2010/967526

PhilAtlas (2023). Demographics, location and Adjacent Barangay. Retrieved from https:// www.philatlas.com/ mindanao/r12/ cotabato/ president-roxas / camasi.html

Pujiastuti, E. S., Tarigan, J. R., Sianturi, E., & Ginting, B. B. (2018). The effect of chicken manure and beneficial microorganisms of EM-4 on growth and yield of kale (Brassica oleraceae acephala) grown on Andisol. *In International Conference on Agribusiness, Food and Agro-Technology (pp. 012020). IOP Publishing*. doi:10.1088/1755-1315/205/1/012020

Quintern, M. (2014). Industrial scale vermicomposting of municipal biosolids by blending with fibrous industrial wastes. https://www.researchgate.net/publication/262936426_Industrial_Scale_Vermicomposting_of_Municipal_Biosolids_by_Blending_with_Fibrous_Industrial_Wastes

Raza, S. T., Wu, J., Rene, E. R., Ali, Z., & Chen, Z. (2022). Reuse of agricultural wastes, manure, and biochar as an organic amendment: A review on its implications for vermicomposting technology. *Journal of Cleaner Production, 360, 132200*. https://doi.org/10.1016/j.jclepro.2022.132200

Rehman, S. U., De Castro, F., Aprile, A., Benedetti, M., & Fanizzi, F. P. (2023). Vermicompost: Enhancing plant growth and combating abiotic and biotic stress. *Agronomy, 13(4), 1134*. https://doi.org/10.3390/agronomy13041134

Revilla, P., Anibas, C. M., & Tracy, W. F. (2021). Sweet corn research around the world 2015–2020. *Agronomy, 11(3), 534*. https:// doi.org/10.3390/ agronomy11030534

Rodda, M.R.C., Canellas, L.P., Façanha, A.R, Zandonadi, D.B., Guerra, J.G.M., De Almeida, D.L. and De Santos, G.A. (2006). Improving lettuce seedling root growth and ATP hydrolysis with humates from Vermicompost. II- Effect of Vermicompost source. *Revista Brasileira de Ciencia do Solo, 30, 657-664*

Rouf Shah, T., Prasad, K., Kumar, P., & Yildiz, F. (2016). Maize—A potential source of human nutrition and health: A review. *Cogent Food & Agriculture, 2(1)*. https://doi.org/10.1080/23311932.2016.1166995

Sánchez-Nuño, Y. A., Zermeño-Ruiz, M., Vázquez-Paulino, O. D., Nuño, K., & Villarruel-López, A. (2024). Bioactive compounds from pigmented corn (Zea mays L.) and their effect on health. *Biomolecules, 14(3), 338*. https:// doi.org/ 10.3390 /biom14030338

Saputra, D., Handajaningsih, M., & Hermawan, B. (2017). Effect of incubation of goat manure on growth and yield of sweet corn. *Akta Agrosia, 20, 43-47*. https://doi.org/10.31186/aa.20.2.43-47

Schmilewski, G. 2008. Peat Covers 77 Percent of the Growing Media Production in th EU. Peatl. Int., 1, 39-43.

Sethi, M., Singh, A., Kaur, H., Phagna, R. K., Rakshit, S., & Chaudhary, D. P. (2021). Expression profile of protein fractions in the developing kernel of normal, Opaque-2 and quality protein maize. Scientific Reports, 11(1), Article 2469. https://doi.org/10.1038/s41598-021-81906-0

Shahbandeh, M. (2024). Exports of corn worldwide 2023/24, by country. Statista. https://www.statista.com/statistics/254299/top-global-corn-exporters/

Silva, P., Silva, P., Oliveira, V., Oliveira, F., & Costa, L. R. (2017). Vermicompost application improving semiarid-grown corn green ear and grain yields. *Revista Caatinga, 30(2), 551-558*. https://doi.org/10.1590/1983-21252017v30n302rc

Singh, A., Kumar, V., Verma, S., Majumdar, M., & Sarkar, S. (2020). Significance of vermicompost on crop and soil productivity: A review. *International Journal of Chemical Studies, 8*. https://doi.org/10.22271/chemi.2020.v8.i5u.10517

Singh, B.; Pathak, K.; Verma, A.; Verma, V.; Deka, B. Effects of vermicompost, fertilizer and mulch on plant growth, nodulation and pod yield of French bean (Phaseolus vulgaris L.). Veg. Crop. *Res. Bull. 2011, 74, 153–165*. [Google Scholar] [CrossRef]

Singh, L., Gurjar, P. K. S., Barholia, A. K., Haldar, A., & Shrivastava, A. (2015). Effect of organic manures and inorganic fertilizers on growth and flower yield of marigold (Tagetes Erecta L.) Var. Pusa Narangi Gainda. *The Bioscan, 10(2), 779-783*.

Singh, R., Gupta, R. K., Patil, R. T., Sharma, R. R., Asrey, R., Kumar, A., & Jangra, K. K. (2010). Sequential foliar application of vermicompost leachates improves marketable fruit yield and quality of strawberry (Fragaria×ananassa Duch.). *Scientia Horticulturae, 124(1), 34–39*. https:// doi.org/ 10.1016/ j.scienta.2009.12.002

Sinha, R. K.; Agarwal, S.; Chauhan, K.; Chandran, V.; Soni, B. K., 2010. Vermistabilization of sewage sludge (biosolids) by earthworms: converting a potential biohazard destined for landfill disposal into a pathogen free, nutritive and safe bio-fertilizer for farms. *J. Waste Management & Res., 2009*.

Soyfan, E. T., & Sara, D. S. (2018). The effect of organic and inorganic fertilizer applications on N, P and K uptake and yield of sweet corn (Zea mays saccharata Sturt). *J Trop Soils, 23(3), 111-116*. https://doi.org/10.5400/jts.2018.v23i3.111

Steve, N. (2018). Worm Bedding: 9 Awesome Choices. 101 Bucket, Teacher Bucket, Vermicomposting 101 Series. https://urbanwormcompany.com/what-to-use-for-worm-bedding/

Subagyo, A., & Chafidz, A. (2018). Banana Pseudo-Stem Fiber: Preparation, Characteristics, and Applications. Banana Nutrition - Function and Processing Kinetics. https://doi.org/10.5772/intechopen.82204

Sugiono, Latifah, E., Krismawati, A., Antarlina, S., Angraeni, L., Handayati, W., & Sihombing, D. (2023). Application of inorganic fertilizer NK (18-32) on growth and yield of sweet corn on clay soil. *IOP Conference Series: Earth and Environmental Science, 1230, Article 012210.* https://doi.org/10.1088/1755-1315/1230/1/012210

Swapna, G., Ganiga, J., & Mahadevu, P. (2020). Sweet corn-A future healthy human nutrition food. International Journal of Current Microbiology and Applied Sciences, 9, 3859-3865. https://doi.org/10.20546/ijcmas.2020.907.452

Szymanek, M. (2012). Processing of sweet corn. In A. A. Eissa (Ed.), Trends in vital food and control engineering. *InTech*. https://doi.org/10.5772/34243

Talip, O., & Villaver, J. (2022). Yield and post-harvest quality of sweet corn (Zea mays L. var. saccharata) to vermicompost and fermented weed teas application. *Journal of Plant Nutrition, 18, 2283-2292.*

Taer, E., Maglinte, E., Humandos, M., Abellano, J., & Villarino, J. (2019). Effect of application of combined organic and inorganic fertilizers on the yield characteristics of Sigue-sigue corn variety (*Zea mays* L.). *Journal of Agricultural Studies, 10*, 17875-17880.

The Editors of Encyclopaedia Britannica. (2024). Corn. In Encyclopedia Britannica. Retrieved from https:// www.britannica.com/ plant/ corn-plant

Thepsilvisut, O., Chutimanukul, P., Sae-Tan, S., & Ehara, H. (2022). Effect of chicken manure and chemical fertilizer on the yield and qualities of white mugwort at dissimilar harvesting times. *PLoS One, 17(4), e0266190*. https:// doi.org/ 10.1371/ journal.pone.0266190

Tilley, N. (2022). Uses For Goat Manure - Using Goat Manure For Fertilizer. [Web article]. Retrieved from https:// www.gardeningknowhow.com

Zhang, M. (2024). Exports of corn worldwide 2023/24, by country. Statista. https://www.statista.com/statistics/254299/top-global-corn-exporters/