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The Effect of Milkfish Stomach Waste Compost on Cayenne Pepper Growth (*Capsicum frutescens* L.)

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ABSTRACT

Cayenne pepper (*Capsicum frutescens* L.) is a high-value horticultural commodity with various benefits, ranging from food ingredients to medicinal purposes. However, cultivation still faces challenges, such as dependency on chemical fertilizers, which can harm the environment. As a solution, organic fertilizer derived from milkfish stomach waste has the potential to be utilized due to its rich nutrient content and environmentally friendly properties. This study aimed to examine the effect of varying amounts of milkfish stomach waste compost on the growth of cayenne pepper plants. The research employed a Completely Randomized Design with five compost mass treatments (0, 200, 300, 400, and 500 g) applied to cayenne pepper plants. The observed parameters included the plant height and leaf count. The results indicated that the compost mass significantly affected the growth of cayenne pepper plants. Treatment with 500 g of compost yielded the best results, marked by the highest average increase in plant height and leaf count compared to other treatments. This study demonstrates that milkfish stomach waste has excellent potential as a raw material for organic fertilizers to support the growth of horticultural crops in the future.

Keywords: cayenne pepper, compost, milkfish waste, organic fertilizer, plant growth

INTRODUCTION

Chili plants are a potential agricultural commodity of high economic value (Lingitubun and Mangera 2019). This plant has great potential for further development because of its abundance in Indonesia and economic value (Devi and Wibowo 2022). Bird's eye chili (*Capsicum frutescens* L.) is a multifunctional horticultural plant that can be used as a cooking spice, sauce, or *sambal*, as well as an ingredient in medicines, and contains numerous nutrients (Karim *et al.* 2019a). Chili contains various nutrients and vitamins, including protein, fat, carbohydrates, calcium, and vitamins A, B1, and C. Chili is well known for its spicy sensation caused by capsaicin (Ziaulhaq and Amalia 2022). This characteristic enhances people's appetite when chili is added to their food. Moreover, the spiciness of bird's eye chili is also beneficial for regulating blood circulation, strengthening the heart, arteries, and nerves, and helping to prevent flu and fever (Ziaulhaq and Amalia 2022). Bird's eye chili is an essential agricultural product that meets food needs. Therefore, it is necessary to cultivate bird's eye chilies (Praswati and Nuswantara 2023). Cultivation can be carried out using appropriate fertilization techniques to support chili production.

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There are two types of fertilizers commonly used: organic and inorganic. Farmers generally rely on inorganic fertilizers to produce fertile and high-quality bird's eye chili plants because these fertilizers are readily available. However, inorganic fertilizers are expensive and have adverse effects on the environment. Excessive use of inorganic fertilizers can pollute the environment, including water and soil, and harm surrounding microorganisms (Amalia *et al.* 2018). Therefore, their use should be adjusted according to the needs of the plants and the usage guidelines. One way to mitigate the environmental pollution caused by inorganic fertilizers is to use organic fertilizers. In addition to being more affordable, organic fertilizers are natural and do not negatively impact the environment. Organic fertilizers are made from plant, animal, or human waste, such as manure, green manure, and solid or liquid compost. They must be applied in large quantities or with appropriate mass compositions because organic fertilizers contain low concentrations of macro and micronutrients. The primary function of organic fertilizers is to enhance soil fertility, chemically, physically, and biologically, and to serve as a nutrient source for plants (Ziaulhaq and Amalia 2022).

According to Meriatna *et al.* (2019), organic fertilizers or compost can be made by decomposing organic materials derived from plant residues. Furthermore, according to Karim *et al.* (2019), compost fertilizer can be made from fruit waste such as *kepok* banana peels, banana stems, pineapple liquid waste (Muarif *et al.* 2021), and others. Additionally, it can be produced using animal waste, including milkfish

entrails (Zahroh *et al.* 2018). Milkfish entrail waste is an organic material that can be used as a raw material for composting because it contains nutrients that are beneficial for plants. Compost fertilizer made from milkfish entrail waste is believed to provide balanced nutrition for plants, including bird's eye chili plants, which are known to require a high nutritional intake. As stated by Asmara *et al.* (2023), milkfish is one of the most popular fish among the public because of its affordable price and high nutritional and protein content. The primary nutrients in fish include proteins, fats, vitamins, minerals, and polyunsaturated fatty acids. The need for organic fertilizer in bird's eye chili cultivation, the abundant and easily accessible milkfish waste, and the high nutritional value of milkfish serve as the background for this study. The research gap lies in the fact that previous studies have examined the nutritional content of milkfish waste, but no research has specifically investigated the utilization of compost fertilizer made from milkfish entrails for bird's eye chili plant growth. Therefore, this study aimed to determine the effect of different mass variations of compost from milkfish entrail waste on the growth of bird's eye chili plants.

METHODS

The study was conducted in a mini plantation behind Building B of the SMA Negeri 3 Tarakan, North Kalimantan, from October 12, 2023, to November 30, 2023. The equipment used in this study included plastic buckets, a scale, a tray, plastic bottles, a shovel, a 30 cm ruler, writing tools, 25 polybags with a diameter of 20 cm × 20 cm, and a mobile phone camera. The materials used were milkfish entrails, waste, and soil samples. Soil was obtained from a vendor in the Bom Panjang area of Tarakan, North Kalimantan. The experimental design was a Completely Randomized Design (CRD) with five treatments and replicates. The following treatments were applied: P1 (without compost fertilizer, control), P2 (200 g of compost), P3 (300 g of compost), P4 (400 g of compost), and P5 (500 g of compost).

Compost fertilizer was prepared from milkfish entrail waste by collecting the waste and drying it in the sun for three days. The mass was then measured using a scale, resulting in 0.5 kg of dried entrail waste. Next, the waste was mixed with 6.5 kg of soil and stirred using a shovel until evenly blended, producing 7 kg of compost. The compost was left in a container until the seedlings were ready for planting.

The chili seedlings used in this study were two weeks of age. A total of 25 seedlings were selected based on the best quality indicators: normal growth, fresh appearance, green leaves, and no signs of pest infestation. Each selected bird's eye chili seedling had the same height of 6 cm and five leaves. The planting containers used were polybags measuring 20 cm × 20 cm. Initially, the polybags were filled with soil, and the volume was adjusted accordingly. Compost was added at different doses (200, 300, 400, and 500 g), and each treatment was repeated five times. Subsequently, the seedlings were planted precisely at the center of the growing medium, and the surrounding soil was gently pressed to ensure that the seedlings stood upright. Chili plants were placed in an area with even sunlight exposure to support optimal photosynthesis. Watering was performed every other day, considering local weather conditions. The growth of the bird's eye chili plants was observed weekly. To assess the effect of the treatments, growth components were measured, namely plant height (cm), which was determined by measuring from the base of the stem to the growth point, and the number of leaves, which were counted manually and recorded.

RESULTS AND DISCUSSION

Plant Height Growth

Plant height growth was observed by comparing the control group with different masses of compost made from milkfish entrails. The results of this study on bird's eye chili plants showed the average plant height in each treatment group over 5 weeks. A significant increase in average plant height was observed from the beginning to the end of the study in each treatment group. The control group (P1) and treatment groups P2, P3, P4, and P5 showed average plant heights of 14.3, 15.3, 16.4, 16.6, and 17.2 cm, respectively. The control group, which was only watered with plain water, exhibited insignificant plant height growth.

The average plant height for each treatment (Figure 1) indicated that the treatment with 500 g of compost from milkfish entrails (P5) resulted in the most effective growth of bird's eye chili plants. This implies that growing chili plants with different compost mass variations from milkfish entrails influences plant height. This finding aligns with Pantang *et al.* (2021), who stated that the application of organic fertilizers at varying volumes has different effects on plant height growth owing to the differences in the nutrient content of the fertilizers.

Leaf Growth

Leaf growth was observed by comparing the control group with different masses of compost made from milkfish entrails. A significant increase in the average number of leaves per week was observed in each treatment group: the control group (P1) and treatment groups P2, P3, P4, and P5. The fifth observation for treatment group P5 recorded the highest number of leaves. This indicates that the control group, which was only watered with plain water, showed insignificant leaf growth.

The average number of leaves in each treatment group (Figure 2) showed that the treatment with 500 g of compost from milkfish entrails (P5) resulted in the most effective growth in the number of leaves. This finding aligns with that of Hariyadi *et al.* (2020), who stated that applying organic fertilizers at different volumes affects the growth of specific plants, such as bird's eye chili plants. From the analysis of the tables and graphs for the two plant growth parameters above, it can be concluded that the effect of different compost compositions from milkfish entrails on bird's eye chili growth was significant. Treatment P1 (light blue) had the lowest average plant height and leaf count, following the order P1 < P2 < P3 < P4 < P5.

The measurement results the first week to the fifth week.
P1 = Without compost fertilizer (control treatment)
P2 = 200 g of compost fertilizer
P3 = 300 g of compost fertilizer
P4 = 400 g of compost fertilizer
P5 = 500 g of compost fertilize

CONCLUSION

The results indicate that applying different compost mass variations from milkfish entrail waste significantly affects bird's eye chili plant growth. Treatment with 500 g of compost yielded the best results, as evidenced by

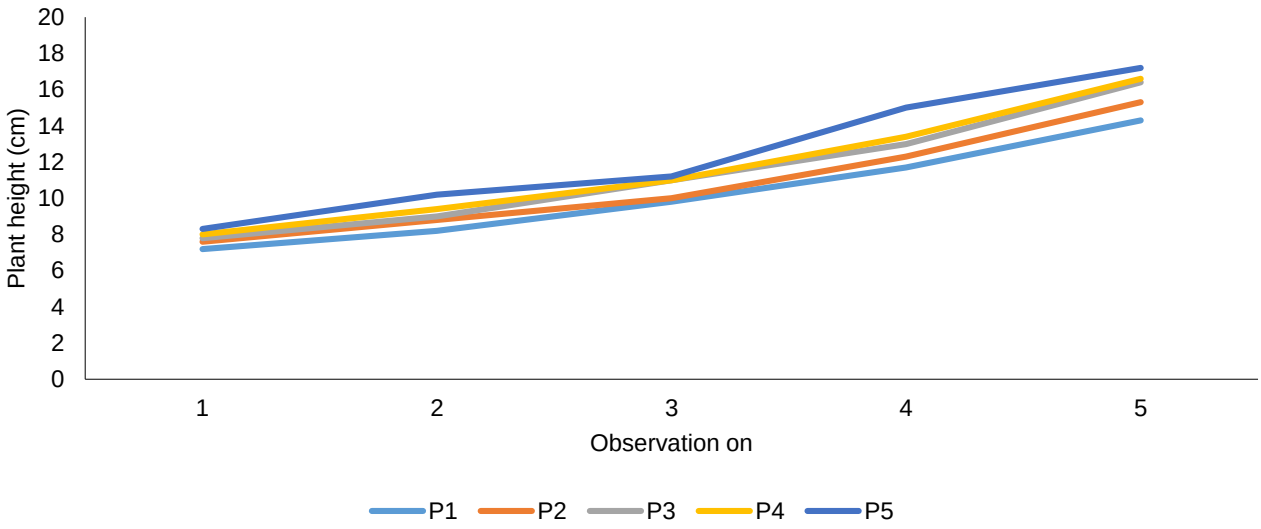

Figure 1 Average of plant height.

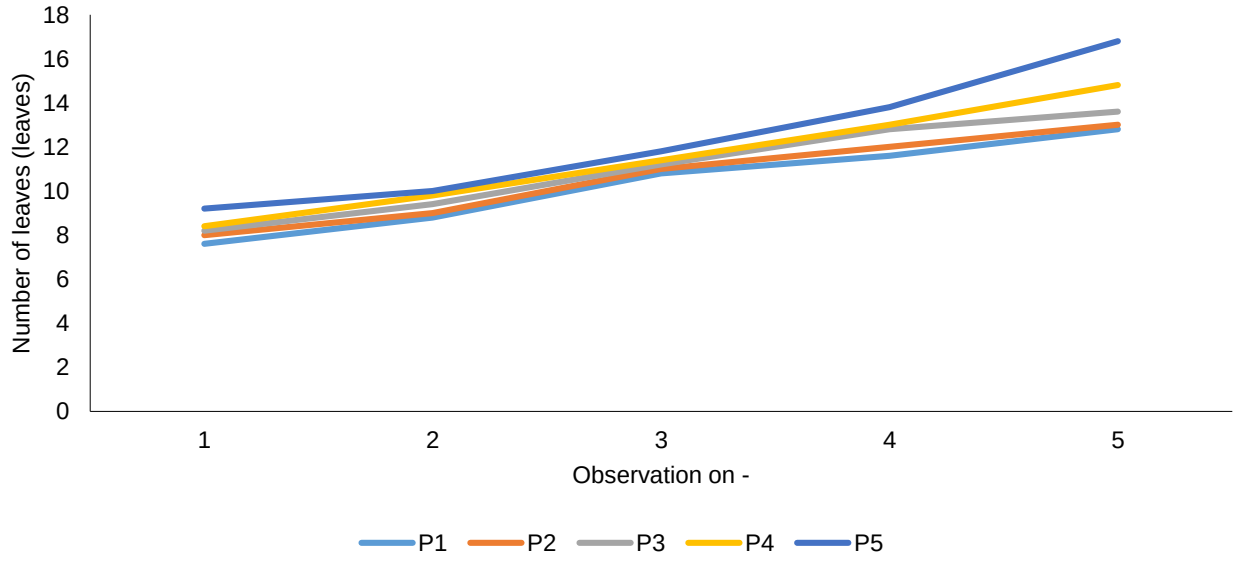

Figure 2 The average leaf number.

the highest average plant height and leaf count compared to other treatments. This finding demonstrates that compost made from milkfish entrail waste has excellent potential as an eco-friendly organic fertilizer alternative to enhance the productivity of horticultural crops.

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