



## Growth and Production of Pakchoy Under Various Type of Organic Fertilizer

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### Abstract

This study was conducted in Wiringpalenna village, Tempe sub-district of Wajo district, with the aim to determine the effect of the type of organic matter on the growth and production of pakchoy plants. The study was arranged based on a Randomized Block Design with five treatments namely: without organic matter, chicken manure, Blotong (Filter press mud), bokashi common water hyacinth, bokashi rice straw. The results showed that from variables tested; plant height, the number of leaves, the width of leaves, fresh weight of plants, fresh weight of plants per plot, and fresh weight per hectare, treatment with bokashi common water hyacinth obtained the best result

**Keywords:** pakchoy, manure, bokasi

### A. Introduction

Development of the horticulture subsector in Indonesia today is directed at the agribusiness system. The role of horticultural commodities is quite large for improving nutrition of the communities, increasing farmers' income, expanding employment opportunities, developing agribusiness and agro-industry, increasing exports, and reducing imports.

During the past five years, in the 2000s, there has been an increase in the absorption of vegetable commodities in the local market. This increase occurred due to public awareness about the nutritional value of vegetables, along with an increase in people's purchasing power that is getting better, especially in organic vegetables. Therefore, efforts are needed to improve the quality and quantity of production and income of vegetable farmers.

One vegetable with a close relative of mustard greens is pak choy. This plant belongs to the same genus as mustard greens in the plant classification, but different in varieties. For the appearance, it is very similar to mustard greens but shorter and compact. Based on this similarity

and the fact that it has almost the same taste as mustard greens, then its presence is easily accepted at the dinner table. In addition, these plants are able to grow in the lowlands and highlands but produce better in the highlands, and can be harvested in a short time, thus, this plant has the potential to be developed.

In order to develop pak choy plants, one way that needs to be conducted is to improve its cultivation techniques. Related to the cultivation of plants which lately is often discussed about sustainable agricultural production systems that are indicated by the existence of sustainability, environmentally friendly and ensure ecological sustainability, so that sustainable agricultural production systems are synonymous with the term organic agriculture development.

The potential and opportunities for developing organic agriculture are quite open and bright in the future. Therefore the results of the study on organic agriculture need to be applied and disseminated quickly and widely.

Considering the above explanation, pak choy cultivation should be developed by applying agricultural technology including the use of organic materials. Sources of organic matter that can be used to increase the production of agricultural crops may come from manure, rice straw, and common water hyacinth leaves, and blotong (waste from a sugar factory). Waste from organic matter usually contains many elements, some of them are essential for crop maintenance.

Common water hyacinth is one of the aquatic plants that live floating on the water due to its hollow stem, this plant contains organic matter which is needed for plant growth and development. This is proven by the results of laboratory analysis stating that common water hyacinth contains 1,681 % nitrogen, 0,275 % phosphorus, 14,268 % calcium, 37,654 % carbon with a C/N ratio of 22,399 (Fryer & Matsunaka, 1988).

*Blotong* (Filter press mud) as a by-product of the process of making sugar from sugar cane, always produced in large quantities, less than 2,7% of the weight of sugarcane that is ground each year. Blotong is a mixture of various materials consisting of sugarcane fiber, sucrose, and thickened colloids such as wax, sand, and soil.

Blotong has physical properties which are formless material, dark brown to black, soft, light and can be as a sponge; has a high ability to absorb water; fresh blotong contains up to 70 % water, while dry blotong that placed in storage for 6 to 12 months contain 15 % water; can be used as mulch, with its chemical properties for releasing nutrients slowly; has a high cation exchange capacity. Nutrient composition of blotong is : 2.19 % N, 2.77 % P<sub>2</sub>O<sub>5</sub>, 0.44 % K<sub>2</sub>O, and microelements such as Fe, Mn, Mg and B (Muhali, 1981).

Rice straw is an agricultural waste that has enough nutrient content, is easy to decay, and has a high-water absorption capacity up to three times its own weight (Setyamidjaya, 1986). Based on research of FAO/UNDP Regional Project RAS / 75/2004 nutrient compositions in rice straw are 0.58 % N, 0.10 % P<sub>2</sub>O<sub>5</sub>, 38 % KCl and 105 % C/N (Wididana & Higa, 1993).

Chicken manure is classified as hot fertilizer with rapid decomposition by microorganisms. The mineral composition and water content of chicken manure are 1.5 % N, 9, 45 % P<sub>2</sub>O<sub>5</sub>, 0.4 % K<sub>2</sub>O, 3.0 % Ca, and 0.6 % Mg (Ayub, 2004).

In agriculture, the use of organic waste to increase soil fertility and agricultural production has been done for a long time. Thus the use of organic waste as a source of plant nutrients can solve the problem of environmental pollution while providing benefits to the soil. The function of organic matter in the soil is as a nutrient source, stimulates the activity of soil microorganisms and improves the physical, chemical and biological properties of the soil.

Based on the explanation above, a study was carried out the entitled effect of organic matter on the growth and production of pak choy plants.

## B. Methodology

This research was arranged according to a Randomized Block Design (RBD) consisting of five treatments namely: Without Organic Materials (p<sub>0</sub>), Chicken Manure (p<sub>1</sub>), *Blotong* (p<sub>2</sub>), Bokashi common water hyacinth (p<sub>3</sub>), Bokashi rice straw (p<sub>4</sub>). Each treatment was repeated three times as a group, then there were 15 experimental plots.

Pak Choy seeds are spread evenly in nursery plots that have previously been mixed with manure and then covered with fine soil. Furthermore, germinated seeds were covered with coconut leaves. Seedling maintenance was done by watering the seedling in the morning and evening by taking care of the moisture of the seedling media. At four weeks after planting the seedlings of pak choy are ready to be transferred to the experimental plot.

Land preparation was done two weeks before planting. Land sanitation was carried out by removing weeds and remaining plant roots. The ground was loosened using a hoe or plows, then a plot was made with a size of 1,2 m x 1,5 m = 1,8 m<sup>2</sup> with a space between plots of 0,5 m. Around the experimental field, a canal was constructed with a width of 0,5 m and a depth of 25 -30 cm. Then fertilizer was applied based on the treatment.

When the seedlings are at one month after planting (leaves 4-5 strands), the seedlings could be transferred to the experimental plot. Planting was done in the afternoon. Before planting, the plot should be watered evenly. The spacing used was 20 cm x 20 cm so that each experiment plot contained 45 plants.

At the beginning of the growth of the pak choy plant, watering was performed routinely twice a day in the morning and evening. The application of organic fertilizer was conducted when making experimental plots with a dose of 2 tons/ha (0,36 kg/plot). Subsequent fertilization using urea fertilizer as a base fertilizer with a dose of 50 kg/ha (9 g/plot) which was done 1 week after transplanting. The first weeding was done when the plants are 1 week after planting and the next weeding was considered based on the field conditions.

Harvesting was done when the plants are 44 days after planting when the lowest leaf has begun to turn yellow. This plant is harvested by cutting the stem of the plant just above the soil surface without the roots.

Variables were observed in each 5 plant samples which randomly selected in each plot, the variables including the plant height, number of leaves, width of leaves, fresh weight per plot and fresh weight per ha

### C. Discussion

Mm Bokashi common water hyacinth provided better results on plant height, the number of leaves, the width of leaves, and fresh weight per plant, fresh weight per plot, and fresh weight per hectare. This result obtained by Bokashi common water hyacinth was better compared to other types of fertilizer treatments (Figures 1,2,3,4,5 and 6).

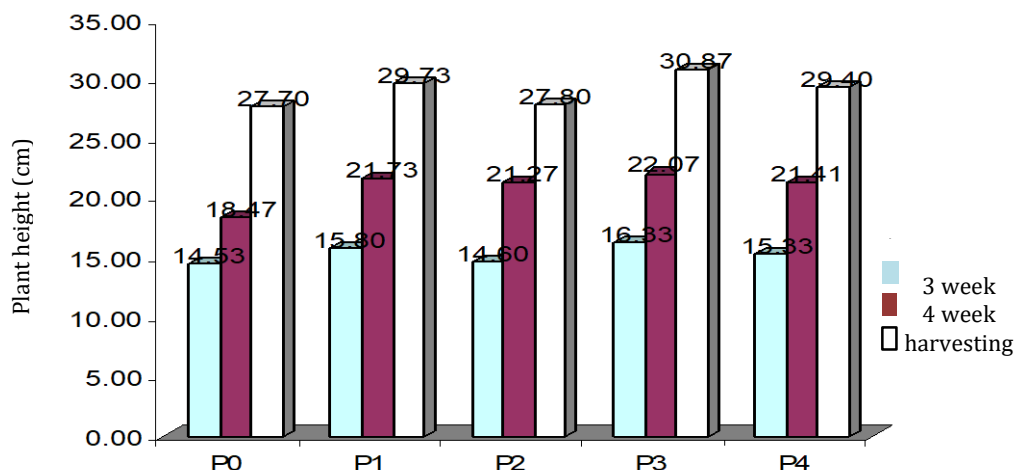


Figure 1. Diagram of Average Plant Height of pak choy

Well grown of the plant in the initial phase causes subsequent well generative growth. As it is known that bokashi common water hyacinth; besides its high nutrient content also been fermented, made this material decomposes quickly and easily available to plants.

While bokashi rice straw, although it has also been fermented, because the nutrient content is rather low, thus, the effect is insufficient to meet the needs of plant nutrients. The application of chicken manure is also showed different results, however, it tends to be better than bokashi straw, blotong, and without organic matter. This might be because manure contains nutrients that are needed for growth and development of the plant, but the effect is slower than bokashi common water hyacinth because chicken manure is not provided in the form of bokashi even though chicken manure is classified as hot fertilizer. Similarly, blotong because it is not in the form of bokashi or did not get fermentation process, therefore, it is slow to available in plants even though the nutrient contents are higher especially nitrogen.

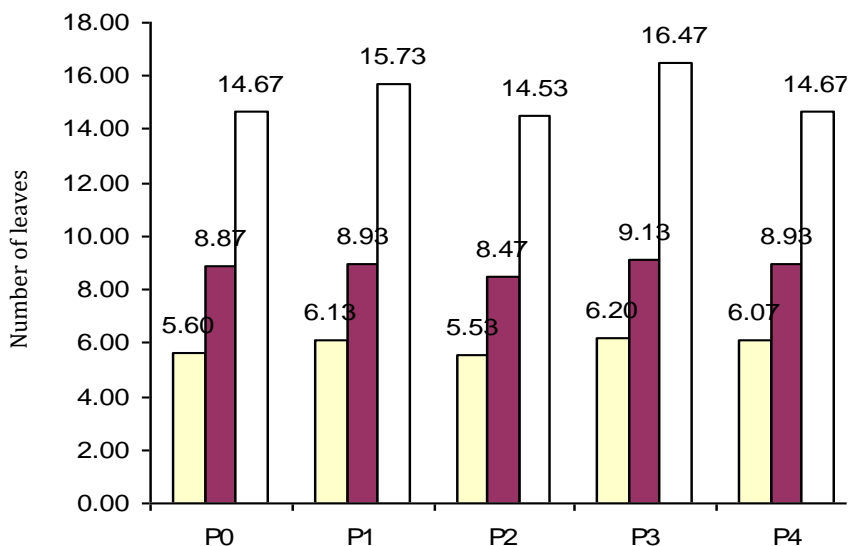


Figure 2. Diagram of Average number of leaves of pak choy

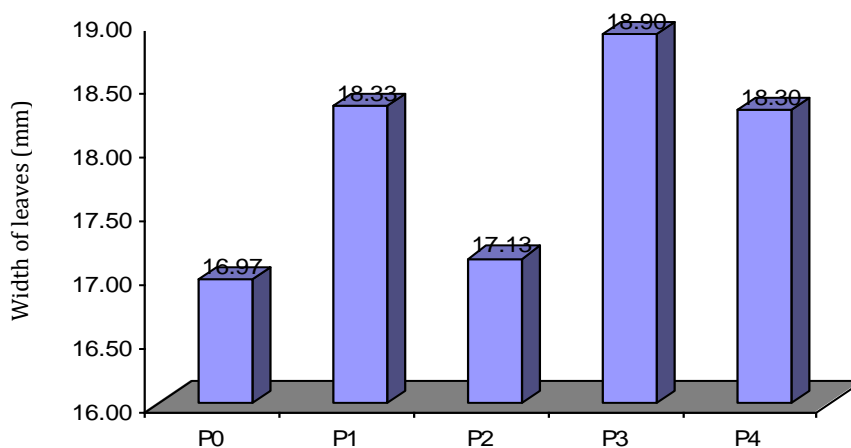


Figure 3. Diagram of Average width of leaves of pak choy

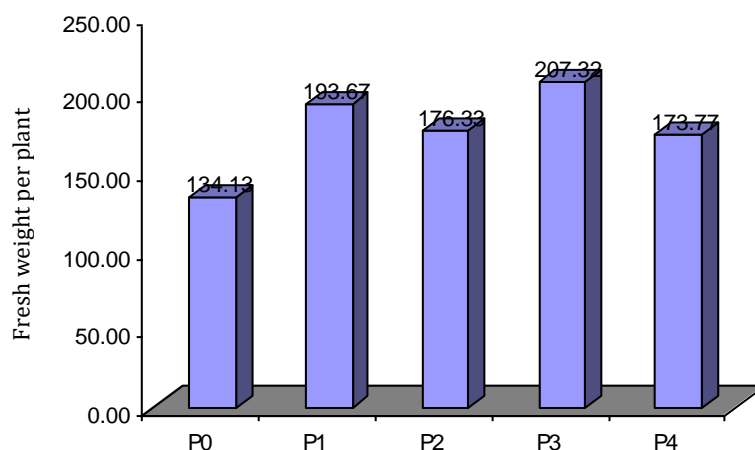


Figure 4. Diagram of Average fresh weight of pak choy

The best growth and production of pak choy were obtained by the treatment of bokashi common water hyacinth, this might be because the nutrient of bokashi common water hyacinth is easily to decompose, so it can more quickly be absorbed by plant roots to support its growth.

The application of organic matter into the soil will increase the availability of nutrients needed by plants. Thus plants can grow and produce well. According to Hakim, Nyakpa, Lubis, Nugroho, Rusdi, Diha, Hong, & Bayley (1986), the addition of organic material into the soil can increase the absorption and cation exchange capacity of the absorption complex.

The application of organic matter into the soil will increase the availability of groundwater. This is in line with the opinion of Setyamidjaja (1986) that the application of organic matter into

the soil will improve soil structure, soil infiltration capacity, water binding capacity, soil aeration, and soil resistance to erosion.

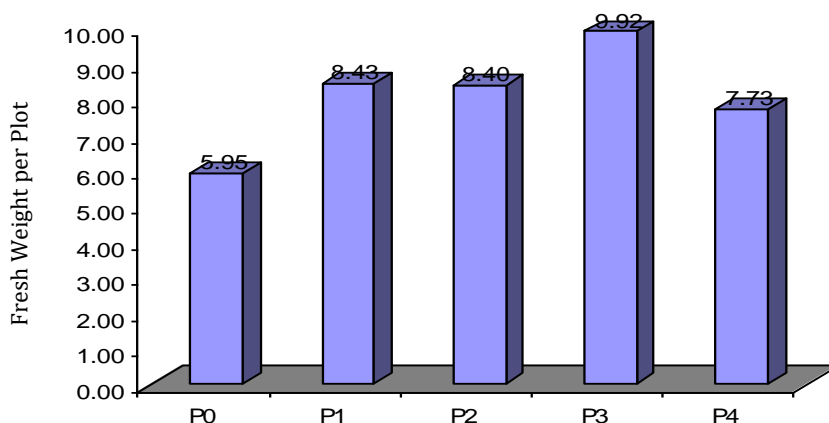


Figure 5. Diagram of Average fresh weight of pak choy per plot

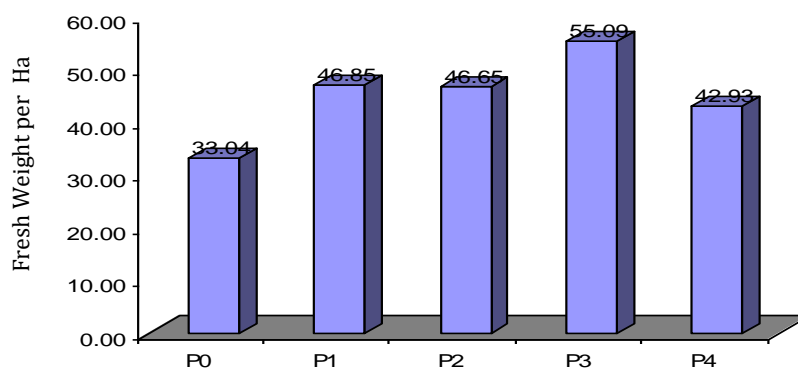


Figure 6. Diagram of Average fresh weight of pak choy per hectare

Whereas N, P, and K contained in the organic matter according to Sarief (1993), nitrogen has a role to stimulate vegetative growth by increasing plant height and is a constituent of protein, protoplasm and the formation of plant parts such as stems and leaves which are photosynthetic activities that produce photosynthates for vegetative growth. In addition, Setyamidjaja (1986) suggested that the leaves are an active part of the plant. In the leaves, photosynthesis as a very important plant life activity is carried out, where plant nutrients play a role. Meanwhile, according to Hardjowigeno (2002), functions of P is for cell division, the formation of albumin, the formation of flowers, fruit, and seeds and accelerate maturation; while K functions to activate enzymes, and enhance resistance to drought, disease, and root development.

#### D. Conclusion

Based on the results of the study, it can be concluded that plant height, number of leaves, the width of leaves, fresh weight of plants and fresh weight of plants per plot, and fresh weight of plants per hectare are best produced in the treatment with application of bokashi common water hyacinth. For the upcoming experiments, it is recommended that all organic matters used in the form of bokashi.

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