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Research Article
Analysis of Plant Growth and Yield of Pakcoy in Organic Garden Farming System

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Abstract

Background and Objective: Improving the quality of pakcoy plants (*Brassica rapa* L.) can be done by utilizing organic waste in compost. Organic waste that can be used as compost has many potentials. Each type of organic waste compost has its unique nutrient content so, the optimal dose for each type of compost is also different. This study focused on the effect of the type and dose of compost on pakcoy plants. **Materials and Methods:** This study has been carried out at the Green House of the Faculty of Agriculture, Universitas Brawijaya, Malang from January to March, 2022. This research used a factorial randomized block design with 3 different types of organic fertilizer as the first treatment and 4 doses of fertilizer as the second treatment. **Results:** Observational data showed that there was an interaction between the type and dose of organic waste compost on the growth and yield of pakcoy plants. The application of organic fertilizer made from sugarcane blottings on pakcoy plants showed better plant growth and yields when compared to compost made from chicken manure and tobacco waste. The application of compost made from sugarcane bagasse showed the highest fresh and economic weight yields of 32.03 and 17.35 g, respectively. **Conclusion:** This study also found that the content of macronutrient NPK in compost showed a positive correlation with the yield of pakcoy.

Key words: Pakcoy, compost, organic farming, organic fertilizer, nutrient content, planting media, carbohydrates

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

During the COVID-19 pandemic, the availability of food was a top priority for the country to prevent a national food crisis. The availability of food is very important to fulfill the needs of an Indonesian citizen, which is nutritious and safe for consumption. Hence, the Ministry of Agriculture 2020 established the *Pekarangan Pangan Lestari* (P2L) program. The P2L concept is to use unproductive yard land to become a market-oriented family food source. One of the plants that can be cultivated to support the P2L program is pakcoy. Pakcoy (*Brassica rapa* L.) is a leaf vegetable that is favoured by the locals. Pakcoy plants have dark green leaves with an oval shape, thick white or green petioles and plant heights ranging from 15-30 cm. The nutritional content in pakcoy includes vitamin A, vitamin C, protein, carbohydrates, Ca, Mg and Fe also contain antioxidants[1].

Pakcoy cultivation in city yards is carried out in pots or polybags due to limited land and planting media. The planting medium used is a mixture of soil and organic fertilizer. The price of organic fertilizer which is relatively expensive is around Rp. 1,500-2,000 per kilogram. This is because compost production only fulfills 10% of the compost market potential with an estimated need of 11 million tons per year[2]. The emphasis on planting media costs can be done by utilizing organic waste through the composting process into organic waste compost.

The availability of organic waste such as chicken manure, sugarcane cakes and tobacco waste in large quantities is a problem in the community. Each type of organic waste has a different nutrient content. The potential for the use of organic waste is still wide open in Indonesia, Indonesia has a high potential for compost production due to the high amount of organic waste that is still not utilized and ends up in open dumps, rivers and burned[3].

Farmers determine the dose of compost based on cultivation techniques and types of plants, but it is also necessary to pay attention to the nutrient content of the compost. In conventional cultivation, the use of compost at the beginning of tillage ranges from 5-15 tons ha^{-1}. Types of organic waste compost have varying nutrient content, so the optimal dose for each type of compost is also different.

Therefore, there is a need for further studies regarding the effect of types and doses of organic waste compost on the growth and yield of pakcoy plants.

MATERIALS AND METHODS

Study area: The research was carried out at the Green House, Faculty of Agriculture, Universitas Brawijaya, Malang with an altitude of 493 meters above sea level, a minimum and maximum temperature are 18.4 and 32.7°C with a relative humidity of about 40-90%. This research was conducted from January to March, 2022.

Study design: This research used a Randomized Block Design (RBD) with 2 factors, the first factor is organic waste compost and the second factor is fertilizer dose.

The first factor of organic waste compost consists of:

- K_1 = Chicken manure compost
- K_2 = Sugarcane bagasse compost
- K_3 = Tobacco waste compost

The second factor of fertilization dose consists of 3 levels:

- D_1 = 10 tons ha^{-1}
- D_2 = 20 tons ha^{-1}
- D_3 = 30 tons ha^{-1}

The research activity begins with making compost which will be used as a treatment. The organic materials used are chicken manure, sugarcane bagasse and tobacco waste. Composting activities are carried out in wooden boxes with a size of 2.6×0.6×0.6 m. Each wooden box contains one type of organic waste and a decomposer is applied at a dose of 5 mL L^{-1}. The length of the decomposition process until the sample is taken to be tested at BPTP is 28 days. Chemical analysis of soil, compost and compost material was carried out to determine the chemical properties of compost, soil and compost material. The results of the chemical analysis were shown in Fig. 1-4(a-b).

After the organic matter composting process is complete, the next activity is planting. Seedlings are carried out in trays with compost planting media. Each planting hole contains 2 pakcoy seeds. The nursery process lasts for 10-14 days or there are 4 leaves. Planting is done by making planting holes in polybags. One pakcoy seedling is planted in each polybag. Plant maintenance includes watering, weeding and pest control. Normal harvest is done at the age of 35 days after planting, done by pulling or cutting the base of the stem. The criteria for the plants to be harvested were shiny dark green leaves, erect leaf stalks and plant heights ranging from 15-30 cm.

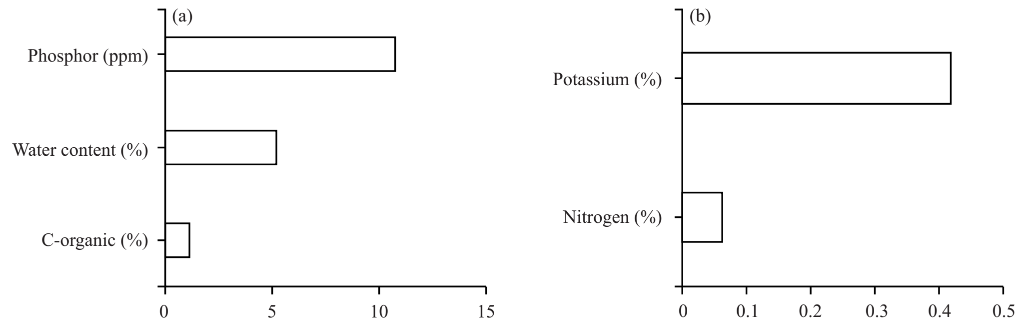

Fig. 1(a-b): Initial soil content, (a) Available phosphor, water content and C-organic of soil and (b) Potassium and nitrogen of soil
X axis of a-b: The value of initial soil water content (%), C-organic content (%), phosphor content (ppm), potassium (%) and nitrogen content (%) and Y axis of a-b: Initial soil chemical analysis (phosphor, water content, C-organic, potassium and nitrogen)

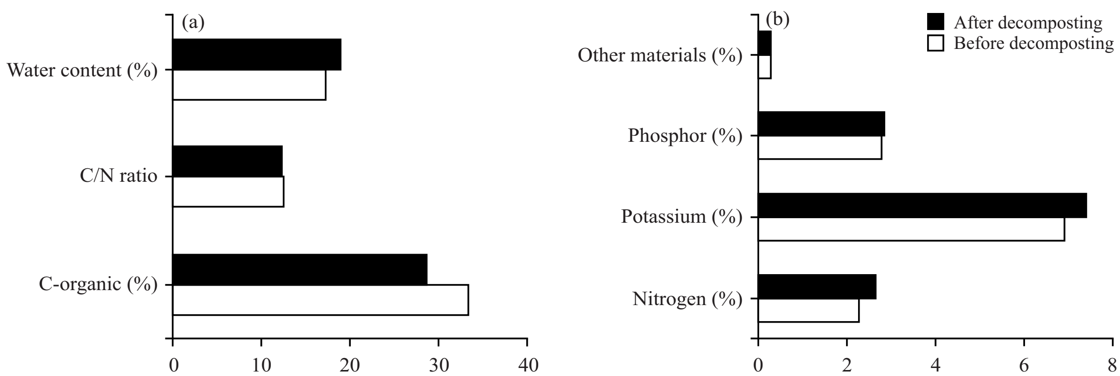

Fig. 2(a-b): Chicken manure chemical content after and before decomposing, (a) Water content, C/N ratio and C-organic and (b) NPK and other materials
X axis of a-b: The value of chicken manure water content (%), C/N ratio, C-organic (%), other materials (%) and NPK (%) content before and after decomposing and Y axis of a-b: Chicken manure chemical analysis (water content, C/N ratio, C-organic, other materials and NPK content)

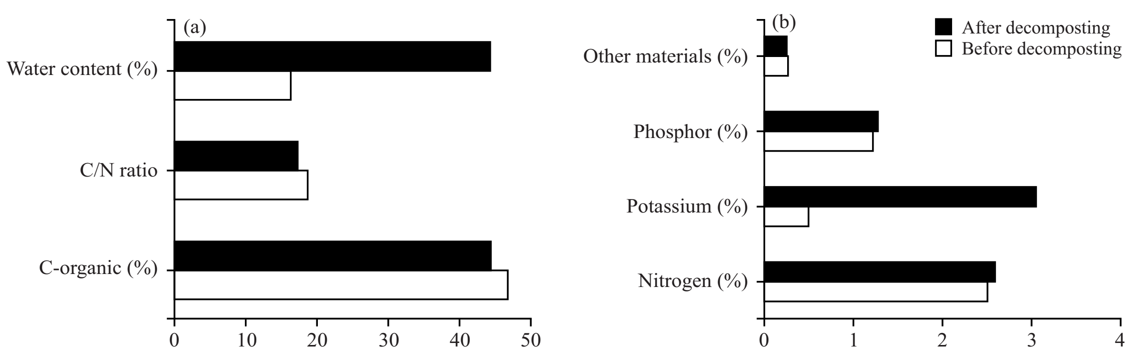

Fig. 3(a-b): Sugarcane bagasse chemical content after and before decomposing, (a) Water content, C/N ratio and c-organic and (b) NPK and other materials
X axis of a-b: The value of sugarcane bagasse water content (%), C/N ratio, C-organic (%), other materials (%) and NPK (%) content before and after decomposing and Y axis of a-b: Sugarcane bagasse chemical analysis (water content, C/N ratio, C-organic, other materials and NPK content)

Observations on the growth and yield of pakcoy plants were carried out destructively and non-destructively. The parameters observed were plant growth parameters, yield observations and plant growth analysis including plant length, number of leaves, leaf area, stem diameter, dry weight, relative growth rate (RGR), harvest time, fresh weight and economic weight.

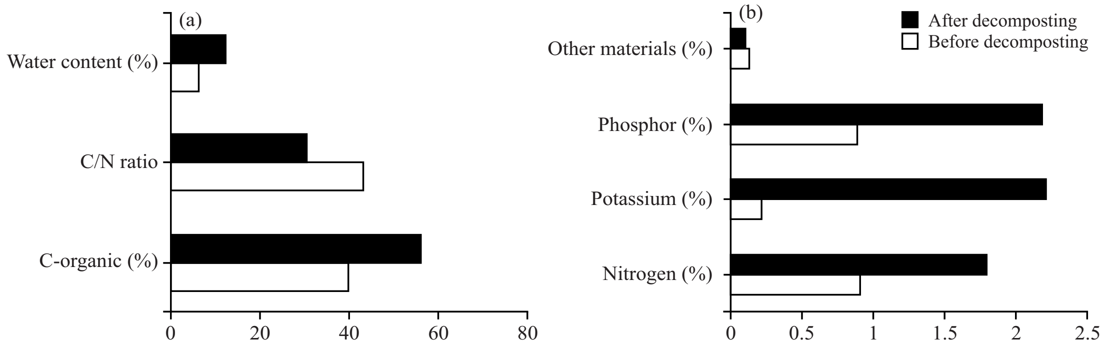

Fig. 4(a-b): Tobacco waste chemical content after and before decomposing, (a) Water content, C/N ratio and C-organic and (b) NPK and other materials

X axis of a-b: The value of sugarcane bagasse water content (%), C/N ratio, C-organic (%), other materials (%) and NPK (%) content before and after decomposing and Y axis of a-b: Sugarcane bagasse chemical analysis (water content, C/N ratio, C-organic, other materials and NPK content)

Statistical analysis: Observational data obtained were analyzed using Analysis of Variance (ANOVA) at the 5% level, if the test results obtained a significant effect, then continued with a comparison test between treatments using least significance different (LSD) at the 5% level. Correlation analysis was also carried out on yield components and composite nutrient content to determine the relationship between these two variables[4].

RESULTS AND DISCUSSION

Growth parameters: The results showed that there was an interaction between the type of compost waste and the dose of compost fertilizer pakcoy on plant height at all observation times 7-35 DAT (days after transplanting) (Table 1), the number of leaves at the time of observation 7, 14, 21 and 35 DAT (Table 2) number of leaves at 28 DAT (Table 3), stem diameter at 14 and 21 DAT (Table 4), stem diameter at 7, 28 and 35 DAT (Table 5), leaf area at 14 and 21 DAT (Table 6), leaf area 7, 28 and 35 DAT (Table 7), plant dry weight at 21 DAT (Table 8), and plant dry weight at 14, 28 and 35 DAT (Table 9). Where compost made from sugarcane bagasse showed higher plant height at all treatments at doses of 10, 20 and 30 tons ha^{-1} at all observation times from 7-35 DAT. Similar results were also found in research, which showed that the application of compost derived from sugarcane bagasse waste resulted in an increase in plant height in *Phaseolus vulgaris*[5]. The increase in pakcoy plant height due to the increase in plant growth resulted from the utilization of photosynthetic nutrients used in stem cells[6].

The data also showed that the other growth parameters such as the number of leaves, stem diameter, leaf area and plant dry weight showed the value that tends to be better with the application of compost made from sugarcane bagasse waste than other types of compost. The higher growth parameters occur because the application of composted sugarcane bagasse can increase the organic matter in the soil that functions to act as an absorbent of mineral nutrients in the soil and make them more available to plant roots for a longer and more effective period[7]. The results of research conducted by Najarian and Souri[8] also showed that the application of compost made from sugarcane bagasse can result in improved soil physical properties that contribute to better plant growth.

The results of the growth parameters data showed that increasing the dose of compost from 10 tons ha^{-1} to 20 tons ha^{-1} caused an increase in growth parameters such as plant height, stem diameter, number of leaves, leaf area and dry weight (Table 1-9). This indicated that the application of compost at the optimum dose will lead to better growth of pakcoy plants. According to Meunchang *et al.*[9], the application of compost showed a significant increase in nutrition minerals in the soil such as N, P, Ca, Mg and other minerals needed for plant growth. However, based on plant growth data, increasing the dose of compost to 30 tons ha^{-1} did not show an increase in the pakcoy plant growth parameters. This was because the nutrients present in compost given to the soil are slow release (release the nutrients contained slowly) and when given to plants it will require a decomposition process so that some of the nutrients can be available to plants[10].

Relative growth rate: Based on the data in Table 10 the treatment of compost type and compost dosage does not show an interaction relationship on the relative growth rate parameter. The treatment of different doses of compost on pakcoy plants did not show an effect on the relative growth

Table 1: Interaction between different compost types and doses on pakcoy plant height at various ages observation

	Plant height (cm)		
Treatment	Dosage 10 ton ha^{-1}	Dosage 20 ton ha^{-1}	Dosage 30 ton ha^{-1}
7 DAT			
Chicken manure compost	6.91^{d}	5.86^{c}	4.53^{a}
Sugarcane bagasse compost	8.06^{e}	7.68^{de}	8.07^{e}
Tobacco waste compost	5.50^{bc}	4.76^{ab}	5.23^{abc}
LSD 5%	0.89		
14 DAT			
Chicken manure compost	10.20^{d}	7.74^{c}	4.96^{a}
Sugarcane bagasse compost	12.09^{e}	12.60^{e}	12.08^{e}
Tobacco waste compost	5.84^{ab}	6.64^{bc}	6.00^{ab}
LSD 5%	1.23		
21 DAT			
Chicken manure compost	13.17^{d}	10.34^{c}	5.91^{a}
Sugarcane bagasse compost	15.70^{e}	17.16^{e}	15.97^{e}
Tobacco waste compost	7.88^{b}	8.68^{bc}	7.68^{b}
LSD 5%	1.73		
28 DAT			
Chicken manure compost	14.83^{d}	12.21^{c}	7.04^{a}
Sugarcane bagasse compost	19.27^{e}	19.03^{e}	17.49^{e}
Tobacco waste compost	10.22^{bc}	11.57^{bc}	9.66^{b}
LSD 5%	2.45		
35 DAT			
Chicken manure compost	15.19^{d}	13.31^{cd}	7.69^{a}
Sugarcane bagasse compost	20.36^{e}	19.46^{e}	18.17^{e}
Tobacco waste compost	11.37^{bc}	13.24^{cd}	10.59^{b}
LSD 5%	2.35		

Numbers accompanied by the same superscripted letter in the same column and row show that they are not significantly different based on the 5% LSD test

Table 2: Interaction between different compost types and doses on pakcoy number of leaves at various ages observation

	Number of leaves		
Treatment	Dosage 10 ton ha^{-1}	Dosage 20 ton ha^{-1}	Dosage 30 ton ha^{-1}
7 DAT			
Chicken manure compost	3.00^{d}	2.67^{bcd}	2.11^{a}
Sugarcane bagasse compost	2.89^{cd}	3.00^{d}	3.00^{d}
Tobacco waste compost	2.33^{ab}	2.33^{ab}	2.56^{bc}
LSD 5%	0.42		
14 DAT			
Chicken manure compost	5.11^{d}	4.22^{c}	3.11^{b}
Sugarcane bagasse compost	4.78^{d}	4.89^{d}	5.00^{d}
Tobacco waste compost	2.44^{a}	3.44^{b}	3.11^{b}
LSD 5%	0.54		
21 DAT			
Chicken manure compost	6.33^{b}	5.33^{a}	4.78^{a}
Sugarcane bagasse compost	6.44^{b}	6.89^{b}	6.33^{b}
Tobacco waste compost	4.56^{a}	4.67^{a}	5.11^{a}
LSD 5%	0.84		
35 DAT			
Chicken manure compost	11.78^{bc}	9.67^{b}	6.56^{a}
Sugarcane bagasse compost	12.00^{c}	12.33^{c}	12.44^{c}
Tobacco waste compost	6.11^{a}	7.33^{a}	6.56^{a}
LSD 5%	2.23		

Numbers accompanied by the same superscripted letter in the same column and row show that they are not significantly different based on the 5% LSD test

Table 3: Number of leaves as the effect of different compost types and doses on pakcoy at 28 DAT

Treatment	Number of leaf at 28 DAT
Compost types	
Chicken manure compost	7.81^{b}
Sugarcane bagasse compost	9.93^{c}
Tobacco waste compost	5.78^{a}
LSD 5%	0.90
Compost dosage	
Dosage 10 ton ha^{-1}	8.00^{b}
Dosage 20 ton ha^{-1}	8.56^{b}
Dosage 30 ton ha^{-1}	6.96^{a}
LSD 5%	0.90

Numbers accompanied by the same superscripted letter in the same column show that they are not significantly different based on the 5% LSD test

Table 4: Interaction between different compost types and doses on pakcoy stem diameter at 14 and 21 DAT

	Stem diameter (cm/plant)		
Treatment	Dosage 10 ton ha^{-1}	Dosage 20 ton ha^{-1}	Dosage 30 ton ha^{-1}
14 DAT			
Chicken manure compost	0.26^{b}	0.18^{a}	0.15^{a}
Sugarcane bagasse compost	0.26^{b}	0.33^{c}	0.32^{c}
Tobacco waste compost	0.16^{a}	0.15^{a}	0.16^{a}
LSD 5%	0.05		
21 DAT			
Chicken manure compost	0.41^{cd}	0.36^{bc}	0.22^{a}
Sugarcane bagasse compost	0.52^{de}	0.62^{e}	0.53^{de}
Tobacco waste compost	0.18^{a}	0.23^{a}	0.27^{ab}
LSD 5%	0.12		

Numbers accompanied by the same superscripted letter in the same column and row show that they are not significantly different based on the 5% LSD test

Table 5: Stem diameter as the effect of different compost types and doses on pakcoy 7, 28 and 35 DAT

	Stem diameter (cm/plant) at 28 DAT		
Treatment	7 DAT	28 DAT	35 DAT
Compost types			
Chicken manure compost	0.14^{a}	0.38^{b}	0.40^{a}
Sugarcane bagasse compost	0.14^{a}	0.68^{c}	0.75^{b}
Tobacco waste compost	0.17^{b}	0.28^{a}	0.36^{a}
LSD 5%	0.02	0.08	0.10
Compost dosage			
Dosage 10 ton ha^{-1}	0.17^{b}	0.47^{b}	0.54^{b}
Dosage 20 ton ha^{-1}	0.14^{a}	0.49^{b}	0.55^{b}
Dosage 30 ton ha^{-1}	0.15^{ab}	0.38^{a}	0.42^{a}
LSD 5%	0.02	0.08	0.10

Numbers accompanied by the same superscripted letter in the same column show that they are not significantly different based on the 5% LSD test

Table 6: Interaction between different compost types and doses on pakcoy leaf area at 14 and 21 DAT

	Leaf area (cm/plant)		
Treatment	Dosage 10 ton ha^{-1}	Dosage 20 ton ha^{-1}	Dosage 30 ton ha^{-1}
14 DAT			
Chicken manure compost	33.57^{b}	17.71^{a}	8.25^{a}
Sugarcane bagasse compost	47.30^{c}	60.56^{d}	56.65^{cd}
Tobacco waste compost	7.44^{a}	11.45^{a}	12.00^{a}
LSD 5%	11.43		
21 DAT			
Chicken manure compost	75.29^{b}	41.24^{ab}	17.26^{a}
Sugarcane bagasse compost	128.73^{c}	174.26^{d}	137.95^{cd}
Tobacco waste compost	19.34^{a}	30.07^{a}	27.56^{a}
LSD 5%	36.70		

Numbers accompanied by the same superscripted letter in the same column and row show that they are not significantly different based on the 5% LSD test

Table 7: Leaf area as the effect of different compost types and doses on pakcoy 7, 28 and 35 DAT

	Leaf area (cm/plant)		
Treatment	7 DAT	28 DAT	35 DAT
Compost types			
Chicken manure compost	8.13[b]	76.46[a]	116.78[a]
Sugarcane bagasse compost	13.88[c]	275.24[b]	345.32[b]
Tobacco waste compost	5.75[a]	51.84[a]	76.74[a]
LSD 5%	3.4	52.66	77.35
Compost dosage			
Dosage 10 ton ha^{-1}	10.16	143.92	218.85
Dosage 20 ton ha^{-1}	9.37	161.84	179.57
Dosage 30 ton ha^{-1}	8.23	97.78	140.42
LSD 5%	ns	ns	ns

Numbers accompanied by the same superscripted letter in the same column show that they are not significantly different based on the 5% LSD test and ns: Not significant

Table 8: Interaction between different compost types and doses on pakcoy dry weight at 21 DAT

	Dry weight (g)		
Treatment	Dosage 10 ton ha^{-1}	Dosage 20 ton ha^{-1}	Dosage 30 ton ha^{-1}
21 DAT			
Chicken manure compost	0.23[b]	0.11[a]	0.09[a]
Sugarcane bagasse compost	0.30[b]	0.51[c]	0.32[b]
Tobacco waste compost	0.07[a]	0.09[a]	0.07[a]
LSD 5%	0.10		

Numbers accompanied by the same superscripted letter in the same column and row show that they are not significantly different based on the 5% LSD test

Table 9: Dry weight as the effect of different compost types and doses on pakcoy 14, 28 and 35 DAT

	Dry weight (g)		
Treatment	14 DAT	28 DAT	35 DAT
Compost types			
Chicken manure compost	0.08[b]	0.19[a]	0.49[a]
Sugarcane bagasse compost	0.14[c]	0.57[b]	1.40[b]
Tobacco waste compost	0.05[a]	0.19[a]	0.58[a]
LSD 5%	0.03	0.18	0.10
Compost dosage			
Dosage 10 ton ha^{-1}	0.08	0.58[b]	1.20
Dosage 20 ton ha^{-1}	0.09	0.55[b]	1.34
Dosage 30 ton ha^{-1}	0.08	0.33[a]	1.19
LSD 5%	ns	0.18	ns

Numbers accompanied by the same superscripted letter in the same column show that they are not significantly different based on the 5% LSD test and ns: Not significant

Table 10: Plant relative growth rate as the effect of different compost types and doses

	Relative growth rate (RGR) (g/g/week)		
Treatment	2-3 WAT	3-4 WAT	4-5 WAT
Compost types			
Chicken manure compost	0.57[a]	0.77	1.04
Sugarcane bagasse compost	1.00[b]	0.93	0.89
Tobacco waste compost	0.51[a]	0.87	1.10
LSD 5%	0.34	ns	ns
Compost dosage			
Dosage 10 ton ha^{-1}	0.78	0.96	0.81
Dosage 20 ton ha^{-1}	0.75	0.87	0.98
Dosage 30 ton ha^{-1}	0.56	0.74	1.23
LSD 5%	ns	ns	ns

Numbers accompanied by the same superscripted letter in the same column show that they are not significantly different based on the 5% LSD test, ns: Not significant and WAT: Weeks after transplanting

Table 11: Plant fresh weight as the effect of different compost types and doses on pakcoy

Treatment	Plant fresh weight (g)	Plant economic weight (g)	Harvest index
Compost types			
Chicken manure compost	19.89[a]	10.63[a]	0.89[b]
Sugarcane bagasse compost	32.03[b]	17.35[b]	0.90[b]
Tobacco waste compost	21.61[a]	11.08[a]	0.85[a]
LSD 5%	5.81	5.40	0.03
Compost dosage			
Dosage 10 ton ha^{-1}	23.28	20.58	89.90
Dosage 20 ton ha^{-1}	24.22	21.86	88.39
Dosage 30 ton ha^{-1}	26.03	22.67	86.15
LSD 5%	ns	ns	ns

Numbers accompanied by the same superscripted letter in the same column show that they are not significantly different based on the 5% LSD test and ns: Not significant

Table 12: Correlation matrix between harvest date, plant fresh weight, economic weight, harvest index, RGR and compost NPK content

	HD	PFW	EW	HI	RGR 2-3	RGR 3-4	RGR 4-5	N	K	P
HD	1									
PFW	0.35	1								
EW	0.34	0.99**	1							
HI	0.10	0.33	0.44	1						
RGR 2-3	-0.87**	-0.28	-0.30	-0.24	1					
RGR 3-4	-0.29	-0.59	-0.55	0.12	0.26	1				
RGR 4-5	0.56	0.53	0.57	0.49	-0.67*	-0.45	1			
N	0.25	0.91**	0.89**	0.16	-0.17	-0.61	0.5	1		
K	0.37	0.69*	0.68*	0.19	-0.39	-0.57	0.45	0.75*	1	
P	0.29	0.92**	0.89**	0.14	-0.19	-0.60	0.58	0.99**	0.69*	1

HD: Harvest date, PFW: Plant fresh weight, EW: Economic weight, HI: Harvest index, RGR: Relative growth rate, N: Compost nitrogen content, K: Compost kalium content and P: Compost phosphor content, If numbers in the table begin with a minus (-) it means there is a negative correlation, **Correlation had significantly different at the level of 0.01 and *Correlation had significantly different at the level of 0.05

rate parameter at all times of observation, while the treatment of the type of compost material at 2-3 WAT showed an effect on the relative growth rate parameters on pakcoy plants, where the addition of sugarcane bagasse compost fertilizer shows a higher relative growth rate compared to other types of compost. Plant growth is strongly influenced by the availability of balanced soil nutrients for plants[11] and compost derived from sugarcane bagasse is known to provide sufficient nutrients to be absorbed by plants so that it shows better growth than other types of other compost[6].

Yield components: The two treatments given to pakcoy plants did not show an interaction relationship on the parameters of plant fresh weight, plant economic fresh weight and harvest index on pakcoy plants (Table 11). Where in the parameters of plant fresh weight and economic fresh weight, different types of compost showed significantly different results and compost made from sugarcane blotting showed better plant fresh weight when compared to other types. The leaf part of the pakcoy plant is the part that is harvested for consumption so the yield is largely determined by the economic fresh weight of the leaf. Based on the results on the growth parameters of sugarcane blotting compost on pakcoy plants showed a higher leaf and plant growth value when compared to other compost fertilizers, which led to better yields indicated by plant fresh weight and plant economic weight. The application of compost derived from sugarcane blotting is known to improve the chemical, physical and biological properties of the soil and thereby increase the growth and yield of plants[12]. Sugarcane bagasse can produce organic acids that can mobilize insoluble P from the soil to the soil solution in a labile form[13], where P nutrient is often a problem in inhibiting plant growth due to its low availability in the soil[14].

Correlation: Based on the data of Table 12 the yield parameters of pakcoy plants, such as plant fresh weight and plant economic weight showed a positive correlation value with macronutrient content (N, P and K) of compost applied to pakcoy plants. This indicates that the increase in pakcoy yields is strongly influenced by the nutrient content of N, P and K in the compost given. Compost is organic material derived from the remains of living things such as animals and plants, which have undergone decomposition and which can supply large amounts of nutrients to the soil in a form that is more available and can be assimilated by soil microorganisms[15]. The availability of NPK nutrients due to the application of compost provides more advantages when compared to inorganic fertilizers which cause a decrease in soil quality and fertility. Application of macronutrient inputs with inorganic fertilizers can cause a decrease in several micronutrients, such as S, Ca, Mg, Zn and Cu[16].

Organic fertilizer is an environmentally friendly fertilizer and is a good source of nutrients for the improvement of degraded soils by improving organic matter and soil physical and chemical properties[17]. The application of compost can increase the number of micro-organisms of bacteria in the soil[18]. The application of organic fertilizer can provide nutrients N, P and K to the soil which has an impact on increasing the yield of pakcoy plants. Nitrogen is an important nutrient needed by plants because nitrogen is a constituent of chlorophyll which results in its availability greatly affecting the growth of vegetative organs in plants[19].

Potassium is a macro element needed by plants to help better growth. The role of potassium can help plants to metabolize carbohydrates and nitrogen and also helps stomata to carry out their functions normally[20]. Nitrogen and carbohydrates are very important in increasing plant biomass. Phosphorus is an important nutrient for plants, P nutrient deficiency in soil is a serious problem that causes a decrease in the productivity of cultivated plants in the world[21]. The availability of P in the soil will affect the development and growth of plant roots which can help better absorption of nutrients and encourage higher growth and yields[22].

Organic pakcoy cultivation is highly recommended using sugarcane bagasse compost. The results of the study using sugarcane bagasse compost will produce greater fresh weight than chicken manure compost and tobacco waste compost. The use of a small compost dose of 10 tons ha^{-1} has the same results compared to 20 and 30 tons ha^{-1}, so the use of sugarcane bagasse compost with the recommended dose of 10 tons ha^{-1} is more efficient.

CONCLUSION

Based on the results of the study, the application of organic fertilizer made from sugarcane blottings on pakcoy plants showed better plant growth and yields when compared to compost made from chicken manure and tobacco waste. The application of compost made from sugarcane bagasse showed the highest fresh and economic weight yields of 32.03 and 17.35 g, respectively. Increasing the dose of compost to 30 tons ha^{-1} does not show an increase in the yield of pakcoy plants. The content of macronutrients N, P and K in compost showed a positive correlation with the yield of pakcoy.

SIGNIFICANCE STATEMENT

The function of the yard is to produce food as an addition to the family. The yard can be defined as a plot of land around the house that is easy to cultivate to increase the fulfillment of micronutrients through improving the family menu. The yard is often also referred to as a living barn, a living shop or a living pharmacy. Under certain conditions, the yard can take advantage of the garden/swamp around the house. Technical use of yard land can be done by utilizing waste. One of them for planting media can be composted from the rest of the harvested land for cultivation. This study analyzes the effect of 3 types of compost and their dosages on organic garden farming. The research examines aspects of compost quality and the benefits of compost on the growth and yield of pakcoy plants.

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