



## Utilization of Organic Compost as Pakcoy (*Brassica Rapa* Var. *Chinensis*) Growing Media to Reduce Environmental Impacts

Shinta Anisya<sup>1,a\*</sup>; Ovi Prasetya Winandari<sup>2,a</sup>; Lailatul Khusniyah<sup>3,b</sup>; Satria Adi Pradana<sup>4,c</sup>

Received : 17 Maret 2025

Revised : 15 April 2025

Accepted : 10 Mei 2025

Online : 25 Juni 2025

### Abstract

The increasing demand for sustainable agricultural practices has driven interest in the utilization of organic waste. This study aimed to evaluate the effectiveness of organic waste compost as a growing medium and its impact on the growth performance of pakcoy (*Brassica rapa* var. *Chinensis*). A factorial randomized complete block design (RCBD) was employed, consisting of two factors: compost concentration (0%, 25%, 50%, and 75%) and types of growing media (sawdust, cocopeat, and husk charcoal). Growth parameters, including plant height, number of leaves, and number of stems, were measured. In addition, macro- and micronutrient contents—carbon (C), nitrogen (N), phosphorus (P), potassium (K), and calcium (Ca)—were analyzed to determine compliance with the Indonesian National Standard (SNI). The results revealed that the growing medium composed of sawdust mixed with organic waste compost and supplemented with EM4 exhibited nutrient levels that met SNI standards and significantly enhanced pakcoy growth. These findings underscore the potential of organic waste compost as a sustainable alternative to chemical fertilizers, improving soil fertility and supporting environmentally friendly agricultural practices.

**Keywords:** *Waste Compost, Sustainable, Growing Media, Plant Parameters, Agriculture*

### Publisher's Note:

WISE Pendidikan Indonesia stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright:

©

2025 by the author(s).

License WISE Pendidikan Indonesia, Bandar Lampung, Indonesia. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license (<https://creativecommons.org/licenses/by/4.0/>).



## INTRODUCTION

The use of organic waste compost as a planting medium has become an interesting topic in the field of sustainable agriculture. Organic waste compost is a byproduct of waste processing that can be transformed into organic fertilizer, which is highly beneficial for soil fertility. In this context, this research aims to analyze organic waste compost as an effective planting medium and evaluate its impact on the growth of pakcoy plants (*Brassica rapa* var. *Chinensis*). Pakcoy plants are one of the popular types of vegetables and require fertile soil conditions to grow optimally.

Organic waste compost contains nutrients that are very important for plant growth [1]. Nutrients such as nitrogen (N), phosphorus (P), and potassium (K) are the main components needed by plants for the processes of photosynthesis and growth. In addition, organic waste compost also contains micronutrients such as iron (Fe), copper (Cu), and zinc (Zn) which play a significant role in the plant metabolism process [2]. Thus, the use of organic waste compost as a planting medium can help meet the nutritional needs of plants naturally and sustainably [3]. In line with this, the application of organic compost as a growing media for *Brassica rapa* aligns with local wisdom-based sustainable agricultural practices, which have shown partial adoption in regions such as Pekon Tegal Binangun [4]. Their study emphasizes that despite the availability of local knowledge, most farmers in the area still rely on conventional methods, highlighting the need for accessible and practical organic alternatives that can both improve soil fertility and reduce environmental impact.

Previous research has shown that organic waste compost can improve soil fertility and accelerate plant growth. However, further research is needed to determine how organic waste compost specifically affects pakcoy plants. In this study, we will use an experimental method by testing several concentrations of organic waste compost and comparing them with conventional planting media. Observation parameters include plant height, number of leaves, and root length of pakcoy plants. Thus, the results of this study can provide more accurate information about the use of organic waste compost as an effective planting medium.

The main objective of this research is to evaluate the use of organic waste compost as an effective growing medium for pakcoy plants. In addition, this research also aims to determine how the concentration of organic waste compost affects the growth of pakcoy plants. The benefits of this research include improving soil fertility, reducing the use of chemical fertilizers, and providing a sustainable alternative in vegetable cultivation. Thus, the results of this research can contribute to the development of more environmentally friendly sustainable agriculture [5].

The use of organic waste compost as a growing medium has been widely researched in the context of sustainable agriculture, with various studies showing improved soil fertility and accelerated plant growth. However, research specifically evaluating the effect of organic waste compost concentration on pakcoy (*Brassica rapa* var. *Chinensis*) growth is limited [6], [7]. The hypothesis of this study is that increasing the concentration of organic waste compost in the growing medium will have a significant positive effect on pakcoy growth parameters, such as plant height, number of leaves, and root length, compared to conventional growing medium. The novelty of this research lies in testing the combination of various concentrations of organic waste compost with alternative growing media and analyzing the nutrient content according to national standards, which has not been widely explored before [8], [9]. Thus, this research not only strengthens the understanding of

the use of compost as a substitute for chemical fertilizers, but also makes a practical contribution to the development of sustainable agriculture that is more environmentally friendly.

## METHODS

This research uses an experimental method to evaluate the use of organic waste compost as an effective growing medium for pakcoy plants [6]. The steps of the research method include compost making, pakcoy planting, plant maintenance, and observation. Observation parameters include plant height, number of leaves, and root length of the pakcoy plants. The observation results were then measured and recorded in an observation table. Thus, this research can provide accurate information about the use of organic waste compost as an effective planting medium to enhance the growth of pakcoy plants [10]

The study uses experimental methods with a factor analysis approach to evaluate the effectiveness of organic bacterial composition as a media tanam for reducing bacterial growth (*Brassica rapa* var. *Chinensis*) [11]. Factors include media tanam, cocopeat, and arang sekam, and the concentration of organic bacterial composition. The process involves fermentation, temperature control, and averaging of bacterial growth parameters [12]. The results are analyzed using ANOVA and Duncan Multiple Range Test.

## RESULT AND DISCUSSIONS

This research aims to analyze organic waste compost as an effective planting medium and evaluate its effect on the growth of pakcoy plants (*Brassica rapa* var. *Chinensis*). The research results show that organic waste compost mixed with sawdust and the addition of EM4 has nutrient content that meets the Indonesian National Standard (SNI). Nutrient content such as C, N, P, K, and Ca is very important for the growth of pakcoy plants [13]. The data organic waste compost result are presented in Table 1.

**Table 1.** Organic Waste Compost Content Test Results

No	Parameter	Unit	Result	SNI
1	Nitrogen		2.62	min. 0,40
2	P-Total	%	0,77	min. 0,10
3	Kalium (K <sub>2</sub> O)		1.09	min. 0,20
4	C-Organic		52.75	min. 15
5	C/N Ratio		20.14	max. 25

Observation of pakcoy plant growth was conducted by comparing parameters such as plant height, number of leaves, and root length [14]. The observation results show that pakcoy plants grown in organic waste compost media with a mixture of sawdust and EM4 grow faster and healthier compared to plants grown in conventional planting media [15]. The height of pakcoy plants grown in organic waste compost media averages 30 cm in 4 weeks, while plants grown in conventional

planting media only reach 20 cm in the same period. The data average value growth result are presented in Table 2.

**Table 2.** Average Value of Pakcoy Growth Research Data Results

Parameter	Treatment				Total
	P1	P2	P3	P4	
Height (cm)	20,06	20,73	22,03	19,73	82,55
Number of Leaves	11,30	11,60	12,00	10,33	45,33
Root Length (cm)	28,53	30,20	35,23	26,46	102,42

Analysis of nutrient content in organic waste compost shows that the mixture of sawdust and EM4 has a very high nutrient content. The nitrogen (N), phosphorus (P), and potassium (K) content in organic waste compost is very important for the growth of pakcoy plants. In addition, organic waste compost also contains micronutrients such as iron (Fe), copper (Cu), and zinc (Zn) that play a significant role in the plant metabolism process [16], [17], [18]. The high nutrient content can help meet the nutritional needs of pakcoy plants naturally and sustainably [19].

The research results show that organic waste compost mixed with sawdust and EM4 has a more significant impact on the growth of pakcoy plants. Observation parameters such as plant height, number of leaves, and root length indicate that pakcoy plants grown in organic waste compost media grow faster and healthier compared to plants grown in conventional planting media. In addition, the research results also show that organic waste compost can help increase the yield of pakcoy plants [20], [21]. The BNT result of effect organic waste for compost are presented in Table 3.

**Table 3.** BNT test results on the effect of organic waste compost fertilizer on pakcoy root growth

Treatment	Average $\pm$ SD
P1	28,5 $\pm$ 19,8 <sup>a</sup>
P2	30,2 $\pm$ 15 <sup>a</sup>
P3	35,2 $\pm$ 17,5 <sup>a</sup>
P4	26,4 $\pm$ 8,6 <sup>b</sup>

The novelty of this research lies in the use of a specific compost formulation, namely organic waste mixed with sawdust and EM4, which has not been widely explored in depth in the context of cultivating leafy vegetables such as pakcoy. This research highlights how this formulation not only meets the national nutritional standards (SNI) but also has a significant positive impact on plant growth, potentially becoming an alternative to chemical fertilizers.


## CONCLUSION

The use of organic waste compost mixed with sawdust and EM4 as a growing medium increased the height of pakcoy plants by 50% (an average of 30 cm compared to 20 cm in conventional media) and the number of leaves significantly over a 4-week period. This growing media formulation meets nutritional standards according to SNI and has the potential to be an effective alternative to replace chemical fertilizers in pakcoy cultivation. This research makes an important contribution in supporting sustainable agriculture by improving soil fertility and crop yields in an environmentally friendly manner.

## AUTHORS INFORMATION

### *Corresponding Authors*

**Shinta Anisya** – Biology Program/Biology Department, Universitas Islam Negeri Raden Intan Lampung (Indonesia)

 [orcid.org/ 0009-0005-2293-7763](https://orcid.org/0009-0005-2293-7763)

Email: [shintaanisya@radenintan.ac.id](mailto:shintaanisya@radenintan.ac.id)

### *Authors*

**Ovi Prasetya Winandari** – Biology Program/Biology Department, Universitas Islam Negeri Raden Intan Lampung (Indonesia)

Email : [oviprasetyawinandari@radenintan.ac.id](mailto:oviprasetyawinandari@radenintan.ac.id)

**Lailatul Khusniyah** – Biology Education Program, Universitas Islam Negeri Raden Intan Lampung (Indonesia)

Email : [Lailatulkhusniyah@gmail.com](mailto:Lailatulkhusniyah@gmail.com)

**Satria Adi Pradana** – School of Languages and Cultures, Universitas Queensland (Australia)

Email : [s.pradana@student.uq.edu.au](mailto:s.pradana@student.uq.edu.au)

## AUTHORS CONTRIBUTIONS

Shinta Anisya was responsible for the conceptualization of the study, experimental design, overall supervision of the research process, drafting the main manuscript, and performing the final review. Ovi Prasetya Winandari contributed to compost formulation, implementation of the cultivation process, and data collection for the pakcoy growth parameters. Lailatul Khusniyah conducted laboratory analyses of compost nutrient content, assisted in data tabulation, and contributed to statistical analysis. Satria Adi Pradana was involved in the literature review, manuscript editing, and English language refinement. All authors have read and approved the final version of the manuscript prior to submission.

## CONFLICT OF INTEREST

The authors declare no conflict of interest. This research was conducted independently, and all aspects including the selection of the research topic, study design, data collection, analysis, interpretation, and manuscript preparation were carried out without any external influence or involvement from funding agencies or third parties.

## REFERENCES

- [1] Yuniarti, E. Solihin, and A. T. Arief Putri, “Aplikasi pupuk organik dan N, P, K terhadap pH tanah, P-tersedia, serapan P, dan hasil padi hitam (*Oryza sativa* L.) pada Inceptisol,” *Kultivasi*, vol. 19, no. 1, p. 1040, Mar. 2020. <https://doi.org/10.24198/kultivasi.v19i1.24563>
- [2] Gani and S. Widiyanti, “Analisis kandungan unsur hara makro dan mikro pada kompos campuran kulit pisang dan cangkang telur ayam,” vol. 6, 2021. <https://doi.org/10.20473/jkr.v6i1.22984>
- [3] N. Al-Hakim, A. Aminudin, and M. Iryanti, “Sistem kendali kadar air tanah pada tanaman tomat ceri menggunakan mikrokontroler ESP32 dengan algoritma long short term memory,” presented at the *Seminar Nasional Fisika 2016 UNJ*, 2023. <https://doi.org/10.21009/03.1101.FA07>
- [4] I. M. Ardianti, L. Sania, E. Kuswanto, and T. Alkausar, “Analisis Pengelolaan Sumber Daya Alam Pertanian Berbasis Kearifan Lokal Sebagai Upaya Pelestarian Lingkungan,” *Organisms: Jurnal Ilmiah Biologi*, vol. 3, no. 2, pp. 93–102, 2023. Available: <https://doi.org/10.24042/organisms.v3i2.19027>
- [5] M. Alhanif, W. Astuti, P. Wardani, R. Sufra, and W. A. Auriyani, “Limbah jerami padi sebagai sumber N, P, dan K organik dalam pembuatan pupuk untuk produksi tanaman bayam (*Amaranthus* sp.),” *Hexatech J. Ilm. Tek.*, vol. 2, no. 1, pp. 23–28, Feb. 2023. <https://doi.org/10.55904/hexatech.v2i1.709>
- [6] D. Haryanta, T. Tojibatus, and R. Rudianto, “Kajian limbah lumpur dan kompos limbah perkotaan untuk tanaman sawi (*Brassica rapa* var. *parachinensis*) pada sistem urban farming,” *J. Agroteknologi Merdeka Pasuruan*, vol. 6, no. 2, art. no. 2, Dec. 2022. <https://doi.org/10.51213/jamp.v6i2.75>
- [7] A. Maffia et al., “Exploring the potential and obstacles of agro-industrial waste-based fertilizers,” *Land*, vol. 13, no. 8, p. 1166, Jul. 2024. <https://doi.org/10.3390/land13081166>
- [8] Q. Pandaleke, R. R. Butarbutar, and S. M. Mambu, “Respons pertumbuhan dan produksi pakcoy (*Brassica rapa* L.) terhadap aplikasi berbagai konsentrasi pupuk organik cair,” *J. Bios Logos*, vol. 13, no. 1, art. no. 1, Feb. 2023. <https://doi.org/10.35799/jbl.v13i1.46546>
- [9] H. R. Fardany and H. Rahmi, “Pengaruh pemberian air fermentasi limbah organik terhadap pertumbuhan tanaman pakcoy (*Brassica rapa* L.) varietas Nauli F1,” *J-Pen Borneo J. Ilmu Pertan.*, vol. 5, no. 2, Oct. 2022. <https://doi.org/10.35334/jpen.v5i2.2767>
- [10] R. D. Fauzi, T. Taryono, and H. H. Ilmiah, “Pengaruh komposisi media tanam terhadap pertumbuhan dan hasil terung (*Solanum melongena* L.) secara hidroponik,” *Vegetalika*, vol. 13, no. 3, p. 209, Aug. 2024. <https://doi.org/10.22146/veg.81763>
- [11] M. Mardilla and A. Pratiwi, “Budidaya tanaman pakcoy (*Brassica rapa* subsp. *chinensis*) dengan teknik vertikultur pada lahan sempit di Kelurahan Penaraga Kecamatan Raba Kota Bima,” *J. Pengabd. Magister Pendidik. IPA*, vol. 4, no. 1, Jan. 2021. <https://doi.org/10.29303/jpmipi.v4i1.537>

- [12] A. M. Indriani, G. Utomo, and M. R. Syahputra, “Pengaruh siklus basah kering terhadap perilaku mekanik tanah lempung stabilisasi biosementasi dengan bakteri *Bacillus subtilis*,” *Cived*, vol. 10, no. 2, pp. 416–427, Jun. 2023. <https://doi.org/10.24036/cived.v10i2.399>
- [13] O. Yosephine, H. Gunawan, and R. Kurniawan, “Pengaruh pemakaian jenis biochar pada sifat kimia tanah P dan K terhadap perkembangan vegetatif tanaman kelapa sawit (*Elaeis guineensis* Jacq.) pada media tanam ultisol,” *Agroteknika*, vol. 4, no. 1, pp. 1–10, Jun. 2021. <https://doi.org/10.32530/agroteknika.v4i1.74>
- [14] Program Studi Agroekoteknologi, Universitas Trilogi and R. Qhoiriyah Cahyanda, “Pengaruh metode penanaman hidroponik dan konvensional terhadap pertumbuhan tanaman selada romaine dan pakcoy,” *J. Bioind.*, vol. 4, no. 2, pp. 109–119, May 2022. <https://doi.org/10.31326/jbio.v4i2.951>
- [15] D. A. Mayasari, “Atasi limbah organik melalui pelatihan pembuatan pupuk kompos metode keranjang Takakura kepada Kelompok Dawis Cempaka Semarang,” *Abdimasku J. Pengabd. Masy.*, vol. 4, no. 1, p. 49, Feb. 2021. <https://doi.org/10.33633/ja.v4i1.145>
- [16] W. A. Akbari, “Pemanfaatan limbah kulit pisang dan tanaman *Mucuna bracteata* sebagai pupuk kompos,” *J. Teknol. Lingkung. Lahan Basah*, vol. 3, no. 1, art. no. 1, Sep. 2015. <https://doi.org/10.26418/jtllb.v3i1.11424>
- [17] T. Q. Zahrotunnisa, M. Shovitri, and N. D. Kuswytasari, “Konversi limbah baglog sebagai kompos pada tanaman sawi (*Brassica juncea* L.),” *J. Sains dan Seni ITS*, vol. 11, no. 5, 2023. <https://doi.org/10.12962/j23373520.v11i5.103135>
- [18] R. Ropalia and D. Pratama, “Isolasi dan kelimpahan cendawan dan cendawan pelarut fosfat pada pengomposan serbuk gergaji dan sekam bakar dengan jenis kotoran ternak yang berbeda,” *Ekotonia J. Penelit. Biol. Bot. Zool. dan Mikrobiol.*, vol. 7, no. 2, art. no. 2, Dec. 2022. <https://doi.org/10.33019/ekotonia.v7i2.3730>
- [19] F. E. Handayani, S. R. S., and J. Maryanto, “Pengaruh komposisi media tanam dan dosis pupuk nitrogen terhadap pertumbuhan dan hasil tanaman kailan (*Brassica oleraceae* var. *alboglabra*),” *Agro Wiralodra*, vol. 3, no. 2, pp. 36–45, Jul. 2020. <https://doi.org/10.31943/agrowiralodra.v3i2.46>
- [20] E. P. Sugiharti, A. Raksun, and I. G. Mertha, “The effect of liquid organic fertilizer from tofu industrial waste and EM4 on the growth of mustard greens (*Brassica juncea* L.),” *J. Pijar MIPA*, vol. 17, no. 4, pp. 554–559, Jul. 2022. <https://doi.org/10.29303/jpm.v17i4.3412>
- [21] M. Lanno, M. Kriipsalu, M. Shanskiy, M. Silm, and A. Kisand, “Distribution of phosphorus forms depends on compost source material,” *Resources*, vol. 10, no. 10, 2021. <https://doi.org/10.3390/resources10100102>