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# USE OF VERMICOMPOST IN ENHANCING THE GROWTH OF PAKCHOY PLANTS (Brassica rapa L.)

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***Abstract***

*Pakcoy (Brassica rapa L.) is a popular vegetable among Indonesian communities due to its rich content of vitamins and nutrients. During its growth stage, pakcoy requires essential nutrients to stimulate its growth, hence the use of organic fertilizer such as vermicompost as a nutrient source. This research aimed to investigate the effect of vermicompost dosage on the growth and yield of pakcoy. The study at PT. Bali Organik Internasional. There were four treatments applied: K0 (0 g/plant), K1 (150 g/plant), K2 (200 g/plant), and K3 (250 g/plant). The experimental design used was a completely randomized design (CRD) with four replications, resulting in 16 experimental units. Data were analyzed using analysis of variance (ANOVA) followed by Duncan's at a significance level of 5%. The results indicated that the application of vermicompost dosage significantly influenced the growth and yield of pakcoy. Application of vermicompost at K3 dosage (250 g/plant) resulted in the best performance across all parameters (plant height, leaf number, fresh weight of shoots, fresh weight of roots, and root length) for pakcoy.*
***Keywords:*** *pakcoy, dosage vermicompost, growth, yield*

***Abstract***

Pakcoy (*Brissica rapa* L.) merupakan tanaman sayur-sayuran yang banyak digemari oleh masyarakat Indonesia karena kaya akan kandungan vitamin dan gizi. Tanaman pakcoy dalam masa pertumbuhannya membutuhkan unsur hara guna memacu pertumbuhannya sehingga menggunakan pupuk organik kascing sebagai sumber unsur hara. Penelitian ini bertujuan untuk mengetahui pengaruh dosis pupuk kascing terhadap pertumbuhan dan hasil tanaman pakcoy (*Brassca rapa* L.). Penelitian dilaksanakan di PT. Bali Organik Internasional. Terdapat 4 perlakuan yaitu: $K_0$ (0 g/ta); $K_1$ (150 g/ta); $K_2$ (200 g/ta) dan $K_3$ (250 g/ta). Menggunakan Rancangan Acak Lengkap (RAL) yang diulang sebanyak 4 kali sehingga terdapat 16 unit percobaan. Data dianalisis menggunakan analisis sidik ragam (ANOVA) dilanjutkan uji jarak berganda Duncan pada taraf 5%. Hasil penelitian menunjukkan bahwa terdapat pengaruh pemberian dosis pupuk kascing terhadap pertumbuhan dan hasil pakcoy. Pemberian pupuk kascing dengan dosis $K_3$ (250 g/ta) memberikan hasil yang terbaik pada semua parameter (tinggi tanaman, jumlah daun, berat segar tanaman, berat segar akar dan panjang akar) pakcoy.
**Kata Kunci :** Pakcoy, dosis pupuk kascing, pertumbuhan dan hasil.

## I. INTRODUCTION

Pak choy (Brassica rapa L.) is a member of the Brassicaceae family and a type of vegetable native to China. This plant was cultivated after the 5th century and spread to Thailand, Malaysia, the Philippines, and even Indonesia. Its development is primarily driven by its economic value and promising market returns. However, its development requires technology and the selection of superior varieties to produce good pak choy (Nugroho, 2022). Furthermore, it offers significant health benefits, as it is rich in vitamins and nutrients (Damayanti et al., 2019). However, Kadir et al., 2023, noted that its growth faces several challenges, such as soil fertility, requiring efforts to address these challenges, including proper fertilizer application, the use of good varieties, improved farming techniques, and intensive maintenance.

Organic fertilizer application can enhance pak choy plant growth (Parwata et al., 2019). To reduce the use of inorganic fertilizers, organic fertilizers derived from manure are used (Jaya et al., 2021). Worm manure (Lumbricus rubellus) is a type of manure that can be used, similar to vermicompost, as it provides essential macro and micro nutrients for plant growth and can increase bok choy productivity. This is evidenced by direct application of vermicompost to bok choy plants at a dose of 125 grams per plant, resulting in good plant growth and yield. Therefore, it is recommended to observe and increase the dose of vermicompost for each plant (Anjani et al., 2022).

The above statement indicates that vermicompost can be used for bok choy (Brassica rapa L.) cultivation, with doses adjusted to suit the plant's growth. The aim of this study was to determine how vermicompost dosage affects bok choy growth and yield.

## II. RESEARCH METHODS

### Research Location and Time

This research was conducted at PT. Bali Organik Internasional, Megati Village, Tabanan Regency, Bali Province.

### Research Methods and Design

This research used an experimental method with statistical analysis. The experimental design consisted of different control and treatment groups to observe the effects on plant growth. Data were collected through direct observation and plant measurements. This research used a Completely Randomized Design (CRD) consisting of four treatments: (K0) = 0 g/t (control), (K1) = 150 g/t (plant), (K2) = 200 g/t (plant), (K3) = 250 g/t (plant). Equipment and materials used: ruler, bucket, labels for each treatment, stationery, books, digital camera, and

scales. b). Materials used in this research were: soil, bok choy seeds, vermicompost, and planting pots.

**Research Procedures**

The research implementation and data collection procedures carried out in the field consisted of soil and vermicompost. The planting medium was prepared using 2 kg of soil per pot and a dose of vermicompost fertilizer according to the treatment doses of 150 g/plant, 200 g/plant, and 250 g/plant. The bok choy seedlings used were 15 days old after sowing. The bok choy seedlings were planted in each pot filled with soil and the appropriate dose of vermicompost fertilizer. Each pot was filled with 1 bok choy seedling, resulting in 16 treatment plants. Replanting was carried out one week after planting to replace damaged or dead plants. Weeding was also carried out to remove weeds around the plants. Parameters measured in this study included: plant height (cm), number of leaves per plant (leaf), fresh wet weight of plants (g), fresh root weight (g), and root length (cm). The harvesting stage for bok choy plants was carried out when the plants were 4 weeks after planting (WAP), with characteristics ready for harvest, namely leaves that grow well and are fresh green, with upright and healthy leaf bases. Harvesting was carried out in the morning when the soil was still moist, making the uprooting process easier.

**Data Analysis**

Data obtained from the field were processed and analyzed using analysis of variance (ANOVA) at a 5% level. If significant, a Duncan's multiple range test was used.

## III. RESEARCH RESULTS

**Average Plant Height**

Bok choy is a compact, leafy green vegetable that thrives in cool to temperate climates, often reaching its ideal harvest height within 25-45 days after planting. The average plant height of bok choy in this study is shown in Table 1.

Table 1. Average Plant Height of Bok Choy (cm)

| Perlakuan | Tinggi Tanaman | | | |
|---|---|---|---|---|
| | 1 MST (cm) | 2 MST (cm) | 3 MST (cm) | 4 MST (cm) |
| $K_0$ | 8.60 | 10.22 | 13.70 | 15.50 b |
| $K_1$ | 8.88 | 10.72 | 15.65 | 18.25 ab |
| $K_2$ | 9.55 | 12.50 | 15.93 | 19.12 a |
| $K_3$ | 10.10 | 13.57 | 19.12 | 21.12 a |

Note: Numbers followed by the same letter in the same column indicate no significant difference in Duncan's further test at the 5% level.

Based on Table 1, the application of vermicompost fertilizer to the height of pak choy plants at 1, 2, and 3 weeks after planting with four vermicompost fertilizer treatments did not produce significant differences. However, at 4 weeks after planting, pak choy plants treated with vermicompost fertilizer showed significant differences. There was no significant difference in the growth of pak choy plants between treatments K3, K2, and K1, and no significant difference between treatments K1 and K0 in the average growth of pak choy plants. However, treatment K3 showed the best results, as seen in the highest plant height growth of 21.12 cm, while the lowest plant height growth was found in treatment K0 (without vermicompost), which only reached 15.50 cm. This aligns with the statement (Syahputra, 2019) that vermicompost is an organic fertilizer derived from worm metabolism, such as feces. It can produce a high nitrogen content of 1.99%, thus increasing vegetative growth, including plant height.

**Average Number of Leaves**

Bok choy is a broad, dark green leafy vegetable with thick, white stems suitable for consumption. In this study, the average number of leaves is as shown in Table 2.

Table 2. Number of Leaves on Bok choy Plants (Sheets)

| Perlakuan | Jumlah Daun (Helai) | | | |
|---|---|---|---|---|
| | 1 MST | 2 MST | 3 MST | 4 MST |
| $K_0$ | 3.00 | 6.00 | 8.25 | 9.50 c |
| $K_1$ | 3.00 | 6.75 | 8.75 | 9.75 bc |
| $K_2$ | 3.00 | 7.00 | 9.25 | 11.00 b |
| $K_3$ | 3.00 | 8.25 | 10.25 | 13.25 a |

Note: Numbers followed by the same letter in the same column indicate no significant difference in Duncan's further test at the 5% level.

Based on Table 2, the application of vermicompost fertilizer on leaf number in bok choy plants aged 1, 2, and 3 weeks after planting with four vermicompost fertilizer treatments showed no significant difference. However, for plants aged 4 weeks after planting, vermicompost fertilizer showed a significant difference in leaf number. There was a significant difference in vermicompost fertilizer application on bok choy leaf number in treatments K3 and K2, and a significant difference in treatments K2, K1, and K0. This indicates that plant growth yields the highest when the amount of vermicompost fertilizer applied is higher. Plants receiving 250 g of vermicompost fertilizer per plant showed the best results in leaf growth compared to other treatments.

Leaf growth in plants is closely related to plant height; the taller the plant, the more leaves are formed because leaves grow from the nodes on the stem (Dos Santos et al., 2023). The nutrient content of bok choy plants, particularly nitrogen (N), phosphorus (P), and potassium (K), is influenced by the fertilizer dosage. The availability of these nutrients is crucial for growth and leaf production.

**Average Fresh Wet Weight**

Table 3. Fresh Wet Weight of Pak choy Plants (g)

| Perlakuan | Berat segar tanaman 4 MST (gram) |
|---|---|
| $K_0$ | 21.50 b |
| $K_1$ | 31.25 b |
| $K_2$ | 35.75 b |
| $K_3$ | 67.25 a |

Note: Numbers followed by the same letter in the same column indicate no significant difference in Duncan's further test at the 5% level.

Based on Table 3, the application of vermicompost fertilizer on the fresh wet weight of bok choy plants in treatments K2, K1, and K0 showed no significant difference, and the K3 treatment was significantly different from treatments K2, K1, and K0. The K3 treatment was the best treatment because it showed the highest yield (67.25 g) on the fresh wet weight of bok choy plants. These research results align with the statement (Jalu Lokha et al., 2021) that vermicompost application to bok choy plants can enhance their growth, with higher doses resulting in good growth.

The weekly increase in plant height and leaf number contributes to the increase in fresh wet weight of bok choy. This is due to increased photosynthetic capacity, which increases carbohydrate synthesis in plants, leading to increased fresh weight (Opusunggu 2017). Adequate nutrient intake, particularly nitrogen (N), phosphorus (P), and potassium (K), is crucial for optimal growth and leaf development of bok choy. The availability of these elements contributes to increased plant fresh weight and overall yield (Junior et al., 2023).

**Average Root Fresh Weight**

Table 4. Fresh Root Weight of Bok Choy (g)

| Perlakuan | Berat Segar Akar 4 MST (gram) |
|---|---|
| K0 | 1.50 b |
| K1 | 2.50 b |
| K2 | 2.75 b |
| K3 | 6.25 a |

Note: Numbers followed by the same letter in the same column indicate no significant difference in Duncan's further test at the 5% level.

Table 4 shows that there was no significant difference between the application of vermicompost fertilizer and the fresh root weight of bok choy plants in the K2, K1, and K0 treatments, and the K3 treatment showed a significant difference compared to the K2, K1, and K0 treatments. The K3 treatment was the best treatment because it produced the highest yield (6.25 g) of fresh root weight for bok choy plants.

Increasing the vermicompost fertilizer dosage has the potential to meet plant nutrient requirements to support optimal plant growth. The plant's ability to absorb water and nutrients from NPK significantly affects the total fresh root weight. If plant roots cannot absorb water and nutrients properly, nutrient supply will be hampered and energy production will be low, thus preventing plant growth and productivity (Junior et al., 2023).

**Average Root Length**

Table 5. Pakchoy Plant Root Length (cm)

| Perlakuan | Panjang akar 4 MST (cm) |
|---|---|
| $K_0$ | 11.38 b |
| $K_1$ | 13.00 b |
| $K_2$ | 14.88 b |
| $K_3$ | 21.25 a |

Note: Numbers followed by the same letter in the same column indicate no significant difference in Duncan's further test at the 5% level.

Table 5 shows that the application of vermicompost fertilizer on the root length of K3 bok choy plants showed a significant difference in treatments K2, K1, and K0, but no significant difference between treatments K2, K1, and K0. The K3 treatment was the best treatment because it produced the highest yield (21.25 cm) in root length for bok choy plants. Plants have long roots because they have sufficient nutrients and good nutrition. According to Dos Santos et al., 2023, optimal fertilization can increase root growth, improve nutrient absorption efficiency, and overall plant development. Furthermore, roots can be considered the primary channel for nutrient uptake.

## IV. CONCLUSION

The use of vermicompost fertilizer has a significant effect on pakcoy plants (Brassica Rapa L.), where the vermicompost fertilizer dose treatment of 250 g/plant is the best dose

because it is able to provide good growth and results such as plant height, number of leaves, fresh wet weight, fresh root weight, and root length.

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